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Foreign Aid, External Debt and Governance

Unbreen Qayyum

Musleh-ud Din

Adnan Haider

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FOREIGN AID, EXTERNAL DEBT AND GOVERNANCE

Unbreen Qayyum
Staff Economist,
Pakistan Institute of Development Economics (PIDE)
Islamabad, Pakistan.
unbreen.qayyum@pide.org.pk

Musleh-ud Din
Vice Chancellor,
Pakistan Institute of Development Economics (PIDE)
Islamabad, Pakistan.
muslehuddin@pide.org.pk

Adnan Haider
Assistant Professor,
Department of Economics and Finance,
Institute of Business Administration, Karachi
ahaider@iba.edu.pk

Abstract

This paper investigate the impact of foreign aid, external debt and governance on economic growth by extending the Ramsey-Cass-Koopman's growth model in an open economy framework. Steady-state and short run analysis show that external debt and foreign aid do not affect the growth rate of consumption but have level impact on consumption. Foreign aid and governance encourage the economic growth but external debt creates a burden on the economy. Both Investment and saving are independent of external debt and thus the current account surplus. Foreign aid does not affect investment directly but it has a direct positive impact on the savings in the economy. Therefore, it is argued that improvements in the quality of governance will stimulate the output and consumption rapidly and it acts like a catalyst.

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Keywords: External Debt; Foreign Aid; Governance; Ramsey-Cass-Koopman Model.

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Contact for correspondence:

Unbreen Qayyum
Staff Economist
Pakistan Institute of Development Economics (PIDE)
Islamabad, Pakistan.
Unbreen.Qayyum@sbp.org.pk

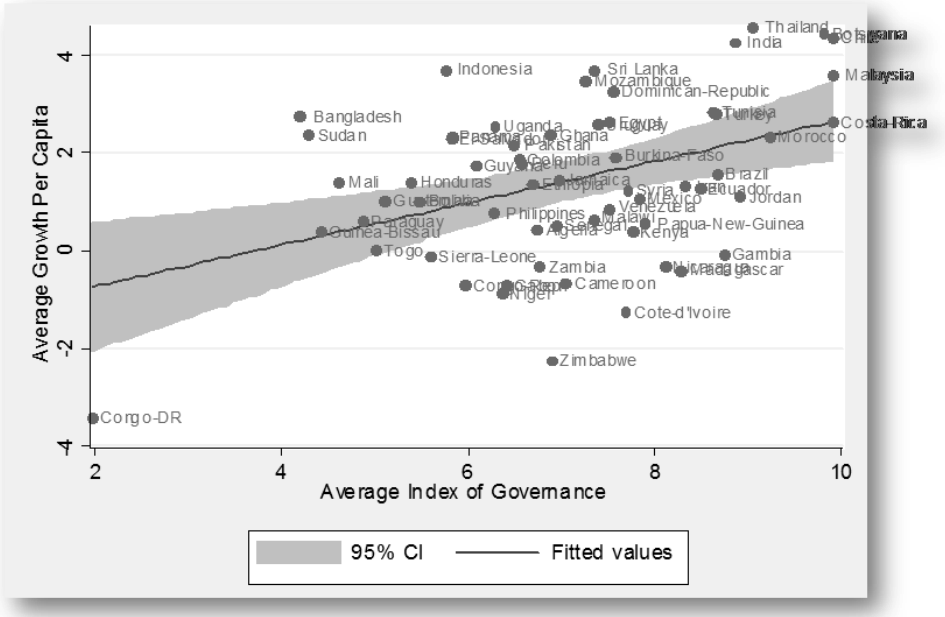
Non-Technical Summary

Foreign aid and external debt are two of the sources through which developing countries finance their budget deficits. Arguably, foreign aid has a positive impact on economic growth and plays a constructive role in spurring economic activity of an economy. On the other hand, external debt is perceived to have a negative impact on economic growth. Most of empirical findings varify second proposition related to external debt, however aid effectiveness depends upon the level of governance. To analyze this fact, this study aim to explore the impact of foreign aid, external debt and governance on economic growth by extending the Ramsey-Cass-Koopman's growth model in an open economy framework. The level of effective governance is taken as a proxy of institutional quality. Steady-state and short run analysis show that external debt and foreign aid do not affect the growth rate of consumption but have level impact on consumption. We show that foreign aid and governance encourage economic growth while external debt creates a burden on the economy. Both investment and saving are independent of external debt and thus the current account surplus. Foreign aid does not affect investment directly but it has a direct positive impact on the savings in the economy. Therefore, it is argued that improvements in the quality of governance will stimulate the output and consumption rapidly and it acts like a catalyst. Most of the developing countries usually have poor level of governance and it is a major obstacle that hinders the economic reform and development process. Therefore, these governments should pay more attention to the institutional quality and need to ensure that foreign aid is used effectively.This will yield significant positive impact of aid on economic growth in the long run.

1. INTRODUCTION

Lack of domestic capital compels the government to look for additional financial resources, so it is supplemented by funds from abroad in order to accelerate the investment activities and the economic growth. Developing countries usually have scarce resources and low earned revenues. In order to fulfill the gap between the expenditures and revenues, they have to rely on the foreign capital i.e. foreign aid and external debt to overcome the budget deficit. Availability of funds are not sufficient to run an economy on the right path of development, what matters is the institutional quality that improves the effeciency of capital,Agnor and Montiel (2010).In the economic litereture there exists controversies regarding the role played by foreign capital in spuring the growth process. In the presence of sound economic institutions foreign inflowswith clear development agendas can be utilized moreefficiently and contribute positively in the total output[1]while weak institutions may result in moral hazard and rent seeking problems that will reduce the productivity of capital[2]Figure 1 and 2 show this fact very well. North (1990, 1992) states that the good governance enables a country to achieve its development goals and become prosperous, by establishing a conductive environment for the high and sustainable economic growth. It also establishes an impartial, predictable and consistently enforced rules that arefundamental for the persistent growth.Acemoglu and Robinson (2008) explains institutional difference as a most important factor that create majordisparity in the per capita growth rates across nations. Countries with weak institutions must must reformulate their institutional structure to enhance the economic growth. It is very evident that countries with good quality of governance are enjoying higher per capita growth rates (see,Figure 1).

Figure 1: Institutional Quality and Economic Growth Nexus



We can say that countries that have good goverenance measured in terms of quality of buerocracy, level of corruption and implementation of law and order, utilize the foreign aid more

[1] The case of South Korea and Taiwan in the East Asia are good examples in this respect. see for instance, Rodrik, et al., (2004), Rodrik (1996) and Carlsson, et al., (1997).

[2]See discussion within, Svensson (2000b) and Rijckeghem and Weder (1997).

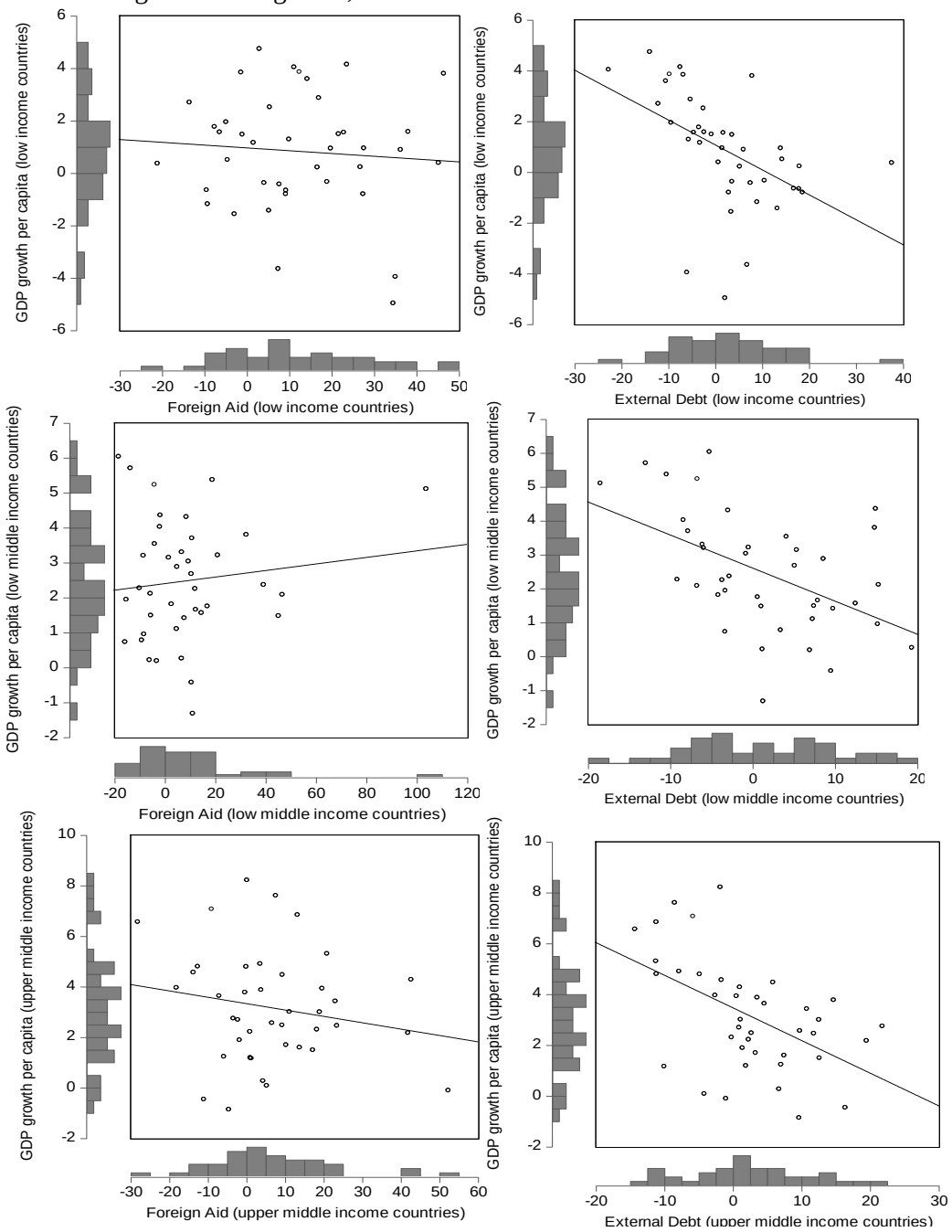
proficiently that results in higher per capita growth. Foreign aid accelerate the economic activity and generate tax revenues that enables governments to focus on enforcing rules of law, fighting against corruption effectively by releasing them from binding revenue constraint.[3] All these factors help to improve investment climate leading to more economic activity which in turn contribute additional revenues and improvement in the credit worthiness of government, eventually helping to improve government quality.

On the contrary, however, foreign aid may dampen the incentive for greater resource mobilization through taxation leading to a decline in government revenues, also goods imported by foreign aid projects are often exempted from import duties. Personnel working for foreign aid agencies and NGOs rarely pay local income taxes (Berg, 1993). External resources can reduce pressure on recipient governments to set up the efficient institutions and policies, essential in order to attract private investment that promote the economic growth.[4] Foreign assistance can even accentuate political instability in situation where the government tends to grab the aid money and neglects economic development leading to political pressure and general unrest in the masses. Political scientists have argued that aid weakens legislative accountability, by impeding the growth of well "civil society" hurting the rule of law and democracy. Foreign aid in developing countries may decrease the government's dependence on its citizens for tax revenues. With high level of foreign aid, recipient governments are answerable mainly to foreign donors rather than the tax payer, in this way the sovereignty of the country is also compromised, as the donors play influential role that may not be a good thing because the donors actually do not know exactly the system of the recipient country and all this collectively leave an adverse impact on the economic growth. (see, Figure 2)

Many development economists are of the view that capital is essential for economic growth and it does not matter from where it is financed. But the impact of external debt on the economic growth is controversial, in the literature their exist different hypothesis including the Liquidity Constraint Hypothesis (LCH), Debt Overhang Hypothesis (DOH), Direct Effect of Debt Hypothesis (DEDH) and uncertainty.The Debt Overhang Hypothesis states that high level of current debt worsens the economic performance because it leads to an increase in the future tax on the output that alters the individuals' incentive to save and invest[5]. The DOH reduces the incentives to invest in new technologies and the human capital, it also makes government not to invest in the activities like structural reforms and fiscal adjustments.[6]The Liquidity Constraint Hypothesis states that in case of highly indebted countries the debt service payments are so high which reduce the funds available for investment.[7] In order to check the impact of external debt on investment and savings DOH and LCH has been tested empirically. Some studies are in favor of DOH while other supports the LCH; by and large the results are mixed.[8] Uncertainty is another factor associated with the external debt; it makes the inflation and interest rates more volatile that affect the economic performance through the volatility in investment. Future capital inflows also depend on the perceived sustainability, risk of default, rescheduling of debt payments and outstanding debt that increase the volatility of future lending.[9] The short term debt and macroeconomic instability diminish the efficiency and productivity of capital that in turn reduce the economic growth.[10]

[3]See for example, Nasir *et al*., (2012), Kasuga and Morita (2012),Kathavate and Malik (2012), Easterly (2003), Islam (2003), Svensson, (2000a) and Dollar and Pritchett (1998).
[4] Rodrik (1996: pp. 31)
[5]Krugman (1988), Corden (1988), Sachs (1989) and Froot (1989)
[6]Sachs (2002)
[7]Hoffman and Reisen(1991).
[8]Cordello et al. (2005), Faini and DeMelo (1990) and Fry (1989) provide evidences that supports DOH and conclude that highly indebted countries experience low rates of capital formation and the debt affects investment negatively. Hoffman and Reisen (1991), Cohen (1993), Clements et al. (2003), Hansen (2004) and Presbitero (2005) find little empirical evidence in favor of DOH, they conclude on the basis of their findings that the high debt service payments crowd out the investment and hence negatively affect the economic growth.
[9]Gunning and Mash (1999)
[10]Moss and Chiang (2003)

Figure 2: Foreign Aid, External Debt and Economic Growth Nexus



High level of external debt and debt service payments are deleterious for investment as on the one hand they induce high tax rates on future output while on the other hand high debt service payments decrease the funds required for investment. DEDH states that even if the debt service payment does not adversely affect investment and saving it may decline the output growth directly through diminishing productivity due to adverse change in investment mix. DOH, LCH, and uncertainty imply a negative impact of foreign borrowing on investment level that leads to a decline in the economic growth, but the DEDH on the other hand states that debt burden may influence the efficiency and productivity of existing

capital even if it does not affect investment. In this way it will influence the output level and the economic growth (see, Figure 2).[11]

Motivating from these empirical facts, this study develops a theoretical model in which exclusive attention has been paid to explore the impact of foreign aid and external debt on economic growth by taking into consideration the governance quality. More specifically, we tries to extend the Ramsey-Cass-Koopman model in an open economy framework by incorporating the foreign aid, external debt and governance quality. Many studies have been conducted in recent years to examine the relationship between (a) economic growth and external debt; (b) economic development and foreign aid; (c) impact of foreign aid on governance and institutional quality; (d) the role of institution in the economic performance of country;[12] but little attention has been paid to explore the inter-linkages among foreign aid, external debt, governance and economic growth in a unified framework.

The main results are: external debt and foreign aid do not affect the growth rate of consumption but have level impact on consumption. Foreign aid and governance encourage the economic growth but external debt creates a burden on the economy. Both Investment and saving are independent of external debt and thus the current account surplus. Foreign aid does not affect investment directly but it has a direct positive impact on the savings in the economy. Improvements in the quality of governance actually stimulate the output and consumption rapidly and it acts like a catalyst. Lastly, steady state dynamics (stability properties around the saddle-path) of output, governance, debt, consumption, capital and investment have been discussed in detail.

The paper follows with the description of theoretical model. The third section discusses steady-state and short-run dynamics and last section concludes the main results.

2. THE MODEL

The standard Ramsey-Cass-Koopmans growth[13] model assumes infinite time horizon; while making decision regarding consumption parents take into account the welfare of their coming generations. Parents maximize their utility by taking into consideration the budget constraint over an infinite horizon. The basic model assumes that all the household units are identical; each family unit has similar preference parameters, assets per person, marginal product of labor, population growth rate but in the present case constant population and all variables in per capita term has been considered. It also assumes that the markets are perfectly competitive, homogeneous agents receive wage in return of their services while the capital that owned by the households receives rent. For simplicity it is assumed that there is no depreciation. Obstfeld (1999) adds foreign aid in Ramsey-Cass-Koopmans model while Xiaoyong and Gong (2008) also worked on the foreign aid and external debt and find out the short run and long run impact of foreign aid on the capital accumulation and the external debt. Following the basic framework used by the Blancherd and fischer (1989) here we extend the Ramsey-Cass-Koopmans model by incorporating foreign aid and governance in an open economy. Production function is purely neoclassical and fulfills all the basic properties. We consider the technological progress as neutral, following the definition of Harrod (Harrod-neutral) and the labor augmented production function specified by Robenson (1938) and Uzawa (1961).

Production in the domestic economy takes place with three inputs: physical capital $K(t)$, labour $L(t)$, and technology $\Theta(t)$ which depends on the quality of governance,[14] $Q(t)$ and can be expressed as:

[11] Fosu (1996)

[12] For a quick bird's eye view of some notable selected studies, please refer to Appendix-C.

[13] The original attempts made by Ramsey (1928), Cass (1965) and Koopmans (1965) in a spirit to make saving behavior endogenous. This resolves the problem of dynamic inefficiency, which emerged in the Solow-Swan growth model under the ad-hoc assumption of savings as exogenous, Barro and Sala-i-Martin (2004).

[14] Governance is measured as a composite index of bureaucratic quality, rule of law and corruption.

$\Theta(t) = \Theta(0).e^{Q(t)+n}$.[15] The parameter $'n'$ is exogenous rate of technological progress. The production function then takes of the form: $Y(t) = F[K(t), \Theta(t).L(t)]$. Where, $Y(t)$ is the flow of output produced at time t. The intensive form of the production function is given as:

$$y(t) = f(k(t)) \tag{1}$$

Where, $f : R_+ \to R_+$ is twice continuously differential, with the following Inada-conditions:

$$f'(k(t)) > 0, \quad f''(k(t)) < 0, \ \forall k(t) > 0$$

$$\lim_{k(t)\to 0} f'(k(t)) = \infty, \ \lim_{k(t)\to\infty} f'(k(t)) = 0, \quad f(0) = 0.$$

Household's utility function can be expressed as:

$$U = \int_0^\infty U(C(t))e^{-\theta t}dt \tag{2}$$

Where, $C(t)$, is the consumption of the household, $U(.)$ is the instantaneous utility function that is nonnegative increasing, concave and twice differentiable, i.e., $U'(.) \geq 0$ and $U''(.) \leq 0$. The parameter θ represents the subjective discount rate that is assumed to be strictly nonnegative, $\theta \epsilon (0,1)$.

In case of an open economy the equality between the saving and investment does not hold as the international trade in goods and assets is allowed. The imbalances in current account can be financed through the external debt and the country can borrow and lend freely at the constant world interest rate θ.[16] From national income identity:

$$f(k(t)) \equiv C(t) + \frac{dk(t)}{dt} + G(t) + NX(t) \tag{3}$$

$NX(t)$ is the net export, $C(t)$ is the private consumption expenditure, while $dk(t)/dt$ represents the change in capital stock that is actually investment at time $'t'$. Here the government expenditure, $G(t)$ has been sub-divided into the expenditure on governance, $Z(t)$[17] and expenditures on public goods, $G(0)$.

$$f(k(t)) \equiv C(t) + \frac{dk(t)}{dt} + Z(t) + G(0) + NX(t) \tag{4}$$

We can define, $g(t)$ the effective governance as percent of output. This can be thought of governance multiplier as:

$$Z(t) = g(t)f(k(t)) \tag{5}$$

[15]Following, Hall and Jones (1999) and North (1990), good governance is defined in terms of institutional credibility, effective laws/regulations and infrastructure stability which favors production process.

[16]This assumption is similar to Blanchard and Fischer (1989).

[17]Government allocate the available funds to improve the quality of governance by enforcing law and order, establishing sound bureaucracy and by making the system transparent enough to reduce the level of corruption.

The equation of motion of capital stock takes of the following form:

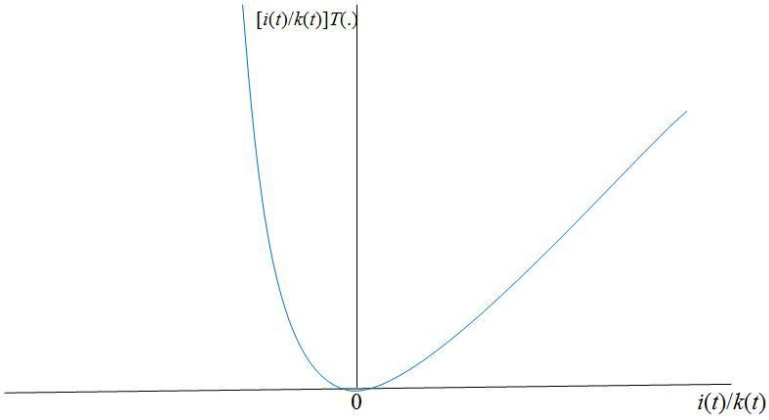
$$\frac{dk(t)}{dt} = I(t) = i(t)\left[1+T\left(\frac{i(t)}{k(t)}\right)\right] \tag{6}$$

Where $i(t)T(.)$ is the cost of installation. In order to increase the capital stock by i units, firm has to face the cost that is equal to $i(t)T(.)$. The installation cost function $[i(t)/k(t)]T(.)$ is non negative and convex as shown in the Figure 3.

When, there is no investment or zero investment, the installation cost function takes its minimum value that is zero. Here investment and disinvestment both are costly:

$$T(0) = 0, \qquad T(.)>0, \qquad 2T^{'}(.)+\frac{1}{kT^{''}(.)}>0$$

Figure 3: Cost of installation for investment



The solution of (4), (5) and (6) yield the following result:

$$f(k(t)) \equiv C(t)+i(t)\left[1+T\left(\frac{i(t)}{k(t)}\right)\right]+g(t)f(k(t))+G(0)+NX(t) \tag{7}$$

As we know, the current account deficit is equal to the change in external debt, $db(t)/dt$, which is equal to the interest payments on dent minus net exports.

$$\frac{db(t)}{dt} = \theta b(t) - NX(t) \tag{8}$$

By re-arranging (8), substitute the value of net exports into equation (7) and incorporating the foreign aid $A(t)$ the final budget constraint is derived as:

$$f(k(t)) + A(t) = C(t) + i(t)\left[1 + T\left(\frac{i(t)}{k(t)}\right)\right] + g(t)\,f(k(t)) + G(0) + \theta b(t) - \frac{db(t)}{dt} \tag{9}$$

This can be re-written as:

$$\frac{db(t)}{dt} = C(t) + i(t)\left[1 + T\left(\frac{i(t)}{k(t)}\right)\right] + g(t)\,f(k(t)) + G(0) + \theta b(t) - f(k(t)) - A(t) \tag{10}$$

If the country is able to borrow an unlimited amount at the prevailing interest rate, it will induce Ponzi-Game. So in order to avoid it, the restriction of Non-Ponzi Game has been applied, i.e.,

$$\underset{t\to\infty}{Limit} b(t)e^{-\theta t} = 0 \tag{11}$$

To solve the underlying optimization problem, the present value Hamiltonian has been used in which the utility function (2) is maximized subject to budget constraint (10), the capital accumulation equation (6), and the co-state variables, $\mu(t).e^{-\theta.t}$ and $\mu(t).q(t)e^{-\theta.t}$ respectively.

$$H = \left[U(C(t)) - \mu(t)\begin{Bmatrix} C(t) + i(t)\left[1 + T(\frac{i(t)}{k(t)})\right] + g(t)\,f(k(t)) \\ +G(0) + \theta b(t) - f(k(t)) - A(t) \end{Bmatrix} + \mu(t)q(t)i(t) \right] e^{-\theta t}$$

The FOC's are:

$$\frac{\partial H}{\partial C} = \left[U'(C(t)) - \mu(t)\right]e^{-\theta t} = 0 \tag{12}$$

$$\frac{\partial H_t}{\partial k} = -\mu(t)e^{-\theta t}\left[-f'(k(t)) - (\frac{i(t)}{k(t)})^2 T'(\frac{i(t)}{k(t)}) + g(t)\,f'(k(t))\right] = 0 \tag{13}$$

$$\frac{\partial H_t}{\partial i} = -\mu(t)e^{-\theta t}\left[1 + T(\frac{i(t)}{k(t)}) + (\frac{i(t)}{k(t)})T'(\frac{i(t)}{k(t)})\right] + \mu(t)q(t)e^{-\theta t} = 0 \tag{14}$$

$$\frac{\partial H_t}{\partial g} = -\mu(t)\,f(k(t))e^{-\theta t} \tag{15}$$

$$\frac{\partial H_t}{\partial b} = -\mu(t)\theta e^{-\theta t} \tag{16}$$

From the above first order conditions, the following results has been derived respectively.

$$U'(C(t)) = \mu(t) \tag{17}$$

$$\frac{d(\mu(t)q(t)e^{-\theta t})}{dt} = -\mu(t)e^{-\theta t}\left[(1-g(t))f'(k(t)) + (\frac{i(t)}{k(t)})^2 T'(\frac{i(t)}{k(t)})\right] \quad (18)$$

$$1 + T(\frac{i(t)}{k(t)}) + (\frac{i(t)}{k(t)})T'(\frac{i(t)}{k(t)}) = q(t) \quad (19)$$

$$\frac{d(-\mu(t)e^{-\theta t})}{dt} = \mu(t)\theta e^{-\theta t} \quad (20)$$

Equations (18) and (20) are the Euler equations for capital and external debt respectively.

$$\underset{t\to\infty}{Limit} - \mu(t)b(t)e^{-\theta t} = 0 \quad (21)$$

$$\underset{t\to\infty}{Limit}\mu(t)q(t)k(t)e^{-\theta t} = 0 \quad (22)$$

Equations (21) and (22) are the respective transversality conditions associated with debt and capital.

3.STEADY-STATE AND SHORT RUN DYNAMICS

This section will derive the steady state relations and transitional dynamics of key variables. Equations (A6) and (A7) show the dynamics of the economy that determine capital, investment and output. The consumption level and the dynamics of debt are determined by (A5) and (10).

3.1 Capital and Investment

In the steady state we know that:

$$\frac{dk(t)}{dt} = \frac{dq(t)}{dt} = 0$$

From equation (A6) it becomes clear that whenever $\xi(1) = 0$, it implies that change in capital is equal to zero i.e. $dk(t)/dt = 0$ or when $q(t) = 1$. So in the steady state:

$$q^* = 1$$

$$(1-g(t))f'(k^*) = \theta$$

If we put this steady state value of $q(t)^*$ and marginal productivity of capital in equation (A7), we find that:

$$\frac{dk(t)}{dt} = \frac{dq(t)}{dt} = 0$$

This equation shows that in the steady state the rate of investment is equal to zero. The shadow price of capital must be equal to replacement cost while the marginal product of capital is equal to the discount rate, which is itself equal to the rate of time preference.

To analyze the dynamics of capital and investment around the steady state neighborhood equations (A6) and (A7) have been linearized around $q^* = 1$ and k^*.From equation (A3) we know that: $\frac{\dot{k(t)}}{k(t)} = \xi(q(t))$, we can write it as:

$$\frac{\dot{k(t)}}{k(t)} = \frac{d\ln(k(t))}{dt} = \xi(e^{\ln(q(t)}) = h_1(\ln(q(t)) \tag{23}$$

Equation (A7) and (23) jointly yields the following result:

$$\frac{\dot{q(t)}}{q(t)} = \theta - \frac{(1-g(t))f^{'}(k(t))}{q(t)} - \frac{\xi(q(t))^2 T^{'}\left[\xi(q(t)\right]}{q(t)}$$

As we know that:

$$\frac{\dot{q(t)}}{q(t)} = \frac{d\ln(q(t))}{dt}$$

This can solve the above equation as:

$$\frac{d\ln(q(t))}{dt} = \theta - (1-g(t))f^{'\ln(k(t))})e^{-\ln(q(t))} - \xi(e^{\ln q(t)})^2 T^{'}\left[\xi(e^{\ln q(t)})\right]e^{-\ln q(t)} = h_2(\ln(k(t),\ln(q(t)) \tag{24}$$

The Taylor series approximation at $(k,q) = (k^*,1)$ simplifies the above expression as:

$$h_1(\ln(q(t))= h_2(\ln(k(t),\ln(q(t))= 0$$

The relevant partial derivatives of the equations (23) and (24) are:

$$\frac{\partial h_1(\ln(q(t))}{\partial \ln(q(t))} = \frac{\partial\left[\xi(e^{\ln(q(t)})\right]}{\partial \ln(q(t))} = \xi^{'\ln(q(t)} = \xi^{'}\cdot q(t) \tag{25}$$

$$\frac{\partial\left[h_2(\ln(k(t),\ln(q(t))\right]}{\partial \ln(q(t))} = \frac{\partial\left\{\theta - (1-g(t))f^{'\ln(k(t))})e^{-\ln(q(t))} - \xi(e^{\ln q(t)})^2 T^{'}\left[\xi(e^{\ln q(t)})\right]e^{-\ln q(t)}\right\}}{\partial \ln(q(t))}$$

$$= (1-g(t))f'^{\ln(k(t))})e^{-\ln(q(t))} - \xi'^{\ln(q(t))})^2 T'\left[\xi(e^{\ln(q(t))})\right]e^{\ln(q(t))} + \xi(e^{\ln(q(t))})^2 T''\left[\xi''(e^{\ln(q(t))})\right]$$
$$-\xi(e^{\ln(q(t))})^2 T'\left[\xi(e^{\ln(q(t))})\right]e^{-\ln(q(t))}$$

$$\frac{\partial\left[h_2(\ln(k(t),\ln(q(t))\right]}{\partial\ln(k(t))} = \frac{\partial\left\{\theta-(1-g(t))f'^{\ln(k(t))})e^{-\ln(q(t))} - \xi(e^{\ln q(t)})^2 T'\left[\xi(e^{\ln q(t)})\right]e^{-\ln q(t)}\right\}}{\partial\ln(k(t))}$$

$$\frac{\partial\left[h_2(\ln(k(t),\ln(q(t))\right]}{\partial\ln(k(t))} = -(1-g(t))f''e^{-\ln(q(t))}$$

$$\frac{\partial\left[h_2(\ln(k(t),\ln(q(t))\right]}{\partial\ln(k(t))} = -\frac{(1-g(t))f''}{q(t)} \tag{26}$$

By evaluating above expressions at steady state values of capital and shadow prices, we get the following results respectively:

$$\frac{\dot{k(t)}}{k(t)} = \xi'(1)\cdot\ln\left(\frac{q}{q^*}\right) \tag{27}$$

$$\frac{\dot{q(t)}}{q(t)} = (1-g(t))f'^*)\ln\left(\frac{q}{q^*}\right) - (1-g(t))f''\ln\left(\frac{k}{k^*}\right) \tag{28}$$

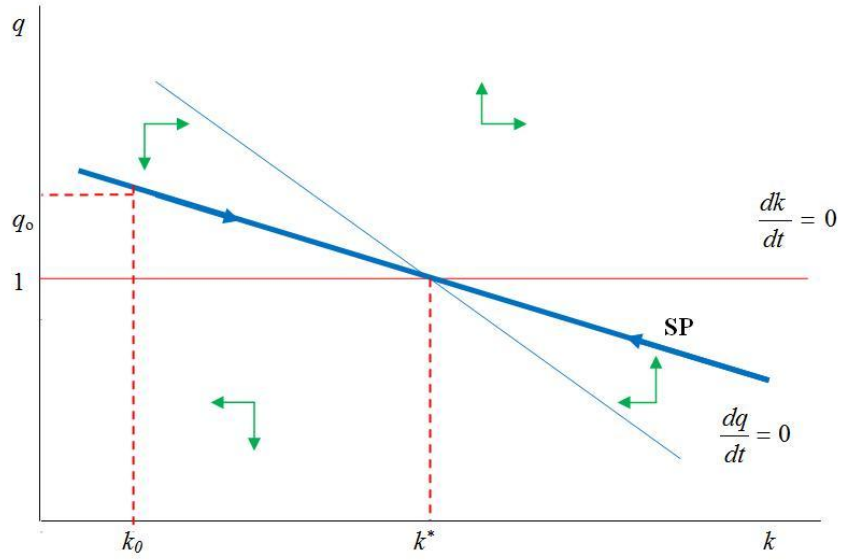
The log linearized equation (27) and (28) can be written in the matrix form as:

$$\begin{pmatrix}\frac{dk}{dt}\\ \frac{dq}{dt}\end{pmatrix} = \begin{pmatrix}0 & \xi'^*\\ -(1-g(t))f''(k^*) & (1-g(t))f'^*)\end{pmatrix}\begin{pmatrix}k-k^*\\ q-1\end{pmatrix} \tag{29}$$

Figure 4, shows the dynamic behavior of investment and capital graphically using phase diagram, corresponding to (40). The $dk(t)/dt = 0$ locus shows the dynamics of capital, this line is horizontal at $q^* = 1$, $dq(t)/dt = 0$ locus is downward sloping. [18]

[18]The $dq(t)/dt = 0$ locus is negatively sloped around the neighborhood, whenever the restriction of close neighborhood is violated there is no assurance that away from the steady state it is negatively sloped without the imposition of further restrictions on the $T(.)$ function. However the restrictions imposed on $T(.)$ are sufficient to ensure the negative slope of $dq(t)/dt = 0$ locus around the steady state.

Figure 4: Dynamics of capital and investment



The arrows show the direction of motion, the line SP is the saddle path that is negatively sloped and indicates a unique path converging to steady state. The saddle path indicates the dynamics of investment. Let k_0 indicates the initial level of capital at which $q_0 > q^* = 1$. As the shadow price is greater than unity, capital accumulates over time. Output increases and so does net output while investment decreases over time due to diminishing marginal productivity.

3.2 Consumption and Debt

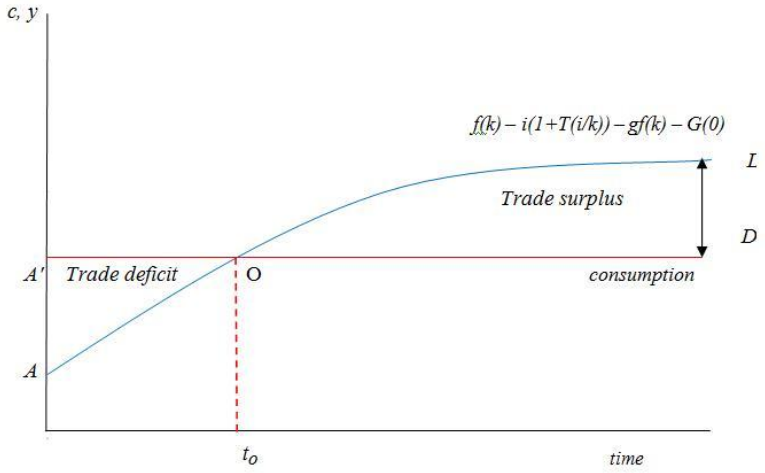
From the Euler equation (A2) for consumption it becomes clear that the consumption is smooth over time and it is independent of the interest rate or the rate of time preference. The consumption level is constant over time as revealed by the equation (A5). The level of consumption depends on the net output that is defined as:

$$Net.Output = Total.Output + Foreign.Aid - Stock.of.Debt - Cost.of.investment \qquad (30)$$

Let the stock of debt and foreign aid be zero initially then from equation (A4), the present discounted value of net output minus consumption must be zero. Alternatively one can say that the present discounted value of current and future trade surpluses is zero. Figure 5 describes this fact graphically, the area AA'ODD' must be divided by horizontal consumption line in such a way that makes the present value of area AA'O equals to present value of $DD'O$.

Net output depends on the changes in capital stock i.e. investment. Let the economy start somewhere below the steady state level with some initial capital stock ko (see, Figure 4), as the capital stock increases to its steady state level k^*, the net output also increases over time (see, Figure 5). Net income increases from the level below consumption (see point A in Figure 5) and eventually exceeds consumption (see point O).

Figure 5: Consumption, net output, trade and current accounts

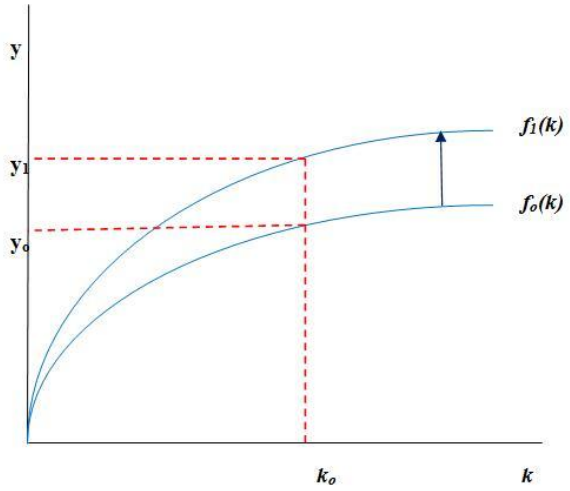


In the start net output is less then consumption and this gap will be financed by foreign aid and debt or by running current account deficit. Debt accumulates in the region $AA'O$ and after point O net income exceeds the consumption. The area $DD'O$ shows the trade surplus, in steady state the current account must be balanced. The interest payments on debt offset the trade surplus $\theta b^* = DD'O$, where b^* is the steady state level of debt that is positive.

3.3 Governance and Transitional Dynamics

Governance plays an important role in all the economic activities of a country. Good economic institutions promote growth by increasing the efficiency of factors of production.[19] Governance has been taken as exogenous so whenever quality of governance improves it shifts the production function upward as shown in Figure 6.

Figure 6: Governance and output



[19]Whenever the government institute good civil services, implement rules and regulations properly and trim down the corruption it will automatically formulate such an environment that not only induce the investment activity by reducing cost of transaction it will also increase the productivity of existing capital.

Improvement in the quality of governance increases the output for a given level of capital stock. Investment depends on the output as well as governance, so whenever output increases or the institutional quality improves it will enhance the investment.

Figure 7: Effect of good governance on capital and investment

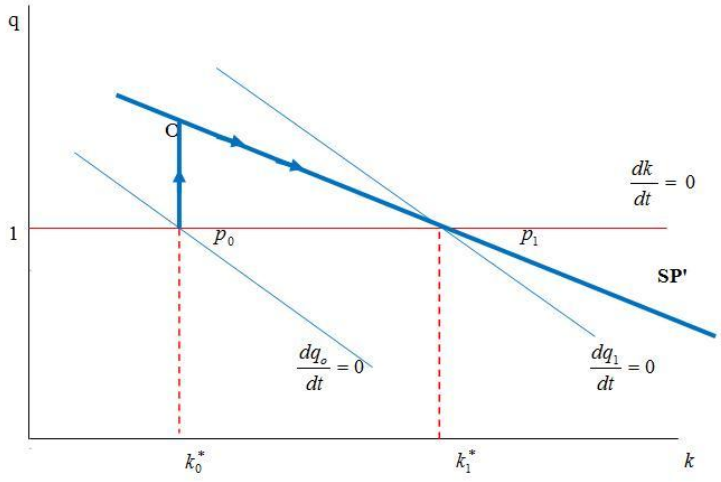
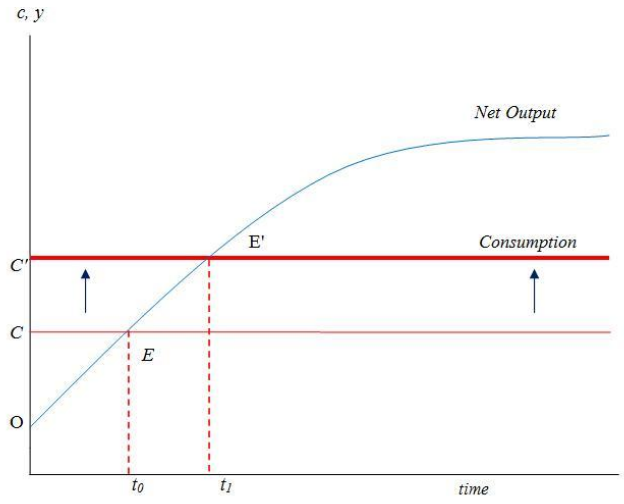


Figure 7, shows the dynamics of investment and capital when quality of governance improves. Governance acts as a shifting parameter and it shift the $dq/dt = 0$ locus to the right, the $dk/dt = 0$ locus does not change its position.The steady state of the economy shifts from P to P', the steady state level of capital also increases from k^* to k'^*. SP' is the new saddle path, due to improvement in the quality of governance investment increases abruptly from $P0$ to O as shown in Figure 7. Then in the long run downward movement along the saddle path takes place from O to $P1$. Rate of investment is positive but decreasing over the period of time due to diminishing marginal productivity of capital.

Initially whenever governance improves it enhance productivity, but it will increase consumption more than the net output due to which the deficit increases but in the long run net output increases and deficit turns into surplus, as shown in the following Figure 8.

Figure 8: Effect of good governance on Consumption and net output



In the start the deficit was equal to OEC but when consumption level increases it shifts the consumption curve from C to C', now equilibrium shifts from E to E' and deficit increases by an area equals to $CC'EE'$.

4.CONCLUSION

This study reveals interesting insights with the help of open economy version of Ramsey-Cass-Koopman Model augmented with foreign aid, external debt and governacne. Based on model calibration results given in Figure B1 and Figure B2 of appendix B, It is recommended that to achieve elevated economic growth rates; developing countries must have impartial and consistent set of rules that ensure the preeminent quality of governance. Good governance is essential and it plays a vital role in determining the destination of a country. Most of the developing countries usually have poor governance and it is the major obstacle that hinders the economic reform and development process.

Foreign aid and external debt are the sources through which developing countries finance their budget deficit. Foreign aid has a positive impact on economic growth and it is playing a constructive role in spurring the economic activity of an economy. External debt has a negative impact on economic growth and it's a burden that puts an economy into trouble. It is recommended on the basis of this study that developing countries should finance budget through foreign aid and not depend on the external debt as it affects the economic activities adversely. If government pays more attention to the institutional quality and uses foreign aid effectively then it will have good impact on economic growth in the long run. Developing countries should try to pay more attention to the issue of lack of quality governance and side by side they must indulge in those activities that augment the tax revenues.

For future research, it is interesting to augment the role of bueaucratic corruption across different political regimes. Some recent empirical studies argued that the effectivness of foreign aid to achieve better economic outcomes is a non-linear process. The relationship differs across different political regimes. Optimal outcomes may only occur in a regime which ensure more transparency and estabilishes stronger rules to kill rent seeking behavior of economic agents.

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APPENDIX A: COROLLARIES

A1. Corollary (i): Behavior of Consumption growth

In order to find out the growth rate of consumption, solve (20) by applying differentiation with respect to time, t.

$$-\left[\frac{d\mu(t)}{dt}e^{-\theta t}-\theta\mu(t)e^{-\theta t}\right]=\mu(t)\theta e^{-\theta t}$$

$$\left[\frac{d\mu(t)}{dt}-\theta\mu(t)\right]e^{-\theta t}=-\mu(t)\theta e^{-\theta t}$$

This simplifies as:

$$\frac{d\mu(t)}{dt}=0 \tag{A1}$$

From (17), we have:

$$U^{'}(C(t))=\mu(t)$$

$$\frac{dU^{'}(C(t))}{dt}=\frac{d\mu(t)}{dt}=0$$

This gives the main result of consumption growth.

$$\frac{\dot{C}(t)}{C(t)}=0 \tag{A2}$$

We can say that the consumption is smooth-over time and it is independent of the rate of time preference.

A2. Corollary (ii): Behavior of Consumption at level

In order to find out the level of consumption, integrate the flow constraint (19) using transversality condition (21).

$$\frac{db(t)}{dt}=C(t)+i(t)\left[1+T(\frac{i(t)}{k(t)})\right]+gf(k(t))+G(t)+\theta b(t)-f(k(t))-A(t)$$

$$0=\int_0^{\infty}\left[C(t)+i(t)\left(1+T(\frac{i(t)}{k(t)})\right)+gf(k(t))+G(t)+\theta b(t)-f(k(t))-A(t)\right]e^{-\theta t}dt$$

$$\int_0^{\infty}C(t)e^{-\theta t}dt=-\int_0^{\infty}\left[i(t)\left(1+T(\frac{i(t)}{k(t)})\right)+gf(k(t))+G(0)-f(k(t))\right]e^{-\theta t}dt$$

$$-\int_0^{\infty}\theta b(t)e^{-\theta t}dt+\int_0^{\infty}A(t)e^{-\theta t}dt$$

$$\int_0^{\infty} C(t)e^{-\theta t}dt = \int_0^{\infty}\left[f(k(t)) - i(t)\left(1 + T(\frac{i(t)}{k(t)})\right) - gf(k(t)) - G(0)\right]e^{-\theta t}dt$$
$$-\int_0^{\infty}\theta b(t)e^{-\theta t}dt + \int_0^{\infty} A(t)e^{-\theta t}dt \qquad \text{(A3)}$$

Where,

$$\int_0^{\infty}\theta b(t)e^{-\theta t}dt = b(0) \qquad as \qquad \underset{t\to\infty}{Limit}\,\theta b(t) = b(0)$$

$$\int_0^{\infty} A(t)e^{-\theta t}dt = A(0) \qquad as \qquad \underset{t\to\infty}{Limit}\,A(t) = A(0)$$

Using above conditions, equation (A3) can be written as:

$$\int_0^{\infty} C(t)e^{-\theta t}dt = \int_0^{\infty}\left[f(k(t)) - i(t)\left(1 + T(\frac{i(t)}{k(t)})\right) - gf(k(t)) - G(0)\right]e^{-\theta t}dt - b(0) + A(0)$$

This can be simplify as:

$$\int_0^{\infty} C(t)e^{-\theta t}dt = V(0) \qquad \text{(A4)}$$

The present discounted value of consumption is equal to net wealth at time zero $V(0)$, the present discounted value of net output (the contents of the braces and foreign aid minus initial level of debt). Since consumption is constant above equation implies that:

$$C(t) = C(0) = \theta V(0) \qquad \text{(A5)}$$

A3. Corollary (iii): Behavior of Investment

Equation (19) indicates that the investment rate is a function of $q(t)$, which is the shadow price of installed capital in terms of consumption goods. It also implies that:

$$q(t) = \vartheta(\frac{i(t)}{k(t)}), \qquad \vartheta' \geq 0 \;\; and \;\; \vartheta(0) = 1$$

From the above specification, inverse function can be formulated as:

$$\frac{i(t)}{k(t)} = \xi(q(t)) \qquad \xi' \geq 0 \;\; and \;\; \xi(1) = 0$$

Put this value in the capital accumulation equation (6) and after replacement, it takes the form as:

$$\frac{dk(t)}{dt} = i(t) = k(t)\xi(q(t)), \qquad \xi' \geq 0 \;\; and \;\; \xi(1) = 0 \qquad \text{(A6)}$$

Capital accumulation (investment) is a function of shadow price $q(t)$, to determine the value of this price consider equation (18), given (A1):

$$\frac{dq(t)}{dt} = \theta q(t) - (1-g(t))\, f^{'2}T^{'}\left[\xi(q(t)\right] \tag{A7}$$

Integrate equation (A7) subject to transversality condition (22):

$$0 = \int_t^{\infty}\left[\theta q(t) - (1-g(t))\, f^{'2}T^{'}\left\{\xi(q(t))\right\}\right]e^{-\theta t}dt$$

This can be simplify as:

$$q(t) = \int_t^{\infty}\left[(1-g(t))\, f^{'2}T^{'}\left\{\xi(q(t))\right\}\right]e^{-\theta t}dt \tag{A8}$$

The shadow price q(t) is equal to the present discounted value of marginal product. From equation (A8) it becomes clear that investment is independent of the consumption, foreign aid and debt. As the economy is open so in the presence of exogenous real interest rate investment does not depend on the savings at all but the most exciting and significant result is that the investment decision is not independent of Governance expenditures. Whenever marginal propensity to invest in Governance increases it will encourage more investors to make investment.

A4.Corollary(iv): Behavior of Saving and Current Account

Saving is given as:

$$S(t) = f(k(t)) - C(t) - gf(k(t)) - G(0) - \theta b(t) + A(t) \tag{A9}$$

As we know that:

$$C(t) = \theta V(t)$$

By putting the value of consumption in equation (A9), we get:

$$S(t) = f(k(t)) - \theta\int_0^{\infty}\left[f(k(z)) - i(z)\left(1+T(\frac{i(z)}{k(z)})\right)\right]e^{-\theta(z-t)}dz + (1-\theta)\left[A(t) - g(t)\, f(k(t)) - G(0)\right] \tag{A10}$$

From the final equation of saving, it becomes clear that whenever output is high compared to future expected output savings will be high. Savings are not independent of foreign aid; increase in foreign aid will lead to enhance savings positively but governance and public expenditures affect negatively. The equality of the marginal propensity to consume and interest rate simply implies whenever debt increases it will decrease the income and consumption equally, leaving savings unaffected.

$$CAS(t) = S(t) - I(t) \tag{A11}$$

The difference between the savings and investment is known as current account surplus (CAS). Savings and investment are independent of debt stock and so the current account surplus but foreign aid affects it positively. Whenever government increase its expenditures either they are related to governance or other public expenses, it affects the current account surplus negatively.

APPENDIX B:MODEL CALIBRATION RESULTS

Figure B1: Absolute responses to an increase in level of Governance

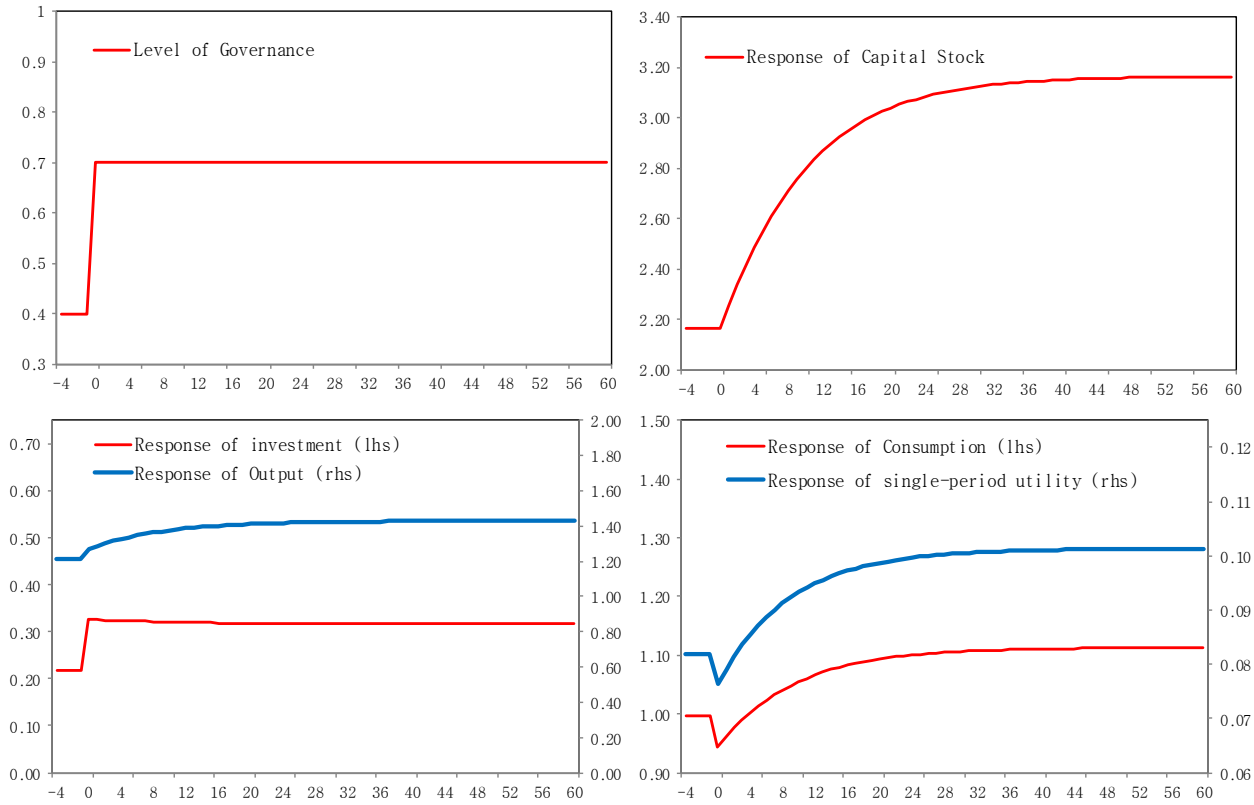
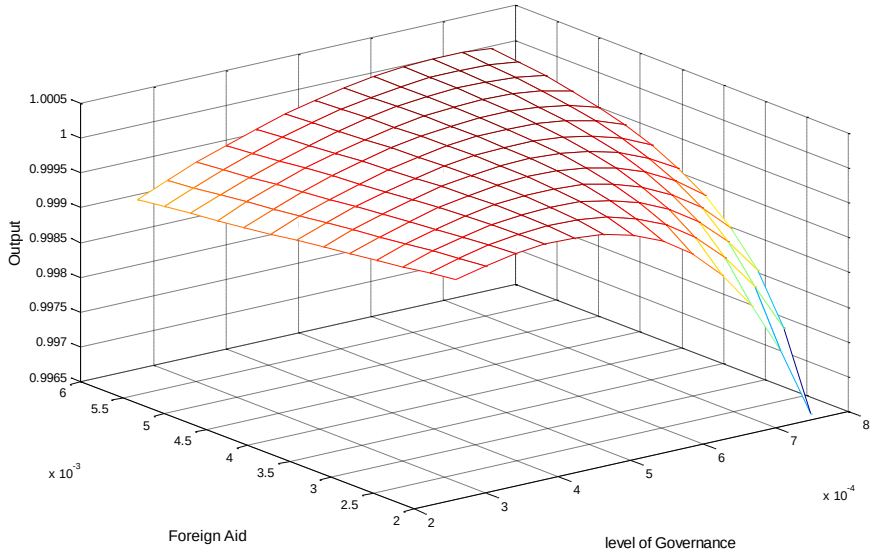


Figure Key: Horizontal axis represents Time (Year); lhs =: left hand scale; rhs =: right hand scale

Figure B2: Nonlinear Effect of Foreign Aid on Output



APPENDIX C: EMPIRICAL LITERATURE REVIEW

Authors	Empirical Approach	Dependent Variable(s)	Regressors	Sample Period	Findings
Feeny and McGillivray (2010)	OLS, Fixed effect model and GMM	Real per capita income growth	Official development assistance/GDP, binary regional location dummies, ethnic fractionalization, governance, macroeconomic policy, natural disasters.	1980-2004	Aid helps in promoting the economic growth but with diminishing returns.
Hansen and Headey (2010)	VAR	Aid, exports, domestic demand, GDP, net imports	Aid, exports, domestic demand, GDP, net imports (absorption)	1972-2003	This study analyzesthe short run impact of aid on macroeconomic variables i.e. absorption and spending. Result indicates that in the small developing countries; half of the aid inflows are absorbed and spent while the spending are equal to absorption.
Alvi, *et al*., (2008)	Fully parametric, semi-parametric, GMM	Per capita GDP growth	Log of initial GDP per capita, ethnic fractionalization, assassinations, institutional quality, M2/GDP, Sub-Saharan Africa dummy, East Asian dummy, budget surplus, inflation, Sachs-Warner openness variable, effective development assistance/real GDP adjusted for PPP climate.	1974-2001	Aid is effective in spurring the economic growth only in the presence of good economic policies and there exist diminishing returns to aid inflows.
Islam (2005)	OLS and 2SLS	Economic growth	Initial GDP, instability in GDP, aid, primary schooling , secondary schooling, human capital, population, mortality, inflation, budget surplus, trade openness, financial depth	1968-97	Aid does not have any significant impact on the economic growth but it

			(M2/GDP), assassinations, coups d'état, revolutions, riots, strikes, regime, political instability, freedom, government consumption expenditures, party fractionalization, export instability, ethno-linguistic fragmentation, time dummy, regional dummy, income dummy.		has a positive impact only in a politically stable environment irrespective of the quality of policies adopted by recipient countries.
Feeny (2005)	ARDL	GDP growth	Investment, trade openness, governance, structural adjustment programs, aid, dummy variable for shocks and crisis	1965-1999	There exist little evidence in favor of Aid's positive contribution in the economic growth of Papua New Guinea it is only effective during the period of structural adjustment programs by World bank
Brautigam and Knack (2004)	OLS and 2SLS	Quality of Governance (ICRG Index)	Aid/GDP, initial ICRG index value, population, GDP, political violence, infant mortality rate, illiteracy rate and tax revenues	1982-1997	Aid has the deleterious effects on the quality of governance in case of African countries.
Easterly (2003)	OLS and 2SLS	Per capita growth	Log Initial GDP, instability in GDP, aid/GDP, policy, financial depth (M2/GDP),	1970-1993	This study verifies Burnside and
Knack (2001)	OLS and 2SLS	Aid/GNP, aid/government spending rule of law, bureaucratic quality, corruption	ICRG index for governance (rule of law, bureaucratic quality, corruption), population, GDP, infant mortality, percent in largest ethnic group, aid/GNP, aid/government spending	1975-1995	High level of aid inflows deteriorates the quality of governance and this result is robust for alternative specifications.

Svensson (2000)	2SLS	Aid and corruption (ICRG Index)	Aid, grants and grants equivalents of concessional loans deflated by imports unit value index to real GDP, black market premium, political liberty, ethno-linguistic fractionalization, freedom from government regulations, log of initial real per capita GDP, exports of primary products/GDP	1980-1994	High level of aid inflows does not necessarily endorse the economic growth as well as the general welfare gains. Huge aid inflows are associated with higher level of corruption especially in those countries that are suffering from competing social groups.
Alesina (2000)	OLS, 2SLS, Tobit estimates	Aid	Colonial past, UN friends, Egypt and Israel, income of recipient country, trade openness index, democracy index, religion, FDI, rule of law, civil liberties index, population,	1970-1994	Political alliances, colonial past strategic considerations as well as economic policies play an important role in the allocation of foreign aid to recipient countries.
Lensink and Morrissey (2000)	Barro type cross country regression	Per capita growth rate of GDP	Initial level of GDP, initial secondary school enrollment rate, investment/GDP, trade openness, financial development	1970-1995	Aid has a positive impact on the economic growth via spurring investment in the recipient economy. The effectiveness of aid trims down due to instable and uncertain inflows.

Burnside and Dollar (2000)	2SLS	Per capita income	Foreign aid, aid interacted with policies, index that measures institutional and policy distortions, regional dummies, ethnic fractionalization and assassinations	1970-1993	In the presence of bad economic policies foreign aid does not affect growth positively, and these results are robust for various specifications that either include or exclude middle income countries, outliers and consider policy variables as exogenous and endogenous.
Boone (1995)	OLS and Fixed Effect (FE)	Aid/GNP, Consumption, primary schooling, inflation tax, infant mortality, life expectancy, black market premium, public and private investment, government consumption	GNP per capita, population, friends of (US, OPEC, France),twice lagged aid/GNP, per capita GNP growth rate, terms of trade, debt rescheduling, infant mortality, life expectancy ,regional dummies for Sub-Saharan Africa, Asia, Latin America, aid/GNP, political right indicator, democratic regime, socialist regime, military authoritarian and other.	1971-1990	Results indicate that foreign aid just increase the size of government and it does not play any significant role in stimulating investment and economic growth. Aid even does not benefit the poor people in the recipient countries.
Khilji and Zampelli (1991)	Full information maximum likelihood (FIML)	Per capita amount of defense consumed, Per capita amount of public non-defense consumed, Per capita private consumption,	Indian defense expenditure ,total real Indian resources, real per capita internal resources of Pakistan, real per capita US military aid to Pakistan, real per capita US non-military aid to Pakistan, fraction of real per capita US military aid to Pakistan converted into fungible resources, fraction of real per capita US non- military aid to	1960-1986	US assistance to Pakistan transformed completely into the fungible resources irrespective of its type whether it is military aid or non-military. It effects the

	Pakistan converted into fungible resources, price of private consumption set, effective price of defense goods, Pakistan's real per capita expenditure on public non-defense from own internal resources	public spending but it is not very significant as was expected.