The New Endogenous Growth Theory:  
An Investigation on Growth Policy for Developing Countries

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ABSTRACT

This article focuses on the main growth policies arising from the new endogenous growth theory. A critical investigation of an important class of theoretical models is presented and relevance is given to variables known to be of crucial importance regarding growth policy’s design and implementation, mainly for developing countries. Levels of education, labor skills/learning, savings, provision of productive services (factors) by the government, and trade are key-variables coming from the new growth models investigated and these macroeconomic variables are shown to have strong appeal as growth policy’s design and implementation in developing countries are concerned.

Key Words: Endogenous Growth, Government Policies, Growth Policies.

1. Introduction

As admitted by Solow in his 1987 Nobel lecture, the development of a new growth model was, at that time, a reaction against the incompleteness of the Harrod-Domar-Hicks tradition, built up as a by-product of the great depression pervading the economic thinking preexistent during the Second World War period.

Completeness, however, has been a moving target in the field of sciences. The logic of the Theory of Growth that emerged in the fifties, probably reflecting the long upswing of the American economy in the mid-sixties, started to be challenged in the last two decades of the current century. Completeness here should be understood not only in the sense of broadening the scope of the theory, while endogeneizing model’s parameters, but also as upgrading the assumptions in order to adequate these models to new stylized facts.

The new endogenous growth theory is an instance of this sort of challenge that has improved upon Solow’s tradition, introducing endogenously into the theory the formation of knowledge, either as part of labor or as a broad notion of capital.

The main purpose of this paper, therefore, is to review the most representative models of the new endogenous growth theory. In this sense the paper has no pretence to originality concerning model construction. Its main contribution is - altogether with the synthesis of the main results - the extraction of growth policy generated by these models, mainly to serve as guide to master policy design and implementation in developing countries. The role of government as a
provider of protective factors, international trade, knowledge generation and the external and spillovers effects they embody are important aspects to guide growth policy in developing countries. In order to do this the remaining of the paper is divided in three sections. The following section reviews the Rommer-Lucas and Rebelo’s growth models and their main predictions concerning policy. The second section presents two extensions of the new endogenous growth theory: Barro’s growth-cum-government model and Grossman-Helpman’s growth-cum-trade model. The last section summarizes the main findings of the paper.

2. The New Endogenous Growth Theory

There are two main branches in the new endogenous growth theory: i) models featuring technological advances that endogenously generate externality effects. Here the production function presents increasing returns to scale due to the presence of spillovers effects coming from knowledge generation and/or education; ii) models using the AK-technology, where constant returns, due to the accumulation of all types of capital – physical, human and knowledge – are present. Beyond these ‘new’ models there are at least two extensions that deserve mention, mainly if economic policy is concerned: i) Growth-cum-government as in Barro (1990) and Growth-cum-Trade as in Grossman & Helpman (1990 and 1991). These models will be presented and growth policy for developing countries derived.

Regarding type i) models, the works of Romer (1986) and Lucas (1988) are the most important to summarize the first branch of the ‘new’ growth theory. The second branch is well known as the AK-Technology model, which Rebelo’s (1991) model is an example. Regarding the extensions, government expenditures and international trade are two powerful features to be introduced in policy-based growth models to be discussed below.

Next section presents the Romer-Lucas model. The novelty, beside the endogenous character of technical advances, is the presence of externality effects, both from Lucas’ introduction of human capital and Romer’s consideration of knowledge spillovers. These external economies are key to the endogenous models’ predictions, in the sense that non-decreasing marginal productivity of capital is obtained and sustained long-run growth results.

2.1. Skills-Knowledge Spillovers: Romer-Lucas’ Model

- Production

Following Romer (1986), consider a generic production function for a firm i in the economy, where output for this firm is a function of its physical capital and intensive labor stocks, i.e., labor corrected by the state of knowledge at time t, $\text{A}_t$:

\[ Y_t = F(K_{it}, A_tL_{it}) \]
Let $G_t$, the stock of experience at time $t$, be a function of past investments of all firms in the economy, such that assuming no depreciation it equals to the aggregate level of capital stock $\kappa_t$:

$$G_t = \int_{-\infty}^{t} I_s ds = \kappa_t. \tag{2}$$

Moreover, by assuming that technology is endogenously generated by $A_t = G_t^\eta \ (0<\eta<1)$, i.e., the state of knowledge is a positive but decreasing function of the stock of experience – Arrow’s (1962) learning-by-investing hypothesis –, equation (1) can be rewritten as a Cobb-Douglas:

$$Y_t = F(K_t, L_t, \kappa_t) = K_t^\alpha L_t^\beta \kappa_t^\eta. \tag{3}$$

This production function for firm $i$ presents constant returns to scale in $K_t$ and $L_t$, if $\kappa_t$, the aggregate level of capital stock (which equals the stock of experience at time $t$), is being held constant, but increasing returns result if all three inputs are considered together. Now assume that there is a large number of firms in the economy and that every firm takes the aggregate stock of capital as given, even though each firm contributes to it, in such a way that the Cobb-Douglas aggregate production function for the whole economy is:

$$Y_t = F(K_t, L_t, \kappa_t) = K_t^\alpha L_t^\beta \kappa_t^\eta, \tag{4}$$

where $Y_t = \sum_i^N Y_{ti}$, $K_t = \sum_i^N K_{ti}$ and $L_t = \sum_i^N L_{ti}$ and $N$ is the number of firms in this economy. To get its intensive representation, divide equation (4) by $L_t$ and use the constant returns to scale (CRS) condition on the two rival inputs ($K_t, L_t$) to yield:

$$y_t = \kappa_t^\eta.$$ \tag{5}

- Consumption

In this model, consumption is modeled with households maximizing an intertemporal constant elasticity of substitution (CES) utility function, i.e.:

$$U_t(c_t) = \left[ c_t^{1 - \xi} \right] \left[ 1 - \xi \right], \tag{6}$$

where $c_t$ is per capita consumption and $0<\xi<1$ represents the parameter of intertemporal substitution in consumption. Needless to say, $U_t(c_t)$ has all nice properties to be eligible for a maximization problem.

- Solution
The dynamic optimization problem is:

$$\text{Maximize } U_t(c_t) = \int_0^\infty \left\{ \frac{c_t^{\alpha} - \xi}{1 - \xi} \right\} e^{-rt} \, dt.$$  

Subject to $k_t = k_t^\alpha \kappa_t^n - c_t,$

where $r$ is the discount rate and $k_t = K_t / L_t,$ i.e., $k_t$ is the capital-labor ratio. To solve this dynamic maximization problem consider the current Hamiltonian:

$$H^C = \left\{ \frac{c_t^{\alpha} - \xi}{1 - \xi} \right\} + \mu_t (k_t^\alpha \kappa_t^n - c_t)$$

The maximum principle conditions are:

$$\frac{\partial H^C}{\partial c_t} = 0.$$  

$$\mu_t = \mu_t \cdot r - \frac{\partial H^C}{\partial k_t}.$$  

$$k_t = k_t^\alpha \kappa_t^n - c_t.$$

The objective is to maximize the present value of the CES utility, which is a function of the control (policy) variable $c_t,$ subject to the capital accumulation equation. This equation connects the state variable $k_t$ to the control variable $c_t.$ Obviously, the optimal paths of $c_t$ will both drive the state variable $k_t$ to its optimal path and maximize the present value of the objective functional utility. Note that because this problem is a dynamic optimization involving the infinite horizon time framework, transversality conditions, i.e., terminal point constraints do not have a role to play.\(^1\)

Combining the results of the first two conditions, after taking logarithms and the derivative with respect to time, and using the fact that for equilibrium in the capital market total capital must be equal to the sum of individual capital stocks ($\kappa_t = L_t \cdot k_t$), the long-run per capita consumption growth rate is:

$$\frac{c_t}{c_t} = \left[ \alpha k_t^{1-(1-\eta-\alpha)} L_t^n - r \right] / \xi.$$  

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\(^1\) See Sargent (1987) for the two methods used to solve dynamic optimization problems of this type.
The positiveness of the long-run per capita growth rate of consumption depends on the difference between the marginal productivity of capital and the discount rate, since the intertemporal parameter is less than one but positive. Using the third condition in equation (9), it is straightforward to show that the long-run per capita capital growth rate is the same as that of consumption (for \( \alpha = 1 \)). Also, using equation (5), it is easy to see that the long-run per capita income growth equals the long-run per capita capital growth rate. Therefore, this model predicts continued long-run growth for a given country depending on how productive its technology is, i.e., how high is its \( MP_k \) level relative to its discount rate.

One salient feature arises when reconsidering equation (5) in the context of the Romer-Lucas model. Assuming that \( \kappa \) includes both physical and human capital, as in Lucas (1988), or the stock of knowledge, as in Romer (1986), externalities will be present due to the non-rival character of skills and/or knowledge. The implication is that the production function [equation (5)] exhibits increasing returns to scale \( (\alpha + \eta > 1) \), the reason being that with the presence of non-rival input, which is a consequence of the manner endogenous technology is modeled, a doubling of output can be achieved by a doubling of only the rival inputs (represented by \( k_t \)). In this case, marginal productivity of capital, while broadly defined, is increasing, which makes \((MP_k - r)\) positive and widening over time. As a result, the per capita consumption, via equation (9), as well as the per capita income and capital growth rates, will be increasing in the long-run.

- Growth Policy Implications for Developing Countries from Romer-Lucas’ Model

Policy implications coming from this model are related to the potential for externalities spillovers coming from the stock of knowledge and/or labor force skills. Economies, which have abundance in those factors, can grow faster than the ones constrained by shortage of them. Considering policy, the most important ways to foster growth is to improve the educational levels of the labor force. Thus, based on this model, education, as a positive spillover, is crucial to growth. Since many developing countries have constraints regarding education and related issues, it is key for governments in those countries trying to prioritize improvements on education.

Regarding the growth model presented above, it is fair to say that both human capital and knowledge spillovers are the key-aspects to be considered as long as growth policy is concerned.

A model based on skills/learning/knowledge, like the Romer-Lucas model summarized here, implies divergence among economies’ growth rates. If, for instance, there are two activities, one giving high skills/learning/knowledge and other that results in low skills/learning/knowledge, countries that specialize in the former will grow sustainably faster then the ones that specialize in the latter. Thus, this model does not predict convergence, mainly because of the presence of skills/learning/knowledge obstacles in lagged countries.

Next section brings an AK-Technology type model, which in many aspects is similar to the one analyzed above, but with very different policy predictions.
2.2. The AK-Technology: Rebelo’s Model

- Production
  Following Rebelo (1991), the production side of the economy is represented by the following Cobb-Douglas production function:

\[ Y_t = A_0 K_t, \]

where \( A_0 \) is the constant average/marginal productivity of capital and \( K_t \) is aggregate capital broadly conceived here. Note that this production function presents constant returns to both scale and capital. This is due to the fact that capital is broadly defined, including not only physical, but also human capital and the stock of knowledge. There is no role for labor, a non-reproducible resource. The argument is that what is relevant is quality adjusted labor, i.e., human capital is accumulated as each generation is more knowledgeable than the one before. This is also in the same spirit of the Romer-Lucas model presented above, the difference being that now broadly defined capital is the unique source of non-diminishing (constant) returns to capital.

Derivation of the intensive form of this production function is straightforward. Dividing both sides of equation (11) by \( L_t \) yields:

\[ y_t = A_0 k_t. \]

- Consumption

The demand side is represented in the same way as in Romer-Lucas’ model, by a constant elasticity of substitution (CES) utility function, given as:

\[ U_t(c_t) = \left[ \frac{c_t^{1-\xi}}{1-\xi} \right], \]

where \( c_t \) is per capita consumption and \( 0 < \xi < 1 \) represents the parameter of intertemporal substitution in consumption as before.

- Solution

Considering production and consumption sides, this model can be written as:

\[
\begin{align*}
\text{Maximize } & \quad U_t(c_t) = \int_0^\infty \left\{ \left[ c_t^{1-\xi} \right]/\left[ 1-\xi \right] \right\} e^{-rt} dt. \\
\text{Subject to } & \quad k_t = A_0 k_t - c_t,
\end{align*}
\]
where the assumption of equality between savings and investment \((S_t = I_t)\) is used, no depreciation on capital is assumed \((\delta = 0)\) and \(r\) is the discount rate as before. To set up the maximum principle conditions, it is needed first to state the current Hamiltonian:

\[
H^C = \frac{c_t^{1-\xi}}{1-\xi} + \mu_t (A_t k_t - c_t).
\]

The three conditions are:

\[
\frac{\partial H^C}{\partial c_t} = 0.
\]

\[
\mu_t = \mu_t r - \frac{\partial H^C}{\partial k_t}.
\]

\[
k_t = A_t k_t - c_t.
\]

To determine the optimal steady-state (balanced-growth) per capita consumption growth rate is straightforward. Taking logarithms and the time derivative of the result in the first of the three conditions above and using the result of the second yields:

\[
\frac{c_t}{c_t} = \frac{A_t - r}{\xi}.
\]

This optimal steady-state per capita consumption is positive as long as \(A_t > r\), i.e., as long as the discount rate is less than the constant average/marginal productivity of capital (because \(0<\xi<1\)). This is the same result reached in the Romer-Lucas model, with the already mentioned qualification on capital.

The long-run per capita capital growth rate is derived using the third condition above. To get it, apply logarithms and take the time derivative to both sides of that condition to yield:

\[
\frac{k_t}{k_t} = \frac{c_t}{c_t}.
\]

Therefore, the long-run per capita capital growth is the same as that of the long-run optimal per capita consumption, and it is a positive constant as long as the discount rate \(r\) is less than \(A_t\). This is what is required by the specification of the optimal control problem: the optimal long-run path of per capita consumption (the control variable), while driving the path of per capita capital growth to its optimal level, maximizes the present value of the utility functional \(U_t(c_t)\), given the parameters of the model. It is clear that in the long-run all positive rates of growth must be equal and constant.

Derivation of optimal long-run per capita output can be done similarly. Using equation (12), after applying logarithms and taking the time derivatives, yields:
Making use of the previous results, the optimal steady-state growth rates of the relevant variables relate one to each other as:

\[
y_t/y_t = k_t/k_t = c_t/c_t = \lambda_o = \left[A_o - r\right]/\xi.
\]

Therefore, all long-run growth rates are determined in this model in a similar way as they were in the Romer-Lucas model, i.e., as the difference between the MP\(_k\) and the discount rate divided by the parameter of intertemporal substitution in consumption. Also, it is possible to endogenously determine the optimal long-run savings rate as a fraction of the aggregate per capita output in the following way:

\[
s_t/y_t = k_t/y_t = c_t/y_t = \lambda_o = \left[A_o - r\right]/\xi.
\]

Now, substituting for \(\lambda_o\), the final expression for the savings rate is:

\[
s_t/y_t = \left[A_o - r\right]/\left[1/\xi A_o\right] = \left[1/\xi\right] - r/\left[\xi A_o\right].
\]

Solving for \(\lambda_o\) (the optimal long-run growth rate of per capita output) in equation (21), the long-run growth rate of the economy investigated can be expressed as:

\[
\lambda_o = A_o \left[s_t/y_t\right].
\]

Therefore, the long run growth rate of a country depends on its savings rate, which depends on \(\xi\) and \(r\), and on how productive its capital \((A_o)\) is.

- Growth Policy Implications for Developing Countries from Rebelo’s Model

Interesting policy implications can be drawn from this growth model. Looking at equation (22), it can be predicted that the more patient a country is (low \(r\)), the larger is its saving rate and thus its long-run growth rate [via equation (23)]. Also, the more willing a country is to substitute intertemporally (low \(\xi\)), the higher its long-run savings and growth rates. Therefore, differently from Romer-Lucas’ Model, policies that have impact on savings are crucial for long-run growth. For example, if East Asian countries are pricing present consumption at a very high level (low \(\xi\)) and/or discounting future consumption at a very low rate \(r\) (both causing higher savings), relative to Latin American countries, then the long-run growth rates of the former will be greater than those of the latter. This can be extended to various developing countries that grow at
different stages and are differently acquired with savings. According to this model, increasing savings is key to foster sustained economic growth.

Considering \( A_0 \) among countries, the higher the marginal productivity of the broadly defined capital of a country is, the more apt it is to save and thus speed up its long-run growth rate. This is an important variable to understand the economic growth paths Latin American countries have experienced in the last five decades. According to this model, e.g., if it is reasonable to assume that Brazil has a relatively small \( A_0 \) (relatively low capital productivity) compared to other more developed countries, it would be expected the former having a lower long-run growth rate.

If two countries have the same parameters \( A_0, r \) and \( \xi \), they will grow at the same rates, even with different initial levels of capital stocks, and thus, convergence will not result. Thus, this model gives sustained long-run growth, but it does not predict convergence.

Next, two extensions of the new growth theory come into analysis. The first is due to Barro (1990) and deals with the government fiscal actions and their effects on the rate of growth, and the second to Grossman & Helpman (1991) who deal with trade and its impact on growth of a small open economy. The two extensions are important in terms of policy implications, as long as economic growth is concerned, since both government intervention and international trade are two powerful tools often used by policy makers.

3. Two Extensions of the ‘New’ Growth Theory: Government and Trade

- Barro’s Model of *Growth-cum-Government*

Barro (1990) modifies Rebelo’s (1991) analysis to incorporate a public sector. Let \( g_t \) be the quantity of public services provided by the government to each private producer in the economy. The main objective is to link the role of these services, as inputs to private production, to the growth performance of a country. A generic representation of the aggregate production function for the economy in its intensive form is:

\[
y_t = \phi(k_t, g_t) = k_t \phi(g_t/k_t),
\]

where it is assumed to be well behaved and all variables are defined in the same way as in Rebelo (1991). This production function presents constant returns to scale in \( k_t \) and \( g_t \) together, but decreasing returns to \( k_t \) itself. Thus, the source of the non-rival input now is the presence of \( g_t \), a public good, which is assumed to be measurable by the per capita quantity of government purchases. Even using a broad definition of \( k_t \), i.e., including physical and human capital as in Rebelo (1991), production here involves decreasing returns to the rival inputs if the government inputs do not expand in a parallel way. A Cobb-Douglas specific form for equation (24) is:

\[
y_t = \phi(g_t/k_t) = A_\xi (g_t/k_t)^{\alpha}, \quad \text{where } 0<\alpha<1 \text{ and } A_\xi = \text{technology}.
\]
Now assume that government finances its expenditures via a flat-rate income tax that, after normalizing the number of households to unity and using equation (24), yields:

(26) \[ G_t = T_t = \tau_t y_t = \tau_t k_t \phi(\frac{g_t}{k_t}), \]

where \( T_t \) is the government revenue and \( \tau_t \) the tax rate. It is clearly seen that equation (26) implies a balanced budget, i.e., the government can neither finance deficits via issuing of debt nor run surpluses via accumulation of assets.

Now it is time to derive the long-run growth rate for this economy. The step-by-step solution for the dynamic optimization problem is similar to the ones performed earlier in the Romer-Lucas and the Rebelo models, resulting in a long-run growth rate given by the difference between the MP\(_k\) and the discount rate divided by the parameter of intertemporal substitution in consumption. Here, using the generic representation for the aggregate production function in equation (24) in the presence of government, the long-run growth rates are:

(27) \[ \frac{\dot{y}_t}{y_t} = \frac{\dot{k}_t}{k_t} = \frac{c_t}{c_t} = \lambda_o = \left[ (1-\tau_t)\phi(\frac{g_t}{k_t})(1-\eta) - r \right]/\xi, \]

where the term inside the brackets and to the left of the minus sign is dy\(_t\)/dk\(_t\) = MP\(_k\) and \( \eta \) is the elasticity of \( y_t \) with respect to \( g_t \). As long as \( \tau_t \) and \( g_t/y_t \) are constants, \( g_t/k_t \) and \( \eta \) and thus the economy’s growth rate will be all constants, implying that in the long-run the economy is always in a position of steady-state growth in which all variables grow at the rate \( \lambda_o \) shown in equation (27). But in terms of the government sizes, i.e., of the magnitudes of \( \tau_t \) and consequently \( g_t/y_t \), the model predicts a negative impact of tax increases and a positive effect of government expenditures. However, since government expenditures are financed by tax, what matters is the net effect of both impacts. If the government is small, then the second effect dominates, i.e., government purchases speed up the economy’s growth rate. On the other hand, if the government is large, then the first force dominates and taxes will affect the economy’s growth rate negatively.

This result is easily seen when the specific Cobb-Douglas production function (25) is considered. To get the effect of the government size in the economy’s growth rate in this case, it is required that the elasticity \( \eta = \alpha \) be a constant, as it is for a Cobb-Douglas. Under the conditions that \( \tau_t = g_t/y_t \) and \( g_t/k_t = (g_t/y_t)\phi(\frac{g_t}{k_t}) \) the derivative of \( \lambda_o \) with respect to \( g_t/y_t \) is:

(28) \[ \frac{d\lambda_o}{d(g_t/y_t)} = [\phi(\frac{g_t}{k_t})(\phi’-1)]/\xi. \]

Therefore, \( \phi’>1 \) or \( \phi’<1 \) will define if the impact of \( g_t/y_t \) on the economy’s growth rate will be positive or negative. If \( g_t/k_t \) is small, which leads to \( \phi’>1 \), growth is speeded up with increased government purchases of public services. On the contrary, if the government size is large, which leads to \( \phi’<1 \), the economy’s growth rate is hurt via high rates of taxes.

Thus, based on this model, the government has a role to play via its provision of public services used as productive inputs in the private sector producers’ production functions. As long as its size is not too large, government purchases are a potential way to speed up growth.
Otherwise, taxes will negatively affect the economy’s long-run growth rate.

- Grossman- Helpman’s Model of Growth-cum-Trade

Grossman & Helpman (1991) develop a model envisioning both technology and foreign trade engagement in an endogenous manner. Their model of a small open country that produces two tradable goods is derived below. The production of these tradable goods uses non-tradable intermediate inputs. Innovation is confined to the sector that produces the non-traded intermediate inputs used to produce the two tradable goods with the usual primary factors of production – unskilled labor and human capital. The Cobb-Douglas production functions are:

\[
Y = A_Y D_y^{\beta} H_y^{1-\beta} \quad \text{and} \quad Z = A_Z D_z^{\beta} L_z^{1-\beta},
\]

where \(Y\) and \(Z\) are the two tradable goods, \(A_i\) is an arbitrary constant reflecting the choice of units, \(D_i\) represents an index of the intermediate inputs used in sector \(i\) (\(i = y, z\)), \(H_y\) is human capital, which is specific of sector \(y\) and \(L_Z\), unskilled labor used only in \(Z\) production. Note that both sectors use \(D\) with the same intensity. Under diversification, the prices of \(Y\) and \(Z\) are:

\[
p_Y = w_H^{1-\beta} p_D^{\beta} \quad \text{and} \quad p_Z = w_L^{1-\beta} p_D^{\beta},
\]

where \(p_i\) is the world price of good \(i\) (\(i = y, z\)), \(w_j\) is the reward to factor \(j\) (\(j = H, L\)) and \(p_D\) is a price index of the prices of intermediates. The main purpose of this model is to introduce some of the ways that world trade might influence the incentives for industrial innovation and growth. Innovation comes about from two different sources. In one version, entrepreneurs develop new varieties of differentiated intermediate goods. In the other, entrepreneurs seek quality improvements of a given set of non-tradable factors. This amounts to specifying formulations for endogenous product variety and quality. The formal analysis of these specifications is used to establish the production side of the small open country. To close the model, the demand side of the economy is considered via characterization of a utility function whose consumers have both \(Y\) and \(Z\) as arguments and for a given interested rate, they decide how much to consume (spend) at optimal patterns. The basic question to be addressed relates to whether or not trade promotes innovation for the small open country and if this is the case, how it impacts on the country’s growth rate. The answer is not unique. According to Grossman & Helpman (1991, p.152):

\[
\text{When trade causes resources to be released from the manufacturing sector, which then find their way into research labs, the rate of innovation rises. But when the sectors that expand in response to the trading opportunities compete with the research labs for factor inputs, international integration may retard growth.}
\]

Therefore, contractions (expansions) in the R&D sector that produces the non-tradable intermediate input are the relevant cause of negative (positive) growth. To see the effects of trade on growth it suffices to compare the equilibrium under autarky with that under trade. Relying upon the Stolper-Samuelson theorem, the model implies that an increase in the relative price of \(Y\) (the human capital intensive final good) raises the relative reward to human capital. For a country importing this final tradable good, foreign trade brings about a decline in its relative price and thus, a relative reduction in the reward to human capital. In this event, the resource base of
human capital expands and its price falls – excess supply; more skilled workers will be available to the innovative sector – as a consequence of economic integration and the country’s growth rate increases – the sector that generates technological progress expands at the expense of the importing sector. It is straightforward to see that the opposite occurs if the small open economy exports the human capital-intensive good. In this case, excess demand for skilled labor in the exporting sector will contract the R&D activities – the exportable sector would expand at the expense of the innovative sector.

- The Government-Trade Extensions: Growth Policy Implications for Developing Countries

The extensions discussed above have with them a concern on the role government and trade should take in terms of impacting on the growth process. As seen above, the two extensions point to certain conditions under which government action and trade engagement can improve the growth possibilities of an economy. Here, a brief summary of two possibilities of economic policy implementation - fiscal policy and trade policy - will be presented.

Regarding fiscal policy, Barro (1990) examines the role of government expenditures in services that enhance productivity in the private sector. He concludes that these expenditures may increase the growth rate of the economy. However, if the government revenues are used to finance government services that have no effects on productivity, or are wasted by bureaucrats, then growth will decrease. On the other hand, the role of taxation depends on how it alters the choices that economic agent faces. For instance, if the engine of growth is capital accumulation, income taxes that include taxation of interest income will decrease capitalist’s incentives to accumulate capital, and consequently, growth will be negatively affected. This will be so since the owners of capital will obtain only a fraction of the future benefits due to the tax. Thus, regarding developing countries, government intervention as a provider of infrastructure cannot be disconnected to the government role as a tax imposer, and if the tax burden is excessive the developing country can face growth restrictions.

Considering the other economic policy branch, international trade has definite implications for economic growth. A large part of the literature on endogenous growth has evolved around this issue. Most of the studies are based on models that emphasize the role of research and development (R&D) activities, as in the Grossman & Helpman (1991) model above, and the possibility of technology-knowledge spillovers. Regarding policy linked to the first, Grossman & Helpman (1991, p. 154) state:

An import tariff or export subsidy that rises the relative domestic price of the labor-intensive good spurs innovation and growth in the small economy, whereas trade policy that promotes the human-capital-intensive final good has the opposite effects.

Grossman & Helpman (1990) also explore the role of comparative advantage in the determination of trade patterns and growth performances of different countries in the world economy. In this model, if technological spillovers are global such that innovative firms have access to a common pool of knowledge, then, eventually, relative factor endowments will determine the specialization of a certain country. A country that is well endowed with human
capital will specialize in R&D and develop a comparative advantage in it, while, on the other hand, a country with an abundance of unskilled workers will end up specializing in other traditional activities and will have slower growth rates.

Another trade/R&D-based model due to Rivera-Batiz & Romer (1991) has also interesting policy implications. They emphasize the role of economic integration between two countries with the same endowments in changing the countries’ ability to conduct research and, at the same time, to benefit from the flow of endogenously generated ideas. Since Rivera-Batiz & Romer (1991) assume that creation of ideas and their flow between countries is what promotes growth, trade policy promoting exports of goods only has no effect on the long run growth rate. But allowing for flows of ideas in addition to trade in goods, trade can positively affect the growth rate of an integrated economy.

4. Conclusion

The main conclusion drawn in this paper relates to the crucial role economic policy has in influencing economic growth, mainly when developing countries are the concern. Based upon the new endogenous growth models summarized above, at least three dimensions deserve comment.

First, the Romer-Lucas’ model showed us that the potential for positive externalities spillovers remain as one of the relevant arenas for government interventions, mainly as education and labor skills improvements are concerned. It is concluded that countries that have abundance in knowledge and/or human capital and get the most from an educated labor force is more prompted to grow in a sustained manner. Based on this model, policy should prioritize education as an important structural variable to foster economic growth.

Second, according to Rebelo’s model, capital of all types – human, knowledge and physical – are the main source of sustained growth. In this model, economic policy has even more influence, other than the ones related to the broadly defined capital, since endogenously generated savings can act as an important variable to foster long-run growth. It was seen that both the discount rate \( r \) and the parameter of intertemporal substitution in consumption \( \varepsilon \) have strong influence in the rate of growth of a given economy, via their impact in the savings rate. Policy makers, based in this model, should prioritize actions that change the fundamentals to save.

Third, to better qualify the importance of economic policy implications in the new endogenous growth models, the extensions from Barro (1990) and Grossman & Helpman (1990 e 1991) have shown us the importance of both government intervention and international trade as promoters of growth.

To sum up on the new growth models and their policy implications, it is worthy noting that differently from old growth models, economic policy has been showed to have strong effects on long-run growth performance, and this paper relies on this result to point out the importance of economic policy, mainly to developing countries that have suffered for so many decades trying to find ways to make economic growth a reality.
BIBLIOGRAPHY


