Institutional Quality and Economic Growth:
A Theoretical Framework Analysis

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Table of Contents

Abstract

Recent literature on institutions and economic growth lays its emphasis on the institutions as an efficiency parameter which enhances the ability of factors of production to contribute to the output. However, this study focuses on the proposition that institutional quality not only acts as an efficiency enhancing parameter but also plays a significant role in determining the stock-level of the factors of production. This results in an increased role of institutional quality in determining and explaining income differentials among the countries. A theoretical framework has been proposed in the study to incorporate such a role of institutional quality. The study employs the system GMM to estimate the empirical relationship between institutional quality and economic growth.

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Dedication

This paper is dedicated to the “hope” that the quality of governance will improve in our country and socio economic prosperity will not be a mere idea anymore.

Chapter 1

1.1 Introduction

Wealth of nations and differences among incomes of countries has been the focus of economists since decades. Many models have been proposed to explain the growth patterns of the countries. Each aims at particular set of aspects of the growth ranging from savings, physical capital, technological change and relatively recent developments include human capital and institutional quality (Sato, 1964).

Institutional quality, though relatively a recent area of interest in growth literature, is considered to be one of the most important factors contributing to economic growth. Several channels have been proposed by different theorists through which quality of institutions affects economic growth. North (1990) sheds light on transaction costs while Acemoglu, Johnson and Robinson (2001) differentiate between extractive and growth promoting institutions. Kong, (2001) considers the provision of public goods while Grastein (2004), Kaufmann and Kraay, (2003) and Porta et,al (1999) take institutions as a key factor that raise the overall efficiency of other factors in the production process thus affecting the growth positively. However in our opinion institutional quality deserves much more attention than it has received in the growth process and this is where the scope of this study lies.

Institutional quality is not a direct factor of production and can hardly replace labor or capital yet it can produce considerable impact on growth nonetheless- an impact which must not be confused with a mere efficiency parameter. This study is based on the notion that institutions quality besides playing its usually conceived role of efficiency parameter also affects the stock of human capital. Meaning thereby that institutional quality not only raises the efficiency of

available stock of both physical and human capital production function but also plays an instrumental role in the accumulation of the latter. This can be intuitively justified based on the view that better quality of institutions raises the overall efficiency of budgetary outlays directed towards the programs directly affecting human capital (Baldacci et, al, 2004). Such programs include investments in education and health sector. Unlike conventional literature, recent literature has also incorporated health conditions as part of human capital (Bloom and Canning, 2003). So much so that Thomas (1998) considers health as important a factor as education in determining the wage differentials. Better law and order conditions, lack of corruption and protection of property right raise the returns to investments in human capital and innovation (Kaasa, Kaldaru & Parts, 2007) which in turn promote technological advancements thus compounding the effects of institutional quality.

The major contribution that this study makes to the development of knowledge is to identify the institutional quality as an important source of accumulation of human capital. Moreover, the study identifies the channels through which institutional quality curbs the depreciation rate of the human capital, thereby positively affects its stock.

1.2 Background of the Study

Institutional quality has not always been given the same importance in explaining the growth trends of the countries as it is enjoys today. In fact earlier economists like Adam Smith and Marshall propagated the view of laissez faire governments, the only desired role of which was to perform no role (Porta et,al, 1999). Even in neo classical models of economic growth the role of government was not given any credible place. Though focus of economists witnessed a change from conventional factors of production like labor and capital as early as early the sixties and ideas like technological change and knowledge economy started finding a place in growth

literature yet institutions remained quite unheard off. So much so that even corruption used to be considered as good or at least harmless for the economic well-being of a country (Wie, 1998). However when institutional degradation led to economic slump in Russia, Latin America and Asian economies, the world witnessed a shift in focus of growth literature. Works started appearing which relied heavily on institutional framework to explain the income differences among nations (Rodrik, 1999).

Several propositions and linkages appeared to explain the role of quality of institutions as an explanatory variable. North (1990) focuses on transactions costs and opportunity costs. According to North (1990) good institutional quality reduces transactions costs and thus encourages economic growth .For example better law and order situations considerably affects the income level of a country (Przeworski and Limongi, 1993). Similarly empirical studies also support the proposition that the institutional quality is closely linked with the human capital of the country which in turn stimulates economic growth (Baldacci et al; 2004). Despite the fact that the role of institutions as a cause of economic growth is now an accepted fact yet it has found little place in modeling economic growth. Only a few studies have incorporated institutional quality in economic growth modeling. Rivera-Batiz (1999) has discussed the positive role of institutional quality by reducing optimal rate of corruption in the economy while Kong (2011) discusses the efficiency of public expenditure as a channel through which institutions impact economic growth.

Gradstein (2004) also provides a dynamic analysis framework and concludes that better institutional quality raises the future income as well as consumption level. All these studies directly or indirectly aim at recognizing the role of institutional quality as efficiency parameter, raising the productivity of capital. However we are not aware of any study which has focused on

the impact of institutional quality on the stock of human and physical capital. This is the main issue that this study is focusing upon.

1.3 Objectives of the Study

This study primarily focuses on analyzing the role of institutional quality on the long term growth patterns of an economy. Theoretical considerations have been catered using an extension of Solow-Swann model incorporating human capital as a factor of production. Steady-state analysis has been carried out to demonstrate the long run impact of institutional quality on economic growth. Moreover, to capture the impact of institutional quality on economic growth, system GMM has been used. The primary objectives of the study include:

- Developing a functional hypothesis to explain the channels through with institutional quality affects economic growth ;
- Developing a standard growth model consistent with the linkages explained;
- Analyzing how institutional quality impacts economic growth;
- Comparing the impact of institutional quality on economic growth in developed and developing countries.

1.4 Organization of the Study

Rest of the study proceeds as follows. Section 2 discusses the relevant literature and identifies the gaps. Section 3 primarily focuses on the theoretical foundations of the model. It also includes the empirical model formulated to examine the impact of institutional quality on economic growth in developing and developed countries. Section 4 is about the data and. Section 5 reports and interprets the estimation results and section 6 concludes the study

Chapter 2
Literature Review

The terms, governance and institutions are considered to be relatively new to the growth literature. Although hints about the role of social planner have been made as early as Ramsey (1928) Cass (1965) and Koopmans (1965) however the more obvious and direct factors of growth engrossed most of the attention of mid 20th-century economists. It is only towards the end of the previous century that institutional quality and efficiency of government started to be considered as important factors to explain the long term income differentials among the countries.

Rodrik (1999) opines that there are three main, though unrelated, developments in the international arena which led the shift of focus of economists towards the institutional quality as explanatory variable for economic growth. First development is the outright failure of Russian efforts to stabilize price structure without having introduced any allied legal and regulatory infrastructure. Second event is considered to be the back-firing of market oriented reforms in Latin American countries which played havoc with the social safety programs thus leading to wide-spread dissatisfaction among the masses. Last but not the least is the Asian financial crisis which proved the fact that financial liberalization without adequate regulation is not only futile but disastrous as well. These developments contributed to the present shift of growth literature towards institutional setup.

There have been several developments on the linkages regarding how institutions influence the growth path. Set rules and established institutions guarantee property rights and reduce uncertainty which makes it easier for the investors to estimate the opportunity costs effectively and engage in entrepreneurial activities as proposed by North (1990). Democratic

institutions also promote growth by reducing the incentive to involve in corrupt practices which in turn promote technological change and stimulate growth in the economy (Rivera-Batiz, 1999). Olson (1993) puts it in slightly different way and maintains that the performance of a government also depends upon the horizon of its rule. Longer horizon and security of tenure results in reduced corruptions. The same argument explains the inefficiency of autocratic regimes which have little tenure security. Przeworski and Limongi (1993) have argued that the political systems having good law enforcing and law adjudicating infrastructure tend to better protect the proprietary and contract rights - a phenomenon the importance of which in determining the growth can hardly be over-emphasized. Similar conclusions have been put forward by Rodrik (1999) where it is maintained that a legislator and a police force is absolutely necessary for even perfect markets to function smoothly.

Institutional quality directly affects the private investments in a country (Baldacci**,** Hillman& Kojo, 2003) particularly when it comes to the developing economies. Economies with low levels of capital stock available, need impetus for economic growth and private investments become pivotal in such a case when government does not have enough resources to lead the growth run. Kong (2011) on the contrary presumes that government performance is like a double edged sword. On one hand government investment internalizes the externalities of private investors and on the other hand this has to deal with the externalities of its own. It not only affects the growth rate by efficient provision of public goods and social overhead capital but also by exercising self-restrain on its own coercive activities. A similar conclusion has been upheld in Baldacci et, al (2005). The study observes that fiscal policies of government play an important part in determining the growth patterns of an economy. Composition of budgetary outlays also explains part of income growth. It has been observed that economies with budgets primarily

comprising of wages and non-development budget tend to grow slower as compared with economies having huge portions dedicated to capital investments.

Another dimension in institutional growth economics is how institutional quality affects human capital and growth. Introduction of human capital to growth literature owe a lot to the ground breaking works of Schultz (1961) and Becker (1964) which in turn has made the investments in human capital an important variable that may explain economic growth. The growth experience in Sub-Saharan area maintains quite different conclusions in the sense that despite substantial investments in education, growth rate has not experienced any noticeable change. Prichett (2001) comes up with a probable explanation. The study concludes that without sound quality of institutions, increasing education will not only be a useless exercise but also at times backfires as it did in African case.

Human capital dimension is not restricted to mere education. Researchers have started to include health capital also in the preview of human capital. The rationale is that a person with good physical and mental health may not only work for longer hours and provide more labor but also get efficiently and effectively involved in the production process (Baldacci et, al, 2004). Similarly in microeconomic setup, Thomas (1998) opines that good health contributes to wage differentials at least as effectively as contributed by education. Bloom and Canning (2003), Bloom and Canning (2004), and Gyimah-Brempong and Wilson (2004) extend this view to macroeconomic settings and conclude that health capital variables do have considerable impact on the aggregate output level.

Empirical work has dominated the literature on institutions and growth. Theoretical modeling has grabbed much less attention. That is why even after so many years we scarcely find works in which institutional quality and institutional parameters have been incorporated as

determinants of economic growth. Kong (2011) also presents a model which incorporates institutional quality in economic growth. However it assumes that institutional quality impacts the growth by the magnitude of public investments alone. Thus the literature severely lacks a proper growth model in which role of institutions is adequately incorporated. The depreciation of human capital is usually taken as constant, an assumption which needs to be relaxed

Chapter 3
Theoretical and Empirical Framework

3.1 Theoretical Framework

The primary aim of this section is to develop a theoretical framework which would incorporate the role of institutional quality in a growth model.

To make things simpler we have chosen a variant of standard Slow-Swann (1956) model. This model has been proposed by Mankiw, Romer, and Weil (1992) commonly known as human capital augmented Solow model of economic growth. First we present the standard assumptions of the Slow-Swan model, followed by brief mechanics of the model. Moving forward we will relax certain assumption to introduce institutional quality and derive the mechanics of the model.

3.2 Standard Assumptions of Human Capital Augmented Solow-Swann Model

Slow-Swann model is based on following fundamental assumptions.

- The small, closed economy is assumed which produces single output, Y.
- There are three factors of production, physical capital, human capital and labor.
- Cobb- Douglas production function is assumed which exhibits constant returns to scale when all three inputs are taken together while diminishing returns to scale hold for each input individually.
- Inada Conditions are assumed to hold.
- All markets are perfectly competitive.
- All firms are assumed to be identical in nature.
- Labor and technological changes are exogenously determined.

3.3 Mechanics of the model

Following is the production function of the economy satisfying above mentioned assumptions.

$$Y(t) = [K(t)]^{\alpha} . [H(t)]^{\beta} . [A(t). L(t)]^{1-\alpha-\beta} \text{.....(3.1)}$$

$\alpha , \beta \in [0,1]$ and $\alpha + \beta \in [0,1]$.

Where

Y = National income

K= capital stock

H= human capital stock which comprises of both education and health capital

L= total population

A refers to the labor augmenting technology and "t" in parenthesis shows the time dependency of different variables.

Both physical and human capitals are assumed to follow the following accumulation functions.

$$\dot{K}(t) = s_k Y(t) - \delta K(t) \text{ .....3.2}$$

$$\dot{H}(t) = s_H Y(t) - \delta H(t) \text{ .....3.3}$$

The function simply states that increase in capital stock is equal to amount invested in that type of capital minus the depreciation.

Labor and technology are assumed to grow exogenously at the following rate.

$$\dot{L} = n\,L(t) \qquad \text{and} \qquad \dot{A} = x\,A(t)$$

Output in intensive form, in terms of effective labor can be written as

$$\tilde{y}(t) = \tilde{k}^{\alpha}(t)\,\tilde{h}^{\beta}(t) \quad \text{.....3.4}$$

Where

$\tilde{y}$ is national income per efficiency units of labor

$\tilde{k}$ is Physical capital per efficiency units of labor

$\tilde{h}$ is Human capital per efficiency units of labor

Taking time derivatives of change in K(t) and H(t) we can arrive at the capital accumulation functions of human and physical capitals.

$$\dot{\tilde{k}} = s_K\tilde{y}(t) + [x + n + \delta]\tilde{k}(t) \quad \text{.....3.5}$$

$$\dot{\tilde{h}} = s_H\tilde{y}(t) + [x + n + \delta]\tilde{h}(t) \quad \text{.....3.6}$$

At steady state the physical and human capital remain constant which implies

$$\dot{\tilde{k}} = 0 \quad \text{and} \quad \dot{\tilde{h}} = 0$$

and

$$s_K\tilde{y}(t) = [x + n + \delta]\tilde{k}(t) \quad \text{.....3.7}$$

$$s_H\,\tilde{y}(t) = [x + n + \delta]\tilde{h}(t) \quad \text{.....3.8}$$

This is the steady state condition, much similar to standard Solow-Swann model.

Now putting the values from eq. 3.4 to eq 3.6 and after simple algebraic manipulations we obtain

$$\tilde{h}(t) = \left[\frac{s_H}{(x+n+\delta)}\right]^{1/(1-\beta)} . \tilde{k}^{\alpha/(1-\beta)}(t) \quad \text{.....3.9}$$

Now substituting this expression in eq. 3.5 and solving it for $\tilde{k}(t)$. After rearranging we arrive at the following expression for $\tilde{k}(t)$ which is denoted by $\tilde{k}^*(t)$ whch denotes the steady state level of $\tilde{k}(t)$.

$$\tilde{k}^*(t) = \left[\frac{s_K}{(x+n+\delta)}\right]^{1-\beta/(1-\alpha-\beta)} . \left[\frac{s_H}{(x+n+\delta)}\right]^{\beta/(1-\alpha-\beta)} \quad \text{.....3.10}$$

Putting the eq.3.10 in eq. 3.9 and after slight algebraic manipulations, we arrive at the steady state expression for human capital ($\tilde{h}^*(t)$). The following expression is obtained.

$$\tilde{h}^*(t) = \left[\frac{s_H}{(x+n+\delta)}\right]^{1-\alpha/(1-\alpha-\beta)} . \left[\frac{s_K}{(x+n+\delta)}\right]^{\alpha/(1-\alpha-\beta)} \quad \text{.....3.11}$$

The steady state equations imply that the steady state level of each of the capital stock (both physical and human) is influenced by the portion of output invested in each type of capital.

Now to solve for steady state expression of output we put the expressions of $\tilde{h}^*(t)$ and $\tilde{k}^*(t)$ in the equation of $\tilde{y}(t)$. We obtain the following expression after rearing the resulting equation.

$$\tilde{y}^*(t) = \left[\frac{s_K}{(x+n+\delta)}\right]^{\alpha/(1-\alpha-\beta)} . \left[\frac{s_H}{(x+n+\delta)}\right]^{\beta/(1-\alpha-\beta)} \quad \text{.....3.12}$$

This expression of steady state level of output is again quite similar to that of standard Solow-Swann model which is a special case of this model with $\beta = 0$. Other dynamics of the model are fairly similar.

3.4 Theoretical foundations of the model

In this section the modified version of human capital augmented model is presented. However before presenting the augmented model we have to make certain assumptions to formulate the model. First we assume that the efficiency of physical and human capital is greatly influenced by the quality of institutions present in the country. The rationale is that better law and order situation, practice of growth promoting institutions, efficiency of government as a regulator and reduced levels of corruption tend to reduce the transactions costs associated with the business. Moreover the term human capital is not merely the education, it also includes health capital as well (Baldacci et, al, 2004). Bloom and Canning (2003), Bloom and Canning (2004), offered similar view and maintained that better institutional quality ensures efficient provision of health services. This in turn is translated into increased output by raising the efficiency of existing stock of both health and education capital. We also assume that institutional quality affects the skilled labor more than what it does in case of unskilled labor. This distinction can be made in model by augmenting institutional quality parameter "G" with only human capital "H" and not with labor. Although G also affects unskilled labor by affecting health capital but its effect gets compounded in the case of skilled labor where it not only affects their health capital but also their education capital. The reason for this assumption is pretty straight forward. We assume that the overall quality of institutions does not have significant impact on the output of unskilled workers. Another plausible reason for this assumption is that unskilled labor has negligible contribution to national output when compared with that of skilled workers.

It is further assumed, against the conventional wisdom, that the quality of institutions not only affects the efficiency of physical and human capitals but also affects the actual stock level

of human capital. Meaning thereby, better institutional quality affects output in at least two distinct ways. One, it raises the efficiency of existing stock of capital (both human and physical). Second, it raises the actual stock of human capital thus compounding its effect on output, which the available literature so far has failed to capture. This proposition can be justified on the grounds that countries where property rights are secured, rule of law prevails, corruption and uncertainty are low, they tend to attract huge amount of domestic as well as foreign investments including the investment that increases human capital (research projects) thus raising the level of human capital. In case of education, institutional quality affects the level of education in several ways. It first raises the efficiency and effectiveness of government investments in education sector which promotes education. Reduction in corruption, better law and order situation, improved accountability and transparency in the system raises the overall effectiveness of all public sector programs. Since education at all levels is partly funded by government hence improved efficiency of government can be conceived as a factor affecting the quality of education in the country. Another channel through which institutional quality raises education and skill level is by raising the overall returns to education and innovation. Secured property rights, peace and security in the country, benevolent government all raise the returns to innovations and skills.

Moreover it may also be held that famous migration- development nexus hints at the fact that people usually migrate from less developed countries having poor institutions to the areas having better institutional quality. The Tiebout effect and the voting by feet find its place in this argument where skilled labor of a country migrates to other countries (Tiebout, 1956). In this study we assume that such transfer is primarily affected by institutional quality in a country. In case of health capital institutional quality improves the provision of general health facilities,

again by raising the overall efficiency of health programs. Given better institutional arrangements and accountability, the efficiency of public expenditure on health sector may increase which may lead to better health facilities, awareness and preventive cure. This may positively affect the life expectancy and quality of the health capital. It may also increase the effective labor-hours employed in a production process. Increased life expectancy may increase the time span of skilled human capital for the production process thus contributing positively to the output level.

We conclude from the foregoing discussion that the institutional quality plays a vital role in determining the income level of the countries, a role which a mere efficiency parameter hardly captures. Institutional quality surely needs to be given more fundamental position in growth models.

3.5 Assumptions

In the light of foregoing discussion we make certain assumptions over and above those which have been captured in augmented Solow-Swann model. Following are the key assumptions;

- Institutional quality affects skilled labor more than unskilled labor. Unskilled labor is only affected through health capital.
- Depreciation of human capital is not constant and declines with improvement in institutional quality.
- Institutional quality not only raises the efficiency of human and physical capitals but also raise the stock of these factors in real terms

- To keep the model simple, it is also assumed that the institutional quality is exogenously determined

3.6 The Model

In conformity with the theoretical foundations of the model presented above, following changes have been brought into the production function. Institutional quality "G (t)" has been augmented with physical and human capital not with labor for the reasons mentioned above. It is assumed here that institutional quality depends upon time.

$$Y(t) = [G(t).K(t)]^{\alpha} . [G(t).H(t)]^{\beta}. [A(t).L(t)]^{1-\alpha-\beta} \text{.....3.13}$$

To capture the effect of institutional quality as a determining factor for accumulation of human capital "G (t)" is also introduced in the accumulation function. Here we assume that the depreciation rate of human capital is not constant but depends upon the quality of institutions. This is done to incorporate the health effects and brain-drain of human capital due to institutional quality. The depreciation of human capital may be caused by deaths, migration, poor health, old age or simply staying out of the labor force. It thus raises or lowers the impact of the investments in capital stocks at each point in time depending upon whether the quality of institutions is poor or good respectively. The interaction of constant depreciation rate "δ" with the variable G(t) makes the entire term a variable. This ensures that depreciation of human capital varies with time through institutional quality.

$$\dot{K}(t) = s_k Y(t) - \delta K(t) \text{.....3.15}$$

$$\dot{H}(t) = s_H Y(t) - \frac{\delta}{G(t)}.H(t) \text{.....3.16}$$

Both labor and technology and other efficiency parameters grow exogenously at the rates of n and x respectively.

$$\dot{L} = n\,L(t) \quad \text{and} \quad \dot{A} = x\,A(t) \qquad \text{.....3.17}$$

By dividing the production by effective labor on both sides we obtain the output in intensive form in the terms of effective labor ($\tilde{y}(t)$).

$$\tilde{y}(t) = G(t)^{(\alpha+\beta)}\,\tilde{k}^{\alpha}(t)\,\tilde{h}^{\beta}(t) \qquad \text{.....3.18}$$

Taking time derivatives of accumulation functions of human and physical capital we arrive at the capital accumulation functions of human and physical capitals in intensive form.

$$\dot{\tilde{k}} = s_K\tilde{y}(t) + [x + n + \delta]\tilde{k}(t) \qquad \text{.....3.19}$$

$$\dot{\tilde{h}} = s_H\tilde{y}(t) + \left[x + n + \frac{\delta}{G(t)}\right]\tilde{h}(t) \qquad \text{.....3.20}$$

At steady state

$$\dot{\tilde{k}} = 0 \quad \text{and} \quad \dot{\tilde{h}} = 0$$

So,

$$s_K\tilde{y}(t) = [x + n + \delta]\tilde{k}(t) \qquad \text{.....3.21}$$

$$s_H\tilde{y}(t) = \left[x + n + \frac{\delta}{G(t)}\right]\tilde{h}(t) \qquad \text{.....3.22}$$

Now putting the values of $\tilde{y}$ in the equation of $\tilde{h}(t)$. After using simple algebra and rearranging the equation we obtain

$$\tilde{h}(t) = \left[\frac{s_H G^{(1+\alpha+\beta)}}{G(t)(x+n)+\delta}\right]^{1/(1-\beta)} . \ \tilde{k}^{\alpha/(1-\beta)}(t) \text{.....3.23}$$

Now substituting this expression in the other steady state equation and solving it for $\tilde{k}(t)$. Rearranging and applying standard algebraic principle we arrive at following expression for $\tilde{k}(t)$ which is denoted by $\tilde{k}^*(t)$.

$$\tilde{k}^*(t) = \left[\frac{s_K}{(x+n+\delta)}\right]^{1-\beta/(1-\alpha-\beta)} . \left[\frac{s_H}{(x+n+\xi)}\right]^{\beta/(1-\alpha-\beta)} . \ G(t)^{(\alpha+\beta)/(1-\alpha-\beta)} \text{.....3.24}$$

Where

$$\xi = \delta/G(\text{t})$$

and denotes the varying rates of depreciation of human capital.

Putting the steady state level of physical capital in human capital equation above and after slight algebraic manipulations, we arrive at the steady state expression for human capital[$\tilde{h}^*(t)$] as well. Following expression is obtained.

$$\tilde{h}^*(t) = \left[\frac{s_H}{(x+n+\xi)}\right]^{1-\alpha/(1-\alpha-\beta)} . \left[\frac{s_K}{(x+n+\delta)}\right]^{\alpha/(1-\alpha-\beta)} . \ G(t)^{(\alpha+\beta)/(1-\alpha-\beta)} \text{.....3.25}$$

These equations describe the steady state level of human and physical capitals. The interesting point in these expressions is that each type of capital is being affected by the institutional quality by the same factor which depends on three things. First the quality of institutions itself and other two are the shares of human and physical capitals in the output. Hence an important result drawn from the above equation is that the greater the share of human and physical capitals in output the larger will be the compounding effect of the institutional quality on steady state level of capitals.

Now to solve for steady state expression of output, put the expressions of $\tilde{h}^*(t)$ and $\tilde{k}^*(t)$ in the equation of $\tilde{y}(t)$. We obtain the following expression after rearranging the resulting equation.

$$\tilde{y}^*(t) = \left[\frac{s_K}{(x+n+\delta)}\right]^{\alpha/(1-\alpha-\beta)} . \left[\frac{s_H}{(x+n+\xi)}\right]^{\beta/(1-\alpha-\beta)} . G(t)^{(\alpha+2\beta)/(1-\alpha-\beta)} \text{.....3.26}$$

Again we arrive at conclusions similar to the steady states of human and physical capitals but with a slight difference. Now the effects of institutional quality gets compounded with the increase in the values of α and β but the overall effect in case of human and physical capitals is much more than that of output.

Taking natural log of eq.3.18 on both sides and then differentiating it with respect to time yields

$$\frac{\dot{\tilde{y}}}{\tilde{y}} = (\alpha+\beta)\left(\frac{\dot{G(t)}}{G}\right) + \beta\left(\frac{\dot{\tilde{h}}}{\tilde{h}}\right) + \alpha\left(\frac{\dot{\tilde{k}}}{\tilde{k}}\right) \qquad \text{.....3.27}$$

Where ;

$\frac{\dot{\tilde{y}}}{\tilde{y}}$ is the growth rate of output in efficiency units denoted by "γ_y"

$\frac{\dot{\tilde{h}}}{\tilde{h}}$ is the growth rate of human capital in efficiency units and is denoted by "γ_h"

$\frac{\dot{\tilde{k}}}{\tilde{k}}$ is the growth rate of physical capital in efficiency units and is denoted by "γ_k"

And $\left(\frac{\dot{G(t)}}{G}\right)$ is the growth rate of institutional quality which is denoted by "γ_G"

This equation shows that the growth rate of output is the weighted average of the growth rates of institutional quality, physical capital and human capital where weights being their shares in the production function respectively. It is also worth mentioning here that the growth rate of output

directly depends on the institutional quality. Hence an increase in institutional quality is expected to raise the output level. This equation also leads us to an important conclusion that the institutional quality also affects output growth through growth in human capital which also depends on institutional quality. In this way the effect of institutional quality on output growth gets compounded.

3.7 Empirical Model

The focus of the discussion until now has been primarily on the theoretical foundations of the model. Now in this section we focus upon developing a robust empirical model to test the mathematical model. The empirical model consists of three equations; output equation, human capital equation (only education capital) and physical capital equation. All three equations and variables therein will be separately discussed.

We theorized that the aggregate output, in addition to physical capital and labor force, is a function of institutional quality and human capital. It may also be also be noted here that to avoid undue complexities in mathematical model the composite variable for human capital was used which include both the health and education capital. However, in empirical model the human capital variable has been bifurcated into components and separate variables have been used for these. Following is the output function

$$Y= f(G,K,H,E,L,\Omega)$$

Where;

Y is aggregate out produced in and economy in a year

G is the institutional quality measured by quality of government in a particular country.

K is the stock level of physical capital

H is the health capital, measured by the quality of health in a country.

E is the education capital

L corresponds to labor force

And Ω has been used as control variables which include money supply (M) and openness of trade (trade volume to GDP ratio). It may be noted here the steady state equation for output has been derived in the previous section in the form of eq. 3.26. This equation is dependent on the rates of depreciation and savings (in terms of saving to output ratio) of human and physical capitals in addition to institutional quality, and growth rates of technology and labor. When converted into natural log form, following equation can be derived.

$$\ln(gdp) = \alpha_1 + \alpha_2 \ln(edexp) + \alpha_3 \ln(mort) + \alpha_4 \ln(inst) + \alpha_5 \ln(m2) + \alpha_6 \ln(opn) + \alpha_7 \ln(fcf) + \alpha_8 \ln(lf) + \varepsilon \quad \text{.....3.29}$$

This equation also includes the fiscal and monetary control variables.

The second equation is of education capital which has been developed on the same lines as human capital accumulation function. Education capital is the function of output (Y), health capital (H), labor force (L) and institutional quality (G) as under.

$$E = f(Y,G,H,L)$$

The steady state equation of the human capital (eq. 3.25) clearly depicts the mathematical solution for the above function in solow swann model. It may be noted here that for the purpose of estimations we have divided the human capital into education capital and health capital. This

could not be done in case of mathematical model to avoid the undue complexities in the model. Following is the empirical form of the above function in logarithmic terms

$$\ln (edexp) = \beta_1 + \beta_2 \ln(gdp) + \beta_3 \ln(inst) + \beta_4 \ln(mort) + \beta_5 \ln (lf) + \varepsilon \quad \text{.....3.30}$$

The physical capital formation is the function of output (Y), institutional quality (G), money supply (M) and openness of trade (OPN)

$$K=f(Y,G,M,OPN)$$

The eq. 3.24 represents the steady state equation of the physical capital formation. The functional form presented above can be translated into the equation 3.24 using the algebra presented in the previous section. Following empirical equation can be arrived at if the natural logarithmic form is taken for the eq. 3.24.

$$\ln (fcf) = \gamma_1 + \gamma_2 \ln(gdp) + \gamma_3 \ln(inst) + \gamma_4 \ln(m2) + \gamma_5 \ln(opn) + \varepsilon \quad \text{.....3.31}$$

3.8 Methodology

The technique for the estimation purposes is System Generalized Method of Moments (GMM). This is because of certain issues present in the data. Panel Ordinary Least Squares (OLS) has not been used because of endogeneity issue. In such a situation OLS estimator is not only biased but is also inefficient (not having minimum variance). Furthermore we have a system of equations in this study, a situation in which OLS estimator fails. It may also be noted here that panel hetroscadasity is also an issue which renders the use of OLS ineffective. Fixed and random effect model have not been used because of the fact that we have to estimate a system of equations which cannot be estimated using these models.

It may be noted here that 2SLS technique cannot be applied in this case. Though 2SLS solves the issue of simultaneous estimation of equations of a system however, for endogeneity and autocorrelation issues 2SLS is not as effective as system GMM.

Keeping in view the problems discussed above the most appropriate technique is System GMM. It not only takes care of endogeneity issues using instruments but also caters for the system of interdependent equations. It may be noted here that dependent variables in the system are not stationary as the time period is small; a case in which differenced variables produce poor results (Baltagi, 2008).

Chapter 4
Data and Variables

4.1 Variables and Data Sources

The following variables have been used in this study to analyze the effects of institutional quality on economic growth and human capital.

- Gross Domestic Product (GDP)
- Education Capital
- Health Capital
- Institutional Quality
- Openness of Economy
- Money Supply
- Fixed Capital Formation
- Labor Force

4.1.1 Gross domestic Product

Economic growth in a country is estimated by measuring the net increase in the output of a country in a year. Generally the proxy used for measuring economic growth is GDP growth rate. GDP is defined as the total value added by all the people in economy with in geographical limits of the country. We have used GDP at producer's prices. This is defined as the GDP plus net taxes (taxes minus subsidies). It may also be noted here that GDP is inclusive of the depreciation charges for the capital installed.

4.1.2 Education Capital

Education capital is defined as the level of education and skill that people have acquired in an economy. To capture the effect of this variable we have used the input proxy that is the education expenditure in a country. We have constructed this variable from percentage of public education expenditure in GDP. Multiplying this figure with GDP we constructed a new variable which represents the total expenditure on education in a country in one year. This is an

input side proxy and is directly related to education level in a country. This education expenditure includes current and capital public expenditure.

4.1.3 Openness of Trade

Openness of trade is a variable that has been used to capture the effects of degree of integration a country has with outside world. This variable has been constructed by adding total imports and exports of a country and dividing it by GDP. In this way we arrive at a figure that shows the percentage of trade in total output the country. For Imports data we have used the total imports of goods and services at 2005 constant US dollars while for exports we have used the data of total exports of goods and services at 2005 constant US dollars.

4.1.4 Fixed Capital Formation

Data on Gross Fixed capital formation has been used as a variable to capture the effect of physical capital and investments in the economy. The gross fixed capital includes the additions and improvements made in lands, buildings, plant and equipment etc. It encompasses the road networks, industries offices but excludes the inventory reserves of the firms.

4.1.5 Health capital and Mortality Rate

Health capital is defined as the general health of the population in a country. The proxy used to capture the effects this variable is mortality rate. It is defined as the probability of a male or female of more than 15 years of age to die before the age of 60. In other words it's the probability of death between the ages 15 and 60. We have constructed this variable by taking the average of mortality rates for males and females. It may also be noted here that mortality rate is inversely related to health capital. Higher the mortality rate, lower will be the health capital in a

country. From this proposition it can be inferred that the expected sign of mortality rate will be inverse of the health capital.

4.1.6 Labor Force

The labor force is defined as the total labor available in the country which satisfies the definition of International Labor Organization. It includes all the people available for the supply of goods and services. It may also be noted here that labor force also includes the people who are unemployed. Furthermore, people employed in armed forces are also included in Labor Force.

4.1.7 Money Supply (M2)

Money and Quasi money (M2) has been used to capture the effects of money supply. This variable has been constructed by dividing the money supply in local currency units (LCU) by average official exchange rates for that currency for the year to convert money supply into dollars for better analysis.

4.1.8 Institutional Quality

The proxy used for institutional quality has been constructed from ICRG governance indicators. The index number has been constructed form different variables based on the methodology provided in quality of governance standard data set code book. The variables used in the construction of the index number are corruption, law and order situation and bureaucratic quality. We have taken the weighted mean of these three indicators to arrive at an index number depicting the quality of institutions prevailing in an economy. The points assigned to each of the indicators are the same as has been assigned in ICRG data. The corruption indicator has been assigned 6 points and so is the law and order indicator. The bureaucratic

quality has been assigned 4 points. As we are using weighted mean so the difference in the maximum points assigned to an indicator will not bias the overall index towards any specific indicator. The maximum value of these indicators has been normalized to 1. So the value of this variable shall be between 0 and 1.

4.2 Data Sources, Time Period and Data Set

The data span is 1995-2012. The primary reason for using this data span is the availability of the data. Data on certain variables is not available prior to 1995. It is worth mentioning here that the issue of few missing values has been resolved by computing such values through interpolation of data using 3 years moving average method.

As this study aims at presenting a comparative analysis of developing and developed countries so to have a representative sample for these two sets of population we have selected G10 countries to represent the developed countries and SAARC countries to represent the developing countries. However in SAARC countries due to unavailability of data on several variables for countries like Maldeves, Nepal, Bhutan and Afghanistan we had to restrict our sample of SAARC countries only to Bangladesh, India, Pakistan and Srilanka.

The data for all variables is from World development indicators (WDI). However, the data for education expenditure for SAARC countries is from SAARC report of 2008 and values beyond the year 2008 are from WDI.

Chapter 5
Results and Discussion

The estimated results of the developed in chapter 3 are discussed in this chapter. It has already been mentioned in previous chapters that the technique used for the estimation of the model is system GMM. First the results of SAARC countries have been presented followed by the results of the results of G10 countries. The comparison between these two sets of sample is presented at the end of this chapter.

5.1 Results: SAARC countries

The results of System GMM employed on model given by equations 3.29, eq. 3.30 and eq. 3.31 for SAARC countries are presented in Table 5.1 as under;

Table 5.1

System GMM Results for SAARC Countries	
Variable	**Coefficient**
GDP	
ln(education expenditure)	-0.25 (0.14)*
ln(mortality rate)	-0.36 (0.15)**
ln(institutional quality)	0.32 (0.16)*
ln(Money Supply)	0.10 (0.01)***
ln(Trade Openness)	-1.20 (1.82)
ln(fixed capital formation)	0.80 (0.24)***

ln(labor force)	0.21 (0.01)***
Constant	2.54 (0.88)***
Education Capital	
ln(gdp)	0.85 (0.38)***
ln(mortality)	-0.65 (0.34)*
ln(institutional quality)	0.54 (0.29)**
ln(labor force)	0.13 (0.02)***
Constant	3.15 (1.43)**
Physical Capital	
ln(gdp)	1.05 (0.16)***
ln(institutional quality)	0.21 (0.12)*
ln(Money Supply)	037 (0.07)***
ln(Trade Openness)	0.30 (0.02)***
Constant	-8.6 (226.87)

Overall Significance Test J- Stat	**Chi Square Value (Calculated)**	**Chi Square Value (Table)**
0.209	14.66227	16.750

Note : Standard Errors in parenthesis. *,,*** correspond to significance at 10%, 5% and 1 % respectively**

5.1.1 Overall Significance of the Model

The primary statistic in system GMM methodology for overall significance of the model is J- statistic which follows Chi- square distribution. The J-stat in this case is 0.21 and when multiplied with 70 (number of observation for 4 SAARC countries) which is 14.67 which is clearly below the tabulated value of chi square for 8 degrees of freedom (number of instruments minus the total number of variables used in the whole system). As long as the calculated value is less than the tabulated value the H_0 of valid instruments cannot be rejected. Hence in our case the J- Statistic shows that instruments selected for estimations are valid. It is worth mentioning here that the instruments that have been used for estimation purposes are three years lag values of the explanatory variables.

5.1.2 GDP Equation

In this section we discuss the estimation results of SAARC countries have been detailed. The relation between public education expenditure and GDP is negative and significant at 90% confidence level. Since the variables have been used in log forms, therefore the coefficients show the elasticity of the GDP with respect to human capital for which the proxy used is the public expenditure on education. The negative sign of the education expenditure in the GDP equation can be justified on the grounds that the countries under observation are primarily developing countries in which the expenditures on education are mostly skewed in favor of higher education (Saavedra,2012). This results in lesser or inadequate allocation of expenditure on primary and secondary education. Moreover these countries have poor institutional quality (Perera & Lee,2013) which also reduces the efficiency of public expenditure due to widespread leakages. Yet another reason could be that the countries under consideration are inherently resource stricken countries; a scenario in which crowding-out effect can be

expected to prevail more frequently (Saavedra, 2012). So when limited available funds are directed towards education sector, the crowding-out effect leads to low investments in the economy thus constraining economic growth.[1]

The measure used for health capital is mortality rate. The results show that that the mortality rate is negatively related to the economic growth which is in conformity with the literature. The increased mortality rate means less or ineffective provision of health services thus leading to poor health capital in the country. Poor health of the labor restricts their output. This leads to reduced overall output of the economy and inhibits GDP growth rate (Baldacci et, al, 2004).

The institutional quality bears positive relationship with economic growth. The coefficient is significant at 90% confidence level. This relationship has been observed to be ambiguous in literature. However, as evident from the table 5.1, in our case institutional quality is positive which implies the growth promoting role of institutions. Institutional quality affects growth in different ways. First of all it raises the overall efficiency of human and physical capitals thus raising the output level. Similar results have been reported by Grastein (2004), Kaufmann and Kraay, (2003) and Porta et; al. (1999) as well. Moreover, improved institutional quality reduces transactions costs (North, 1990) in the in the economy and thus reduces the opportunity cost of investments which in turn increases the marginal efficiency of investment. This encourages investments in the economy thus promoting economic growth**.** Moreover, institutional quality also plays an important role in accumulation of human capital by reducing the depreciation of human capital. Depreciation of human capital is reduced because of decreased migration of skilled labor in a country where the quality of institutions is good. This is

[1] World Investment Report(1999)

in conformity with the Tiebout effect (Tiebout, 1956). Furthermore, improved institutional quality also reduces the crime rates (Kaasa, Kaldaru & Parts, 2007) which in turn raises the labor force participation and thus leads to higher economic growth. In addition to this, institutional quality also plays a phenomenal role in improving the physical health of the labor and thus raises their output, which contributes to economic growth (Baldacci et, al, 2004).

The money supply has been captured using broad money supply (M2) as its measure. The results show that money supply is positively related to economic growth because the countries under consideration are developing countries facing resource constraints most of the times. Printing of notes is an important tool in these countries to finance the government expenditure. Thus money supply is directly related to increased economic growth because it raises government expenditure, both development and non- development (Amen & Khan, 2011)

Openness of trade shows negative relationship with economic growth however this relation is insignificant for developing countries (representative SAARC). Negative relationship may be explained by the fact that these countries often have negative trade balance and the imports are usually much higher than exports which inhibits economic growth (Baldwin, 2004) However, the t-statistic for openness coefficient shows that the coefficient is insignificant. Thus openness tend to play little role in determining national income in SAARC countries. This could be due to lesser integration with the world. Although India has performed much better yet the combined effect of Pakistan, Srilanka and Bangladesh has overshadowed the effects of India and thus the net results turn out to be insignificant.

Labor force shows strong positive relationship with economic growth. The reason for such a relationship is simple in the sense that the labor being a fundamental input in production

function plays a pivotal role in determining output level. So an increase in labor force tends to produce an increase in aggregate output level as well (Weiss, 1992). Thus the results in this case are in line with the prevalent economic intuition.

5.1.3 Education Capital Equation

All variables in this model are in log form as was the case in the previous model. Hence the coefficients represent the elasticity of the dependent variable with respect to independent variable.

The coefficient of GDP is positive and significant at 95% of significance level. This shows that a positive relation prevails between education-capital (captured using expenditure on education) and economic growth. This implies that an increase in income level leads to greater education capital in an economy (Krueger & Lindahl, 2000). This is because when larger amount of income is available to spend, each head is expected to register an increase in general. So with larger income available and the basic needs like food and shelter being met, people are expected to allocate an increasing share of their income to education and acquiring skills. This results in an increase in human capital accumulation. Furthermore, increased amounts are allocated for research and development which also leads to improvement in quality of human capital (Krueger & Lindahl, 2000).

The coefficient of health capital (which has been captured using the mortality rate as proxy) is negative and significant at 90% level of significance. This shows that a negative relationship exists between mortality rate and education capital. This negative relationship shows that with increase in mortality rate (which means declining health capital) education capital tends to decline. Thus with declining health the ability of labor force to acquire education and skill

declines which results in decline in the accumulation of education capital (Bloom and Canning, 2003). Similar observations have been upheld in Bloom and Canning (2004) as well. Furthermore, it also hints at poor health conditions in SAARC countries where expenditure on education is cut to divert expenses to meet increasing health needs.

Institutional quality has a positive coefficient at 90% level of significance. This shows a positive relationship between institutional quality and education capital. This may be explained with the argument that with improved institutional quality the government becomes more responsive and corruption is reduced. This results in increased allocation of resources to the education sector which leads to improved and increased human capital accumulation (Baldacci et, al, 2005). Improved institutional quality also raises the efficiency of the investments made in education capital due to reduced corruption and transaction costs which also increases the accumulation of human capital (Kong, 2011).

Labor force coefficient is positive and significant at 99% level of significance. This shows a positive and highly significant relationship between labor force and education capital. The education capital (captured by expenditure on education) is expected to increase with increase in labor. This is because of the non-myopic trends in the family structure of the SAARC countries especially in India, Pakistan and Srilanka. Families in these countries tend to think about their coming generations. Children in these areas tend to depend on their families for much longer period and people tend to spend much more on the welfare of their children. The inter generational behavior of the labor force leads to investments in the education and thus raises the education capital in the economy (Krueger & Lindahl, 2000). Moreover when labor force becomes more educated, parents tend to give more importance to education for their children.

5.1.4 Physical Capital Equation

The coefficient of GDP is positive and significant at 99% significance level. This shows that the GDP is positively related to accumulation of physical capital and this relationship is highly significant. The result can be explained by the fact that the portion of income saved by the people depends on the income earned by the people. The more they earn the more they are likely to save (Sajid & Sarfaraz, 2008). These savings then determine the level of investments in a country. Countries having higher saving rates generally have higher level of investment. So when GDP increases the increased investment leads to an increase in the formation of fixed capital.

The coefficient of institutional quality is also positive and significant at 99 % level of significance. This shows a positive and strongly significant relationship between institutional quality and physical capital. Improved institutional quality attracts more and more investments in a country mainly because of two factors. One the reduction in transaction cost leads to lower opportunity costs of investments (North, 1990) and thus raises the marginal efficiency of investment in a country. Hence with improved institutional quality people tend to invest more which leads to increase in formation of fixed capital. In addition to this improvement in institutional quality also decreases uncertainty in an economy which also boosts up the investments (Kong, 2011). Similar conclusions have also been drawn by Baldacci**,** Hillman& Kojo (2003) where it has been maintained that improved institutional quality leads to increased private investments in the country.

The coefficient of money supply (M2) is positive and is significant even at 99 % of significance level. This predicts a positive and a highly significant relationship between money supply and accumulation of physical capital in representative SAARC countries. This could be

due to the reason that these countries often face resource crunch which is usually met by printing new money thus raising the money supply (Schreft & Smith, 1997). With much less independent central bank in these countries where money printing is used to fulfill the fiscal needs of the government, development projects have a strong correlation with increased money supply, including foreign aid (Schreft & Smith, 1997).

The coefficient for openness of trade turns is positive and highly significant. This can be explained on the basis of the argument that when openness increases it leads to increased demand in the economy. Increased amount of infrastructure and industrial base is required to meet such demand. This leads to higher level of physical capital accumulation. It may also be noted import substitution policies may also boost up the fixed capital formation in a country.

5.2 Results: G10 Countries

5.2.1 GDP Equation

To have a complete analysis the same model has been run for both SAARC and G10 countries. Former represent the developing countries while the later represent the developed countries. The results of G10 countries are presented in table 5.2. The J- statistic is 0.102 which when multiplied with number observation (160 in this case) becomes 16.281. This figure is clearly lesser than the tabulated chi square value. This shows the validity of the instruments used in the model.

Table 5.2

System GMM Results for G10 Countries	
Variable	**Coefficient**
GDP	
ln(expenditure on education)	0.16 (0.09)*
Ln(mortality rate)	-0.59 (50.14)
ln(institutional qaulity)	0.14 (0.06)*
Ln(money supply)	-0.13 (0.03)***
ln(trade openness)	0.15 (0.09)**
ln(formation of fixed capital)	1.02 (0.01)***
ln(labor force)	4.58 (0.28)***
Constant	1.24 (0.47)
Education Capital	
ln(gdp)	0.46 (0.02)***
ln(mortality rate)	0.29 (0.34)
ln(institutional quality)	0.11

	(0.02)***
ln(labor force)	0.45 (0.20)***
Constant	0.23 (0.05)***
Physical Capital	
ln(gdp)	3.39 (1.47)**
ln(institutional quality)	0.87 (0.47)*
ln(money supply)	0.06 (0.11)
ln(trade openness)	0.49 (0.27)*
Contant	-0.34 (0.03)***

Overall Significance Test J- Stat	**Chi Square Value (Calculated)**	**Chi Square Value (Table)**
0.102	16.281	16.750

Note : Standard Errors in parenthesis. *,,*** correspond to significance at 10%, 5% and 1 % respectively**

The coefficient of education capital is positive and significant at 99% significance level. This shows that the education capital has strong, significant and positive relationship with economic growth in G10 countries. This is because of the fact that increase in expenditure on education contributes to education capital which plays a pivotal role in determining national

income (Prichett, 2001). It may also be argued that these countries have well established institutions and better opportunities of employment because which there is almost negligible net brain drain in these countries. So whatever is invested in the education sector is effectively translated into output which raises the aggregate income and hence induces economic growth (Kong, 2001). Moreover it may also be noted here that in these developed countries much is invested in research and development which leads to improved technology and which in turn leads to economic growth (Rivera-Batiz, 1999).

The coefficient of mortality rate is negative but insignificant. The negative sign shows that with increase in mortality rate the output growth declines. This is because of the fact that with poor health the efficiency of labor to utilize its education capital to produce output declines. Further the labor hour used in the production of output also declines which slows down economic growth (Gyimah-Brempong & Wilson, 2004). However, the coefficient is insignificant. This means that health capital has no significant role in determining economic growth in developed countries. This is because of the fact that the health capital and its quality remained more or less same for the period under consideration for analysis. These countries had achieved a fairly sound quality of health capital by the last decade of 20^{th} century. Thus this variable shows insignificant results.

The coefficient for institutional quality is positive and significant at 90% level of significance. This shows that the institutional quality is fairly significantly and positively related to economic growth. This is because of the fact that improved institutional quality enhances the efficiency of the factors of production which results in increased output level (Grastein, 2004). Kaufmann and Kraay, (2003) also show that institutional quality is one of the major determinant of quality and efficiency of human capital. Institutional quality also reduces the depreciation of

human capital thus increasing the overall availability of human capital for production purposes. This can be understood by the fact that net migration is positive in the countries having improved institutional quality and tiebout effect holds (people migrate where marginal returns are high) presented by Tiebout, (1956). Furthermore, the institutional quality also leads to reduced transactions costs and opportunity costs (North, 1990). This leads to increased investments in the country which raises the output level through multiplier effect.

The coefficient of money supply (M2) is negative and significant at 99% level of significance. This shows a negative and strongly significant relationship between money supply and economic growth. This means that the growth in these countries has declined with increase in money supply during the period under consideration. This could be somehow related to the real estate boom that preceded the financial crisis. The crisis led to increase in money supply which could not be effectively translated into economic growth.

The coefficient of Openness is positive and significant at 95% level of significance. This shows that the trade is positively related to economic growth in these countries. This is because of the fact that these countries have strong research and development infrastructure and fairly high tech industrial footings (Frankel and Romer, 1999). The exports from these countries are heavily demanded in other countries. Thus these countries usually have positive trade balance which raises their GDP level and hence positively affects economic growth (Lee *et al.*, 2004).

Fixed capital formation and labor also show positive and significant behavior with economic growth. This is because of the fact that both labor and physical capital are fundamental factors of production. Any increase in these factors directly affects the output level. This positive relationship is in conformity with the economic theory (Weiss, 1992).

5.2.2 Education Capital Equation

The coefficient of GDP is positive and highly significant. This means that with the increase in income the human capital of G10 countries also increases. This has a pretty straight forward explanation that with the increase in income, more resources are available to spend on education. Thus the budget for education increases which results in the increase in human capital accumulation (Krueger & Lindahl, 2000). Moreover with increase in income the demand for such goods and services increase the production which require greater amount of human capital. The supply of human capital responds to the increased demand which in turn raises economic growth.

The coefficient for health capital is positive however, the relationship is insignificant and practically health capital has no significant relationship in developed countries with education expenditure.

The coefficient of institutional quality is positive and significant at 99% level of significance. This shows that the institutional quality has a positive and highly significant relationship with education capital in developed countries. This result can be explained with the argument that with improved institutional quality the governments become more responsive towards public needs and demands. They tend to direct more funds towards the education sector which results in increased accumulation of human capital in the country. It may further be argued that with increase in institutional quality the efficiency (by reducing corruption) of investments in human capital increases which results in the increase in stock level of human capital for a

given level of investment. Similar results have been presented by Baldacci et; al. (2004) and Kong (2011).

The labor force coefficient is positive and significant which means that with increase in labor force the expenditure on education increases in developed countries. This shows that more resources are required to cater the needs of the increasing labor force.

5.2.3 Physical Capital Equation

The coefficient of GDP is positive and significant at 95 percent level of significance. This means that with the increase in GDP the physical capital accumulation is expected to register an increase in developed countries like G10. This is because of the fact that when GDP increases, savings also increase and hence investment increases (Sajid & Sarfaraz, 2008). This results in increase in fixed capital formation in the country.

The coefficient of institutional quality is positive and highly significant. This shows that with the increase in institutional quality the accumulation of physical capital increases. This is because of the fact that when law and order situation is better in a country and corruption is low the transactions cost of investment is lower and people try to invest more in the country (North, 1990) This leads to increase in physical capital formation. It may also be argued that when institutional quality improves the uncertainty in business declines (Kong, 2011). This results in increase in investments and hence physical capital formation increases.

The coefficient of money supply is positive but insignificant. This shows that with increase in money supply fixed capital formation increases. It may be argued that money printing may be used to finance the development projects in developed countries. However, the fact

remains that the coefficient is insignificant and does not play any considerable role in determining the formation of fixed capital.

The coefficient of openness is positive and significant at 90 % of significance level. This means that openness is positively related to physical capital formation and this impact is fairly significant. This relationship can be explained with the argument that these countries have well integrated economies with external world. When openness increases the demand for country's product also increases. To meet this increased demand the industrial base of the country needs to expand. Thus the fixed capital formation increases in response to increased trade volume (Razin, Sadka & Coury, 2002).

5.3 Comparison between SAARC and G10 Countries

The results of SAARC and G10 countries show a stark difference in how different variables affect the dependent variables in these two sets of countries. The education capital coefficient in GDP equation is negative and significant in case of SAARC countries while it is positive and significant in case of G10 countries. This difference is because of the fact that SAARC countries are primarily developing in nature where weak institutions prevail. It's the weak institutional quality which reduces the efficiency of investments in developing countries. The corruption in these is quite high as compared to G10 countries which not only increases the opportunity cost of investments but also adversely affects the allocation of resources (North, 1990). Whereas in developed countries in the presence of good institutional quality the efficiency and hence the impact of such investment is quite high (Rivera-Batiz, 1999) It may also be noted that in developing countries usually there prevails the issue of resource crunch and crowding out effect. With increase in expenditure on education the private investment decreases due to

crowding out effect which results in decrease in overall investment in the country and therefore the growth rate of GDP declines (Trinh,Gibson & Oxeley, 2005).

The health capital is positively related to national income in both set of countries, reasons for which have been put forth earlier. However, this relationship is significant in developing countries while it is insignificant in developed countries.

The role of institutions is similar in both the developed and developing countries when it comes to its contribution in determining national income that is in both the set of countries the institutional quality positively affects economic growth. However, the difference lies in the extent of this affect. In developing countries the effect of institutional quality has turned out to be much stronger than in developed countries. Results suggest that the effects of institutional quality are almost three times stronger in developing countries than that in developed countries. One reason for such a stark difference could be that developed countries already had good institutional framework which has undergone little improvement in the time period under consideration. However, this is not the case with developing countries where institutional quality though not that good but has improved over the period of time and also contributed positively and strongly in economic growth.

Money supply also shows different results for both the set of countries. In developing countries it shows significant positive relationship while in developed countries it shows significant negative relationship with economic growth. The reason for this difference could be that in developing countries the budget deficit is largely financed by printing new money which raises money supply. Even development projects are financed in this way. The negative sign in developed countries could be due to real estate boom which preceded the financial crisis.

The openness of trade plays insignificant role in developing countries while it plays a positive and much significant role in developed countries. This difference could be because of difference extent of integration in the two sets of countries; the level of integration being low in developing countries and high in developed countries.

The labor force and fixed capital formation have positive significant relationship with economic growth in both set of countries. No major difference is observed in the results of these variables.

The estimation of education capital accumulation model also suggests huge differences between developing and developed countries. The effect of changes in GDP on education capital is almost similar in both sets of countries except that in developing countries the value of coefficient for GDP is two times greater than that observed for developed countries. This difference is because of the fact that developing countries have lesser resources available to allocate in different sectors of the economy. When income level increases, more amount is available to be allocated for different sectors. Same is the case with education. However, in developed countries slight changes in GDP do not have a huge impact on allocation of resources towards education.

Health capital also shows different behavior in both sets of countries. In developing countries there is limited availability of resources as compared to developed countries. When resource allocation in one head increases the resource available for other heads gets affected more in developing countries than in developed countries. This is the main reason why health capital seems not to be related to education capital in developed countries but shows significant relationship in developing countries.

Institutional quality plays important role in both sets of countries in determining accumulation of education capital. However, it may be noted that in case of developing countries this affect appears to be much stronger than that in developed countries. The reason could be that in developing countries where institutional quality is quite poor, an improvement in institutions leads to better allocation of resources in education sector. Improved institutional quality also reduces the corruption which raises the efficiency of investments made in this sector of the economy. Whereas in developed countries the institutional quality is already high and it has not registered any considerable change during the data span selected for the analysis that is fron1995-2012.

The impact of labor force on education capital is almost similar in both sets of countries and is in conformity with the literature.

Physical capital accumulation equations also show differences between developed and developing countries like education capital accumulation and growth equations. The effect of GDP is almost three times stronger in developed countries than that in developing countries. This difference is probably due to factors like corruption, poor law and order situation in developing countries where low institutional quality has attracted lesser investments because of increased transactions costs. So the impact of GDP on physical capital accumulation, though still positive in these countries, is reduced considerably.

The role of institutions in determining formation of fixed capital also shows the similar trend in both sets of the countries. However, this effect is much greater in developed countries. The primary reason for this could be the poor law and order situation in Pakistan and Srilanka which has shattered that confidence level of the investors. So they are reluctant to invest in such

hostile conditions. India is an exception in this and has attracted huge foreign as well as domestic investments. However, this effect is not apparent in aggregate impact of institutional quality on formation of fixed capital in South Asian countries.

Money supply shows positive relationship with physical capital in both sets of countries. However this impact is insignificant in case of developed countries while it is highly significant in developing countries. The reason for this difference is the extent of independence of central banks in both sets of countries. Central banks are generally independent in the developed countries while in developing countries central banks cannot take independent policy decisions. Deficit financing by governments, financing development projects with the help of central banks may result in positive relationship between money supply and physical capital accumulation.

Openness of trade also shows similar relationship with physical capital in both sets of countries. However, in developed countries its impact is more than two times stronger than that in developing countries. The reason for this difference is that the developed countries are more integrated with the world and they generally have much larger and wider export base. They generally tend to have either positive or balanced trade balance. This implies that with increase in export demands new infrastructure has to be installed in these countries which results in increase in fixed capital formation in the country. This process leads to a strongly positive relationship between openness and physical capital formation.

Chapter 6
Conclusion and Policy Recommendations

Economists have endeavored hard to solve the mystery of income differences among nations. Several answers have been proposed in the struggle. Apart from physical capital, labor technology and human capital on whose growth promoting role there exists little disagreement, several other factor have also been identified which include institutional quality as well. Although institutional quality now finds its place in modern growth literature, this study proposes additional channels through which institutional quality may affect growth of a country.

We conclude that institutional quality plays a more important role than just an efficiency parameter as proposed by Kong (2011). Our model suggests that apart from enhancing the efficiency of factors of production, institutional quality also plays a pivotal role in determining the accumulation of human capital which in turn raises the stock level of the human capital available for production. The role of institutional quality in promoting human capital may be attributed to different factors. The model developed in the study suggests that depreciation of human capital which is usually assumed to be a constant, is in fact not constant, rather the depreciation is affected by institutional quality to the extent that it has considerable impact on the output produced. The institutional quality affects the depreciation of human capital in different ways. First of all institutional quality affects the provision of health services in a country positively (Canning, 2003) which increases the efficiency of human capital. Improved institutional quality leads to better law and order situation, reduced corruption and increased efficiency of government which leads to positive net migration in the country. The famous migration development nexus and tiebout effect comprehensively explain such a trend. It may

also be argued here that better institutional quality also attracts more public investments in education sector which leads to increased human capital formation in an economy in any given time frame. These results have been shown in this study where expenditure on education is observed to be positively related to the institutional quality.

The results also indicate that the output in developing countries is expected to be influenced more by the improvements in the institutional quality than that in developed countries. The reason could be that the developed countries have already approached their steady state level as proposed by Solow, as a result of which any impact produced by any single variable on the output is quite less as compared to the impact produced in a country which is farther from the steady state. This theory holds true for the impact of institutional quality as well.

We conclude that the institutional quality plays a very important role in determining economic growth. The conclusion is not different from many other studies on the subject. However, the difference lies in the channels through which the institutional quality affects human capital and hence economic growth.

In the light of above discussion and conclusion following policy recommendations are proposed.

- Governments should strive to improve the institutional quality in an economy on order to boost up economic growth.
- More human capital can be attracted into the country if better environment could be provided to the labor force through improved institutional quality.
- Investments in the human capital may become unproductive without good institutional quality so efforts should be made to improve both simultaneously.

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