World Development, Vol. 18, No. 1, pp. 19–27, 1990.
Printed in Great Britain.

0305–750X/90 $3.00 + 0.00

Private Investment and Economic Growth in Developing Countries

MOHSIN S. KHAN and CARMEN M. REINHART*
International Monetary Fund, Washington, DC

Summary. — Despite the growing support for market-oriented strategies, and for a greater role of private investment, empirical growth models for developing countries typically make no distinction between the private and public components of investment. This paper sheds some light on this important issue by formulating a simple growth model that separates the effects of public sector and private sector investment. This model is estimated for a cross-section sample of 24 developing countries, and the results support the notion that private investment has a larger direct effect on growth than does public investment.

1. INTRODUCTION

The recent economic difficulties facing many developing countries — widening current-account and balance-of-payments deficits, rising inflation rates, growing foreign debt burdens, and perhaps most importantly, falling growth rates that have sharply reduced living standards — have led to a fundamental reexamination of adjustment and development strategies. Specifically, the sentiment in the profession and in policy-making circles has shifted against large-scale government intervention and toward greater reliance on the market in the allocation and use of resources.[1] Thus, market-based reforms are now considered part and parcel of what has come to be known as growth-oriented adjustment.[2] Conventional wisdom has it that the way to prosperity, as represented by a sustained higher rate of economic growth, requires stable and conservative macroeconomic policies, liberalization of the goods and factor markets, greater flexibility in the financial system, and an enhanced role for the private sector in economic activity.

While the merits of a market-based economic system are well-established under certain theoretical conditions, far less is known of its empirical relevance in the developing world. Supporters of market-oriented adjustment strategies, which include important multilateral institutions like the International Monetary Fund and the World Bank, point to the experiences of Korea and certain other (Asian) newly industrialized economies, the recent performance of Turkey, and Chile during certain periods. Furthermore, there is a substantial body of literature indicating that trade liberalization encourages faster economic growth.[3] In addition, there is some support for a positive relationship between financial development — usually taken to mean freer interest rates — and growth performance.[4] These relationships are usually perceived as operating through increased private savings and investment. What is missing, however, in all this discussion is any evidence on the relationship between private sector activity, in particular private investment, and growth in developing countries.

Popular growth models that relate the rate of growth of output to the rate of capital formation, among other factors such as labor force growth, imported inputs, and technical progress, make no distinction between the private and public components of investment. Therefore, it is not possible to determine if policies designed to encourage private investment at the expense of public investment will necessarily help the growth rate. They well might if investment undertaken by the private sector is more efficient and productive, but that judgment has to be based on empirical evidence. What is surprising is that despite the importance of this relationship to growth-oriented adjustment policies, there is

*We are grateful to Joshua Greene, Deena Khatkhate, Peter Montiel, and Delano Villanueva for helpful comments, and to Ravina Malkani for excellent assistance. The views expressed are the sole responsibility of the authors, and not necessarily those of the IMF.

virtually no empirical evidence that can be called on to support or disprove the notion that private investment is in some sense "better" than public investment insofar as long-run growth is concerned. Consequently, the proposals favoring the private sector in this particular context appear to rest more on theory than on proven fact.

The purpose of this paper is to shed some light on this important issue by formulating a simple growth model that separates the effects of public sector and private sector investment. This model is estimated for a cross-section sample of 24 developing countries over the 1970s. The estimates of the parameters provide a quantitative picture of the respective roles of public and private investment in the growth process in developing countries. To our knowledge this information is as yet unavailable, and should prove useful in evaluating *a priori* whether policies aimed at promoting private investment will be successful in raising the long-run growth rate.

The remainder of the paper proceeds as follows: in Section 2 we outline the basic model that is developed. The results of the estimation are contained in Section 3. The concluding section summarizes the principal results and their main policy implications.

2. SPECIFICATION OF THE GROWTH MODEL

Most growth models specified for developing countries trace their roots back to the neoclassical framework of Solow (1956).[5] This framework takes as its starting point an aggregate production function relating output to factor inputs and a variable usually referred to as total factor productivity:

$$y = Af(K,L,Z) \tag{1}$$

where y is the level of output (usually potential output), K is the stock of physical capital, L is the labor force, and Z is a vector including other factors affecting growth. The variable A measures factor productivity, which is generally assumed to grow at a (constant) exogenous rate. The signs of all partial derivatives of y with respect to the arguments in $f(\cdot)$ as well as A are assumed to be positive.

Expressing equation (1) in growth terms we obtain:

$$\frac{dy}{y} = \left[A \cdot \frac{\partial y}{\partial K}\right]\frac{dK}{y} + \left[A \cdot \frac{\partial y}{\partial L} \cdot \frac{L}{y}\right]\frac{dL}{L} + \left[A \cdot \frac{\partial y}{\partial Z} \cdot \frac{Z}{y}\right]\frac{dZ}{Z} + \frac{dA}{A} \tag{2}$$

which can be written for estimation purposes as:

$$\frac{\Delta y}{y_{-1}} = \alpha_0 + \alpha_1 \frac{I}{y_{-1}} + \alpha_2 \frac{\Delta L}{L_{-1}} + \alpha_3 \frac{\Delta Z}{Z_{-1}} \tag{3}$$

where:

$$\alpha_0 = \frac{dA}{A}$$

$$\alpha_1 = A \cdot \frac{\partial y}{\partial K}$$

$$\alpha_2 = A \cdot \frac{\partial y}{\partial L} \cdot \frac{L}{y}$$

$$\alpha_3 = A \cdot \frac{\partial y}{\partial Z} \cdot \frac{Z}{y}$$

and $I = dK$.

The constant term (α_0) is assumed to capture the growth in productivity;[6] α_1 is the marginal productivity of capital;[7] α_2 is the elasticity of output with respect to labor; and α_3 the elasticity of output with respect to other factors.

Equation (3) is, of course, very familiar and has been used in one form or another in most studies of the growth process in developing countries. To obtain the standard two-factor model involving only capital and labor one would set $\alpha_0 = \alpha_3 = 0$.[8] In the empirical analysis of growth in developing countries, an even simpler form of equation (3) is sometimes used, in which $\alpha_0 = \alpha_2 = \alpha_3 = 0$. The result is the familiar "incremental capital output" relationship (ICOR) associated with, among others, Chenery and Strout (1966). The ICOR is also the key relationship employed in the basic model utilized by the World Bank to calculate external financing needs for developing countries.[9]

The more general specification of equation (3) is now the most popular, with various other determinants of growth introduced in addition to capital, labor, and productivity growth. For example, proponents of "export-led growth," such as Balassa (1978), Tyler (1981), and Ram (1985), argue that growth of exports belongs in the specification on grounds that in a number of developing countries the growth of exports has led to the development of infrastructure, transport and communications, etc., which in turn

facilitated the production of other goods and services. Furthermore, investment opportunities 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 nonexistent prior to the expansion in exports. Since many developing countries are also heavily dependent on imports of capital and intermediate goods as inputs into production, the variable Z could be imported inputs, as suggested by Bardhan and Lewis (1979). Recent work on development theory emphasizes the role of education and research and development (R&D), and thus human capital has also been included in the specification (Otani and Villanueva, 1989). In summary, while there have been a number of variants of equation (3) proposed in the literature, the essential nature of the model remains the same.

One drawback of this model from the point of view of the "new" market-based development and growth analysis is that it tells us very little about the independent effects of private and public investment on growth. Since the effects are combined into a single total investment variable, it is obviously not possible to ascertain whether an increase in private investment matched by a cut in public investment will help or hurt the rate of growth of output. In fact, with a single investment variable such a change in the composition of investment would leave total investment unchanged and growth unaffected. In order to test whether private sector investment and public sector investment have differential impacts on the growth rate, one can split these up and rewrite equation (3) as:[10]

$$\frac{\Delta y}{y_{-1}} = \beta_0 + \beta_1 \frac{I^p}{y_{-1}} + \beta_2 \frac{I^g}{y_{-1}} + \beta_3 \frac{\Delta L}{L_{-1}} + \beta_4 \frac{\Delta Z}{Z_{-1}} \qquad (4)$$

where I^p is private sector investment and I^g is public sector investment, $I^p + I^g = I$.

If the effects on growth of private investment and public investment are the same, this would imply that the respective marginal productivities are equal, $\beta_1 = \beta_2$. On the other hand, if private investment is more efficient and productive at the margin than is public sector investment, as argued by the proponents of market-based reforms, then we would expect that $\beta_1 > \beta_2$.

One has to be cautious, however, in forming conclusions about the respective roles of private and public investment only on the basis of the relative sizes of the coefficients β_1 and β_2. This is because it is well-known that in developing countries private and public investment are themselves related, although there is some uncertainty about whether, on balance, public sector investment raises or lowers private investment.[11] In broad terms, public sector investment can cause crowding out if it utilizes scarce physical and financial resources that would otherwise be available to the private sector, or if it produces marketable output that competes with private output. Furthermore, the financing of public sector investment — whether through taxes, issuance of debt, or inflation — will lower the resources available to the private sector and thus depress private investment activity. Such crowding out would work in favor of strategies aimed at cutting back public sector investment as they would create a commensurate increase in private investment.

Yet public investment that is related to the development of infrastructure and the provision of public goods can also clearly be complementary to private investment. Public investment of this type can enhance the possibilities for private investment and raise the productivity of capital, increase the demand for private output and ancillary services, and augment overall resource availability by expanding aggregate output and savings. Consequently, it can be argued that the marginal productivity of private capital reflects the rate of public sector investment, and therefore judgments made simply by inspecting the sizes of β_1 and β_2 may well be in error.[12] But at this stage we have no firm evidence on what the respective sizes of β_1 and β_2 are.

As our concern is solely with the investment-growth relationship, we chose to be indifferent about the fourth determinant of growth in equation (4) — using alternatively the growth in exports and imports:

$$\frac{\Delta y}{y_{-1}} = \beta_0 + \beta_1 \frac{I^p}{y_{-1}} + \beta_2 \frac{I^g}{y_{-1}} + \beta_3 \frac{\Delta L}{L_{-1}} + \beta_4 \frac{\Delta X}{X_{-1}} \qquad (5a)$$

and

$$\frac{\Delta y}{y_{-1}} = \beta_0 + \beta_1 \frac{I^p}{y_{-1}} + \beta_2 \frac{I^g}{y_{-1}} + \beta_3 \frac{\Delta L}{L_{-1}} + \beta_4 \frac{\Delta M}{M_{-1}} \qquad (5b)$$

where X is the volume of exports and M is the volume of imports. The rationale for X is provided by Balassa (1978) and others. The variable M is used as a proxy for imported inputs, under the assumption that imported inputs are a constant proportion of total imports.[13]

3. RESULTS

Equations (5a) and (5b) were estimated for a cross-section sample of 24 developing countries.[14] All data are averages for the period 1970–79 as we are interested in capturing long-term changes, and not cyclical variations in output. For purposes of comparison we also estimated restricted versions of the two equations in which the two investment variables were collapsed into one, i.e., we assumed $\beta_1 = \beta_2$.

This section first describes the empirical estimates and then the contributions to growth of the principal factors.

(a) *Empirical estimates*

The results for the equations estimated are shown in Table 1. The first two equations, which are variants of equation (3), were estimated to provide a benchmark against which to compare our results when investment is disaggregated into its public and private components. They also help to establish whether our results are consistent with those in the empirical literature on growth.

Consider then the results in which total investment is the explanatory variable. In the case where the growth of exports is the third factor in the growth model, we find that the coefficient of investment has the correct sign and is significantly different from zero at the 5% level, as is the coefficient for the growth of exports. The growth in the labor force apparently does not exert a significant effect on the growth of output, but this may have something to do with the fact that we have to, by necessity, proxy the labor force with the population level.[15] While there is undoubtedly a relationship between the growth in the labor force and population growth, it is not necessarily a tight one. Overall, the estimates here are broadly consistent with those obtained in previous studies.[16]

When the growth of imports — representing imported inputs — is introduced into the specification, the coefficient of total investment rises and continues to be significant. The effect of labor, by contrast, is reduced and, as in the case of the equation with exports, is not significantly different from zero. The results support the role of imported inputs in the growth process, with the elasticity turning out to be quite high (above the other coefficients in the equation) and significant as well. At the same time it should be noted that the fit of the equation is reduced once we substitute imports for exports.

So far our results tell us that an increase in the investment-income ratio of 1% will raise the growth rate of output by around 0.1 to 0.2 percentage points, irrespective of whether the increase in the investment-income ratio comes about from an increase in private investment or

Table 1. *Results for growth models**

Constant	Total Investment	Private Investment	Public Investment	Growth of Labor	Growth of Exports	Growth of Imports	R^2	S.E.E.
1.085	0.119	—	—	0.427	0.212	—	0.660	1.209
(0.81)	(2.36)			(1.33)	(4.97)			
0.991	0.149	—	—	0.105	—	0.189	0.470	1.509
(0.59)	(2.42)			(0.26)		(2.95)		
2.145	—	0.158	−0.108	0.573	0.163	—	0.737	1.091
(1.66)		(3.27)	(1.02)	(1.94)	(3.75)			
2.504	—	0.194	−0.182	0.404	—	0.136	0.651	1.258
(1.69)		(3.63)	(1.55)	(1.14)		(2.42)		
1.314	—	0.163	—	0.521	0.178	—	0.723	1.091
(1.31)		(3.38)		(1.79)	(4.35)			
1.072	—	0.209	—	0.289	—	0.154	0.607	1.301
(0.89)		(3.84)		(0.80)		(2.72)		

*T-values in parentheses below coefficients; R^2 is the coefficient of determination; and S.E.E. is the standard error of the estimated equation.

in public investment. This equality of marginal productivities is precisely what we wish to test, and thus the more interesting results from the point of view of this paper are when investment is split up into the ratios of private investment to income and public investment to income — equations (5a) and (5b).

In the results for these two equations in Table 1 we find that the coefficient of private investment is positive and significantly different from zero at the 1% level. But, more importantly perhaps, the marginal productivity of public sector capital turns out to be negative. However, as the estimated coefficient is not significantly different from zero at the 5% level, one cannot make too much of the sign of this coefficient. At best all we can say is that public sector investment in developing countries has no direct effect on growth, which in itself is, of course, an important result. On the basis of these estimates there is little doubt that the direct effects of private investment on growth outweigh the direct effects of public sector investment. In other words, $\beta_1 > \beta_2$ in equations (5a) and (5b), so that to assume these parameters to be the same — as is done when total investment is used — would be incorrect.[17]

Both equations in which private and public investment are separated show a sizeable increase in the productivity coefficients (represented by the respective constants) as well as in the effects of labor force growth. In the case of the latter it can be seen that the coefficient is close to being significantly different from zero at the 5% level when exports are used. The explanatory power of the equations is also improved.

Taken at face value the results for equations (5a) and (5b) would point to the conclusion that private investment plays a dominant role in growth relative to: (a) total investment; and (b) public sector investment. The positive relationship between private investment and growth in our sample of countries is illustrated in Figure 1, which is a scatter diagram of the average ratio of private investment to total investment against the average rate of growth of real GDP during 1970–79. The observations lie along a positively sloped line, and we find that generally the countries with the highest average ratios of private to total investment also experienced the highest average growth rates. There are, of course, certain outliers, such as Trinidad and Tobago and Argentina, where one would have expected on the basis of the average private to total investment ratio a much higher average growth rate. But by and large the observations support a positive relationship.[18]

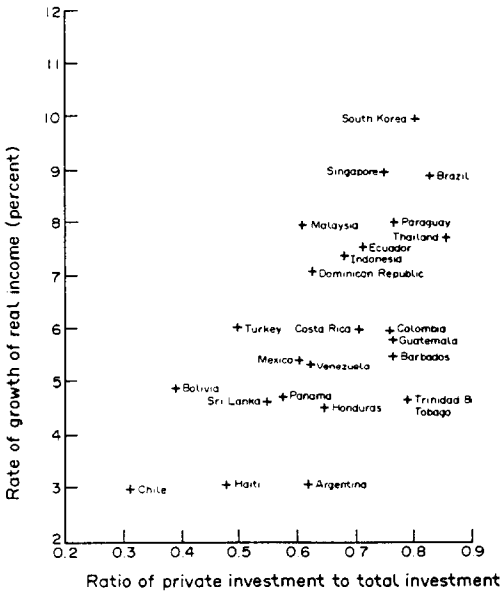

Figure 1. *Relationship between ratio of private investment to total investment and real growth: 1971–79.*

In order to further analyze the effects of private investment, we reestimated equations (5a) and (5b), leaving the public investment variable out of the specification, i.e., imposing the restriction $\beta_2 = 0$. These results are also reported in Table 1. Since the coefficients of public sector investment were insignificant in the previous set of regressions, excluding this variable has no effect on the overall goodness-of-fit of the model. What is different, however, is that the estimated coefficients of private investment increase in size and become slightly more significant. The lack of statistical significance of labor force growth is maintained, as are the positive and significant effects of export and import growth in the respective equations.

In summary, the results in Table 1 demonstrate the following: first, that the standard growth models explain average growth rates of the 24 countries in our sample reasonably well; and second, that among the investment variables, private investment seems to have the most important effect.

(b) *Sources of growth*

Having estimated the relevant growth coefficients and elasticities (Table 1), one can describe the relative contributions of the various factors of production, as well as that of productivity, by

using the standard sources of growth, or growth-accounting, analysis. In this analysis the contributions of each factor are calculated by multiplying their growth rates by their respective elasticities.[19] The difference between the actual rate of growth and the estimated rate is the famous Solow Residual (R), and is attributed to technical change or productivity growth.[20]

The sources of growth analysis was applied to all six equations in Table 1. The results of the calculations are given in Table 2. The first panel (A) in this table provides the contributions to growth of each of the factors of production, while the second panel (B) expresses these contributions as a percentage of the actual average rate of growth. The constant term in the regressions captures the role of productivity.

Starting with the equations with total investment as an explanatory variable, it can be seen from Table 2 that capital contributes between 43 and 54% to the average growth rate in our sample, depending on the specification. Labor adds relatively little, and the contributions of exports and imports are around 25%.

Productivity growth in the model with total investment plays a relatively minor role, at least as compared to the developed countries. For industrial countries, Chenery *et al.* (1986) show that on average the growth of total factor productivity accounts for about 50% of the growth of output, while capital formation accounts for less than 40%. Chenery *et al.* (1986) also estimate that the growth of factor productivity contributes to about 30% of growth in their sample of 15 developing countries, which is higher than our estimates obtained using the standard specifications.[21]

There are, of course, several difficulties associated with the productivity variable, so that one should be careful about the above comparisons. As the variable is calculated as a residual it captures all omitted variables. It is, therefore, picking up the effects of a variety of factors — technology, education, resource efficiency, etc. Furthermore, all errors in measurement of the included variables show up in this variable. Basically it would be unwise to say that because the productivity variable is larger, this necessarily implies that productivity *per se* is higher.

In the equations where both private and public investment are included, we find that private investment contributes about 43% to average growth. The contribution of public investment is negative, as was expected since the estimated coefficient of public investment was negative in the regressions. The contributions of labor force growth are somewhat higher, and those of exports and imports lower. The contribution of productivity growth rises substantially, but this is most likely due to the fact that it is offsetting the negative contribution of public sector investment.

When public investment is dropped from the equations, there is an increase in the contributions of private investment, and of exports and imports. The contribution of total productivity growth is now more in line with what we observed in the case of the standard model.

Table 2. *Average sources of growth (percentages)*

	Regressions					
	1	2	3	4	5	6
A. Contributions to growth						
Capital	2.6	3.3	—	—	—	—
Private	—	—	2.3	2.9	2.4	3.1
Public	—	—	−0.8	−1.3	—	—
Labor	0.9	0.2	1.3	0.9	1.2	0.6
Exports	1.5	—	1.1	—	1.2	—
Imports	—	1.6	—	1.2	—	1.3
Residual	1.1	1.0	2.2	2.5	1.3	1.1
B. Shares of Contributions						
Capital	42.8	53.5	—	—	—	—
Private	—	—	38.2	46.9	39.4	50.5
Public	—	—	−12.7	−21.4	—	—
Labor	15.6	3.8	20.9	14.7	18.9	10.5
Exports	24.1	—	18.5	—	20.2	—
Imports	—	26.3	—	18.9	—	21.4
Residual	17.5	16.4	35.1	40.9	21.5	17.6

4. CONCLUSIONS

While there is a widespread view that private investment is generally more efficient and productive than public investment, there has been no systematic testing of this hypothesis for the case of developing countries. Clearly, in the absence of any persuasive empirical evidence it is very difficult to argue that promotion of private sector initiatives and reduction in the role of the public sector in the area of investment would necessarily be beneficial to the overall growth of the economy. The objective of this paper was to develop a simple growth model that allowed private and public investment to exert differential effects on output growth, and then to test the resulting model for a broad cross-section sample of developing countries.

The principal conclusion of this study is that private investment and public investment do appear to have different effects on the long-run rate of economic growth. In other words, the marginal productivities of private and public investment differ in developing countries. Furthermore, and perhaps more relevant to the debate on market-based reforms, private investment plays a much larger, and thus more important, role in the growth process than does public investment. We find that at best public investment has no statistically significant effect on growth. One could, therefore, say that the proposition that private investment should be favored in development and adjustment strategies has some empirical support.

But this conclusion needs to be qualified. What we have looked at are only the direct effects of private and public investment. It is quite possible that public investment has positive indirect effects on growth. For example, if private and public investment are complementary, then the effects of private investment that have been estimated are only part of the story. By providing the necessary infrastructure — roads, electricity, telecommunications, and schools — public sector investment can have a strong influence on the rate and productivity of private capital formation. In many developing countries the elimination, or reduction, of public investment could well have adverse consequences for private investment. Further, as Otani and Villanueva (1988) show, some forms of public current expenditures — such as outlays on human capital — can be productivity enhancing and indirectly contribute to growth. Some of the contemporaneous indirect effects could, in principle, also be negative via crowding-out. However, none of these indirect channels are investigated in this paper. If it were possible to capture both the direct and indirect effects of the public-private components of investment, and take into account the relationship between the two, one would then get a truer picture of the respective roles of private and public investment.[22]

Considering only the direct effects of private and public investment that we have addressed in this paper, the policy implications are straightforward. Governments should aim at creating conditions which make private investment attractive. These conditions can range from the most general — establishing a stable macroeconomic environment, provision of adequate legal and institutional arrangements for the protection of private property — to more specific ones, such as adequate access to credit and to imported inputs by private investors. Policies to promote private investment would generally have significant benefits for long-run growth, and thus standards of living. In some instances, these benefits may be greater than if the same amount of investment were undertaken by the public sector. This should suit the government as well as it would release resources that could be used toward other purposes, and would help control the fiscal situation. All in all, there does seem to be some merit in the key role assigned to private investment in the development process by supporters of market-based strategies.

NOTES

1. The most vocal proponent of this new wave of thinking is perhaps Lal (1983). See also Balassa (1982).

2. See, for example, the papers contained in Corbo, Goldstein, and Khan (1987).

3. The work of Krueger (1978) and Balassa (1978) is generally the most cited in this context. For surveys of the growing literature in this area, see Lal and Rajapatirana (1987) and Edwards (1988).

4. This is the view associated with McKinnon (1973). For empirical tests of the McKinnon hypothesis, see Fry (1980) and Giovannini (1983).

5. See Robinson (1971), Chenery *et al.* (1986), and Fischer (1987).

6. Recall that productivity in this model grows at a constant rate. Because this parameter is largely determined by changes in existing technology, we assume it to be uniform across countries.

7. The specification adopted was dictated by lack of

data on capital stocks. However, the assumption that α_1 is constant across countries is not that restrictive.

8. See Chenery *et al.* (1986).

9. See Khan, Montiel and Haque (forthcoming).

10. This would simply involve starting with equation (1) and separating the variable K into private and public capital stocks.

11. See Blejer and Khan (1984).

12. In general, the indirect effects of public investment could affect the level of private investment, I^p, the productivities of private investment, labor, and total productivity, β_1, β_3, and β_0 respectively, or all of these.

13. Fortunately, in developing countries the share of capital and intermediate goods in total imports has remained fairly stable over time. During the 1970s, for example, capital and intermediate goods accounted for about 75% of total imports.

14. The selection of countries (see appendix) as well as the sample period covered were dictated by the availability of consistent data on public investment.

15. For most developing countries it is extremely difficult to obtain accurate and continuous time series on the labor force. As such we were forced to rely on population growth, for which data are readily available.

16. For example, Balassa (1978) obtained a value of 0.16 for the marginal productivity of capital, while Ram (1985) obtained an estimate of 0.13. Using savings in place of investment, Otani and Villanueva (1988) also obtained a value of between 0.12 and 0.14 for the marginal productivity parameter. Tyler's (1981) estimates are somewhat larger for this parameter (0.25), but this is probably due to the fact that he utilized the growth rate of investment rather than the investment-income ratio as was done in other studies. While the sizes of the other coefficients are different from previous estimates, these differences do not alter any of the principal conclusions.

17. More formally, tests that compare the residuals of the constrained ($\beta_1 = \beta_2$) equation to the unconstrained equation yield F values of 9.79 and 5.60 for the specifications including imports and exports respectively, allowing us to reject the null hypothesis of $\beta_1 = \beta_2$ at the 5% level.

18. A simple regression between the two variables yielded the following results:

$$(\Delta y/y_{-1}) = \underset{(0.08)}{0.136} + \underset{(3.91)}{0.091}\ (I^p/I);$$

$R^2 = 0.410$;

S.E.E. = 1.520.

19. Assuming that the economy is in competitive equilibrium so that these elasticities are equal to the respective factor shares. See Chenery *et al.* (1986).

20. See Solow (1957).

21. The average contribution of capital formation in the Chenery *et al.* (1986) sample of developing countries is approximately 35%.

22. It is relevant to note in this context that for the same set of countries, Blejer and Khan (1984) found that public infrastructure investment was complementary to private investment, while other kinds of public investment led to crowding-out of private investment.

REFERENCES

Balassa, Bela, *Development Strategies in Semi-Industrial Economies* (Baltimore, MD: Johns Hopkins University Press, 1982).

Balassa, Bela, "Exports and economic growth: Further evidence," *Journal of Development Economics*, Vol. 5, No. 2 (June 1978), pp. 181–189.

Bardhan, Pranab, and Sydney Lewis, "Models of growth with imported inputs," *Economica*, Vol. 30, No. 4 (November 1979), pp. 373–385.

Blejer, Mario I., and Mohsin S. Khan, "Government policy and private investment in developing countries," IMF *Staff Papers*, Vol. 31, No. 2 (June 1984), pp. 379–403.

Chenery, Hollis, and Alan M. Strout, "Foreign assistance and economic development," *American Economic Review*, Vol. 56, No. 4 (September 1966), pp. 679–733.

Chenery, Hollis, Sherman Robinson, and Moshe Syrquin, *Industrialization and Growth, A Comparative Study* (Washington, DC: Oxford University Press for the World Bank, 1986).

Corbo, Vittorio, Morris Goldstein, and Mohsin Khan (Eds.), *Growth-Oriented Adjustment Programs* (Washington, DC: IMF and World Bank, 1987).

Edwards, Sebastian, "Stabilization, macroeconomic policy and trade liberalization," Mimeo (Washington, DC: The World Bank, May 1988).

Fischer, Stanley, "Economic growth and economic policy," in V. Corbo, M. Goldstein, and M. Khan (Eds.), *Growth-Oriented Adjustment Programs* (Washington, DC: IMF and World Bank, 1987), pp. 151–178.

Fry, Maxwell J., "Saving, investment, growth and the cost of financial repression," *World Development*, Vol. 8, No. 4 (April 1980), pp. 317–327.

Giovannini, Alberto, "The interest elasticity of savings

in developing countries: The existing evidence," *World Development*, Vol. 11, No. 7 (July 1983), pp. 601–607.

International Monetary Fund (IMF), *International Financial Statistics* (Washington, DC: IMF, various years).

Khan, Mohsin S., Peter J. Montiel, and Nadeem Ul Haque, "Adjustment with growth: Relating the analytical approaches of the IMF and the World Bank," *Journal of Development Economics* (forthcoming).

Krueger, Anne O., *Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences* (Cambridge, MA: Ballinger, 1978).

Lal, Deepak, *The Poverty of Development Economics* (London: Institute of Economic Affairs, 1983).

Lal, Deepak, and Sarath Rajapatirana, "Foreign trade regimes and economic growth in developing countries," *World Bank Research Observer*, Vol. 2, No. 2 (July 1987), pp. 189–217.

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

Otani, Ichiro, and Delano Villaneueva, "Theoretical aspects of growth in developing countries: External debt dynamics and the role of human capital," IMF *Staff Papers*, Vol. 36, No. 2 (June 1989), pp. 307–342.

Otani, Ichiro, and Delano Villanueva, "Determinants of long-term growth performance in developing countries," IMF Working Paper, WP/88/97 (Washington, DC: IMF, November 1988).

Ram, Rati, "Exports and economic growth: Some additional evidence," *Economic Development and Cultural Change*, Vol. 33, No. 1 (January 1985), pp. 415–425.

Robinson, Sherman, "Sources of growth in less developed countries: A cross-section study," *Quarterly Journal of Economics*, Vol. 85, No. 3 (August 1971), pp. 391–408.

Solow, Robert, "Technical change and the aggregate production function," *Review of Economics and Statistics*, Vol. 39, No. 3 (August 1957), pp. 312–320.

Solow, Robert, "A contribution to the theory of economic growth," *Quarterly Journal of Economics*, Vol. 70, No. 1 (February 1956), pp. 65–94.

Tyler, William G., "Growth and export expansion in developing countries: Some empirical evidence," *Journal of Development Economics*, Vol. 9, No. 1 (March 1981), pp. 121–130.

APPENDIX

The main source for the data used in this paper is IMF, *International Financial Statistics*. Gross private and public investment data were obtained from national sources. All rates of growth and ratios are averages for the period 1970–79.

The 24 countries in the sample were: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Mexico, Panama, Paraguay, Venezuela, Barbados, Trinidad and Tobago, Turkey, Singapore, South Korea, Sri Lanka, Malaysia, Indonesia, and Thailand.

The definitions of the variables are as follows:

y = real GDP
L = population
I = total gross fixed capital formation (in real terms)
I^P = gross private fixed capital formation (in real terms)
I^g = gross public sector fixed capital formation (in real terms; the public sector is defined to include general government, principal autonomous agencies, and nonfinancial state enterprises)
X = volume of total exports
M = volume of total imports