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Issues in the Design of Growth Exercises *

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Abstract

This paper deals with the design of quantitative exercises relating objectives for the growth of national income over the medium term to key macroeconomic policy variables. It focuses on the roles of capital formation, saving, and total factor productivity in the process of economic growth and examines the main conceptual and empirical problems involved in accounting for the growth of national income, dealing explicitly with the cost of borrowing from abroad. The paper examines the link between fiscal and structural policies and the growth of productive capacity through the effect of those policies on productivity, saving and the cost of capital.

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Contents

Summary

This paper deals with analytical and empirical issues in the design of growth exercises. These exercises are viewed as attempts to relate, within a quantifiable framework, medium-term objectives for the growth of national income to key macroeconomic variables, particularly policy variables. The paper focuses on the influence of capital formation, saving, and total factor productivity in the process of economic growth. It also examines conceptual and empirical problems involved in accounting for growth.

The paper extends the framework for growth exercises outlined in the recent Group of Twenty-Four Report to deal explicitly with the cost of borrowing from abroad and the servicing of external debt. Considerable importance is placed on the distinction between domestic output and national income. The paper suggests that the objectives of macroeconomic policy should be defined in terms of national income, because this concept excludes that portion of domestic output devoted to external-debt service. An important conclusion is that the extent to which inflows of foreign saving can be relied upon to finance higher domestic investment and growth is likely to be limited, particularly in the present environment in which the external debt of many developing countries is seen to be excessive. In those circumstances, more vigorous growth of national income will be achieved primarily by raising national savings and improving the performance of productivity.

The paper adopts a supply-side perspective: it does not deal with cyclical fluctuations in output, but instead concentrates on the behavior of potential GNP. It examines the links between fiscal and structural policies and the growth of productive capacity through the effect of these policies on productivity, domestic saving (both public and private), and the cost of capital. The paper also analyzes the implications of lags and uncertainty about the effects of policies and examines the differences and interactions between structural and fiscal policies. It concludes that fiscal and structural policies generally should be viewed as complementary rather than substitutable.

I. Introduction

During the past few years there has been considerable discussion on the general issue of the design of Fund-supported adjustment programs. 1/ An important theme in those discussions has been the need to better integrate growth-oriented policies into the design of programs, and to extend the theoretical framework underlying programs so that it incorporates more specifically economic growth in a medium-term context. 2/ In its recent report on "The Role of the IMF in Adjustment with Growth," the Intergovernmental Group of Twenty-Four on International Monetary Affairs (G-24) has elaborated this theme by presenting the following specific proposal on the design of Fund-supported adjustment programs:

> "In order to provide Fund programs with a growth perspective, it is proposed that a set of 'growth exercises' be performed prior to the 'financial exercises.' From these exercises, the amount of external finance necessary to support a growth-oriented adjustment program could be determined. The financial exercises should be built upon these estimates of necessary external finance."

The objective of this paper is to discuss some of the main analytical and empirical issues that arise in the design of growth-oriented adjustment programs and, specifically in the design of "growth exercises." These exercises are viewed as attempts to relate, within a quantifiable framework, objectives for the growth of national income over the medium term to key macroeconomic variables, including in particular policy variables. The central focus of the paper is on the roles of capital accumulation, saving, and total factor productivity in the process of economic growth. Attention is also devoted to extending the framework for growth exercises outlined in the recent G-24 Report to deal explicitly with the cost of borrowing from abroad. The paper adopts a supply-side perspective and concentrates on the link between economic policies--especially fiscal and structural policies--and the growth of productive capacity through the effect of those policies on domestic saving and productivity. It does not deal with the problem of inflation nor with the influence of monetary growth and other demand variables in the short-run determination of output.

The paper is organized as follows: Section II examines the relationship between the growth of output, capital formation and productivity and discusses some of the conceptual and measurement problems involved

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1/ See, for example, "Theoretical Aspects of the Design of Fund-Supported Adjustment Programs" (1987).

2/ The growing interest in this topic has been reflected in the recent joint Bank-Fund symposium on growth-oriented adjustment programs. See Corbo, Goldstein and Khan (1987).

in accounting for economic growth. Section III focuses on the links between domestic and foreign saving, capital formation and growth. It extends the framework for growth exercises presented in the G-24 Report by dealing explicitly with the servicing of the external debt and the cost of borrowing from abroad, and it draws certain conclusions about the appropriate pace of foreign borrowing. Section IV examines the role of economic policies in influencing the growth of national income through their effects on domestic saving, productivity and the cost of capital. The differences and interactions between fiscal and structural policies are discussed in Section V, and Section VI presents some conclusions.

II. Economic Growth: Sources and Measurement

The analytical framework for the empirical analysis of economic growth has evolved from the work of Solow (1956, 1957) and Denison (1962, 1967). In general, this kind of analysis concentrates on the concept of the capacity (or potential) output--i.e., the level of output that can be attained when factors of production are fully utilized--and does not attempt to explain cyclical fluctuations in demand and capacity utilization. The centerpiece of this framework is the concept of the production function, which relates potential output to the level of capital and labor inputs and to a variable usually referred to as total factor productivity (or "multifactor" productivity). This latter variable captures the role of a wide variety of factors (such as technological progress, improvements in human capital, and the efficiency of resource use) which influence the level of potential output for a given level of capital and labor inputs. In this framework, which is sometimes referred to as "neoclassical," the rate of growth of potential output is thus accounted for by capital accumulation, growth of the labor force, and growth of multifactor productivity. The contribution of each factor of production to the growth of potential output is given by the rate of growth of that factor multiplied by the share of that factor in total output. 1/

Most of the early empirical studies on the sources of economic growth focused on the industrial countries, perhaps because these countries provided most of the economic time series that were required. An important result of these early studies was the relatively major role of total factor productivity, and the comparatively smaller role of

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1/ This can be summarized by Chenery's (1986) "basic neoclassical growth equation": $G_V = G_A + \beta_K G_K + \beta_L G_L$, where G indicates the rate of growth of a particular variable and the subscripts V, A, K and L indicate total value added, total factor productivity, capital and labor, respectively. The shares of capital and labor are indicated by β_K and β_L, respectively.

capital accumulation, in explaining the growth of output. 1/ Subsequent studies of industrial country growth concentrated on improving the measurement of capital and labor by incorporating estimates of changes in the quality of these inputs. The result of these improvements was to raise somewhat the estimated contribution of capital and labor to output growth--and to reduce the measured contribution of multifactor productivity growth by a corresponding amount--in comparison with studies that did not allow for changes in the quality of inputs. Still, a number of industrial country studies reviewed by Chenery (1986) attribute, on average, almost one half of the growth of output to the growth of total factor productivity and less than 40 percent to capital formation.

Empirical studies generally suggest that the contribution of capital and labor to output growth may be larger in the developing countries than in the industrialized economies, although there are large differences among individual countries in both groups. For example, DeMelo (1985) found that the growth of multifactor productivity in the period from 1955 to 1973 accounted for 46-64 percent of total output growth in Southeast Asian countries and for 30-55 percent in industrial market economies, but for only 12-34 percent in Latin American countries.

A systematic international comparison of empirical studies on growth using the neoclassical production function approach has recently been provided by Chenery (1986). The analysis attempts to identify the main differences in the sources of growth in developed and developing countries by focusing on a comparison of the role of factor inputs and the role of productivity growth. To circumvent the problem raised by the unavailability of satisfactory estimates of factor shares in many of the empirical studies of developing countries included in his survey, Chenery consolidates the effects of capital and labor into a single combined factor input. 2/

The main results of Chenery's comparisons are summarized in the table below. On average, developing countries have had relatively strong growth of output, capital and labor, and comparatively slow growth of total factor productivity. Output growth has been somewhat less strong in developed economies; the pace of capital formation has been almost as rapid as in developing countries, but the growth of the labor force has been substantially slower. The estimated contribution of total factor input to the growth of output has been, on average, close to 50 percent for developed countries and just under 70 percent for developing countries. Taking into consideration the 15 developing country studies in

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1/ For a discussion of this result, see Fischer (1987).

2/ This allows Chenery to express the growth of value added in terms of the simple equation $G_V = G_A + G_F$, where G_F is the combined contribution of factor inputs to growth and is defined as a weighted average of the growth rates of capital and labor, with weights adding up to one.

Chenery's sample for which capital share data are provided, the average contribution of capital formation to output growth can be estimated at approximately 35 percent, or just below the average of 37 percent for the developed countries in the sample.

Estimated Growth of Output, Inputs and Total Factor Productivity 1/

(In percent)

	Averages 2/	
	Developed Countries	Developing Countries
Growth of value added	5.4	6.3
Contribution of:		
Total factor input	51	69
Total factor productivity	49	31
Rate of growth of:		
Capital	5.2	5.5
Labor	1.1	3.3
Total factor input	2.7	4.3
Total factor productivity	2.7	2.0

It should be emphasized that these results represent averages for large numbers of countries and that the variance of individual country results around these averages is large, particularly for the developing economies. By way of illustration, the estimated contribution of total factor input to the growth of value added ranges from a low of 40 percent in Taiwan Province of China to 116 percent in Peru. This underscores the wide variety of experiences among developing countries and suggests the need to tailor growth exercises to the particular circumstances of individual countries. It should also be noted that the results of the studies surveyed by Chenery appear to be quite sensitive to the use of alternative sample periods and estimation methods.

The contribution of the growth in total factor productivity to the growth of output is generally not subject to direct measurement. In the empirical analysis of production functions this contribution is typically

1/ Adapted from Chenery (1986), Table 2-2.

2/ Averages relate to a number of studies on 12 developed countries and 20 developing countries covering a variety of sample periods ranging from the late 1940s to the mid-1970s. Accordingly, these averages do not correspond to specific time periods.

calculated as a residual--i.e., what is left after the contributions of capital and labor have been taken into account. The measurement of multifactor productivity thus will be affected by errors in the measurement of the factors of production. Unfortunately such errors are likely to be substantial, particularly in the case of certain developing countries where estimates of the capital stock and the labor force are subject to especially large margins of error.

Another difficulty with the concept of total factor productivity is that it encompasses the effects of a wide variety of factors, including technology, efficiency in resource allocation, managerial skills and administrative efficiency, and economies of scale. In addition, the growth of multifactor productivity may reflect changes in the quality of factors of production. For example, whereas the labor input in the production function should, in principle, be measured in efficiency units, available data refer only to the number of workers or, at best, to the number of man-hours (often, the labor force can only by approximated by data on the economically active population). Thus, the contribution of factors such as the motivation, the physical health and the level of education and experience of the labor force will be reflected in the productivity variable unless an explicit effort is made to quantify the impact of such factors. In a similar fashion, changes in the composition and age structure of the capital stock are usually not subject to direct measurement and are often subsumed in the growth of multifactor productivity.

Unfortunately, the contribution of these qualitative factors is difficult to measure. Several authors, starting with Denison (1962) have attempted to deal with this difficulty by disaggregating the capital stock and the labor force by type, and weighting these variables by their imputed returns. For example, the labor force might be broken down according to various characteristics (such as age, sex and education) which are thought to affect the contribution of the labor input to economic growth. This methodology has been applied by Elias (1978) to a group of Latin American countries. 1/

It has been argued that the growth accounting framework discussed above underestimates the role of capital because it fails to recognize that investment is the vehicle through which new technologies are incorporated into the production process. While this hypothesis is intuitively appealing, it has been surprisingly difficult to find convincing evidence that technological change embodied in new capital goods plays a major role in explaining productivity and output growth. Chenery (1986) attempts to test the more general hypothesis that productivity changes are (at least in part) embodied in additions to

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1/ The alternative is to compute total factor productivity as a residual and estimate the contribution of qualitative factors to the growth of that variable by regression.

the capital stock and/or the labor force. He finds that, for the entire sample of 57 countries (which includes developed, developing and centrally planned economies) the hypothesis cannot be accepted at conventional levels of statistical significance. Disaggregated results indicate that an increase in the growth of combined factor inputs has a more than proportionate effect on output growth in developed economies and in a group of four developing economies (Hong Kong, Israel, Korea and Taiwan Province of China); and a less than proportionate effect in other developing countries. It is interesting to note that the four developing economies cited above experienced a growth performance similar to that of Japan, with substantially above average rates of increase in total factor productivity, combined factor input and value added.

The limitations of the available data in some developing countries make it difficult to deal with the type of general, two-factor, production function discussed above. Partly for this reason, the analysis of growth in developing countries sometimes has relied on a simpler production function that involves a fixed relation between output and the capital stock. This type of fixed-coefficient production function--sometimes referred to as the "ICOR model" or incremental capital/output ratio model--is often expressed in the form of an equation relating the rate of growth of output to the ratio of investment to output.

There are certain analytical and practical difficulties with the ICOR model. First, the fixed-coefficient production function rules out substitutability between capital and labor and therefore is unable to account for the observed fluctuations in real wages. 1/ Second, the assumption of a constant capital/output ratio is of doubtful validity; indeed, there is considerable evidence of significant variations in capital/output ratios over time. This is not surprising: if the true production functions were to be of the neoclassical variety, movements in the capital/output ratio would be expected to reflect changes in capital intensity as well as changes in total factor productivity. By assuming a constant capital/output ratio, the ICOR model either rules out the possibility of changes in total factor productivity or implies that such changes are offset by movements in the capital/labor ratio.

The estimation of production functions requires, in principle, estimates of potential output--a variable which is not directly observable. In practice, this means that time series for potential output will need to be constructed using one of several existing methods; 2/ or that some proxy for capacity utilization must be used in the estimation process to account for cyclical fluctuations in output that cannot be

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1/ Some of the problems associated with the use of a fixed-coefficient production function in an open-economy growth model with external borrowing are discussed in the Appendix.

2/ For example, the method based on the concept of middle-expansion-trend GNP, proposed by DeLeeuw and Holloway (1983).

explained by changes in the existing measures of the labor force or the capital stock. 1/ Without such adjustments, changes in capacity utilization would show up in the form of cyclical fluctuations in total factor productivity (or, in the case of the ICOR model, in cyclical fluctuations in the computed capital/output ratio).

III. Capital Formation, Saving and Growth

As indicated in Section I, empirical studies on developing countries have found the contribution of capital accumulation to total output growth to be substantial. Moreover, there is a relatively close and identifiable link between the rate of capital formation and macroeconomic policies inasmuch as these policies can influence the availability of domestic and foreign saving. The relation between saving, capital formation and growth should thus be a key element in growth exercises.

The G-24 Report proposed a framework in which growth exercises could be conducted and the mathematical relationships underlying this framework were specified in Annex II to the Report. The basic ingredients of this framework (which is labeled the "Savings Gap" approach) are: (i) a fixed-coefficient production function relating the rate of growth of output to the investment/output ratio; and (ii) an equation expressing the equality of investment and saving. Total saving is disaggregated into domestic and foreign saving, and the latter is defined as the difference between net foreign borrowing and the expansion of foreign exchange reserves. These relationships are then combined into an equation that links the rate of growth of potential output to the net inflow of foreign credit, the change in reserves and the domestic saving rate. The equation "establishes the amount of foreign credit required to sustain a desired rate of growth of capacity GDP, given the domestic saving rate and the targeted rate of reserve accumulation."

1. National product, domestic product and the servicing of the external debt

An important extension of the framework proposed in the G-24 Report is the explicit recognition of the distinction between gross national product (GNP) and gross domestic product (GDP). Without such a distinction it is not possible to allow for the costs incurred in borrowing from abroad in the form of interest payments on the foreign debt. The framework of the G-24 Report involves a relation between potential GDP growth and saving. However, the objectives of macroeconomic policy would be more appropriately defined in terms of potential GNP, since this concept excludes that portion of domestic output which is devoted to servicing the external debt and therefore is closer to the concept of national income.

1/ A procedure of this kind is used by Adams, Fenton, and Larsen (1987).

This distinction is introduced in the Appendix to this paper, where real national income (product) is defined as real domestic product minus interest payments on the net external debt. 1/ The distinction affects the relationship between the use of foreign saving and the growth of potential GNP in one important respect: because of the need to service the foreign debt, it is not possible to achieve any desired target for the growth of potential GNP merely by increasing the reliance on foreign saving. A rise in foreign saving will lead to a higher growth rate of real GNP if and only if the marginal product of capital is higher than the interest rate charged on foreign borrowings. 2/ If the interest rate exceeds the marginal product of capital, increased reliance on foreign saving would reduce the growth rate of national income, even though it would raise the growth of domestic production.

As shown in the Appendix, a rise in the world interest rate would reduce the growth of national income of an indebted country in proportion with its ratio of external debt to GNP. Since the external debt of most debtor countries (with the notable exception of the United States) is predominantly denominated in foreign currency, a depreciation of the exchange rate would also reduce national income and expenditure by increasing the debt servicing burden in terms of local currency. In a study covering 15 heavily indebted industrial and developing countries, Gylfason and Risager (1984) found that high levels of foreign debt tend to reduce the favorable effects of a depreciation on GNP but to increase the generally positive effects of a devaluation on the external current account measured in foreign currency.

2. The cost of external borrowing and the level of foreign debt

Another extension of the framework for growth exercises involves the relation between the level of foreign debt and the cost of borrowing from abroad. In the simple growth model discussed in the first section of the Appendix, the cost of borrowing is assumed, for simplicity, to be equal to the international interest rate. This assumption, however, would imply that the country in question can borrow indefinitely at the prevailing world market interest rate. A more realistic alternative would be to allow for a positive spread between the country's borrowing rate and the world market interest rate, with this spread rising in relation to some indicator of the adequacy of external indebtedness, such as the debt/GNP ratio.

1/ This definition is adopted for the sake of simplicity. A more accurate definition would need to take into account all factor payments including net dividend payments--which can be quite large where foreign direct investment is an important component of the country's net liability position.

2/ In a more general framework, the marginal product of capital would have to exceed the sum of the foreign interest rate and the rate of depreciation of the capital stock.

The rationale for this assumption is that, from the standpoint of the foreign lenders, loans to a country become increasingly risky as that country accumulates external debt at a rate which exceeds the rate of expansion of its productive capacity. In line with this assumption, the marginal cost of borrowing from abroad would need to be defined as the international interest rate plus a risk premium which rises with the country's debt/GNP ratio, as foreign lenders seek to cover themselves against what they perceive to be a rising probability of debt servicing problems. The simple exercise presented in section 2 of the Appendix suggests that, in such circumstances, the contribution of foreign saving to the growth of real GNP diminishes as the foreign debt rises in relation to GNP. Indeed, for large values of the debt/GNP ratio, increased reliance on foreign saving might lower the growth rate of national income even if the marginal product of capital exceeds the international interest rate. Of course, it is possible that for very large values of the debt/GNP ratio the supply of foreign saving might become perfectly inelastic with respect to the interest rate so that external borrowing would be subject to a rigid constraint.

3. Capital flight

An excessive rise in the government's external debt relative to GNP might also influence how the domestic private sector allocates its wealth between domestic and foreign assets. Specifically, a rise in the debt/GNP ratio might increase the perceived probability of future debt-servicing difficulties, thus raising private expectations about increased future taxation of domestic assets--via ordinary taxes, inflation, or currency depreciation. In such circumstances, new external borrowing by the government might lead to a rise in domestic private holdings of foreign assets, thus reducing the net inflow of foreign saving to a fraction of the initial rise in the public external debt.

4. Optimal borrowing strategy over time

In the simple framework developed in the Appendix, the rate of growth of national income can be raised through increased external borrowing in any given period as long as the marginal productivity of capital exceeds the marginal cost of borrowing. This basic result is in line with the findings of the theory of optimal borrowing developed, among others, by Cooper and Sachs (1985), and recently applied to evaluate the performance of three developing countries by Alesina (1987). The theory derives the optimal borrowing policy of a country by maximizing an intertemporal national welfare function based on consumption levels, subject to the constraint that foreign lenders will not provide a country resources in excess of the discounted value of that country's domestic output minus domestic expenditure.

The main policy prescriptions derived from this theory can be summarized as follows: first, the country should expand foreign borrowing and investment up to the point where the marginal productivity of capital is equal to the cost of borrowing from abroad. Borrowing to finance investments whose rate of return falls short of the cost of borrowing leads to a situation in which the debt burden becomes unsustainable. Second, the country's investment and borrowing decisions should take into consideration future, as well as current, values of output and interest rates. Specifically, the country should "adjust" to permanent disturbances and "accommodate" transitory disturbances. If output is temporarily depressed (for example, as a result of a natural disaster) the country should borrow to smooth the path of consumption. If output is permanently reduced, however, consumption should be lowered--i.e., domestic saving should be raised--for example by reducing the budget deficit. In the same vein, a temporary increase in the world interest rate might justify a temporary increase in foreign borrowing, but a rise in interest rates that is expected to last should be addressed by reducing domestic absorption. 1/

IV. Growth Objectives and the Role of Fiscal and Structural Policies

The discussion of the previous section indicates that growth objectives cannot be achieved solely through reliance on foreign financing. As domestic outputs and the external debt rise (and as the marginal product of capital falls), a given increment in the level of external borrowing will have diminishing returns in raising the growth of national income. At some point, stepping up the reliance on foreign saving will, in fact, lower the growth rate of national income. Moreover, for high levels of external indebtedness the cost of borrowing abroad may rise above the world interest (and at some point the supply of new foreign credits may even dry up), and capital flight may reduce the availability of domestic private saving. For all these reasons, the extent to which inflows of foreign saving may be relied upon to finance domestic investment and growth is likely to be limited, particularly in present circumstances where the external debt position of many countries is seen to be excessive. Of course, the counterpart to an excessive level of foreign borrowing will be an unsustainable external current account deficit, and the objective of improving the current account will necessarily involve a reduction in the net inflow of foreign saving.

1/ In a two-sector economy producing both tradable and nontradable goods, the optimal borrowing policy requires: (i) that the marginal product of capital in the tradable goods sector equal the cost of capital; and (ii) that investment in nontradable goods be carried to the point where the cost of capital equals the marginal product of capital times the relative price of nontradables.

The limitations on foreign borrowing that are likely to arise suggest that the achievement of higher growth of potential GNP will need to focus on three goals: increasing domestic saving, raising total factor productivity and lowering the cost of capital. In turn, the attainment of these goals involves two types of policies: fiscal policy, which influences the level of government saving; 1/ and a wide variety of measures often classified under the label of "structural policies."

1. Structural policies

The term "structural policy" is often used rather loosely to encompass a wide variety of measures that can influence economic activity in two different ways. First, the term is used to cover policies which raise the level of potential output by increasing total factor productivity, or by fostering capital formation through incentives to save and invest. Second, the term is often used to include actions to remove rigidities that hinder the intersectoral or geographic mobility of resources--such as institutional or regulatory barriers to the intersectoral (or international) mobility of labor--and price rigidities. Such actions may improve resource allocation and therefore raise productive capacity, but they also facilitate the reallocation of resources that is generally needed following major disturbances stemming from technological innovations, changes in relative prices or trade liberalization. By allowing adjustment to proceed more smoothly, the removal of such rigidities can help to reduce transitional costs in terms of unemployed resources. For this reason, measures of this kind have been consistently emphasized by Fund missions in the design of adjustment programs.

The remainder of this section focuses on structural policies as instruments aimed at raising potential output. These policies can be described under three broad categories.

(i) As noted in Section I, policies to raise total factor productivity include measures to enhance the efficiency of resource allocation, to promote technological advances and to improve the quality of the factors of production. For example, liberalization of the trade system and, more generally, the removal of impediments to the working of the price system would improve resource allocation and therefore raise total

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1/ Of course, specific fiscal measures can also influence the level and allocation of private saving and, more generally, economic efficiency. These "microeconomic" aspects of fiscal measures are discussed under the heading of structural policies. The question whether private savings are likely to adjust in response to changes in the government deficit--the issue of debt neutrality--is examined in the section on fiscal policy.

factor productivity. 1/ Investment in research and development might enhance productivity by boosting technological progress. Improvements in the educational system and tax reform aimed at equalizing the tax treatment of various types of capital assets would raise productivity by improving the efficiency of labor and capital, respectively. Finally, liberalization of the restrictions on foreign direct investment that exist in many countries could improve productivity by enhancing the transfer of advanced technologies embodied in foreign direct investment.

There is no doubt that measures of this kind can be of great importance from the standpoint of improving economic performance over the long term and they need to be given a proper role in the design of growth-oriented adjustment programs. For example, recent studies suggest that the favorable impact of eliminating protectionist barriers in countries such as Turkey and the Philippines might be in the order of 5 percent of GNP. 2/ At the same time, it is important to recognize that the effects of structural measures on productivity are often very difficult to quantify, and that productivity is influenced by factors (such as demographic trends) that are largely beyond the scope of economic policies. In addition, the favorable effects of some structural measures mentioned above on productivity and growth might take time and their initial contribution to the process of adjustment might therefore be limited. This issue is examined more fully in Section V.

(ii) The objective of raising private saving and improving its allocation can be pursued through a variety of measures aimed at removing distortions in financial markets, eliminating tax disincentives and fostering a climate of confidence and stability. While a discussion of the problem of inflation is outside the scope of this paper, it is clear that monetary and fiscal policies aimed at keeping inflation under control can play a key role in maintaining a stable environment. Such an environment would foster an adequate level and an efficient allocation of saving

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1/ Under this heading, Khan and Knight (1985) mention monopolies and other forms of imperfect competition, government pricing policies and controls, subsidies, and barriers to international trade. For example, they discuss the inefficiencies stemming from policies aimed at isolating domestic energy prices from international prices. Also, they emphasize the distortions frequently associated with agricultural pricing policies. In this connection, they present empirical evidence on the long-run price elasticity of supply for selected commodities which suggest that agricultural pricing policies aimed at increasing the return to producers would have a significant effect on the output of major agricultural commodities.

2/ For a discussion of these studies, which use general equilibrium methods and therefore attempt to allow for the secondary effects of trade liberalization in one industry or sector on the rest of the economy, see World Bank Development Report (1987).

and investment by reducing uncertainty about the rate of return on capital and by reducing the need for holding assets that are favored because they are less vulnerable to economic instability.

The removal of distortions would involve measures such as the deregulation of the financial system and particularly the removal of interest rate ceilings that in many developing countries discourage the accumulation of wealth in the form of domestic financial instruments. In reviewing the empirical literature on the subject, Khan and Knight (1985) conclude that the question whether interest rates affect domestic saving in developing countries has not been settled. However, they do cite estimates suggesting that a one percentage point increase in the real interest rate would, other things being equal, raise the ratio of savings to GNP by about one tenth of one percentage point. Also, they suggest that financial reforms including the removal of domestic interest rate ceilings have at times resulted in significant net inflows of foreign saving.

Incentives to save might be improved by reducing marginal tax rates on personal income and by introducing tax preferences for certain types of saving. In general, however, these measures would involve some loss of government revenue. Therefore, they would need to be carefully designed to ensure that the rise in private saving is not offset by a fall in government saving. It should also be noted that the existing level of private saving reflects individual decisions about the intertemporal distribution of consumption and, unless relative prices are distorted, there is no prima facie reason to believe that this level is suboptimal. Accordingly, public policies toward private saving should generally be limited to removing distortions.

(iii) Policies aimed at raising the growth of potential output also include a variety of measures usually included under the label of "investment incentives." In the framework discussed in Section III, such measures would influence growth by reducing the cost of capital and therefore raising the level of investment that can be profitably carried out given the physical marginal productivity of capital. A full definition of the cost of capital should include not only the real interest rate, but also the rate at which capital assets can be depreciated. Furthermore, the formula for the cost of capital becomes more complex if interest payments by businesses are deductible, if capital gains are subject to a preferential tax treatment, or if the present value of tax savings stemming from depreciation deductions (or investment tax credits) exceeds the tax savings from deducting economic depreciation. If some of these features are present, the cost of capital can be reduced: by lowering the tax rate on business income; by lowering the tax rate on capital gains; by introducing a more generous treatment of depreciation allowances; and by raising the investment tax credit on machinery and equipment.

The fact that the capital stock can be raised by measures to lower the cost of capital does not mean that it will be necessarily appropriate to do so. First, virtually all the measures aimed at lowering the cost

of capital would, other things equal, result in a loss of government revenue from the business sector. Thus, as in the case of incentives to raise private saving, the provision of investment incentives may require a simultaneous rise in personal taxes to avoid a net reduction in government saving. Moreover, the introduction of investment incentives often leads to distortions and inefficiencies by discriminating against certain types of assets and by encouraging investment decisions based on tax, rather than economic considerations. It is interesting to note, in that regard, that many of the tax reform plans recently considered or adopted in industrial countries proposed to eliminate some of these distortions and inefficiencies by removing tax preferences while limiting any resulting rise in the cost of capital by reducing marginal tax rates on business income.

2. Fiscal policy

Measures to increase government saving by reducing government current spending or by increasing revenue raise well known social and political difficulties and are likely to involve some transitory weakening of output. At the same time, a reduction in the absorption of saving by the government would release financial and real resources that could be used to boost capital formation and growth over the longer term while diminishing the reliance on foreign saving. In other words, strengthening the fiscal position could help to reduce the gap between income and expenditure, thus improving the current account, while contributing to the crowding-in of private investment. Also, fiscal targets are relatively easy to quantify and involve measures that are under the direct control of the authorities. For all these reasons, fiscal measures have been a key ingredient of Fund-supported programs aimed at fostering adjustment while achieving satisfactory growth over the medium term.

The role of fiscal policy in a growth context can also be seen in the light of the theory of optimal borrowing (see Alesina, 1987). This theory suggests that in the early stages of the development process (when output and income per capita are relatively low) taxes should be kept at relatively low levels and the reliance on foreign saving to finance investment should by relatively high. However, as output and income rise as a result of past investments, taxes should be gradually increased to pay back the debt. If the government faces a binding constraint on the amount of taxes it can collect--for political reasons or because of inefficiencies in the tax system--the policy prescription is altered in the following way: external borrowing by the government should now proceed up to the point where the marginal product of capital exceeds the cost of borrowing from abroad by a factor that is inversely related to the maximum average tax rate that is practically attainable. Accordingly, the more stringent the constraint on raising government revenue, the higher the marginal productivity of capital must be to satisfy the optimal borrowing condition. In other words, the lower the tax rate that can be achieved given the prevailing political and fiscal systems, the lower the

level of foreign borrowing that can be justified for a given marginal product of capital. It should be emphasized that this is a "second best" solution. The "first best," of course, would be to enhance the government's ability to raise revenue, for example, by improving the efficiency of revenue collection.

The importance attached to fiscal policy as an instrument to raise domestic investment and the growth of potential output presumes that the private sector does not behave in accordance with the debt neutrality (or "Ricardian equivalence") theorem. In other words, it presumes that private saving does not adjust to offset the effects of changes in the fiscal position on domestic saving in anticipation of a future change in tax liabilities. The likelihood of such an effect has been questioned by Tobin (1980), among others. More generally, Stiglitz (1983) has shown that changes in public financial policy generally should be expected to have real effects on the economy--and notably on capital formation--inasmuch as they affect the intergenerational distribution of income and the sharing of risks among members of different generations.

The empirical literature (which has focused mainly on the United States) generally has rejected the extreme version of debt neutrality, although it has found evidence of some tendency for private saving to offset government dissaving. 1/ Questions about the relevance of this doctrine for developing economies remain to be fully resolved. However, a recent study by Haque and Montiel (1987) on a relatively large and diverse group of developing countries suggests that the hypothesis of full Ricardian equivalence can be rejected because a substantial fraction of the population in these countries faces liquidity constraints.

In a somewhat different vein, Corden (1987), has suggested that debt-financed deficits in many developed countries might well result in a buildup of foreign assets rather than increased domestic private saving, as the private sector attempts to avoid--not to provide for--future tax liabilities. This type of behavior might be expected in particular from individuals whose income consists largely of profits and interest earnings and are therefore relatively unconcerned about future rises in the taxation of wage income. Deficit financing coupled with capital flight could thus have redistributive effects as the burden of reducing personal consumption to provide for future tax liabilities would fall predominantly on wage earners.

Another important question relates to the specific types of measures that should be adopted in order to reduce the absorption of saving by the Government. In this paper, the concept of government saving has been interpreted in accordance with national accounts conventions, i.e., as

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1/ For recent reviews of the empirical literature on debt neutrality, see Leidermand and Blejer (1987), and Evans (1987).

the difference between total revenue and current expenditure of the Government. In line with this interpretation, investment has been defined to include private as well as public capital formation. This would seem to be the appropriate interpretation if the rate of return on government investment (with due allowance for the external economies generated by investment in infrastructure and other government projects) were to be broadly similar to the rate of return on private investment. In that case, efforts to strengthen the fiscal position should concentrate on reducing current expenditure and/or raising revenue, thus making room for capital formation, both private and public. However, if the rate of return were to be significantly lower for certain public investment projects than for private investment, these projects would need to be considered as part of a program to strengthen the fiscal position, since they would contain an element of consumption. As regards the choice between raising revenue and reducing current expenditure as ways to raise government saving, an important consideration would be the extent to which excessive taxation of personal income might have adverse effects on economic growth by discouraging work effort.

V. The Effects of Fiscal and Structural Policies: Differences and Interrelations

In the framework discussed in the previous sections and formalized in the Appendix, the growth rate of potential real GNP is influenced by a few key variables: private and government saving, external borrowing, the cost of capital and the growth of total factor productivity. 1/ Since fiscal and structural policies influence these variables in a variety of ways, it might appear that there is a trade-off between these two types of policies in the sense that intensifying action on one front would justify a less stringent effort on the other front. 2/ This section examines a number of issues that are relevant to this question, including uncertainty about the effects of policies, differences between policies in terms of the timing of their effects on the economy, the fiscal cost of structural measures and the effects of fiscal measures on economic efficiency.

1. Uncertainty about the effects of policies

Given the quality of existing data and the tools of quantitative analysis that are available, estimates of the impact of government policies on incentives to save and invest are likely to be rather imprecise. As was mentioned in Section I, attempts to quantify the impact of

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1/ See, for example, equation (9) in the Appendix.

2/ The concept of a trade-off between structural and fiscal policies and, more specifically, between the "size" and "quality" of fiscal adjustment has been proposed by Tanzi (1987).

structural measures on total factor productivity would face even greater difficulties, because this variable cannot be measured directly and its estimates are subject to a wide margin of error. To be sure, the task of measuring the effect of tax and spending variables on government saving appears to be comparatively easier. In those circumstances, accepting a relaxation of fiscal targets in exchange for the adoption of structural measures would mean accepting a higher degree of uncertainty in the achievement of specific growth targets.

It should also be noted that uncertainty about the relation between economic policies and objectives introduces the need for "redundancy" in the use of policy measures. Indeed, as was shown by Brainard (1969), Tinbergen's principle of equality between the number of instruments and the number of targets breaks down in the presence of uncertainty. For example, in order to reduce the degree of uncertainty attached to a given growth target for potential GNP, it may be desirable to direct both fiscal and structural measures to the achievement of that target. In that sense there would seem to be complementarity (rather than substitutability) between structural and fiscal policies.

2. Lags in the effect of structural policies

The beneficial impact of structural measures on the growth of productive capacity usually involves delays of two kinds. First, many structural policies take time to be put in place, especially when institutional changes are required. This is likely to be the case, for example, when changes in financial or labor legislation are required, or when improvements are sought in the provision of public goods, such as education and health. Second, in many cases there will be a delay between the implementation of structural policies and their impact on macroeconomic variables.

A variety of empirical studies of developing countries suggests that lags of the second kind often extend over several years. 1/ More specifically, these results suggest that it may take somewhere between two and four years for one half of the full effect of certain structural measures on the relevant macroeconomic variable to come through. In the case of trade liberalization, studies based on the experience of Argentina, Chile and Uruguay suggest that it can take from one to two years for tariff reductions to affect the price of imported goods, and an additional two to three years for the change in the relative price of importables to influence the supply of tradable goods. The response of agricultural production following measures to increase producer prices for commodities appears to take between two and four years, depending on the type of crop. Policies to increase private saving by raising domestic interest rates seem to involve lags of one to two years and the effect of investment incentives on the rate of capital formation generally is estimated to take at least two years to come through.

1/ See Bond (1983), Khan and Zahler (1983) and MacDonald (1983).

Altogether, the results of the empirical studies cited above seem to indicate that the effects of many structural policies on output involve delays that are considerably longer than those usually associated with demand management policies, suggesting that there is little scope for policy substitution over the short term. However, this conclusion needs to be qualified in two important respects. First, the long lags found in these empirical studies may reflect to some extent private individuals' expectations about the durability of structural measures. The higher the probability assigned by individuals to a policy reversal, the more their response is likely to be delayed, as the credibility of policy will have to pass the test of time. Conversely, the response to a policy that is generally expected to remain in place should be relatively fast and, specifically, faster than would have been expected on the basis of historical relationships.

The second qualification refers to situations where private initiative has been stifled, work effort discouraged, and the operation of markets has been severely constrained (or even suppressed) by legal or regulatory barriers. It would seem that, in such circumstances, liberalization can produce results that are not only substantial but also quite rapid. By way of illustration, the measures adopted by the government of the People's Republic of China in the period since the late 1970s to encourage private ownership of small plots by farmers, to allow private sales of certain consumer goods in urban centers and to legalize free markets in certain areas appear to have encouraged a strong and rapid increase in economic activity. 1/

Another point to be made about structural policies is that they generally lead to a once-and-for-all adjustment in the level of output. The adjustment often will be distributed over a period of time, as was noted above, so that these policies will affect the measured rate of growth of output for several years. But, contrary to what is frequently asserted, they will not have significant effects on the growth rate of the economy after the completion of this adjustment period. 2/ In this respect, the effects of a change in fiscal policy would be qualitatively similar. For example, the initial effect of a rise in government saving relative to GNP would be to increase the rate of capital formation and hence the rate of growth of output. Over time, however, capital

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1/ A description of these measures and an interpretation of their effects on the Chinese economy are provided by Perkins (1988). One of Perkin's findings is particularly noteworthy in the present context: the bulk of the 3.7 percentage point rise in the annual growth rate of real net material product from 1965-76 to 1976-85 reflected an acceleration of total factor productivity.

2/ It should be noted, however, that some structural measures could have more lasting effects, for example, if the benefits derived from measures to improve the educational system are embodied into a growing labor force.

deepening would lower the marginal product of capital, slowing investment and output growth. In the new steady state equilibrium, the rate of growth of potential GNP again will be determined by the growth rates of the labor force and total factor productivity. In conclusion, structural and fiscal policies should not be expected to raise the growth rate of the economy indefinitely. They will, however, lead to a permanent increase in the level of potential GNP.

3. Interrelations between fiscal and structural policies

As was noted above in Section IV, measures to stimulate private saving and to reduce the cost of capital to firms often involve a loss of government revenue that must be kept in mind given the objective of raising total domestic saving to encourage investment and growth. Other structural measures, such as those aimed at improving education, cutting personal taxes to encourage work effort, or reducing taxes on international trade also may have significant costs in terms of fiscal revenue. But generalizations are difficult in this area: some measures will have little effect on revenue, and some might even help to improve the fiscal position, such as the elimination of subsidies. Structural policies thus would need to be evaluated on a case-by-case basis, with due regard for their fiscal implications as well as their expected impact on efficiency.

It is now well recognized that fiscal measures can have far-reaching effects on efficiency and on incentives to work, save and invest. Yet, attempts to reduce the fiscal deficit often include specific revenue measures such as export duties, import restrictions, payroll taxes and taxes on interest income, that are detrimental to export performance, saving, employment and growth. There is no doubt that the impact on the economy of a change in fiscal policy will depend on the "quality" of the fiscal measures adopted. This point has been emphasized by Tanzi (1987) who has suggested that Fund stabilization programs should "systematically deal with microeconomic issues of public finance in addition to other structural policies." He also discussed some of the problems raised by this proposal. For example, the design and implementation of specific fiscal measures in the context of Fund-supported programs would require considerable and specialized staff resources, and might be seen as involving interference by the Fund in areas that are politically sensitive because they are likely to affect the interests of specific groups.

VI. Conclusion

The analytical framework presented in this paper has focused on the growth of productive capacity over the medium term. While the considerations mentioned in this framework generally have played an important role in Fund-supported programs, a more systematic use of growth exercises could be a useful ingredient in the design of such programs and, more generally, in the Fund's analysis of economic prospects and policy requirements in member countries. The framework discussed in this paper

(and formalized in the Appendix) provides an illustration of how quantitative growth exercises might be conducted. To be sure, the framework will need to be broadened in many cases to deal with important issues such as inflation, exchange rate depreciation and the implications for aggregate supply of various forms of nominal or real wage rigidity and the dependence on imported inputs.

Even in the relatively simple framework presented in this paper, the requirements for growth exercises in terms of data and statistical estimates of key parameters would seem to be quite demanding. Indeed, it is likely that for many countries, the required information will not be available and the conduct of growth exercises will need to rely on rough estimates and a considerable degree of judgment. Of course, this problem is not limited to growth exercises. Financial programming also must confront a considerable degree of uncertainty about the structure of key economic relationships, such as the demand for money. However, the data requirements for growth exercises are likely to be more difficult to meet since information on certain key variables such as the capital stock and the labor force is less readily available, and at less timely and frequent intervals, than monetary surveys or balance of payments data.

The framework for growth exercises must be sufficiently broad to evaluate the contributions of both productivity growth and capital formation to the growth of output. Moreover, in relating investment requirements to growth objectives, such exercises must distinguish between national income and domestic product and take into account the implications of external debt servicing and debt accumulation. In such a framework, the appropriate level of foreign borrowing is likely to be circumscribed, given the cost of borrowing abroad and the rate of return on domestic investment. Inevitably, growth-oriented policies will need to focus on raising domestic saving and improving the performance of productivity.

In pursuing growth objectives, the authorities would be expected to rely on two broad categories of instruments: fiscal policies (to raise domestic saving and investment while contributing to adjustment in the current account of the balance of payments); and structural policies (to increase total factor productivity and to remove distortions that discourage private saving and favor an inefficient pattern of private investment). Government policies also can have important effects on economic growth through their influence on the level and the efficiency of public investment. Fiscal measures and structural policies thus might appear to provide alternative ways to achieve growth objectives. However, an examination of the differences regarding lags in the effects of various policies, of the interrelations between fiscal and structural measures, and of the consequences of uncertainty about the effects of policy instruments, suggests that fiscal and structural policies generally should be viewed as complementary rather than substitutable. In particular, accepting a relaxation of fiscal targets in exchange for a program of structural reforms may increase the risk that the objectives for external adjustment and growth may not be attained.

1. Relation between the growth of real GNP, domestic saving and external borrowing

For simplicity, the model presented in this section assumes that prices remain constant and that domestic output depends only on the capital stock. As shown below in Section 2, the model can be extended to incorporate a production function involving both capital and labor by expressing key variables in per capita terms without altering the main conclusions. 1/ Potential domestic product (Q) is given by the production function:

$$Q = F(K) \tag{1}$$

and potential national product (Y) is the difference between potential domestic product and interest payments on the external debt:

$$Y = Q - rD \tag{2}$$

Where r is the world market interest rate and D is the net stock of external debt. 2/ Combining equations (1) and (2), differentiating with respect to time and assuming no change in the interest rate yields the expression:

$$\dot{Y} = F_K\dot{K} - r\dot{D} \tag{3}$$

where $\dot{K}$ is the rate of capital formation (including both private and government capital), F_K is the marginal productivity of capital, and dots indicate time derivatives.

Saving is defined to include domestic saving (S_d) and foreign saving (S_f), and domestic investment is equal to the change in the capital stock. In equilibrium, domestic investment must be financed by domestic or by foreign saving. Thus, assuming there is no depreciation:

$$\dot{K} = I = S_d + S_f \tag{4}$$

Combining (3) and (4):

$$\dot{Y} = F_K S_d + (F_K - r)S_f \tag{5}$$

1/ In some respects the model presented in this Appendix is similar to the discrete-time model developed by Ortiz and Serra-Puche (1986).

2/ More generally, D could be defined as the country's net external liability position, i.e. its external debt minus its claims on foreigners (including official international reserves). Differences in the interest rates corresponding to the various components of the net external liability position would need to be taken into consideration.

where $\dot{Y}$ is the change in potential GNP,

S_d is domestic saving (private and public),

S_f is the inflow of foreign saving (assumed to equal the net change in the external debt, $\dot{D}$)

r is the cost of capital, assumed to be equal to the world interest rate, and

$F_K = \frac{\partial Q}{\partial K}$ is the marginal product of capital.

Dividing through by Y, and using horizontal bars to indicate ratios to potential GNP, equation (5) becomes an expression relating the rate of growth of potential GNP to the domestic and foreign saving rates and to the international interest rate:

$$\dot{Y}/Y = F_K\bar{S}_d + (F_K - r)\bar{S}_f \qquad (6)$$

Equations (5) and (6) indicate that the growth of potential GNP can be raised by increasing the reliance on foreign saving as long as the marginal product of capital exceeds the world interest rate. 1/ A rise in domestic saving would increase the growth of potential GNP as long as F_K is positive, although, of course, this would involve a reduction in the current level of consumption. It may be noted that if F(K) is a fixed-coefficient production function with constant capital/output ratio 1/b (as in the G-24 Report) the optimum level of foreign borrowing occurs when b = r. If $b \neq r$, the interpretation of the model is rather difficult. When $b > r$, the country keeps borrowing and investing until it uses up all of its labor. If $b < r$, the country reduces its stock of foreign debt and its capital stock. Since b is constant, there is no tendency toward equilibrium. When the external debt is reduced to zero, the country shifts to an increasingly large net foreign asset position and the capital stock continues to contract. Eventually, the capital stock will vanish, domestic output will drop to zero, and national income will consist only of interest receipts on the country's external claims.

The model can be extended to incorporate fiscal variables by defining domestic saving as the sum of private saving and government saving:

$$S_d = S_p + \tau Y - G, \qquad (7)$$

1/ Allowing for depreciation, the condition for foreign borrowing to raise national income would be $F_K > r + \delta$, where δ is the rate of depreciation of the capital stock.

where τ is the average income tax rate, and

G is government current expenditure on goods and services.

The simplest way to allow for the growth of productivity (A) is to replace equation (1) by the additive production function:

$$Q = F(K) + A \qquad (1)'$$

Differentiating (1)' and taking equations (2), (4) and (7) into account yields:

$$\dot{Y} = F_K[S_p + \tau Y - G] + (F_K - r)S_f + \dot{A} \qquad (8)$$

Assuming that private saving is a constant fraction (s) of disposable income, and allowing for a degree of debt neutrality, then

$S_p = s(1-\gamma\tau)Y - (1-\gamma)(\tau Y-G)$, where

$1-\gamma$ is the proportion of a change in government saving offset by an opposite change in private saving ($\gamma = 0$ represents the case of full debt neutrality).

Substituting for private saving and dividing through by Y yields:

$$\dot{Y}/Y = F_K[s(1 - \gamma\tau) + \gamma(\tau - \bar{G})] + (F_K - r)\bar{S}_f + \lambda\bar{A} \qquad (9)$$

Where $\bar{G}$ and $\bar{A}$ are government current spending and total factor productivity, respectively, expressed as ratios to potential GNP, and $\lambda = \dot{A}/A$. Equation (9) indicates that the growth of potential GNP in any given period is influenced by: the domestic savings rate--which in turn depends on the private saving rate (s) the tax rate (τ), the ratio of government current spending to GNP ($\bar{G}$) and the nonneutrality parameter γ; the cost of capital (r); foreign saving as a ratio to GNP ($\bar{S}_f$); and the growth of multifactor productivity (λ).

If the world interest rate is allowed to change, equation (3) becomes $\dot{Y} = F_K\dot{K} - r\dot{D} - \dot{r}\bar{D}$. The result is to modify equations (8) and (9) by adding the term $-\dot{r}\bar{D}$, indicating that a rise in the world interest rate would reduce the growth of national income in proportion to the country's external debt/GNP ratio.

2. Rising cost of capital

Assume that the rate at which the country can borrow from world financial markets is equal to the international interest rate r^* plus a fraction Φ of the country's debt/GNP ratio, so that $r = r^* + \Phi\bar{D}$.

Assuming a stable debt/GNP ratio and no change in the international interest rate ($\dot{r}^* = 0$) the change in national income is then given by

$$\dot{Y} = \dot{Q} - \dot{D}(r^* + \bar{\Phi D})$$

Using equation (4) it can be shown that

$$\dot{Y}/Y = F_K S_d + (F_K - r^* - \bar{\Phi D})S_f$$

In this model, the higher the debt/GNP ratio, the higher must be the marginal product of capital in relation to the world interest rate for external borrowing to raise the growth of GNP.

3. Generalization to the two-factor production function

The linear homogeneous production function $Q = F(K, N)A$, where N stands for the labor force, can be written in the intensive form $q = f(k)A$, where lower-case letters denote variables expressed in per capita terms. 1/ Per capita income is given by $y = q - rd$, so that

$$y = f(k)A - rd$$

where y is per capita income,

k is the capital/labor ratio,

A is total factor productivity, and

d is per capita external debt.

Taking time derivatives and using the definition of saving yields:

$$\dot{y} = \frac{\partial Q}{\partial K} s_d + (\frac{\partial Q}{\partial K} - r)s_f + n(rd - \frac{\partial Q}{\partial K} k) + \lambda q$$

where s_d and s_f are per capita domestic and foreign saving, respectively,

n is the rate of growth of the labor force, and

$\frac{\partial Q}{\partial K} = Af_k$ is the marginal productivity of capital.

1/ For simplicity it is assumed that population and the labor force grow at the same rate, but changes in the participation rate can be easily incorporated into the model.

Dividing through by y and using bars to indicate ratios to GNP:

$$\dot{y}/y = \frac{\partial Q}{\partial K}\bar{S}_d + (\frac{\partial Q}{\partial K} - r)\bar{S}_f + \lambda(1 + r\bar{D}) + n(r\bar{D} - \frac{\partial Q}{\partial K}\bar{K})$$

The basic conclusion thus remains: increased reliance on foreign saving will raise the growth of national income only insofar as $\partial Q/\partial K > r$. If the production function is Cobb-Douglas, the condition becomes $\alpha\, Q/K > r$, where α is the elasticity of domestic output with respect to the capital stock. If the marginal product of capital initially exceeds the interest rate, capital accumulation financed by foreign borrowing will lower the output/capital ratio to the point where $\alpha\, Q/K = r$.

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