

**Macroeconomic policies and  
long-term growth:**  
a conceptual and empirical review

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AERC Special Paper 13  
Initiatives Publishers, Nairobi  
May 1991

*\*The views expressed in this paper are those of the authors and do not necessarily reflect those of the IMF.*

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## Acknowledgements

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We are grateful to Pierre-Richard Agenor, Eduardo Borensztein, Phillippe Callier, Dean DeRosa, William Easterly, Jeffrey Fine, Joshua Greene, Deena Khatkhate, Peter Montiel, Benno Ndulu, and the AERC Economic Research Workshop participants for useful comments and discussions, and to Ravina Malkani for research assistance.

# I. Introduction

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The growth performance of developing countries over the past two decades has been both unsatisfactory and uneven, often accompanied by sharp declines in rates of investment. Domestic saving rates have fallen even more dramatically, thereby contributing to unsustainable external payment positions. In attempting to correct external imbalances by reducing aggregate demand, many developing countries have further compressed investment expenditures, completing the vicious circle of sluggish growth and declining investment and saving rates.<sup>1</sup> To extricate themselves from this low equilibrium trap, developing countries need to implement adjustment programmes that emphasize increasing medium-term growth. Designing such programmes, however, is not an easy task. It requires, at the minimum, a macroeconomic framework encompassing the policy determinants of economic growth, which unfortunately appears lacking at present.

The main purpose of this paper is to review the theoretical and empirical literature on the relationship between macroeconomic policies and the long-term growth rate of potential GNP. It should be stressed that the paper does not provide specific policy prescriptions of how growth can be raised to a sustainable high level in individual countries. Nor does it provide explanations for cyclical fluctuations in demand and capacity utilization that lead to a divergence between actual and potential output. Rather, the paper lays out the current state of theory and the empirical findings on the subject. Further, the paper discusses generally the kinds of macroeconomic policies appropriate for promoting and sustaining a satisfactory rate of long-run economic growth in developing countries.

By way of motivating the theoretical and empirical review, Section II describes some stylized facts about the growth and macroeconomic performance in developing countries over the last two to three decades, with special reference to African countries. The literature on growth theory is reviewed in Section III, beginning with the basic Solow-Swan growth model. Following modifications of this standard framework to incorporate external borrowing, external debt, and the newer concept of "endogenous growth," the channels through which macroeconomic policies influence the rate of economic growth are discussed. Section IV then surveys the empirical studies linking macroeconomic policies to growth. Section V offers a general discussion of policies to promote economic growth, suggestions for further research, and a few concluding observations.

## II. Review of growth performance and related developments

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### Developing countries

The growth rate of real GDP in the developing countries fell from an average rate of 5.8 percent from 1969–1982 to 3.6 percent from 1983–1989; by comparison, the average rate of growth in the industrial countries rose slightly, from 3.2 percent during the same period.<sup>2</sup> The overall performance of the developing countries, however, conceals the wide variety of experiences across individual countries or groups of countries. Except for Asia, which posted an increase in the growth rate by nearly two percentage points to 7.4 percent in the second period, all regional groups experienced slow growth between the two sub-periods, with the Middle East suffering the largest decline (–6.7 percentage points), followed by the Western Hemisphere and Africa (–3.5 percentage points), and Europe (–2.3 percentage points). In many developing countries, the debt crisis that began in the early 1980s has been associated with a significant weakening of growth performance. In particular, countries with debt-servicing difficulties have had substantially lower growth rates of real GDP than those without. In the first group of countries, the growth rate of real GDP declined from 6.6 percent in 1969–1973 period to 3.5 percent in the 1974–1982 period and finally to 1.9 percent in the period 1983–1989 (IMF, 1990 p.48). Many of these countries were in the African and the Western Hemisphere (Latin American) regions, where severe economic stagnation was aggravated by the oil shocks, falling export prices, and external debt problems. By contrast, the group of countries without debt-servicing problems (including several in Asia) managed even to raise real GDP growth from 5.6 in the 1969–1982 period to 6.7 percent in the 1983–1989 period (IMF, 1990 p.48).

In *per capita* terms, the growth performance has been even more disappointing, owing to rapid population growth in many developing countries. Table 1 summarizes the growth rate in real per capita GDP and related indicators for net debtor developing countries during the 1969–1989 period.<sup>3</sup> Per capita GDP growth was halved to 2 percent between 1969–1973 and 1974–1989 in all 124 developing countries as a group. The growth performance of countries with debt-servicing difficulties was particularly disappointing, with

*per capita* GDP growth declining from 4 percent from 1969–1973 to 1 percent from 1974–1982 and down to –0.3 percent in the post-debt-crisis period. In stark contrast, countries without debt-servicing problems managed to post an average of 4 percent growth in real *per capita* GDP over the last 20 years. It is unfortunate to note that poorer countries did relatively worse—the rate of economic growth of the high-income group (with per capita income exceeding US\$1,000) was larger than that of the low-income group by as much as 2 percentage points during the 1980s (see Aghevli *et al.*, 1990).

The above variations in growth rates among developing countries in different regions and with different income levels have several explanations. Besides sociological, cultural, and political factors, some basic economic variables that may account for disparities in growth patterns include the rates of investments and the efficient use of both physical and human capital.

Table 1 shows different investment ratios among groups of developing countries. After rising from 22.8 percent from 1969–1973 to 26 percent from 1974–1982, the ratio of investment to GDP fell to 19.3 percent from 1983–1989 in countries with debt-servicing difficulties. In contrast, the investment ratio steadily rose from 20.6 percent from 1969–1973 to 25.4 percent from 1974–1982 to 28.6 percent from 1983–1989 in countries that avoided debt-servicing problems. There have also been different investment patterns among countries with dissimilar records on inflation and predominant exports. As Table 1 indicates, countries with higher investment ratios also have substantially lower rates of inflation. Data covering all developing countries concludes that the decline in the investment ratio of countries in the low-inflation group (1.5 percentage points) has also been much less than that in the high-inflation group (nearly 6 percentage points).<sup>4</sup> On average, the investment ratio has also been smaller for developing countries exporting primary commodities (many African countries fall into this category) than for countries specializing in manufactured exports.<sup>5</sup> By region, the investment ratio declined in all country-groups except Asia. From 1976–1981 to 1982–1989, these ratios fell by 6–7 percentage points in Africa and the Western Hemisphere and by 2–4 percentage points in Europe and the Middle East.<sup>6</sup>

Trade performance has also differed across groups of developing countries. Table 1 shows that export volume growth has been significantly and uniformly higher in countries without debt-servicing difficulties than in those with such problems. In the latter group, whereas import volume growth turned negative (i.e., –1.8 percent) from 1983–1989, it was sustained at a high positive level throughout the period in the former group. Throughout the whole period, there has been progressive deterioration in the terms of trade of countries with debt-servicing problems. Countries with such problems experienced an average improvement in their terms of trade of about 3 percent per year between 1969 and 1982. However, since the onset of the debt crisis in 1982, countries with debt-servicing difficulties have suffered a much greater decline in their terms of trade (–3.1 percent against –0.6 percent for countries that avoided debt-servicing problems during 1983–1989).

**Table 1** Net debtor developing countries: growth and related indicators, 1969–1989

| Net debtor countries, total                       | 1969–1973 <sup>a, b</sup>                              | 1974–1982 <sup>a</sup> | 1983–1989 |
|---|--|------------------------|-----------|
|   | (annual changes in percent or percent of GDP)          |                        |           |
| Real <i>per capita</i> GDP                        | 4.2  | 1.9                    | 2.0       |
| Investment ratio                                  | 21.9   | 25.8                   | 23.5      |
| Export volume                                     | 6.2  | 1.9                    | 8.1       |
| Import volume                                     | 7.7  | 5.5                    | 4.2       |
| Terms of trade                                    | 2.3  | 2.2                    | -1.7      |
| Consumer prices                                   | 10.5   | 27.8                   | 57.4      |
|   | (as percent of exports of goods/services) <sup>c</sup> |                        |           |
| Current account balance                           | -11.1  | -14.1                  | -6.3      |
| Total external debt                               | 110.8  | 165.7                  | 149.3     |
| Debt-service payments                             | 17.2   | 18.6                   | 23.4      |
| Of which: interest payments                       | 7.6  | 8.1                    | 12.5      |
| Countries with recent debt-servicing difficulties | 1969–1973 <sup>b</sup>                                 | 1974–1982              | 1983–1989 |
|   | (annual changes in percent or percent of GDP)          |                        |           |
| Real <i>per capita</i> GDP                        | 4.1  | 1.0                    | -0.3      |
| Investment ratio                                  | 22.8   | 26.0                   | 19.3      |
| Export volume                                     | 4.4  | -0.5                   | 4.6       |
| Import volume                                     | 6.8  | 4.2                    | -1.8      |
| Terms of trade                                    | 2.5  | 3.2                    | -3.1      |
| Consumer prices                                   | 11.9   | 34.8                   | 107.8     |
|   | (as percent of exports of goods/services) <sup>c</sup> |                        |           |
| Current account balance                           | -10.1  | -17.4                  | -8.7      |
| Total external debt                               | 111.5  | 222.2                  | 248.7     |
| Debt-service payments                             | 18.8   | 24.2                   | 31.6      |
| Of which: interest payments                       | 7.4  | 10.2                   | 19.3      |
| Countries without debt-servicing difficulties     | 1969–1973 <sup>a, b</sup>                              | 1974–1982 <sup>a</sup> | 1983–1989 |
|   | (annual changes in percent or percent of GDP)          |                        |           |
| Real <i>per capita</i> GDP                        | 4.4  | 3.3                    | 4.7       |
| Investment ratio                                  | 20.6   | 25.4                   | 28.6      |
| Export volume                                     | 9.3  | 5.6                    | 10.8      |
| Import volume                                     | 8.9  | 7.0                    | 8.5       |
| Terms of trade                                    | 1.8  | 0.7                    | -0.6      |
| Consumer prices                                   | 7.8  | 15.8                   | 11.3      |
|   | (as percent of exports of goods/services) <sup>c</sup> |                        |           |
| Current account balance                           | -12.7  | -10.2                  | -4.6      |
| Total external debt                               | 110.4  | 105.4                  | 90.0      |
| Debt-service payments                             | 15.0   | 11.5                   | 17.1      |
| Of which: interest payments                       | 8.0  | 5.5                    | 7.3       |

Source: IMF (1990), p. 51. Data on real *per capita* GDP were taken from the *World Economic Outlook* data base.

- Notes: a. Excluding China.  
 b. Debt-service and interest payments shown are 1971–1973 averages.  
 c. Period averages.



Owing to the poorer performance of exports in countries with debt-servicing problems, the ratios of debt-service payments and of total external debt have kept rising, whereas countries that avoided such problems managed to reduce their ratio of external debt and to stabilize their debt-service payments ratio (see Table 1).

Information on human capital expenditures in developing countries is difficult to obtain. However, Otani and Villanueva (1989) have recently compiled data for 55 developing countries and observed that the ratio of central government resources to GNP devoted to expenditures on human capital (through the provision of educational services and related infrastructure) has ranged from 4–5 percent of GNP in the Western Hemisphere, Middle East, and African regions to about 3–3½ percent in Asia and Europe. The relatively higher proportions observed in the Western Hemisphere, Middle East, and African regions appear to reflect the emphasis on education in those regions, whereas the lower proportions in Asia and Europe reflected their development strategy to improve the physical infrastructure of the economy in order to balance physical and (the initially high stock of) human capital. The high-income group spent 4.2 percent of GNP on improvements of human capital, followed by the middle-income and low-income groups with 3.6 and 3.4 percent of GNP, respectively—a pattern suggestive of a positive relationship between expenditures on human capital and income levels (see Otani and Villanueva, 1989).

#### Low-income countries, with special reference to Africa<sup>7</sup>

It is obvious from the long-term trends discussed above that the low-income countries as a group have performed very poorly in terms of most growth and related indicators—disappointing growth rates, low ratios of saving and investment to GNP, and declining rates of export growth. Among these countries, those in Africa have fared even worse, at least in comparison to the low-income countries in Southeast Asia. The remainder of this sub-section focusses on a more detailed discussion of the African region.

There were three broadly distinct phases in the performance of per capita income growth in Africa. The 1961–1972 period witnessed per capita income growth of just under 3 percent per annum, followed by no growth at all in 1973–1980, and negative growth of about –3 per cent annually during 1981–1987. Within this group, some countries have had particularly poor records on per capita income growth since 1980, averaging annual rates of –8 percent for Mozambique, –6 percent for Sao Tomé and Príncipe and Zambia, and –5 percent for Liberia, Niger, and Nigeria. A few countries, however, have shown positive per capita income growth rates, including Botswana, which has recorded over 8 percent annual growth of per capita income for the past 25 years or so; Congo with 4 percent; and Lesotho, Mauritius, and Seychelles, with 3 percent.

The factors behind the uneven and mostly unsatisfactory performance in the growth of per capita income in Africa have been debated in many circles. Are the reasons mainly external or internal, or a combination of both? External factors include changes in the terms of trade and changes in net debt service payments (and in debt stock, as an influence on domestic investment). Internal factors include population growth and changes in the levels and productivity of investment, broadly defined to include investment in human capital, and overall macroeconomic instability.

For Africa, it appears that the more dominant external factor behind the recent disappointing performance of per capita GNP has been mounting external debt burden rather than the deterioration in the terms of trade. Except from 1986–1987, the effect of changes in the terms of trade on per capita income growth has been on the order of less than one-tenth of a percentage point a year during 1961–1987.<sup>8</sup> On the other hand, based on data contained in Greene and Khan (1990), the negative effect of external debt-service payments on income growth has averaged about 1.4 percent of GDP annually, on average, during 1975–1985.<sup>9</sup>

This is not to say that terms-of-trade losses have been unimportant—the disappointing growth performances of oil-producing and low-income African countries have followed the collapse of oil and primary commodity prices, respectively. But other regional groups, notably the low-income countries of southeast Asia, had suffered similar losses and yet performed much better, largely owing to lower population growth rates, less onerous debt-service burdens, higher investment rates, and larger returns on investment. The poor returns on investment projects in Africa, measured by the ratio of the growth of output to the rate of investment, have been documented in world Bank (1989a, pp.24–27). This disappointing investment performance has served to magnify the significance of the mounting external debt burden, because past investment projects financed by external borrowing have not yielded returns commensurate with their costs.

Africa's declining export volumes, rather than falling export prices, have accounted for the bulk of poor export receipts.<sup>10</sup> A recent empirical study (DeRosa, 1990) concludes that the high rates of nominal protection, with consequent overvaluation of real exchange rates, reduce the total value of exports from 23 African countries by 15–33 percent annually and inhibit the diversification of exports. The contraction of the export sector may partially account for the secular decline in factor productivity and output growth in most of Africa.

Declining exports and levels of economic activity have meant falling fiscal revenues. One important reaction of most African governments has been to scale down the budgetary shares of expenditures on capital formation (including operations and maintenance) and education and health, with unfavourable implications for labour productivity, while continuing to channel dwindling resources into other current expenditures and generally inefficient rates enterprises. In response to shortfalls in foreign exchange and public sector revenue, a number of African governments have reversed their initia-

tives on structural reforms (for example, by increasing departure from market prices and by tightening trade restrictions), exacerbating inefficiency in resource allocation. Thus, the public sector has failed to adjust to the decline in primary export prices since the mid-1970s, to the contraction of non-concessional flows since the onset of the debt crisis, and to the increasingly burdensome debt problems. The resulting increase in budgetary deficits has led to excessive expansion of the money supply, fuelling inflation. Rigidity in nominal interest rates in the presence of rising inflation has meant negative real interest rates, resulting in investment inefficiency.<sup>11</sup> Inflation, as a measure of macroeconomic instability, has also had direct negative effects on the ratios of private investment and saving to GDP.<sup>12</sup> Finally, rigidity in nominal exchange rates has meant that the real exchange rates became overvalued, further adversely affecting the export sector.

In sum, the major economic explanations for the disappointing performance of per capita GNP growth in Africa have been the rapid rates of population increase, declining rates of investment in physical and human capital, macroeconomic instability, and perhaps most importantly, falling factor productivity and poor returns on investments. Among the significant factors behind these developments have been inefficient investment projects, the declining size of the export sector, the relative neglect of the human sector, and an inability to maintain financial discipline.

### III. Macroeconomic policies and growth: theoretical aspects

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The stylized facts described in the preceding section raise several questions of interest to policy-makers. Are there well-defined causal relationships between growth and related variables? What factors can account for the divergent growth patterns experienced by different groups? What is the role of macroeconomic policies in the process of economic growth? Answers to these questions are by no means simple, and certainly any attempt to find them would require a consistent and coherent analytical framework.

The theoretical framework for the analysis of economic growth has evolved from the classic works of Solow (1956) and Swan (1956). This framework, which is referred to as “neoclassical,” generally focusses on the concept of the capacity or potential output of an economy, defined as the output level that is consistent with full employment of capital and labour. Accordingly, this approach does not focus on explaining cyclical fluctuations in demand and capacity utilization, which may lead to deviations of actual from capacity output, unemployment, and inflation.

Growth in the neoclassical model is entirely determined by supply factors, and the economy is assumed to be always operating at full capacity. As such, changes in aggregate demand have no effect, even in the short run, on the rate of capacity utilization. In a properly specified macroeconomic model, one would presumably wish to distinguish between growth in productive capacity, growth of output resulting from more efficient use of productive capacity, and growth that results from increases in aggregate demand (when there is excess capacity in the economy). In the present full-capacity framework, one cannot deal with important issues of employment and wage determination. Combining the effects of supply (capacity-increasing and efficiency-enhancing) and demand factors on the growth process is a topic that deserves serious attention.<sup>13</sup>

The key relationship in neoclassical analysis is the “aggregate production function”, which relates potential output to the levels of capital and labour inputs and to multi-factor productivity. The latter concept is a catch-all variable that captures all influences on increases in output for given levels of the factor inputs. Thus, the productivity concept incorporates factors such as

technological progress, improvements in education and training, and efficient allocation of resources. In this framework, the growth of potential output is the result of the growth of capital and labour and improvements in factor productivity.

The Solow-Swan framework, being a close-economy model, does not distinguish between potential output (GDP) and potential income (GNP), because it does not take account of changes in international trade in factor services, including changes in the terms of trade and in the costs incurred on external borrowing. In view of the external debt crisis facing many developing countries (as discussed in the preceding section), it would seem less appropriate to define macroeconomic objectives in terms of potential GDP, as in the basic neoclassical model, than in terms of potential GNP, which excludes a portion of GDP used in servicing the external debt and thus is closer to the concept of national income.<sup>14</sup>

Another important, perhaps crucial, shortcoming of the Solow-Swan framework is its implication that macroeconomic policies can affect only the equilibrium level, but not the rate of growth, of domestic output. This is because, in the long run, the growth rate of potential output is constrained by the constant rate of growth of the labour force, augmented by technological change, which is assumed exogenously given. Recent work on the "new or endogenous growth" theory has tried to remedy this major weakness of the standard framework, and thereby allow a role for macroeconomic policies in affecting the rate of growth of output.<sup>15</sup>

This section builds on the neoclassical growth model by incorporating endogenous growth, external borrowing, and external debt. Endogenous investment in human capital is highlighted and formally integrated into the model. The section then analyzes the impact of macroeconomic policies on the rate of economic growth, and concludes with a brief discussion of the cost and burden of external debt.

### The modified framework

One way to incorporate endogenous growth, external borrowing, and external debt into the basic Solow-Swan framework is through a simplified version of a growth model developed in Otani and Villanueva (1989). In so doing, the nature of the relationships among macroeconomic policies, the growth of potential domestic output, the use of foreign saving, and the growth of potential national income can be clarified. As mentioned in the introduction, because the focus of the analysis is on long-term economic growth, no attempt is made to model the inflationary process and the possibility of excess capacity in the economy. This by no means implies that inflation and unemployment are unimportant, nor that they are unaffected by real and monetary developments; however, these phenomena are not directly relevant to the main argument of this paper.<sup>16</sup>

There are two building blocks in this modified framework. First, as in the standard growth model, the centrepiece is an aggregate production function of the neoclassical type:

$$(1) \quad Q = F(K, L) = LF(k)$$

where  $Q$  is potential GDP,  $K$  and  $L$  are the quality-adjusted supplies of physical and human capital, respectively, measured in efficiency units, and  $k = \frac{K}{L}$  is the ratio of physical to human capital.<sup>17</sup>

Potential gross national income,  $Y^a$ , is  $Q$ , adjusted for the terms of trade, less interest payments on the external debt:

$$(2) \quad Y^a = ttQ - rD$$

where  $tt$  is the terms of trade and  $r$  is the world market interest rate (both are assumed exogenously given to the domestic economy) and  $D$  is the net stock of external debt. In the equations that follow,  $S$  is the sum of private ( $S_p$ ), government ( $S_g$ ) and foreign savings<sup>18</sup> ( $S_f$ ).

Differentiating equations (1) into (2) with respect to time yields:

$$(3) \quad \hat{Q} = \hat{L} + p \hat{k}$$

$$(4) \quad \hat{Y}^a = ttQ^* \hat{Q} - rS_{f^*} - \dot{r}D^* + ttQ^*$$

where the hat and dot symbols indicate a proportional growth rate and a time derivative, respectively;  $\pi = kf'(k)/f(k)$  is the share of income going to physical capital under marginal productivity pricing (where  $f'(k)$  is the positive marginal product of physical capital),  $Q^* = Q/Y^a$ ,  $S_{f^*} = S_f/Y^a$ ; and  $D^* = D/Y^a$ .<sup>19</sup> It can be immediately seen from equations (3) and (4) that an increase in the growth rate of potential national income is the result of six basic factors<sup>20</sup>:

- An increase in the growth rate of labour;
- An increase in the rate of capital accumulation (investment);
- An increase in the marginal product of capital;
- A decrease in the level and rate of change in the world market interest rate;
- A decrease in the ratio of external debt to GNP;
- An improvement in the level and rate of change in the terms of trade.

As they stand, equations (3) and (4) are virtually identities. In order to have the rudiments of a theory of economic growth, we have to specify how the terms on the right-hand side of these two equations evolve over time and, more importantly, to identify the links between these basic growth-determining variables and various macroeconomic policies. This strategy leads us to

the second building block of the modified framework. The increments in the effective supplies of physical and human capital depend positively on total savings,  $S$ , consisting of  $S_p$ ,  $S_g$ ,  $S_f$ . For simplicity, depreciation and population growth are ignored.<sup>21</sup>

$$(5) \quad \dot{K} = bS$$

$$(6) \quad \dot{L} = a(1 - b)S$$

Here  $S$  represents a broad concept of savings, referring to a portion of current output devoted to increasing capital, both physical and human; the parameter  $b$  is the fraction devoted to augmenting physical capital;  $1-b$  is the remaining fraction for improvements in human capital (education, training, health); and the parameter  $a$  translates savings (in constant dollars) into units of  $L$  (man-hours).<sup>22</sup>

Private saving is a positive function of disposable income:

$$(7) \quad S_p = s(1 - tx)Y^a,$$

where  $s$  is the average propensity to save and  $tx$  is the average tax rate on income.

Government saving consists of tax revenues (non-tax revenues are assumed zero),  $txY^a$ , less non-capital (physical and human) expenditures,  $C_g$ :

$$(8) \quad S_g = txY^a - C_g$$

Finally, foreign saving is equal to the current account balance (net foreign borrowing):

$$(9) \quad S_f = \dot{D}$$

The following ratios to potential GNP are taken to be pre-determined: government non-capital expenditure,  $C_g/Y^a = C_g^*$ ; foreign saving,  $S_f^*$ ; net external debt,  $D^*$ , and potential output,  $Q^*$ . This completes the modified theoretical framework.

In the long run, the ratio of physical to human capital,  $k$ , approaches a stationary equilibrium value, say  $k^*$ . At this long-run value, the growth rate of physical capital matches that of human capital. In equation (3),  $\dot{\hat{k}} = 0$  in long-run equilibrium, so that potential GDP also increases at the rate of growth of human capital. Thus, the long-run growth rate of potential output is given by the following expressions, using equations (5) and (6):

$$(10) \quad \hat{Q} = \hat{K} = bS/K$$

$$(11) \quad \widehat{Q} = \widehat{L} = a(1 - b) S/L$$

Substituting equations (7) – (9) into (10) – (11), then the results into equations (3) and (4), and noting that  $\widehat{k} = 0$  (that is,  $k = k^*$ ) in long-run equilibrium, yields the basic growth expressions for potential GNP:<sup>23</sup>

$$(12) \quad \widehat{Y}^a = ttb [s(1 - tx) + tx - C_{g^*}] f(k^*)/k^* + [ttf'(k^*) - r] S_{f^*} - iD^* + ttQ^*$$

$$(13) \quad \widehat{Y}^a = tta(1 - b)[s(1 - tx) + tx - C_{g^*}] f(k^*) + [tt(f - k^*f') - r] S_{f^*} - iD^* + ttQ^*$$

where we have used the relations  $f'(k^*) = bf(k^*)/k^*$  (that is,  $b = \pi(k^*)$ ) and  $f(k^*) - k^*f'(k^*) = a(1 - b)f(k^*)$  in deriving the second terms (involving foreign borrowing  $S_{f^*}$ ) on the right-hand side of equations (12) and (13).<sup>24</sup> In the standard model, the parameter  $b$  is assumed to be unity, that is, all unconsumed output is devoted to augmenting the physical capital stock. The labour input is assumed to grow at a constant rate  $n$  (the rate of population growth plus an exogenous rate of labour-augmenting technical change). Thus, in the long run, the growth rate of capital,  $K$ , being constrained by that of labour, converges to a fixed rate  $n$ . By the assumption of constant returns to scale, domestic output also grows at the rate  $n$ . In the modified model, the parameter  $b$  is assumed to be positive but less than unity, thus allowing for an endogenous rate of labour-augmentation (through resources set aside for education, training, health, and the like). Since, like physical capital, the human capital component of labour is assumed to be reproducible, being a positive function of  $k^*$ , the long-run equilibrium growth rate of human capital, and thus of output and income can vary, or can be raised by appropriate macroeconomic policies, as long as they result in an increase in  $k^*$ .<sup>25</sup> According to equations (12) and (13), an increase in the growth rate of potential GNP would result from any combination of the following structural parameters, policy variables, and pre-determined variables:

- An increase in the average private propensity to save;
- An increase in the average tax rate;<sup>26</sup>
- A decrease in the ratio of government non-capital (physical and human) expenditures to GNP;
- An increase in the marginal product of physical and human capital ( $f'(k^*)$  and  $f(k^*) - k^*f'(k^*)$ );
- An increase in the ratio of foreign borrowing to GNP, as long as the marginal product of capital (physical and human), adjusted for the terms of trade, exceeds the world market interest rate;
- A decrease in the level and rate of change in the world market interest rate;
- A decrease in the external debt-to-GNP ratio.
- An improvement in the level and rate of change in the terms of trade.



We now discuss how various macroeconomic policies can influence the growth potential of the economy both directly and indirectly through their effects on some of the above factors.

### Macroeconomic policies affecting economic growth

With the help of equations (12) and (13), the possible links between macroeconomic policies and the long-run growth rate of potential GNP can be identified and are laid out in Table 2. Each of these policies influences long-run growth through its effects on the above structural parameters, policy variables, or pre-determined variables.

**Table 2** Macroeconomic policies for higher long-term growth

| Policies  | Growth effects   | Factors   |
|---|--|---|
| <i>Fiscal policies</i>  |  |   |
| Increase in tax-to-GNP ratio  | Will raise the rates of domestic saving and investments in physical and human capital. However, depending on composition of taxes, possible distortions and disincentives may have an adverse impact on export performance, saving, employment and growth.                                     | The average tax rate ( $t_x$ ). Possible adverse impact on the private saving rate ( $s$ ) and the marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).  |
| Reduction in fiscal deficit-to-GDP ratio  | Will release resources towards the private sector and slow the rate of monetary expansion and, hence, the expected rate of inflation, thereby stimulating private investment and saving rates and thus increasing long-run growth.   | The private saving rate ( $s$ ) and possibly favourable impact on the marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).   |
| Reduction in the non-capital expenditure-to-GNP ratio   | Will directly raise domestic saving rate via higher rate of government saving. There are also positive growth effects indirectly transmitted through favourable impact on private investment and saving rates of a fall in ratio of fiscal deficit to GNP.                                     | Non-capital spending ratio ( $C_g^*$ ). Favourable indirect effect on private saving ( $s$ ) and marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).  |
| Cuts in income, corporate, and indirect taxes with base broadening; harmonization of indirect taxes | Will raise effective supplies of labour and capital, improve capital's marginal product, and encourage efficiency in resource allocation. These tax reforms, however, should be carefully designed to minimize revenue loss, which is detrimental to domestic saving rate and long-run growth. | Composition of the overall tax ration ( $t_x$ ). Favourable impact on the private saving rate ( $s$ ) and on the marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ). Possible adverse effect on tax effort ( $t_x$ ). |

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| Policies  | Growth effects   | Factors  |
|---|--|--|
| <i>Fiscal policies</i>  |  |  |
| Reorientation of expenditures in favour of basic infrastructure, operations and maintenance, education, training, and health            | Will increase effective supplies of capital and labour, resulting in higher GNP growth.  | Reduction in $C_g^*$ . Favourable indirect effect on private saving (s) and marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).              |
| <i>Monetary and interest-rate policies</i>  |  |  |
| Avoidance of excessive expansion of money supply  | Will increase long-run growth by reducing expected rate of inflation, thereby stimulating private saving rate and improving climate for private saving and investment. Price stability will also enhance prospects for successful financial reforms.   | Favourable impact on private propensity to save (s) and possibly on the marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).                  |
| Achievement and maintenance of flexible and positive real interest rates, improved bank supervision, growth of money and equity markets | Will enhance efficient allocation of capital and may raise private saving rate. Even if latter is interest-insensitive, increase in productive investments will raise long-run growth. Stabilization and strengthened bank supervision will ensure that interest rates do not rise to risky levels under the impact of interest-rate liberalization.   | Positive effects on the marginal productivity of capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ), and possibly on the average rate of private saving (s).                        |
| <i>External policies</i>  |  |  |
| Realistic and flexible exchange-rate policy and avoidance of overvalued real exchange rates   | Will promote long-run growth to the extent this policy leads to expansion and diversification of export with consequent improvement in factor productivity associated with production and demand, technology transfer, development of efficient and internationally competitive management, and training of skilled workers. This favourable growth effect, however, would be partly offset by increase in the debt-service burden (in local currency), particularly for heavily indebted countries. | Favourable effects on the marginal product of physical and human capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ). Adverse impact on the local currency cost of servicing $D^*$ . |
| Liberalization of foreign trade and direct investment   | Will improve factor productivity by removing barriers to imported inputs and to the inflow of risk capital.  | Positive impact on the marginal product of capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).  |
| <i>Other policies</i>   |  |  |
| Reform in agricultural pricing and marketing, in state enterprises, and in the labour market  | Will promote greater efficiency in resource allocation, raise factor productivity, and thus economic growth.   | Favourable effects on the marginal product of capital ( $f'(k^*)$ and $f(k^*) - k^*f'(k^*)$ ).   |

*(a) Fiscal policies*

The effects of fiscal policies on the growth rate of potential GNP are transmitted through changes in the ratios to GNP of tax revenue, non-capital expenditure, and the budget deficit. The composition of government expenditures and taxes also affect the growth rate of potential GNP.

As long as the private sector does not reduce its own saving rate to fully offset the increase in government saving in anticipation of a future change in tax liabilities, that is, Ricardian equivalence is not complete, the effects of an increase in the tax to GNP ratio are to raise the rates of domestic saving and investments in both physical and human capital, and the rate of growth of potential GNP would rise.<sup>27</sup> However, depending on the composition of taxes, there may be distortions and disincentives that would adversely affect export activity, saving, employment, and growth. For example, income taxes, to the extent that they inhibit human and physical capital accumulation, would have a negative impact on growth.<sup>28</sup> Taxes on various saving instruments, which effectively lower their net returns, would have adverse effects through an unfavourable influence on the private propensity to save. Foreign trade taxes, to the extent that they limit the degree of openness of the economy—and thus foreign competition and access to technological innovations—and introduce distortions and inefficiencies in resource allocation, would also lower growth.

If total expenditures remain constant, or increase by less than the rise in tax revenues, the associated reduction in the ratio of the fiscal deficit to GNP would release resources toward the private sector and slow the rate of monetary expansion and, hence, the expected rate of inflation. The rates of private investment and saving would be stimulated, further increasing the rates of capital formation (broadly defined) and of economic growth.

The opposite effects on domestic saving and investment and, hence, on the growth rate of potential GNP are triggered by an increase in the ratio of non-physical and non-human capital government expenditures to GNP. In addition to the direct reduction in the domestic saving rate induced by a lower rate of government saving, there are indirect negative effects on private investment and saving rates that are associated with a higher ratio of the fiscal deficit to GNP.<sup>29</sup>

Tax reforms that cut rates on income, corporate, and indirect taxes, while at the same time broadening the base through elimination of many tax preferences and exemptions, and that harmonize indirect tax rates, would raise marginal factor products, and thus the growth rate of potential GNP. Marginal factor products would be raised because of the narrowing, or perhaps elimination, of differential wedges between marginal products of different types of capital. On the other hand, tax reforms have to be carefully designed to minimize revenue loss, which would tend to pull down the rate of domestic saving and the growth in potential GNP.

For given ratios of tax revenues, government expenditures, and budgetary deficits, a reorientation of the composition of expenditures in favour of basic

infrastructure (roads, ports, bridges, communications), operations and maintenance, education, training, and health would be directly growth-promoting—this policy would imply declining values for the variable  $C_g^*$ .<sup>30</sup>

*(b) Monetary and interest-rate policies*

An excessive increase in the rate of monetary expansion, additional to the monetary effects of a given level of budgetary deficits, may reduce the growth rate of potential GNP in at least two ways. An acceleration of the rate of inflation, to the extent it threatens macroeconomic stability, will reduce the propensity to invest.<sup>31</sup> In addition, the increase in the expected rate of inflation may reduce the private propensity to save.<sup>32</sup>

Interest-rate and financial-sector policies that result in competitive returns and positive real interest rates on financial assets, and promote the growth of money markets will enhance the marginal productivity of capital, and may also raise the propensity to save. Even if the interest elasticity of saving were small, positive real interest rates may be associated with more productive investments and less distortion in project selection, and as argued by Polak (1989), with higher growth rates of potential GNP. However, to be successful, interest-rate and financial-sector policies have to be carefully designed and implemented. Recent theoretical developments (Villanueva and Mirakhor, 1990) help to explain the failure of recent interest-rate and financial reforms in several countries.<sup>33</sup> To prevent such an outcome, economic stabilization and strengthened bank supervision should generally precede complete removal of control on interest rates.<sup>34</sup> Furthermore, institutional changes should be in the forefront of financial sector reforms in developing countries, including a strong supporting infrastructure that will provide for adequate information flow, credit appraisal and rating, suitable legal and accounting systems, and the development of equity markets. Such institutional reforms will help reduce the dependence of firms on bank credit and help orient them towards equity financing. The vulnerability of firms to interest-rate shocks would then be reduced, allowing more room for interest-rate liberalization.

*(c) External policies*

Outward-oriented policies are generally taken as synonymous with policies designed to promote the expansion and diversification of exports. The avoidance of overvalued real effective exchange rates, by timely adjustments in the nominal exchange rates and maintenance of domestic price stability, will encourage economic growth to the extent that it results in the long-term expansion and diversification of exports.<sup>35</sup> How exports encourage economic growth and development can be discussed in relation to two main factors: production and demand (see Goldstein and Khan, 1982). On the production side, an increase in the output of export goods often leads to the development of infrastructure, transport and communication systems, etc., which in turn facilitates the production of other goods and services. Investment oppor-

tunities are opened up in areas far removed from the actual export activity as the need to supply inputs rises and productive facilities are created, utilizing inputs and outputs that were non-existent prior to the expansion in exports. Also related to production is the transfer of factors from the rest of the economy to the export sector, which is typically the most productive sector, thereby raising the overall rate of economic growth. Improvements in factor productivity are also associated with technology transfer from abroad. The export sector serves as a vehicle for technology transfer through the importation of advanced capital goods, as elucidated by Bardhan and Lewis (1970), Chen (1979), and Khang (1987), and as a channel for positive inter-sectoral externalities through the development of efficient and internationally competitive management, training of workers, and the spill-over consequences of scale expansion (see Keesing, 1967, and Feder, 1983). These processes basically represent the "secular" or "trend" effects of export growth on output.

Economic growth from exports is also linked to demand since an increase in income results directly from a rise in demand for a wide range of products, including non-tradeables. These demand-pressures are reflected in an expansion in domestic supply and, therefore, involve investment in facilities providing such products. Increased demand for importables also contributes to the expansion of domestic production. In short, overall output increases in response to the export-induced rise in demand. This linkage to demand represents the "cyclical" effect of export growth on real output.

The link to production and demand ensures that the development of the export sector is accompanied by a rise in investment, an increase in, and greater utilization of, productive capacity, an increase in employment, exploitation of economies of scale, and technological improvements. These are just the direct effects of export expansion on the rate of output growth. There are several other indirect effects, which turn out to be just as important.

First, aggregate savings may rise because of the general increase in incomes associated with the initial rise in exports. Furthermore, as argued by Maizels (1968), the marginal propensity to save in the export sector could be larger than elsewhere, in which case the rise in aggregate savings would be magnified. The rise in savings translates into an increase in investment in physical and human capital, and thus in the rate of economic growth. Second, direct foreign investments and foreign loans may be stimulated by the expansion of the export sector, since investment and lending decisions take into account the country's ability to repay out of export earnings. By enhancing profitability and the capacity to service external debt and, therefore improving credit-worthiness, the expansion of the export sector induces higher flows of direct foreign investment and foreign loans that enable an even higher rate of investment (and growth). Third, exports provide the necessary foreign exchange for importation of capital goods and raw materials for which there are no convenient domestic substitutes (Khang, 1968; Bardhan and Lewis, 1970).<sup>36</sup> For all the above reasons, superior export performance has generally been associated with superior growth performance, as documented by Balassa (1978), Krueger (1978), and Bhagwati and Srinivasan (1979).

An increase in the ratio of foreign borrowing would raise economic growth only if the marginal product of capital (physical or human), adjusted for the terms of trade, exceeds the world market interest rate. This principle underscores the importance of macroeconomic policies that raise the marginal productivity of capital.

The liberalization of foreign trade and direct investment would also improve factor productivity by removing barriers to imported inputs and to the inflow of risk capital, as well as promoting greater competition from imports. Romer (1990) notes that in foreign trade data on developing countries, exports track imports very closely, suggesting that replacing exports by imports would not affect the growth-inducing impact of trade liberalization. Thus, it is openness that is correlated with faster growth, with the causality running from openness to technological change to growth, as suggested by models that postulate a positive effect of market size on research and growth (Romer, 1990), and by the findings of Sokoloff (1988).

*(d) Other policies*

Measures to reform the goods and labour markets, so that the mobility of goods and labour is enhanced and prices and wages are made flexible, will promote efficiency in resource allocation, improve factor productivity, and thus increase the rate of economic growth. Examples are: reforms of producer pricing and agricultural marketing, public enterprise reforms, and labour-market policies. Additionally, by encouraging greater wage-price flexibility, these structural reforms will allow adjustment to exogenous shocks to proceed smoothly and to reduce transitional adjustment costs (in terms of unemployment).

Intervention in agricultural pricing and marketing usually results in severe distortions in the level and structure of domestic producer prices or in substantial subsidies, and thus in inefficient resource allocation and in macroeconomic imbalances. The serious distortions in relative prices and the limitations placed on private-sector participation have an adverse impact on productivity and output growth. Frequent and timely adjustments of producer prices in line with international prices and increased participation of the private sector in domestic marketing and exporting would be the first steps toward reform.<sup>37</sup> In some cases, export taxes may have to be reduced or eliminated, and government involvement in marketing limited to the operation of a price-support system or buffer stock that would allow greater participation of private traders in agricultural marketing, and some price flexibility. In designing these reforms, however, it is essential that changes in exchange rates be directly reflected in producer prices and that exchange-rate overvaluation be avoided. Also, where export taxes are reduced or eliminated, tax reforms should be designed to protect government revenues. The eventual objective should be to fully liberalize agricultural pricing and marketing, allowing prices to be freely determined by market forces, and domestic marketing and exporting to be undertaken by the private sector.

Reforms of public enterprises will help reduce the public-sector deficit and raise allocative efficiency. Where a public enterprise is engaged in a purely commercial activity and is already subject to competition, a case for privatization would be straightforward and uncontroversial, as long as privatization is accompanied by measures to increase competition. However, privatization may be limited in cases where social or strategic objectives are pursued through enterprises, notwithstanding the efficiency gains associated with this type of reform.

Finally, the structure of labour markets and the level of real wages are crucially important for economic growth. Real wage flexibility is needed for external competitiveness, full employment, and accumulation of human capital. Real wages that are either too low or too high in relation to labour's marginal productivity often result in poor work incentives, unemployment or deterioration in external competitiveness. Measures that reduce or eliminate wage-indexation schemes, segmentation of labour markets, and wage-setting procedures unrelated to financial discipline, will also reduce or eliminate distortions and impediments to labour mobility, and thus promote both the efficient allocation of different types of labour, and the efficient substitution between capital and labour.

#### *Cost and burden of external debt*

It is clear that an increase in either world market interest rates or in the ratio of the net stock of external debt to GNP would cut directly the rate of growth of potential GNP by diverting a portion of domestic output from growth-producing savings towards higher levels of debt-service payments. There would be other indirect effects as well. First, an increase in the interest rate represents an increase in the marginal cost of capital, and thus tends to discourage capital accumulation for a given marginal product of capital. Second, the existence of a large debt overhang, in the form of a high ratio of external debt to GNP, can reduce the incentives for private investment, because much of the forthcoming returns from investment must be used to repay existing debt, and therefore act as a tax on domestic investment (Borensztein, 1990a; Froot and Krugman, 1990). Third, to the extent that a substantial external debt leads to debt-servicing difficulties, relations with external creditors may deteriorate, thus reducing the amount of trade-financing a country can obtain. This in turn may make it harder or more costly to finance private investment, because imports play a major role in investment projects of many developing countries, and the preponderance of imports in all developing countries are investment-related (Mirakhor and Montiel, 1987). Other indirect negative effects on the rate of private investment are low profitability owing to depressed economic activity, and debt-induced declines in public investment which is complementary to private investment (Borensztein, 1990b).

## IV. Macroeconomic policies and growth: empirical studies

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Empirical studies linking macroeconomic policies to the growth rate of output and income are extremely important for several reasons. First, it is necessary to determine empirically the extent to which the theoretical relationships involved in the “endogenous growth-cum-debt framework” surveyed in the preceding section stand up against the observed growth performance of developing countries. Second, the empirical studies should help in formulating growth-oriented adjustment programmes and establishing priorities in their implementation. Finally, empirical investigations usually provide suggestions for further research, aimed at understanding how macroeconomic policies influence the rate of growth in potential output and national income.

Empirical growth studies have evolved from the sources-of-growth framework pioneered by Denison (1962, 1967). Most empirical studies to date have focussed on the growth effects of fiscal policies (government expenditure, taxation, and deficits); a highly useful review of such studies has been undertaken recently by Orsmond (1990). A summary of the studies considered in Orsmond’s survey is reproduced in Table 3, supplemented by other empirical studies that emphasize the growth effects of monetary, interest-rate, and external policies aimed at promoting macroeconomic stability, the optimal use of savings, and the steady expansion and diversification of exports. The majority of these studies are cross-sectional, using observations averaged over a long period; the specific methodologies employed in them are described in Appendix 2.



**Table 3** Empirical Studies of the effects of macroeconomic policies on long-term growth

| Authors                      | TG | CG | INF | EDH | TR | TAX | DEF | RINT | RX | CPI |
|------------------------------|----|----|-----|-----|----|-----|-----|------|----|-----|
| Balassa (1978)               |    |    |     |     |    |     |     |      | +  |     |
| Barro (1989)                 |    | -  | +   | +   |    |     |     |      |    |     |
| Castles and Dowrick (1988)   |    | -  |     | -   | +  |     |     |      |    |     |
| Diamond (1989)               |    | -  | +   | +   | +  |     |     |      | +  |     |
| Dornbusch and Reynoso (1989) |    |    |     |     |    |     |     |      |    | -   |
| Easterly (1990)              |    | -  |     |     |    |     |     | +    |    |     |
| Khan and Reinhart (1990)     |    |    |     |     |    |     |     |      | +  |     |
| Koester and Kormendi (1989)  |    |    |     |     |    | 0   |     |      |    |     |
| Landau (1983, 1985, 1986)    | -  | -  | -   |     | +  |     |     |      |    |     |
| Marlow (1986)                |    |    |     | -   | -  |     |     |      |    |     |
| Marsden (1983)               |    |    |     |     |    |     | -   |      |    |     |
| Martin and Fardmanesh (1990) | -  |    |     |     |    |     |     | +    |    |     |
| Michaely (1977)              |    |    |     |     |    |     |     |      | +  |     |
| Michalopoulos and Jay (1973) |    |    |     |     |    |     |     |      | +  |     |
| Orsmond (1990)               |    |    | +   | +   |    |     | -   |      | +  |     |
| Otani and Villanueva (1990)  |    |    |     | +   |    |     |     |      | +  |     |
| Polak (1989)                 |    |    |     |     |    |     |     | +    | +  |     |
| Ram (1985, 1986)             | +  |    |     |     |    |     |     |      | +  |     |
| Rubinson (1977)              |    |    |     |     |    | +   |     |      |    |     |
| Saunders (1985)              | -  |    |     |     |    |     |     |      |    |     |
| Skinner (1987)               | -  |    |     |     |    |     |     |      |    |     |
| Tyler (1981)                 |    |    |     |     |    |     |     |      | +  |     |
| Weede (1986)                 |    |    |     |     | -  | -   |     |      |    |     |

Note: A positive effect is indicated by "+", negative by "-", and no effect by "0." TG denotes total government expenditure; CG current expenditure; INF infrastructure; EDH education and health; TR transfers; TAX tax receipts; DEF fiscal deficit; RINT real deposit interest rate; RX rate of change in real exports; and CPI rate of inflation (consumer prices). All variables are expressed as ratios to either GDP or GNP, except for RINT, RX and INF, which are in percent. Estimates for Michaely (1977) are based on equations using data contained in his paper.

### Growth effects of fiscal policies<sup>38</sup>

The results for the growth effects of the ratio of total government expenditure to GDP have been inconclusive, which is not altogether surprising, since different expenditure compositions for a given level of the total have diverse effects on output growth (see the columns representing changes in capital and non-capital expenditure shares in Table 3).

To detect a discernible growth effect, several studies focus on the components of government expenditure. Some studies support a negative relation-

ship between the ratio of government consumption to GDP and the rate of growth of output. One interpretation is that government consumption spending, financed by either higher tax rates or higher inflation (through deficit finance), introduces distortions that reduce saving and growth boosting neither public investment directly nor private productivity indirectly. On the other hand, the average ratio of infrastructure expenditure to GDP has been found to exert a positive impact on long-run growth in other studies. The positive impact on growth of the average ratio of expenditures on education and health has also been generally confirmed.

Just like the aggregative results on expenditure ratios, the results from empirical investigations into the growth effects of taxation are inconclusive. This ambiguity arises from the diverse impact of different compositions of a given level of the overall tax-to-GDP ratio. The study by Orsmond (1990) attempts to disaggregate tax effects, and concludes that the ratio of import taxes to GDP is positively associated with the growth rate of output. In a recent survey on empirical work in developing countries, Ebrill (1987) finds that changes in the effective labour supply are fairly inelastic with respect to changes in real wages. In addition, while changes in gross capital formation are responsive to tax incentives and disincentives, the effective supply of capital is significantly influenced by various other distortions in the markets for capital, goods and services.

Finally, there have also been empirical studies of the joint growth effects of expenditure, taxes, and deficits. Here again, the evidence is mixed. In at least one study (Martin and Fardmanesh, 1990), expenditure ratios are found to have positive growth effects, while tax and deficit ratios exert negative effects. This pattern is reversed, however, when non-tax revenue replaces deficits, that is, the growth effect of the expenditure ratio becomes negative and that of the tax ratio turns positive. The estimates of Orsmond (1990) show that when the ratios of expenditure, tax, and deficit to GDP are jointly utilized in a growth regression, only the deficit ratio is significant (with a negative sign). When the ratio of non-tax revenue is substituted for the deficit ratio, the expenditure ratio has a negative effect on growth, whereas both the tax and non-tax revenue ratios have positive effects.

Why is the empirical evidence on the growth effects of fiscal policies by and large so inconclusive? Apart from econometric reasons—measurement errors, problems of simultaneity, and possibly heteroskedasticity—two principal factors may account for the different empirical results:

- *Ad hoc* selection of explanatory variables; and
- The length of time over which the sample observations are averaged.

A number of empirical studies listed in Table 3 include only government policy variables as explanatory in the regression equation for the growth rate of output. But we know from the discussion in Section III that there are many other variables that determine output growth. The total government expenditure ratio includes both “productive” and “unproductive” compo-

nents. Assuming that the “productive” expenditure elements have direct positive effects on private productivity, their positive impact on growth serves to partially offset any distorting effects arising from associated financing costs (taxes and deficits). On the other hand, there is a limit to the inclusion of all expenditure and tax categories owing to multi-collinearity, which will increase the estimated variances of the regression coefficients.

Empirical studies that find either negative or insignificant coefficients for educational and health expenditure ratios usually employ observations averaged over a relatively short time. As Orsmond (1990) rightly points out, the long gestation period for such expenditures biases downward both the size and significance of their coefficients. Studies that utilize samples over a longer time, such as those by Diamond (1989) and Otani and Villanueva (1990), support a positive and significant relationship between these “productive” expenditures and long-run economic growth. In assessing the growth effects of such expenditures, however, the associated financing costs through taxes and deficits should be taken into account.

The *ad hoc* selection of explanatory variables is another possible factor responsible for the diverse results from empirical studies. Even Orsmond (1990) himself undertakes empirical regressions that appear to lack theoretical foundations. Apparently, only the empirical growth equations of Otani and Villanueva (1990) are derived from a particular structural model, wherein the growth-macroeconomic policy relationship is estimated in reduced form.<sup>39</sup> A fully specified growth model would not only take account of all variables relevant to the process of economic growth, but also would separate the endogenous from the exogenous and policy-determined variables. In this manner, the econometric problems of variable exclusion, simultaneity, and multi-collinearity are avoided to a large extent. Even a reduced-form estimation of a structural model, however, cannot entirely escape the problem of simultaneous-equation bias, since some of the policy variables may indeed be endogenously determined by the government in response to macroeconomic developments, including changes in the rate of economic growth.

### Growth effects of monetary and interest-rate policies

As discussed in Section III, the effects of monetary and interest-rate policies on the rate of economic growth are transmitted through the effects of the rate of inflation and real interest rates on the level of private investment and its productivity. High rates of monetary growth usually lead to inflationary episodes. In a recent study by Khan (1990), the relationship between inflation and growth performance was examined in a sample of 69 developing countries during the period 1973–1988. Cross-sectional regression equations yielded significant negative effects of inflation on the growth rate.<sup>40</sup> Using a dummy variable applied to inflation rates in excess of 20 percent for a cross-section of 41 countries over the 1965–1985 period, Dornbusch and Reynoso

(1989) also find that per capita growth is negatively related to the rate of inflation, after controlling for the independent effect of total investment (public and private). The use of total investment, however, is problematical, in view of the empirical evidence provided by Khan and Reinhart (1990) that the direct effects of private investment outweigh the direct effects of public investment—in fact, the latter is found to have no statistically significant effect on growth.

Using data on private investment averaged over the 1975–1987 period for 23 developing countries,<sup>41</sup> we find that the growth rate of per capita output is significantly and negatively influenced by the rate of monetary expansion, holding constant the ratio of private investment to GDP and the rate of change in real exports, as summarized by the equation.<sup>42</sup>

$$g = -1.95 + 0.166I^P - 0.0042M2G + 0.284RX$$

(2.4)    (2.4)    (2.2)    (3.9)

$$R^2 = 0.708; \text{S.E.E.} = 1.298$$

Where  $g$  is the growth rate of per capita real GDP,  $I^P$  is the ratio of private investment to GDP,  $M2G$  is the growth rate of M2, and  $RX$  is the rate of change in real exports.<sup>43</sup>

High positive real interest rates, on the other hand, are purported to promote economic growth through their positive impact on savings and thus on capital accumulation (McKinnon, 1973), or through the optimal use of a given level of savings (Polak, 1989). While the interest elasticity of savings has been estimated to be relatively small,<sup>44</sup> the powerful effects of positive real interest rates on the optimal use of savings, and thus on growth, have been borne out by empirical tests undertaken by Polak (1989), who, like Dornbusch and Reynoso (1989), uses total investment as one of the independent variables. In our regression work, the growth rate of per capita output is made to depend on the ratio of private investment to GDP and on the real interest rate. Using the same sample of cross-sectional observations averaged over the 1975–1987 period for 23 developing countries, we conducted a preliminary regression of the private investment ratio,  $I^P$ , on the real interest rate,  $RINT$ , and a constant term. Based on the standard two-tail test, the real interest rate is found to be insignificant (a finding generally consistent with the private saving studies, such as that of Giovannini, 1985).<sup>45</sup> Thus, the rationale behind the inclusion of positive real interest rates may be that they raise total factor productivity and thus deserve to be treated as a separate factor of production. We then ran the following regression equation for the rate of per capita output growth:

$$g = -1.13 + 0.25I^P + 0.08RINT$$

(1.3)    (3.4)    (2.4)

$$R^2 = 0.55; \text{S.E.E.} = 1.57$$

It is clear from this equation that, after allowing for changes in the rate of private investment, the real interest rate has a significant direct positive effect on per capita growth, suggesting that the direct favourable effects of real interest rates on the efficient use of capital, and thus on factor productivity, outweigh any possible negative impact on the rate of private investment.<sup>46</sup>

### Growth effects of external policies

It was also argued in Section III that a sustained expansion of exports supported by appropriate external policies would raise total factor productivity and should thus be included as a separate factor of production. Several cross-country estimates of the effect of growth of exports on the rate of growth of real GNP for developing countries are available. Basically, these estimates have ranged from 0.04 – 0.06 (Michalopoulos and Jay, 1973; Balassa, 1978; and Tyler, 1981) to 0.18 – 0.19 (Khan and Reinhart, 1990; Polak, 1989; Robinson, 1971), 0.25 (Michaely, 1977), and 0.38 (Otani and Villanueva, 1990). Using the same sample of 23 developing countries that was used to test for real interest rate effects, we expanded the list of explanatory variables to include the growth rate of real exports,  $RX$ , in the per capita output growth equation, and the resulting regression is:<sup>47</sup>

$$g = -1.997 + 0.184I^P + 0.067RINT + 0.241RX$$

(2.36)    (2.86)    (2.34)    (3.37)

$$R^2 = 0.718; \text{S.E.E.} = 1.276$$

The positive coefficient of the real interest rate remains significant. Comparing our results with those of Polak (1989), we find that the real interest rate coefficient is somewhat smaller than that in Polak (1989), while the real export growth coefficient is somewhat larger (Polak's estimates of these coefficients are 0.18 and 0.17, respectively), and that our equation has a much higher explanatory power than Polak's (his  $R^2$  is 0.49).<sup>48, 49</sup> Our estimate of the export growth coefficient is similar to that obtained by Michaely (1977).

In addition to the positive direct effects of exports on economic growth, there is ample empirical evidence that the size of the tradeable sector is positively correlated with private investment rates. On the basis of data on 90 countries over the period 1960–1985, Romer (1990) finds that countries that export a higher share of GDP tend to invest more because of a higher rate of technological change associate with a high ratio of exports to GDP. Using the import ratio does not change the results, since exports and imports move closely together. Thus, it is really "openness" that drives this empirical result.

## V. Conclusions

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This paper has surveyed the conceptual and empirical links between macroeconomic policies and the growth rate of productive capacity. Fiscal, monetary, interest-rate, external, and other policies influence the growth rate of potential GNP through their direct and indirect effects on the rate of private investment, investment in human capital, and on total factor productivity. From reviewing the two to three decades of economic experience in the developing countries, and in the light of the current state of growth theory and available empirical evidence, it is clear that macroeconomic policies and structural reforms should be aimed at not just increasing investment but, more importantly, at improving the returns on investment by fostering the expansion in two key sectors, namely, the foreign trade (export and import) and the capital (physical and human) sectors, while avoiding high inflation and ensuring competitive returns on savings. Balanced and steady increases in the rates of physical and human capital investments, and an equally steady expansion in the scale (in both absolute size and in relation to GDP) of the tradeable goods sector, appear to be keys to a durable improvement in the rate of growth of per capita income. Sustained increases in these activities, which interact and reinforce each other in raising output per worker and in increasing the supplies of effective capital and labour, are necessary conditions for improved performance of per capita income growth.

Although specific policy prescriptions to raise long-term economic growth to sustainable levels would require country-specific knowledge of initial conditions and other factors, some general policy guidelines emerge from the analytical and empirical review.

1. Increased shares of per capita government expenditures on basic (primary and secondary) education and health would directly improve the quality of the labour force. Cost recovery in infrastructure services would improve the efficiency of resource use and, by helping to reduce the public sector deficit, would also slow the rate of monetary expansion and hence contribute to price stability. The resulting stable macroeconomic environment would enhance prospects for a higher rate of private investment, and thus of economic growth.

2. Positive real interest rates are likely to lead to increased returns on investment, as more productive investments are undertaken and less productive ones abandoned. Stabilization and strengthened bank supervision would help prevent real interest rates from rising to risky levels when controls on interest rates are ultimately lifted.
3. Competitive exchange rates would help foster the tradeable goods sector, and diversify exports. Trade liberalization and low tariff protection would ensure that domestic industries stand up against foreign competition, and that the resulting openness would facilitate the production and demand linkages resulting from export expansion, as well as the smooth transfer of technology and know-how, the development of internationally-competitive management, and the training of skilled workers.
4. The domestic agricultural sector would also benefit to the extent that its exports and profitability are enhanced by joint action on market-related pricing of agricultural products and increased participation of the private sector in agricultural marketing. Reforms of the state enterprises through rehabilitation, privatization, or liquidation would increase the overall productivity of capital and improve the public sector finances, thus contributing to economic growth and macroeconomic balance. Reforms in wage bargaining would ensure that the behaviour of real wages does not get out of line with productivity growth.
5. Prudent and credible fiscal and monetary policies are essential to prevent recurrent bouts of high levels and accelerating rates of inflation, which are detrimental to both the climate for investment and its productivity.
6. Proper sequencing of financial and trade liberalization is important, and should be preceded by fiscal stabilization, increased competition in the banking sector, and improved bank supervision. Tariff reductions should be gradual to minimize the budgetary impact, as well as to allow orderly adjustments by firms.

In developing countries in general, there is a need to quantify the effects of macroeconomic policies on total savings and investments, as well as on total factor productivity. The effects of quantifiable policies, such as the levels and compositions of tax revenues and government expenditures, on private investment and its efficiency, and thus on output growth, are perhaps relatively easier to measure than those of other policies such as trade and financial liberalization on total factor productivity. This is because changes in factor productivity are either unobserved or, at least at the macro level, only indirectly estimated with considerable error. The degree of uncertainty therefore increases in attempts to quantify the growth effects of some policies, particularly those aimed at structural reforms.

In addition, the beneficial effects of government policies, particularly structural policies, on the growth rate of potential GNP may take a considerable amount of time to emerge, stemming from lags in recognition, implementation, and impact. There has been increasing awareness of the need for growth-oriented adjustment policies, so that the recognition lag has shortened considerably in recent years. However, the implementation lag is bound to be substantial, particularly where policy changes require institutional and legislative changes. The impact lag may also vary from one type of policy to another. For example, the effects of trade liberalization or of increases in agricultural product prices on growth may take longer than those of raising domestic rates of return through tax reductions or interest-rate flexibility.

Research on lags in effects of macroeconomic policies and of structural reforms is obviously needed in developing countries. In undertaking such research, however, there are two considerations to bear in mind, apart from the poor quality of data. The first concerns the role of private-sector expectations about the durability and credibility of government policy and reform efforts. There is little guidance from empirical estimates of long lags in the growth effects of these efforts if the private sector expects a certain degree of permanence in growth-promoting policies that have been put in place, because in this case the growth response may be fairly rapid. Second, the lifting of legal or regulatory barriers can have a dramatic impact on private incentives to save and invest and on work efforts, and therefore on the rate of economic growth.

In conclusion, the growth process is extremely complex, and we do not as yet have a good understanding of why growth rates differ across countries, and more importantly, how countries can raise their rates of economic growth. The work on both the theoretical and empirical fronts to date offers some useful insights on the growth-macroeconomic policies nexus, but has not produced a general framework which yields definitive policy prescriptions. Until such a framework is developed, it is necessary to rely on partial results. Once there is sufficient theoretical and empirical backing for these partial results, it may be possible to develop a generalized growth model linking macroeconomic policies to long-term economic growth. Thus, even limited and directed research on the effects of specific policies on growth would have a significant payoff in the future.



## Appendix 1

From text equations (7) – (9) and the definition of  $S$  as the sum of private, government, and foreign savings, we obtain;

$$S = [s(1 - tx) + tx]Y^a - C_g + S_f$$

Using the definitions  $C_g^* = C_g/Y^a$   $S_f^* = S_f/Y^a$ , it follows that

$$S = ([s(1 - tx) + tx] - C_g^* + S_f^*)Y^a$$

substituting (A2) into text equation (10) yields:

$$\hat{Q} = b \{ [s(1 - tx) + tx] - C_g^* + S_f^* \} Y^a / K$$

Multiplying both sides by  $\pi Q^*$ , remembering that  $Q^* = Q/Y^a$ , we have:

$$\pi Q^* \hat{Q} = \pi b \{ [s(1 - tx) + tx] - C_g^* + S_f^* \} Q / K$$

Noting that  $Q/K = f(k^*)/k^*$ , using the relation  $b = \pi(k^*)$ , which implies that  $\pi b f(k^*)/k^* = f'(k^*)$ , and substituting (A4) into equation (4), we obtain the growth equation (12).

Similarly, substituting (A2) into text equation (11) yields:

$$\hat{Q} = a(1 - b) \{ [s(1 - tx) - C_g^* + S_f^* \} Y^a / L$$

Multiplying both sides by  $\pi Q^*$ , we obtain:

$$\pi Q^* \hat{Q} = \pi a(1 - b) \{ [s(1 - tx) + tx] - C_g^* + S_f^* \} Q / L$$

Noting that  $Q/L = f(k^*)$ , and using the relation  $a(1 - b) = 1 - \pi(k^*)$ , which implies that  $a(1 - b)f(k^*) = f(k^*) - k^*f'(k^*)$ , and substituting (A6) into equation (4), the growth equation (13) is derived.

## Appendix 2

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### Methodologies of the empirical studies

- Balassa (1978)*: Pooled data of 10 countries for 1960–1966 and 1966–1973. Regressors include domestic and foreign capital flows, labour growth, and export growth.
- Barro (1989)*: A cross-section of 98 countries, including industrial and developing, for 1960–1985. Regressors include the initial per capital GDP level, its squared value, the initial level of human capital, proxied by primary and secondary enrolment rates, the ratio of government consumption to GDP, and measures of political instability and market distortions. To deal with potential heteroskedasticity, observations are weighted by either the level of GDP or population. However, these standard errors do not differ greatly from the OLS estimates.
- Castles and Dowrick (1988)*: A cross-section of 18 OECD for 1960–1985 including initial per capita GDP, an institutional sclerosis dummy, population growth and investment rate as regressors.
- Diamond (1989)*: Five-year averages of growth rates for 125 countries during 1960–1980 with private capital, growth of the labour force, export growth and external interest rate as regressors.
- Dornbusch and Reynoso (1989)*: A cross-section of 41 countries, using averages for the period 1965–1985, with the level of per capital income in 1965, change in the capital-labour ratio, and an inflation dummy that applies to inflation rates in excess of 20 percent as regressors.
- Easterly (1990)*: Cross-sections of 22 and 70 developing countries, using-to-averages for the period 1965–1987. Regressors include the investment-GDP ration, population growth, export-to-GDP ration, government consumption ratio, a subjective dummy variable measuring trade restriction, and a dummy variable measuring financial repression (defined as an average real interest rate less than minus 5 percent).
- Khan and Reinhart (1990)*: A cross-section of 24 developing countries, using averages for the period 1970–1979. Regressors include total investment, private investment, public investment, and growth of labour, exports, and imports.
- Koester and Kormedi (1989)*: A cross-section of 63 countries between 1970–1979 with investment rate, labour force growth, and initial GDP per capita as other regressors.
- Landau (1983, 1985, 1986)*: The 1983 and 1986 studies use cross-sectional data for 104 countries over 1960–1977, including education, energy consumption, initial GDP per capita and climate dummies. The 1985 study utilizes 16 developed countries for pooled cross-sections over the 1952–1976 period, with investment rate, per capita initial GDP, changes in terms of trade, education, and various dummy variables as regressors. Lags of some variables are employed.
- Marlow (1986)*: A cross-section of growth and the size of the government sector in 19 industrial countries during 1960–1980 with no other regressors.

- Marsden (1983)*: A comparison between 10 countries with low growth and another 10 countries with high growth, using mixed data for developed and developing countries with high growth, using mixed data for developed and developing countries during 1970–1979.
- Martin and Fardmanesh (1990)*: A cross-section of 76 developing and developed countries, with labour and capital as additional regressors over 1972–1981.
- Michaely (1977)*: Using averages of the ratio of exports to GNP and change in this ratio for 41 developing countries over the period 1950–1973, coefficients of the Spearman rank correlation are computed.
- Michalopoulos and Jay (1973)*: A cross-section of 39 developing countries in the period 1960–1966, with domestic and foreign investment, labour growth, and export growth as regressors.
- Orsmond (1990)*: A cross-section of 36 developing countries over the 1975–1986 period. This study undertakes both linear and non-linear regressions, including the components of expenditures and taxes alternately, non-tax revenues, and the fiscal deficit. Other regressors include the initial per capita GDP level, changes in exports, inflation, investment rates, and population growth.
- Otani and Villanueva (1990)*: The growth equation, derived from a structural macroeconomic model, includes the saving rate, export performance, expenditures on education, population growth, the real interest rate on external debt, and regional dummy variables. The sample consists of 55 developing countries over the 1970–1985 period. Regression results are reported for the entire sample and for different income groups.
- Polak (1989)*: A cross-section of 40 developing countries over the period 1965–1985. Regressors are the ratio of total investment to GDP, median interest rate on 6–12 month deposits, corrected for the average annual rate of inflation (consumer prices), and the growth rate of real exports.
- Ram (1985, 1986)*: The 1985 study is a cross-section of 73 LDCs in the periods 1960–1970 and 1970–1977, using the ratio of total investment to GNP, growth of labour force, growth of real exports, and a dummy variable that takes value one if the country is low-income, zero otherwise. In the 1986 study, annual data for 88 LDCs covering the period 1960–1982 are used. First, the growth relationship is estimated for each country separately. Then, the relationship is also estimated using a cross-sectional sample. The same explanatory variables are used as in the 1985 study.
- Rubinson (1977)*: A cross-section of 40 countries during 1955–1970 with initial GDP, population growth and export ratio as additional regressors.
- Saunders (1985)*: A cross-section of 20 OECD countries during 1961–1983 using various aggregate measures of government expenditures.
- Skinner (1987)*: Pooled cross-section of 31 Sub-Saharan nations over 1965–1973 and 1974–1982 with the terms of trade, population, and investment rates as other regressors.
- Tyler (1981)*: A cross-section of 55 middle-income LDCs for the period 1960–1977, with the rate of total investment, labour force growth, growth of total real exports, and growth of real manufactured exports as independent variables.
- Weede (1986)*: Pooled cross-section of industrial countries over a split 1960–1982 period with initial per capita GDP and an index of democracy as additional regressors.

## Notes

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1. The national saving rate of the developing countries has fallen from an average of 27 percent of national income from 1976–1981 to 22.5 percent from 1982–1988. African countries, for example, have recorded by far the sharpest decline in saving rates. The decline in the saving rate of the developing countries has been accompanied by a drop in the ratio of domestic investment to GNP, from 27 percent from 1976–1981 to 24 percent from 1982–1988. See Aghevli *et al.* (1990) for details.
2. Following the methodology employed in the *World Economic Outlook* (IMF, 1990, p. 48), data for all developing countries and for each group are based on individual countries' annual averages weighted by the average U.S. dollar value of gross domestic products over the preceding three years.
3. There are 124 net debtor developing countries (as categorized in the *World Economic Outlook* IMF, 1990). Net creditor countries (Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Taiwan Province of China, and the United Arab Emirates) are defined as developing countries that unambiguously were net external creditors in 1987, or that experienced substantial cumulated current account surpluses (excluding official transfers) between 1967–1968 and 1987.
4. See Aghevli *et al.* (1990), P. 36. The low-inflation group consists of countries that managed to keep average annual inflation rates below 10 percent after 1982. All others are defined as high-inflation countries.
5. See IMF (1990).
6. See Aghevli *et al.* (1990), pp. 36–37. The decline in investment rates reflects many common factors that have affected the developing countries during the 1980s: falling prices for primary commodity exports; a decline in private external financing; the presence of large stocks of foreign debt; and the implementation of adjustment programmes designed to restore balance of payments viability.
7. In this sub-section, "Africa" refers to Sub-Saharan Africa, excluding South Africa and Namibia. For a comprehensive review of 30-year economic trends in Africa, see World Bank (1989a), Chapter 1, pp. 16–36, on which this sub-section draws heavily. Also see World Bank (1989b).
8. See World Bank (1989a), pp. 24–25.
9. For a discussion of the causes and consequences of the African debt crisis, see Greene and Khan (1990) and World Bank (1989a).
10. See World Bank (1989a), pp. 19–20.
11. See Section IV ad Polak (1989).
12. See Greene and Villanueva (1990) and Aghevli *et al.* (1990).
13. For a simple model that combines capacity growth, inflation, and the balance of payments, see Khan and Montiel (1989). In this model, actual output is assumed to be

- equal to capacity output at all times. In Khan and Montiel (1990), a deviation of actual from capacity output is permitted, which is then linked to domestic inflation.
14. The distinction between potential GDP and GNP has also been made by Khan and Montiel (1989), Otani and Villanueva (1989), and Hernández-Catá (1989).
  15. See, among others, Romer (1986), Lucas (1988), Otani and Villanueva (1989), Grossman and Helpman (1990), and Becker *et al.* (1990). These approaches fall into the category of what has been termed "endogenous growth" models.
  16. See Khan and Montiel (1989, 1990) for attempts to incorporate inflation and excess capacity in a simple growth model. Although this model addresses important issues of inflation and unemployment, it shares the well-known property of the standard Solow-Swan model that, as Grossman and Helpman (1990, p. 796) put it, the "(endogenous) growth in per capita income dissipates in the long run. For this reason, the familiar models which incorporate investment only in capital equipment seem ill-suited for analysis of long-run growth." A natural extension of the Khan-Montiel model would be to allow for endogenous human capital accumulation, and one way to do this is suggested in the modified framework presented here.
  17. If a 1990 man-hour is equivalent as an input in the production function to two man-hours in the base period, say 1960, then the ratio  $K/L$  is the amount of capital per half-hour 1990 or per man-hour 1960.
  18. Strictly speaking, it is the portion of  $Q$  exported that should be corrected for the terms of trade. However, the simplifying assumption made here does not affect the main thrust of the analysis.
  19. It is assumed that foreign saving is equal to the current account balance (net foreign borrowing).
  20. The growth effects of changes in the ratio of foreign borrowing to GNP are taken up later.
  21. Thus, the growth in  $L$  reflects quality improvements, e.g. better educated and trained labour force.
  22. The parameter  $b$  is sometimes referred to as the bias of technical change. The value of  $b$  could be a negative function of the capital-labour ratio,  $K/L$ —as this ratio rises, capital's marginal productivity falls, and society would be inclined to devote a lesser fraction of  $S$  (smaller  $b$ ) to augmenting  $K$  and a larger fraction (larger  $b$ ) to augmenting  $L$ . In the long run,  $b$  approaches a stationary value, since  $K/L$  also approaches a stationary value. It can be shown that for long-run maximum economic growth to be attained,  $b$  should be set equal to capital's relative share in potential output.
  23. For details steps in the derivation of (12) and (13), see appendix 1.
  24. These relations are consistent with a balanced growth path characterized by maximum per capita consumption. The terms  $f(k^*)$  and  $f(k^*) - k^*f'(k^*)$  are the positive equilibrium marginal products of physical and human capital, respectively.
  25. See equations (11) and (13). That the growth of human capital is a positive function of  $k^*$  can be seen by differentiating (13) with respect to  $k^*$ , noting that: (i) the equilibrium marginal product of physical capital is positive; and (ii) the equilibrium marginal product of human capital is a positive function of  $k^*$ .
  26. Strictly speaking, the growth effects of an increase in the tax rate can go either way, depending on the distortionary cost of taxation, the relative productivities of private and public capital, whether the tax revenues are applied to government consumption or investment, etc. These points are taken up later.
  27. For a review of the general literature on debt neutrality or Ricardian equivalence, see Leiderman and Blejer (1988); for empirical evidence on developing countries, see Haque and Montiel (1989).
  28. See King and Rebelo (1990) for the theoretical arguments, and Jorgenson and Yun (1990) for empirical evidence on the effects of taxes on growth.

29. Assuming that other expenditures and tax revenues (in relation to GNP) are held constant.
30. This outcome is often a requirement for successful growth-oriented adjustment.
31. Dornbusch and Reynoso (1989) argue that macroeconomic instability, as measured by high inflation, affects investment behaviour adversely. For empirical evidence of the negative effects of the rate of inflation on the rate of private investment in developing countries, see Greene and Villanueva (1990). Evidence on the positive relation between long-run growth and macroeconomic stability is presented in Khan (1990).
32. For evidence on the negative effects of inflation on the total saving-to-income ration, see Aghevli *et al.* (1990).
33. Chile, Argentina, Uruguay, Philippines, and Turkey, to name a few.
34. Villanueva and Mirakhor (1990) show why the interaction of economic instability and inadequate bank supervision (the decision of banks to undertake risky lending in the presence of deposit insurance, sometimes referred to as "moral hazard") often results in an immediate increase in real interest rates risky levels, bankruptcies of financial institutions, and loss of monetary control.
35. The favourable effects on the export sector of a real exchange rate depreciation, however, would be partly erased by the increase in the local currency cost of servicing the external debt, and by the consequent decline in the growth rate of GNP for an assessment of the possibility of contractionary devaluation in developing countries, see Lizondo and Montiel (1989).
36. The transfer of efficient technologies and the availability of foreign exchange have featured prominently in recent experiences of rapid economic growth (see Thirlwall, 1979).
37. According to Vandemoortele (1990), besides favourable weather, higher producer prices and domestic trade liberalization during 1984–1987 were among the major factors responsible for the recent rapid growth in Sub-Saharan Africa's agricultural output.
38. This sub-section draws heavily on Orsmond's (1990) survey.
39. A reduced-form growth relationship derived from a model with endogenous technical change is also estimated by Conlisk (1967), but contains no government policy variables.
40. These results are consistent with alternative causal effects:
  - (1) Inflation tends to depress growth directly, through the distorting effects on the functioning of the price mechanism that result in inefficiencies in resource allocation and in low multi-factor productivity, and indirectly, through the adverse impact on macroeconomic stability and thus on saving and investment; or
  - (2) Low growth and investment result in high inflation through, for example, effects on tax revenues or due to production bottlenecks.
41. Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, India, Kenya, Korea, Mexico, Pakistan, Peru, Philippines, Singapore, Sri Lanka, Thailand, Tunisia, Turkey, Uruguay, Venezuela, and Zimbabwe. For a detailed explanation of the variables and data sources, see the statistical annex to Greene and Villanueva (1990).
42. This test implicitly assumes that the rate of inflation is driven mainly by rapid monetary growth.
43. All variables are in percent.  $R^2$  is the coefficient of determination, S.E.E. is the standard error of the estimated equation, and t-values are in parentheses below the estimated coefficients. The results are little changed when the ratio of total (public plus private) investment to GDP is used.

44. For a careful empirical study of the interest-elasticity of savings in developing countries, see Giovannini (1985). This study points to the presence of very low intertemporal substitution elasticity, thus indicating negligible responses of aggregate saving to the real rate of interest.
45. The equation is: 
$$IP = 12.63 + 0.14RINT$$

(12.52) (1.48)

$$R^2 = 0.095; S.E.E. = 4.551$$
46. Such as found by Greene and Villanueva (1990). As in the preceding growth equation, the use of the total investment-to-GDP ratio does not materially change the regression results.
47. Again, as in the previous two growth equations, the regression results hardly change when the ratio of total investment to GDP is used.
48. Even though we use the same explanatory variables in addition to a constant term. The main reason is probably Polak's use of the total investment rate, which he finds insignificant. The inappropriateness of this approach has been argued by Khan and Reinhart (1990).
49. The direct negative effect of inflation on growth is probably captured by the real interest rate variable, that is, a significant and sustained increase in the inflation rate with infrequent and small interest-rate adjustments may lead to low or even negative levels of the real interest rate, contributing to inefficiency of resource use and thus to low levels of factor productivity and rates of economic growth. These adverse direct and indirect effects (through the negative impact on private investment) of inflation on economic growth underscore the importance of financial discipline. For a discussion of the negative effect of inflation on the rate of private investment and supporting empirical evidence, see Greene and Villanueva (1990).

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