Remittances and Economic Growth: The Role of Financial Development

Unbreen Qayyum
Muhammad Nawaz

PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS

Remittances and Economic Growth: The Role of Financial Development

Unbreen Qayyum
Pakistan Institute of Development Economics, Islamabad

and

Muhammad Nawaz
Pakistan Institute of Development Economics, Islamabad

**PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS
ISLAMABAD**

Pakistan Institute of Development Economics
Islamabad, Pakistan

E-mail: publications@pide.org.pk
Website: http://www.pide.org.pk
Fax: +92-51-9248065

Designed, composed, and finished at the Publications Division, PIDE.

C O N T E N T S

List of Figures

ABSTRACT

Remittances and financial developments have been an important and overgrowing source in accelerating the growth process of many transitional economies. The economies that have enough source of remittance from their expatriate necessitate the well established technology for financial transactions that ultimately result in economic growth. This paper theoretically extends the Ramsey-Cass-Koopmans model by incorporating the remittances and financial developments that has emerged in financial sector. Theoretical results of steady-state indicate that higher amount of migrant remittances along with financial developments increase the consumption level of the domestic residents that results in higher economic growth by inducing more investment. In the long-run, both overseas remittances and financial developments increase the steady-state rate of output growth and capital stock. The findings also highlights that remittance creates the current account surplus and financial developments produce an upward shift in production function that lead to further growth. This research explores the new dimension for policy-maker particularly, working for innovations in the financial sectors.

JEL Classification: G2, F24, F43
Keywords: Financial Development, Remittances, Economic Growth

1. INTRODUCTION

Emerging economies have long aspired for innovations in financial sectors, higher remittances, improvements in current account and acceleration in growth. A major source of income of most developing countries (DCs) that has evolved over time has been overseas remittances of their immigrant workers. In the meanwhile, developments in domestic financial markets, such as easy access to loans and widening credit growth mainly have contributed to high growth as well as better income level of domestic population. Moreover, globalisation has helped integration between financial sectors and overseas remittances, which in turn has led to higher innovation in technology as well as production.

Since the pioneering work of Gurley-Shah (1955) that introduced the concept of financial development in promoting growth, many remarkable studies such as Goldsmith (1969), Mckinnon (1973), and Shaw (1973) have incorporated it in theoretical as well as empirical literature. Though income flows from expatriates and financial sector developments have been linked in growth analysis by Giuliano and Ruiz-Arranz (2009), King and Levine (1993) and Levine, *et al*. (2000) argue that the growth enhancing effect of financial development works through expansion of private credit and liquid liabilities, while any crisis in banking and currency may lead to recession due to developments in financial sector [Gourinchas, *et al.* (1999); and Kaminsky and Reinhart (1999)].

Overseas remittances and financial innovations have an ambiguous relationship with economic growth [Giuliano and Ruiz-Arranz (2009)]. In both LDCs and DCs, there have been very few facilities in the financial sector for its development. Hence, the growth of remittances has been ineffective in promoting productive activities in these economies through expansion of credit. But, at the same time, sound financial innovations have been important in increasing the amount of remittances and decreasing transaction cost for the economy in general and promoting growth. Mundaca (2009) explains that innovations in financial market and the increasing trend of developing economies to attain maximum remittances which have led to promoting growth and higher income generation are trends that have achieved importantance in economic literature. Hinojosa-Ojeda (2003) also contributes to the literature by pointing out that the flow of remittances in the presence of banking sector innovations leads to the growth process.

Remittances and financial sector developments have contradictory and complex application in affecting the growth nexuses especially in conflict

affected countries [Maimbo (2007)]. Threats to remittances and lack of financial innovations worsen the economic situation. Remittances are not just an unwavering source for the development of infrastructure but are also a stable source of foreign exchange reserves with less volatile characteristics as compared to other foreign earning resources [Ratha (2005)]. Lundahl (1985) explain that expatriate earnings do not necessarily contribute to raising income of domestic residents that mainly depends on the types of traded goods. Quibria (1997) theoretically finds in the general equilibrium model that benefits and losses of remittances are dissimilar for factor endowments and volume of remittances.

There is abundant literature that explains that increasing amount of remittances may have stimulating effect on income, consumption as well as investment. Arzeki and Bruckner (2011) find that high flow of remittances may have transitory shock on income and may amplify the growth process in the long-run. They highlight the impact of remittances in the presence of transitory income component. The findings examine the unique case in which negative effect of remittances emerges in Sub-Saharan African countries. Since the emergence of the concept of financial developments and remittance playing a role in enhancing the growth process, keen interest has been shown in both macroeconomic indicators as engines of growth. Here, this study is another attempt to highlight this finding by extending the Ramsey-Cass-Koopmans model in the presence of remittances and financial developments that have emerged in the financial sector.

2. THEORETICAL MODEL

This section incorporates the theoretical contribution of the model developed by Ramsey (1928), Cass (1965), and Koopmans (1965). We extend the macroeconomic developments by incorporating the latest innovations in financial market that follow the remarkable work of Gurley-Shah (1955) by including financial developments as the important component of economic growth together with remittances.

2.1. Set up of the Model

We assume an infinite time horizon for achieving long term economic growth. We follow all the basic assumptions of Ramsey-Cass-Koopmans model and also assume technological progress as a Harrod neutral. We consider the labour augmented neoclassical production function following Robenson (1938) and Uzawa (1961):

$$Y(t) = f\left[K(t), L(t).A(t)\right] \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

$$A(t) = A(0)e^{F(t)+N(t)} \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1')$$

Where, *Y(t)* stands for output of an economy while *A(t)* shows technological progress that depends on *F(t)* financial development and *N(t)* exogenous rate of technological progress, *K(t)* and *L(t)* is the capital and labour input, respectively. We can express effective labour as $\hat{L}(t) = L(t). A(t)$ and the production function as: $Y(t) = f[K(t), \hat{L}(t)]$. In per capita form the production function can be expressed as:

$$y(t) = f(k(t)) \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (2)$$

For simplicity, it is assumed that the depreciation rate is zero and the production function is strictly concave that is twice differentiable and satisfies the Inada conditions, such as:

$$f(0) = 0, \ f'(0) = \infty, \ f'(\infty) = 0$$

The household's utility function can be expressed as:

$$\text{where } U = \int_0^\infty U[c_D(t), c_R(t)]e^{-\theta t}dt \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (3)$$

$C_D(t)$, $C_R(t)$ are the domestic and the remittance related per capita consumption of the agent. However, $U(.)$ is the instantaneous utility function that is non-negative increasing, concave and twice differentiable as $U'[c_D(t), c_R(t)] \geq 0$, $U''[c_D(t), c_R(t)] \leq 0$. The parameter "θ" represents the subjective discount rate that is assumed to be strictly non-negative. In order to incorporate the remittance in open economy environment, the national income identity can be written as:

$$f(k(t)) \equiv c_D(t) + c_R(t) + i(t)\left[1 + \Re(\frac{i(t)}{k(t)})\right] + g(t) + ca(t) \qquad \ldots \qquad (4)$$

$$ca(t) = x(t) + r'(t) - m(t)$$

$$ca(t) = \theta b(t) - \frac{db(t)}{dt}$$

$$x(t) - m(t) = \theta b(t) - \frac{db(t)}{dt} - r'(t)$$

For theoretical convenience, we write the current account in place of net export that consists of factor payments from abroad[1] along with country trade in currently produced goods and services. *g(t)* indicates the government expenditures while *b(t)*, *x(t)*, $r'(t)$ and *m(t)* stands for debt, exports, remittances

---

[1] We do not take net factor payments or exclude the factor payments that are earned by the foreign factors of production in domestic economy. This analysis supports us to use just remittance for theoretical extension. In addition to that, transfer payments are zero in our analysis. So, current account is the sum of net export and remittances.

and imports respectively, all these variables are in per capita form. The change in capital stock represents the investment related to domestic income and remittances and here we also consider the cost of installation.

The change in capital depends on the cost of installation $\Re(\frac{i(t)}{k(t)})$ i.e. non negative and convex. Whether agents go for investment or disinvestment they have to bear some cost, in case of no investment the installation cost will be zero.

$$\Re(0) = 0, \qquad \Re(.) > 0, \qquad 2\Re'(.) + \frac{1}{k\Re''(.)} > 0$$

If we take remittances as a function of output then we can express the budget constraint as

$$\frac{db(t)}{dt} \equiv c_D(t) + c_R(t) + i(t)\left[1 + \Re(\frac{i(t)}{k(t)})\right]$$

$$+ g(t) + \theta b(t) - \left[1 + r(t)\right] f(k(t))$$

$$\frac{dk(t)}{dt} = i(t) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5b)$$

Before developing the optimisation framework, we also assume that agents cannot borrow unlimited amount at the prevailing interest rate so we rule out any possibility of ponzi game.

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

To solve the underlying optimisation problem, the present value Hamiltonian has been used in which the utility function (3) is maximised subject to budget constraint (5a) and capital accumulation Equation (5b), the respective co-state variables are $\lambda(t)e^{-\theta t}$ and $\lambda(t)p(t)e^{-\theta t}$. Using the first order conditions the following equations have been derived.

$$U'(c_D(t)) = \lambda(t) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$U'(c_R(t)) = \lambda(t) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6')$$

$$\frac{d(\mu(t)p(t)e^{-\theta t})}{dt} = -\lambda(t)e^{-\theta t}\left[(1+r(t))f'(k(t)) + (\frac{i(t)}{k(t)})^2\Re'(\frac{i(t)}{k(t)})\right] \qquad (7)$$

$$1 + \Re'(\frac{i(t)}{k(t)}) + (\frac{i(t)}{k(t)})\Re'(\frac{i(t)}{k(t)}) = p(t) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

$$\frac{d(-\lambda(t)e^{-\theta t})}{dt} = \lambda(t)\theta e^{-\theta t} \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (9)$$

$$\underset{t \to \infty}{Limit} - \lambda(t)b(t)e^{-\theta t} = 0 \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (10)$$

$$\underset{t \to \infty}{Limit} \, \lambda(t)p(t)k(t)e^{-\theta t} = 0 \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (11)$$

Equations (7) and (9) are the Euler equations for capital and external debt respectively. Equations (10) and (11) are the respective transversality conditions associated with debt and capital.

2.1.1. *Consumption Analysis*

By using the first order conditions derived above, we can write the following equation:

$$U'(c(t)) = U'(c_D(t)) = U'(c_R(t)) = \lambda(t)$$

In order to find out the growth rate of consumption we go through the following steps

$$\frac{d\lambda(t)}{dt} = 0 \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (12)$$

As from Equation (6)

$$\frac{dU(C(t))}{dt} = \frac{d\lambda(t)}{dt} = 0$$

$$\frac{\dot{C}(t)}{C(t)} = 0 \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (12')$$

We can say that the consumption is smooth over time and it is independent of the interest rate and the subjective discount rate or the rate of time preference. In order to find out the level of consumption, integrate the flow constraint (5a) using transversality condition (10) and this result as

$$\int_0^\infty c(t)e^{-\theta t}dt = \int_0^\infty \left[\left[1+r(t)\right]f(k(t)) - i(t)\left[1+\Re(\frac{i(t)}{k(t)})\right] + g(t) \right]$$

$$e^{-\theta t}dt - b(0) = v(0) \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (13)$$

As the consumption is constant and it is not growing over time so we can write the Equation (13) as

$$c(t) = c(0) = \theta v(0) \qquad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (14)$$

2.1.2. *Investment*

Equation (8) explains investment as a function of shadow price $p(t)$ and it is defined as cost of capital in terms of consumption goods.

$$p(t) = \nabla(\frac{i(t)}{k(t)}), \qquad \nabla' \geq 0 \quad and \quad \nabla(0) = 1$$

We can formulate the inverse function from the above equation as:

$$\frac{i(t)}{k(t)} = \Psi(p(t)) \qquad \Psi' \geq 0 \quad and \quad \Psi(1) = 0$$

Using the above inverse function we get the capital accumulation equation as:

$$\frac{dk(t)}{dt} = i(t) = k(t)\Psi(p(t)), \qquad \Psi' \geq 0 \quad and \quad \Psi(1) = 0 \qquad \ldots \quad (15)$$

Equation (15) indicates that capital accumulation is a function of shadow price $p(t)$, we can find the value of this price by considering Equation (7), given (12),

$$\frac{dp(t)}{dt} = \theta p(t) - (1 + r(t)) f'(k(t)) - \Psi(p(t))^2 T'\left[\Psi(p(t))\right] \quad \ldots \qquad \ldots \quad (16)$$

Integrate Equation (16) subject to transversality condition (11)

$$\int_t^\infty \theta p(t) e^{-\theta t} dt = \int_t^\infty \left[(1 + r(t)) f'(k(t)) + \Psi(p(t))^2 \Re'\{(\Psi p(t))\} \right] e^{-\theta t} dt$$

$$p(t) = \int_t^\infty \left[(1 + r(t)) f'(k(t)) + \Psi(p(t))^2 \Re'\{\Psi(p(t))\} \right] e^{-\theta t} dt \qquad \ldots \quad (17)$$

Equation (17) shows that the present discounted value of future marginal products is equal to the shadow price of capital. The most important feature is that the characteristics of utility function and the level of debt do not affect the rate of investment but the remittances do enhance the investment activity.

2.1.3. *Savings*

From the traditional national income identity we derived the equations for savings that indicate that, increase in remittances will increase the savings.

$$s(t) = f(k(t)) - c(t) + r(t) f(k(t)) - g(t) - \theta b(t) \qquad \ldots \qquad \ldots \quad (18)$$

By putting the value of consumption in Equation 18 we get

$$s(t) = f(k(t)) - \theta \int_0^\infty \left[f(k(z)) - i(z)\left(1 + \Re(\frac{i(z)}{k(z)})\right) \right]$$

$$e^{-\theta(z-t)} dz + (1 - \theta) r(t) f(k(t)) - (1 - \theta) g(t)$$

2.2. Steady State and Dynamics

The dynamics of capital, investment and output has been determined through Equations (15) and (16) while that of (14) and (5a) determine the level of consumption and the dynamics of debt.

2.2.1. *Dynamics of Capital and Investment*

In the steady state we know that

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

From Equation (15) we know that whenever $\psi(1) = 0$ it implies that $\frac{dk(t)}{dt} = 0.$ So in the steady state

$$p^* = 1$$
$$(1 + r(t)) f'(k^*) = \theta$$

By putting steady state value of p^* and marginal productivity of capital in Equation (16) we get $\frac{dp(t)}{dt} = 0,$ which indicates that the rate of investment becomes zero at the steady state. Equations (15) and (16) have been linearized around $p^* = 1$ *and k* to* analyse the dynamics of capital and investment around the steady state neighbourhood.

$$\begin{pmatrix} \frac{dk}{dt} \\ \frac{dp}{dt} \end{pmatrix} = \begin{pmatrix} 0 & \Psi'(1)k^* \\ -(1+r(t))f''(k^*) & (1+r(t))f'(k^*) \end{pmatrix} \begin{pmatrix} k - k^* \\ p - 1 \end{pmatrix}$$

$$\qquad \dots \qquad \dots \quad (19)$$

Equation (19) explains the dynamic behaviour of investment and capital that is shown graphically in Figure I. The *dk(t)/dt=0* locus indicates the dynamic behaviour of capital[2], while *dp(t)/dt=0* curve is sloping downward. The downward sloping line SP (saddle path) elucidates the dynamics of investment that has a unique path and converges toward steady state. It is assumed that at the initial level of capital k_0, the shadow price (p_0) *is* greater than p^* that indicates the accumulation of capital over time. In consequence, net output increases but investment decreases over the period due to diminishing marginal productivity.

3.2.2. *Dynamics of Consumption and Debt*

The consumption path does not depend on interest rate or the rate of time preference and it is smooth over time as explained by Euler Equations 12' and

---

[2]This line is horizontal at $p^* = 1$.

8

14. Let at the initial level, the stock of debt and remittances are zero, given this and Equation 13, the present discounted value of net output minus consumption must be equal to zero. In other way around, the present discounted value of current and future trade surpluses is zero which is shown graphically in Figure II. The total area BB$'OAA'$ must be divided by horizontal consumption line that makes the present value of area BB$'O$ equals to present value of AA$'O$.

Fig. I. Dynamics of Capital and Investment
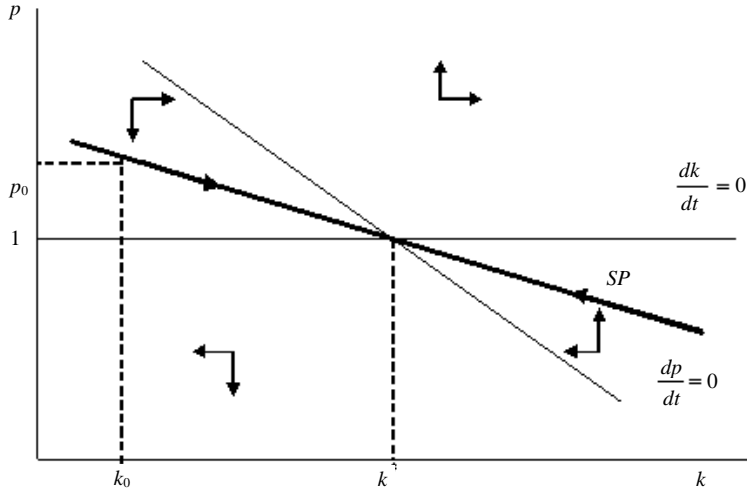
Source: Blancherd and Fischer (1994).

Fig. II. Consumption, Net Output, Trade and Current Accounts
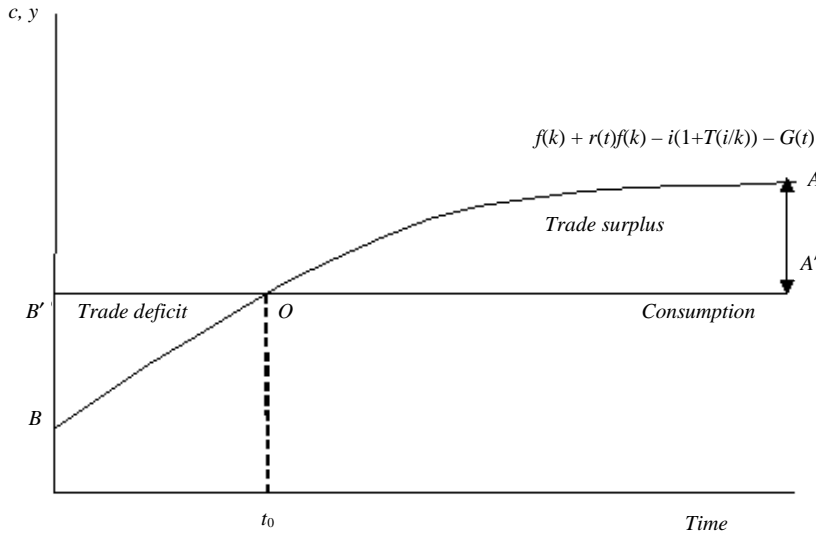
In the long-run, net output depends on investment i.e. change in capital. It is assumed that the economy start somewhere below the steady state level with some initial capital stock k_o, the net output increases due to the increase in capital stock to its steady state level k^*. Net income increases from the level below consumption from point B and eventually exceeds consumption (point O). At the level below to that is the starting point, where net output is less than consumption that is financed by remittances or by running current account deficit. Debt accumulates over time in the region BB′O and after point O net income goes beyond consumption. The area AA′O above the consumption line shows the trade surplus.

**Fig. III. Financial Development and Output**
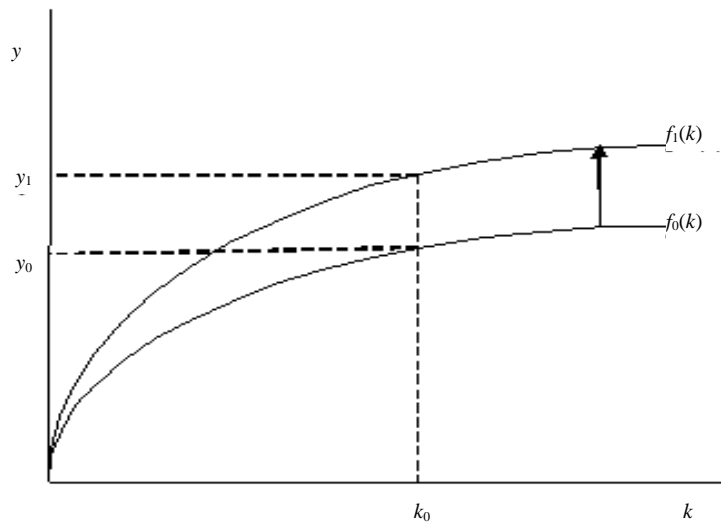
3.2.3. *Financial Development and the Steady State Dynamics*

Financial development plays an important role in all economic activities of a country. Better financial transaction facilities not only improve the efficiency on the consumer side, but the producer also benefits. In conseguence, it increases the efficiency of factors of production. The improvement in exogenous financial developments causes to make an upward shift in production function as shown in Figure III.

The innovations in financial market ease and quicken financial transactions. If a majority of the population depends on remittances then they will desire to have more stable and easy transactions that may actually increase the consumption and investment facilities available for individuals. Figure IV shows the dynamics of investment and capital due to the developments in financial sector that appear as a shifting parameter and cause to make the shift in

10

the $dp_0/dt=0$ *locus* to the right $dp_1/dt=0$, but the *dk/dt=0 locus* does not change its position. With the shift in *dp /dt=0 locus,* the steady state also shifts from *P* to *P'*, it cause an increase in the steady state level of capital from k^* to $k^{'*}$. The well developed financial system results in higher investment from P_0 to *O* and *O* to P_1 due to the long-run movements on the new saddle path *SP'*.

Fig. IV. Effect of Financial Development on Capital and Investment
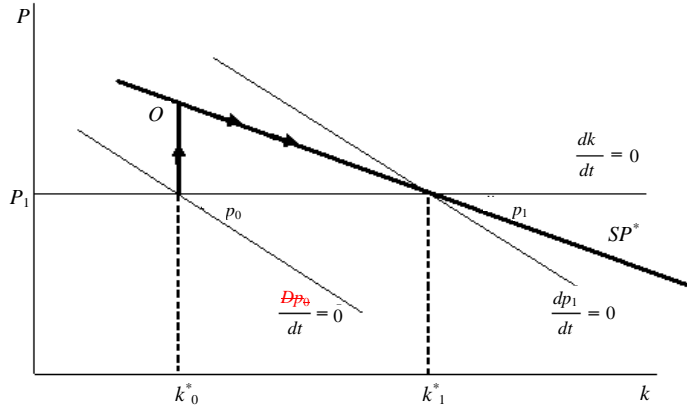
The well established financial system initially increases the productivity but it results in higher consumption as compared to net output that ultimately results in higher deficit. But in the long-run, the system works, net output increases and deficit becomes the surplus that is shown in Figure V. Initially, the deficit was equal to *OED* but higher consumption level caused it to shift in D *to D'*, the new equilibrium is attained at *E'* with the deficit equal to an area DD'EE'.

Fig. V. Effect of Financial Development on Consumption and Net Output
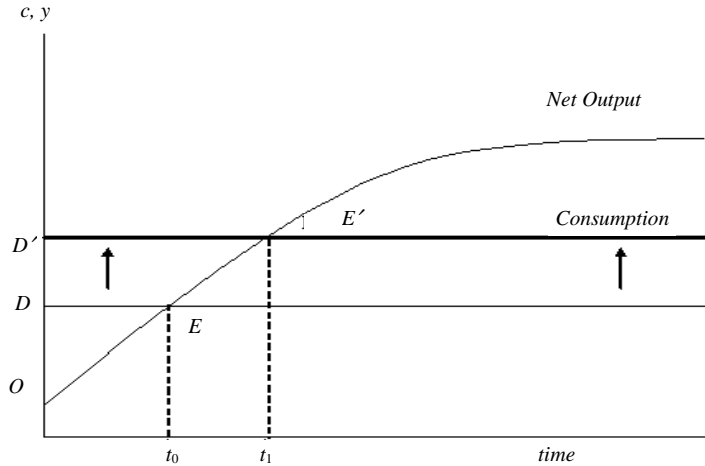
4. CONCLUSION

This study theoretically extends the Ramsey-Cass-Koopman's model of economic growth by incorporating the important macroeconomic indicators of "workers remittances" and "financial developments" in an open economy framework. The theoretical approach has profound implications as workers remittances require developments and new innovations in the financial sector that further accelerate the growth process. Higher amount of remittances from the expatriates leads to higher consumption path that also appears as the growth indicator in an open economy framework.

In addition to that, new innovations in financial sectors directly lead to technological progress that is related with the positive shift in production function. Financial developments initially lead to increase in both consumption and net output. that may appear as deficit but, in the long-run, means expansion in net output over and above consumption resulting in trade surplus in the dynamic system. In consequence, both the workers remittances and financial developments generate higher steady-state level of capital stock and output.

On the basis of the findings, policy-makers should develop an innovative and well established financial sector that may be sufficient to catch the higher amount of remittances. A highly developed financial sector together with higher amount of remittances directly induces economic growth. .

REFERENCES

Arezki, R. and M. Brückner (2011) Rainfall, Financial Development, and Remittances: Evidence from Sub-Saharan Africa. International Monetary Fund. (IMF Working Paper, WP/11/153).

Blancherd, O. J., and S. Fischer (1994) *Lectures on Macroeconomics* (8th ed.), 37–90.

Brown, R., F. Carmignani, and G. Fayad (2011) Migrants Remittances and Financial Development: Macro- and Micro-level Evidence of a Perverse Relationship. Prepared for Conference on Economic Development in Africa, 2011, CSAE, Oxford, 20-22 March, 2011.

Cass, D. (1965) Optimisation Growth in an Aggregate Model of Capital Accumulation. *Review of Economic Studies* 32, 233–240.

Chinn, M. and H. Itˆo (2006) What Matters for Financial Development? Capital Controls, Institutions and Interactions. *Journal of Development Economics* 81, 163–192.

Giuliano, P. and M. Ruiz-Arranz (2009) Remittances, Financial Development, and Growth. *Journal of Development Economics* 90, 144–152.

Goldsmith, R. W. (1969) *Financial Structure and Development*. New Haven: Yale University Press.

Gourinchas, P. O., O. Landerretche, and R. Valdes (1999) Lending Booms: Some Stylised Facts. Unpublished Paper.

Gurley, J. G. and E. S. Shaw (1995) Financial Aspects of Economic Development. *The American Economic Review* 45:4, 515–538.

Hassan, M. K., B. Sanchez, and Y. Jung-Suk (2010) Financial Development and Economic Growth: New Evidence from Panel Data. *The Quarterly Review of Economics and Finance* 51, 88–104.

King, R. and R. Levine (1993) Finance, Entrepreneurship, and Growth: Theory and Evidence. *Journal of Monetary Economics* 32:3, 513–542.

Koopmans, Tjalling C. (1965) On the Concept of Optimisation Economic Growth. In *The Economic Approach to Development Planning*. Amsterdam: Elsevier.

Levine, R., N. Loayza, and T. Beck (2000) Financial Intermediation and Growth: Causality and Causes. *Journal of Monetary Economics* 46:1, 31–77.

Loayza, N. and R. Ranciere (2002) Financial Development, Financial Fragility, and Growth. Central Bank of Chile. (Working Papers).

Lundahl, M. (1985) International Migration, Remittances and Real Incomes: Effects on the Source Country. *The Scandinavian Journal of Economics* 87:4, 647–657.

Maimbo, S. W. (2007) Remittances and Financial Sector Development in Conflicted-affected Countries. Report developed by "Small Enterprises Development Agency (SEDA)".

McKinnon, R. I. (1973) *Money and Capital in Economic Development*. Washington, DC: The Brookings Institution.

Shaw, E. S. (n.d.) *Financial Deepening in Economic Development*. London: Oxford University Press.