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Economic Convergence, Technology Transfer, and Freer Trade

Someshwar Rao and Sunder Magun

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Foreword

Over the last four decades, differences in the labour productivity and per-capita real income levels of the industrialized countries have narrowed considerably. In addition, some of the developing countries have significantly improved their relative economic standing vis-à-vis the industrialized countries.

Economic convergence is considered the most important explanation of this narrowing of productivity and per-capita income level gaps. The convergence hypothesis asserts that being backward in terms of technology and productivity carries the potential for future rapid economic growth.

The authors review the theoretical rationale and testable empirical predictions of the convergence hypothesis and examine the growth experiences of the industrialized and the Third World countries since World War II. They also analyse the factors which determine the realization of the growth potential of the two sets of countries.

The empirical evidence on the convergence hypothesis is mixed. The post-war economic trends in the industrialized countries are generally consistent with the convergence thesis. However, except for the countries of Southeast Asia, the experience of developing countries during the last 25 years or so does not conform with the predictions of the convergence hypothesis.

This analysis strongly suggests that the realization of growth potential is not automatic. Instead, it critically depends on the existence of several favourable domestic and external factors. Internal conditions include an educated and well-trained work force, high savings and investment ratios, adequate transportation and communications infrastructure, political stability, outward-looking and market-oriented economic policies, population control, and flexible and dynamic factor and product markets. These favourable domestic factors in combination with a favourable external economic climate, including a stable and growing world economy and a freer flow of trade and investment, will create a virtuous cycle of export expansion, increased investment in human and physical capital, and improved productivity and real incomes.

This study is part of the Council's ongoing research programme on Canada's international competitiveness. Someshwar Rao and Sunder Magun are senior researchers with the Economic Council of Canada.

Judith Maxwell
Chairman

Abstract

This paper reviews the theoretical rationale of the economic convergence hypothesis and examines the growth experience of the industrialized and the developing countries. It also analyses the factors determining the realization of growth potential and the degree and rate of convergence in the two sets of countries.

The empirical evidence on the convergence thesis is mixed. Differences in per-capita income and aggregate labour productivity levels among the industrialized countries have steadily narrowed, consistent with the catch-up hypothesis. On the other hand, except for the Southeast Asian countries, the experience of the developing countries over the postwar period is not, in general, consistent with the convergence thesis.

Our empirical results suggest that the convergence of productivity and per-capita income levels in the "follower" countries is not automatic. Instead, it depends on a host of favourable internal and external economic conditions, including an educated and well-trained work force, high savings and investment ratios, adequate infrastructure in transportation and communications, flexible and dynamic product and factor markets, population control, outward-looking and market-oriented economic policies, freer world trade, a stable and growing world economy, and political stability.

The convergence thesis has important implications for the growth potential of the developed as well as the developing countries and for future patterns of world trade. The postwar experience of the industrialized and the Southeast Asian countries strongly suggests that the fulfilment of the growth aspirations of the developing countries will critically depend on an open and liberal global trading system.

Introduction

The United States has experienced higher levels of real per-capita income and labour productivity than all other countries since 1890, when its productivity overtook that of the United Kingdom. However, in the period since World War II, labour productivity and per-capita income have grown substantially faster in most of the industrialized countries and some of the developing countries than in the United States, resulting in a significant closing of their per-capita income and productivity level gaps relative to the United States.

Among the many explanations of the rapid pace of improvement in labour productivity and per-capita income in industrialized countries, the most prominent is the hypothesis of economic convergence [see Baumol, 1986; Helliwell and Chung, 1988 and 1990; Abromovitz, 1979 and 1986; and Maddison, 1987]. In this hypothesis the United States is viewed as the "leader" and the other countries as the "followers" who have the opportunity to "catch-up." According to the convergence thesis, if the follower countries pursue appropriate policies, they should be able to increase their productivity and per-capita incomes at a faster pace than the leader country, because they enjoy "opportunities of backwardness." The follower countries can emulate the leader over a considerable range of technology and achieve a given amount of growth with less expenditure on research and development. They can increase their capital-labour ratios faster without running into diminishing returns. Similarly, structural changes will be rapid. In short, the convergence hypothesis asserts that being backward in levels of productivity and per-capita income carries a *potential* for rapid advance. In cross-country comparisons, the growth rates of productivity and per-capita income performance over the longer term should be *inversely* related to their *initial levels*.

The objective of this paper is to do a thorough theoretical and empirical analysis of the convergence hypothesis, a hypothesis that has important implications for the medium- to longer-term outlook for output, productivity and real income growth in both industrial and developing countries, the longer-term prospects for world trade, and future patterns of international trade. The following are some of the important research and policy questions we hope to answer:

1 What is economic convergence?

2 How is it transmitted from the leader to the follower countries?

3 Does the postwar experience of the industrialized and the developing countries conform to the convergence hypothesis?

4 If so, what role did freer trade play in bringing about economic convergence?

5 Were the rates of convergence of the various countries uniform?

6 If not, what were the important determinants of convergence?

7 What factors are responsible for the marked variations in postwar growth performance among the developing countries?

8 What are the important policy implications for Canada of the economic convergence theory?

The theoretical basis of the convergence hypothesis will be discussed in the second section. In the third and fourth sections, we will review the industrialized and the developing countries' historical experience with the convergence hypothesis and analyse the determinants of convergence or the lack of convergence. In the final section, we will summarize the findings of this paper and discuss their policy implications.

The Convergence Hypothesis

Before we proceed with the discussion of the convergence hypothesis and the transmission mechanism, it would be useful to describe briefly the determinants of improvements in per-capita income and labour productivity. The growth in per-capita income of a country is positively influenced by the growth rate of output (GDP). Other things being equal, an increase in population growth, because of its adverse effect on the capital-labour ratio, will reduce the growth rate of per-capita output and vice versa. The expansion rate of output in turn depends on the growth rate of inputs (capital and labour) and of total factor productivity.

Improvements in total factor productivity capture the effects of a wide variety of sources including technology, efficiency in resource allocation, managerial skills and administrative efficiency, economies of scale, and the quality of factors of production. The contribution of factors such as motivation, physical health, the levels of education and experience of the labour force, and changes in the composition and age structure of capital stock to improvements in real incomes is often subsumed in the growth of multi-factor productivity [Daly and Rao, 1985; Rao and Lemprière, 1990*a*]. In short, the growth of per-capita income over the longer term is mainly determined by the growth of the capital-labour ratio, improvements in total factor productivity, and the growth rate of the population. Similarly, improvements in labour productivity can be explained in terms of improvements in the capital-labour ratio and total factor productivity. Therefore, relative improvements in per-capita income in the medium to longer term (and hence the per-capita income level gaps) are largely determined by the relative growth rates of labour

productivity. Other determinants of per-capita income gaps include gaps in the dependency rates, participation rates, hours worked, and unemployment rates [Rao and Lemprière, 1990*b*].

The Transmission Mechanism

The convergence hypothesis asserts that over the longer term the labour productivity and per-capita income levels of the follower countries converge to the levels of the leader. Therefore, the lower the level of a country's productivity, the higher will be its growth potential. But once the productivity level of the follower country converges to the level of the leader, the growth potential of the follower will be similar to that of the leader.

The central idea of the convergence thesis has to do with the level of technology embodied in a country's capital stock. For the sake of analytical simplicity, let us assume that the level of labour productivity is entirely governed by the level of technology embodied in capital stock. Let us also assume that in a leading country the technology embodied in each vintage of its capital stock is at the very frontier of technology at the time of investment. In this case, the technological age of the capital stock, so to speak, is similar to its chronological age. On the other hand, in the follower country – whose productivity level is lower – the technological age of the capital stock is high relative to its chronological age; the stock is obsolete even for its age. When the leader discards its old stock and replaces it, the accompanying productivity increase will be governed and limited by the advance of knowledge between the time when the old capital is installed and the time it is replaced.

In contrast, the follower countries have the potential to make a larger leap, because the new capital embodies the frontier knowledge. Hence, the larger the technological gap the stronger the follower's potential for growth in total factor productivity and, other things being equal, the faster one expects the follower's growth rate to be. However, the catch-up process would be self-limiting, because as the follower catches up, the possibility of making large leaps by replacing superannuated with best-practice technology becomes smaller and smaller. A follower's growth potential weakens as its productivity level converges towards that of the leader.

During the period of convergence the follower country's growth prospects will be further strengthened by the positive effects of the diffusion of state-of-the-art technologies on output, capital formation, modernization, industrialization, scale economies, and resource allocation. In addition, the convergence of productivity levels will be accompanied by the convergence of the structure of final demand, production, employment, and factor prices of the follower countries with those of the leader.

Abromovitz [1979 and 1986] has strongly argued that technologically backward countries will have greater growth potential than do more advanced countries only if the social capabilities of the backward countries are sufficiently developed to permit successful exploitation of the frontier technologies already employed by the more advanced countries. These social capabilities include the education and skill levels of the labour force, transportation and communications infrastructure, and the nature of the industrial, commercial, and financial organizations. Furthermore, the pace at which the potential for catch-up is actually realized will depend on factors limiting the diffusion of knowledge, the rate of structural change, the accumulation of capital, and the expansion of final demand. For example, improvements in the channels of international telecommunications, freer trade, a freer flow of foreign direct investment, an increased role for multinational corporations in world investment and trade, and a favourable and stable international economic climate will facilitate and accelerate the diffusion of frontier technologies in the follower countries.

In summary, the convergence hypothesis implies that both the productivity and per-capita income levels of follower countries will converge to the levels of the leader over the longer term, provided they pursue appropriate policies. Since the basis of the convergence hypothesis is the transmission of frontier technologies, we should observe substantially higher growth rates in total factor productivity (especially in the manufacturing sector) in the follower countries than in the leader country. In short, the convergence of labour productivity and per-capita income levels will be mainly brought about by the convergence of total factor-productivity levels. Therefore, the acid test of the convergence hypothesis is the equalization of total factor-productivity levels across countries, especially in the traded-goods sectors.

The Experience of Industrialized Countries

In the previous section we discussed the theoretical rationale of and some of the important preconditions for convergence. In this section we will examine the historical experience of the industrialized and the developing countries to see if it lends support to the convergence hypothesis.

The Postwar Period

As predicted by the convergence hypothesis, in the period 1965-86 real per-capita income expanded at a faster pace in all the follower industrialized countries (with the exception of New Zealand and Switzerland) than it did in the United States. Similarly, growth rates in real GDP in 1965-80 were significantly higher in the follower industrialized countries than they were in

the United States (see Table 1). However, during the period 1980-86, the real GDP of the United States grew faster than those of the other countries (with the exception of Japan, Norway, and Australia). Contrary to the predictions of the convergence thesis, the sluggish growth of the follower countries has resulted in either a widening or at best a maintenance of the gap between their per-capita incomes and that of the United States during the 1980s (see Table 2).

Based on unpublished estimates by the U.S. Bureau of Labor Statistics of the per-capita income and labour productivity levels in selected industrialized countries, we will examine in detail the evidence on the convergence hypothesis for 12 industrialized countries (see Tables 2 to 4).[1] The following are some of the more important findings:

1 During the postwar period, both the per-capita incomes and labour productivity of all the industrialized countries grew faster than did that of the United States. In addition, as predicted by the convergence hypothesis, the growth rates of productivity and real per-capita income were inversely related to the initial levels (see Tables 2 and 3).[2]

2 As expected, the average levels of labour productivity and per-capita income of the industrialized countries, relative to that of the United States, have steadily increased (see Table 5).

3 The steady decline in the variance (coefficient of variation) around the mean level of the relative productivity of the industrialized countries (excluding the United States) during this period implies that the countries that started at relatively low levels of productivity grew faster than those with initially higher levels, supporting the convergence hypothesis (see Table 5).

4 Differences in per-capita incomes and labour productivity gaps among countries in a given time period and/or in a given country over time can be explained by differences in the shares of the working-age group in total population and by differences in unemployment rates (see Tables 6 and 7).[3] For instance, during the period 1980-87 the per-capita income gaps of France, the Federal Republic of Germany, and the Netherlands relative to the United States actually widened, in spite of a substantial improvement in their relative productivity levels. The large increase in these countries' unemployment rates relative to the United States explains this apparent inconsistency between the movements in their relative productivity and per-capita income levels.

5 In terms of per-capita income and aggregate labour productivity, Canada has done very well relative to the United States and the other industrialized countries. For instance, Canada's per-capita income has increased from about 70 per cent of the U.S. level in 1950 to 94 per cent in 1987. Similarly, its

labour productivity level increased from about 77 per cent of the U.S. level in 1950 to about 95 per cent in 1987. All the other countries' productivity and per-capita income levels are still significantly lower than those of the United States and Canada (see Tables 2 and 3).

6 The relative productivity performances of Japan, France, Germany, and Italy have been more impressive than Canada's achievements over the period (see Table 3). However, if we adjust for the initial productivity level differences among the countries (as the convergence hypothesis requires) the Canadian performance also looks impressive.

What about the manufacturing productivity levels? Like aggregate labour productivity, labour productivity in the manufacturing sector has also increased at a significantly faster pace in all the follower industrialized countries during this period compared to the United States (with the exception of Norway). Our results suggest that the improvements in manufacturing productivity played a major role in bringing about the convergence of aggregate productivity and per-capita income levels in the industrialized countries.[4] For instance, in Japan, where the aggregate labour productivity level increased from a mere 15 per cent of the U.S. level in 1950 to about 71 per cent in 1987, labour productivity in the manufacturing sector increased by over 1,700 per cent during the period 1950-87, compared to about 250 per cent in the United States (see Table 4). Hence, the performance of manufacturing productivity in the industrialized countries is also consistent with the convergence thesis [see Rao and Lemprière, 1990*a*].

Dollar and Wolff [1988] have investigated the changes in labour productivity levels in 28 manufacturing industries for 13 industrialized countries over the 1963-82 period. In these countries, the coefficient of variation of industry labour productivity declined in all but one of the industries. However, their results show that the convergence was stronger in aggregate manufacturing than within individual industries, especially the heavy and high-technology industries. In addition, their findings suggest that changes in the employment mix did not play an important role in narrowing the aggregate manufacturing productivity gaps among the industrial countries.

In summary, the experience of the industrialized countries in the postwar period generally favours the convergence theory. Our findings are in line with the conclusions of Baumol [1986]; Streissler [1979]; Abromovitz [1979 and 1986]; Maddison [1987]; Helliwell et al. [1985]; Helliwell and Chung [1988]; and Dollar and Wolff [1988].

The Prewar Period

Did a convergence of productivity and per-capita income levels occur in the industrialized countries between World Wars I and II. It appears that the

process of convergence was either weak or absent during the interwar period (see Table 5). The lack of support for the convergence hypothesis during this period may be attributed to the following factors:

1 Prior to 1913, the measured levels of productivity depended heavily on the quantity of farmland in relation to the population. Consequently, productivity levels were poor indicators of gaps between the actually used and the best practice technology.

2 In many of the countries that are today industrialized, social competence in exploiting what were then the most advanced methods was still limited.

3 The adverse effects of World War I on political and financial conditions, the uneven impact of the Great Depression, and the restrictions on international trade hit the poor countries hardest. These factors could explain the divergence of productivity and per-capita income levels experienced during the period 1913-38. The effects of World War II further increased the gaps among the productivity and per-capita income levels of the industrialized countries during the period 1938-50 (see Table 5).

4 The advent of the automobile industry in the 1920s gave the United States a massive impetus at a time when many European countries were recovering from the huge loss of young men in World War I.

Determinants of Convergence

The convergence of productivity and per-capita income levels experienced after World War II is the result of several favourable factors, including large technological gaps, improved social capabilities – higher levels of education, greater experience with large-scale production, distribution and finance – and conditions favouring rapid realization of growth potential. In addition, the liberalization of both trade and capital account transactions, the increased role of multinationals in world trade, the dramatic reduction in the cost of transportation and communications, more flexible factor and product markets, increased government support for technology adoption and diffusion, and the stable international economic environment have all contributed significantly to the faster diffusion of frontier technologies and improved resource allocation in the industrialized countries.

Our analysis suggests that the convergence of productivity and per-capita income levels in the industrialized countries during this period was mainly due to rapid increases in exports and R&D expenditure, capital accumulation, increased per-capita expenditure on education, and the movement of labour out of farming (see Tables 8 to 12).[5] For example, in Japan, where both

aggregate and manufacturing labour productivity increased dramatically, non-residential capital stock per employed person increased by about 800 per cent between 1950 and 1986. During this period, the volume of exports increased by about 6,500 per cent. These results strongly suggest that the rate of convergence critically depends on favourable external and internal economic conditions. However, the strong performance of investment, exports, and R&D might have been partly influenced by the favourable impact of technology diffusion on productivity, real incomes, and final demand expansion.

In summary, the experience of the industrialized countries in the postwar period in general supports the convergence hypothesis. However, the rate of convergence as well as its longer-term sustainability would appear to crucially depend on favourable external and internal economic conditions. It seems that the substantial liberalization of world trade, the results of the successive rounds of the GATT negotiations, the increased role of multinationals in international trade (particularly intra-industry trade), the marked reduction in transportation and communications costs, and the stable world economic environment have all facilitated the rapid diffusion of frontier technologies among the industrialized countries. These favourable external economic conditions, in combination with the outward-looking and market-oriented domestic economic policies, have set in motion a virtuous cycle of technology diffusion, productivity and per-capita income improvements, increased investment and R&D, export expansion, industrialization, and increased productivity growth.[6]

The Experience of Developing Countries

In the previous section we examined the experience of the industrialized countries in the period since World War II and concluded that their output and productivity performance has been broadly consistent with the convergence hypothesis. In this section we will review the experience of the developing countries to see whether their growth performance over the same period is also in accordance with the convergence thesis.

The convergence hypothesis states that being backward in levels of productivity and per-capita income carries the potential for rapid advance. This in turn implies that both output and productivity should increase at a much more substantial pace in the developing countries than in the industrialized countries, because the developing countries' productivity levels are far behind those of the industrialized countries (see Tables 13 to 16).

In contrast to the experience of the industrialized countries, the growth performance of the developing countries in the postwar period does not generally support the convergence hypothesis. Only a small number of the

developing countries (especially the Asian newly industrialized countries [NICs], the Southeast Asian countries, and Israel) have experienced rapid growth in their per-capita incomes, closing some of the large gap compared to the United States (see Tables 13 to 17).[7] Moreover, contrary to the predictions of the convergence hypothesis, the growth in per-capita incomes in the developing countries during this period seems to be positively related to their per-capita income levels – in other words, the richer countries grew faster than the poorer countries.

In Africa, only a handful of countries (Botswana, Cameroon, Lesotho, Mauritius, and South Africa) enjoyed a higher growth in real per-capita income than did the industrialized countries (over 2.5 per cent per annum) during the period 1965-87. Many of the poorer African countries actually experienced an absolute decline in their real incomes during this period (see Table 13). On average, the per-capita incomes of African countries increased by a mere 1.3 per cent per year over this period, implying a significant per-capita income divergence compared to the industrialized countries. In addition, the gap between the rich and the poor African countries has further widened during this period, again inconsistent with the convergence hypothesis.[8] Furthermore, the growth performance of almost all of the African countries deteriorated substantially during the period 1980-86, compared to 1965-80 (see Table 13). This suggests that the relative position of these countries has declined considerably in the 1980s. Rapid population growth seems to have contributed significantly to the poor performance of per-capita income in these countries.

In contrast to the poor performance of African countries, the per-capita incomes of Asian countries during the period 1965-87 increased, on average, at a significantly faster pace (5.6 per cent per year) than did those of the industrialized countries, which is generally in line with the predictions of the convergence hypothesis (see Tables 14 and 17). However, among the Asian countries, growth performance is not inversely related to per-capita income levels as predicted by the convergence thesis.[9] On the contrary, the upper-middle income countries such as Hong Kong, Singapore, Taiwan, and South Korea continue to enjoy substantially higher growth rates than do the low-income countries such as India and Bangladesh. The Southeast Asian countries and China have also done very well. The per-capita incomes of the poor countries of Asia, like those of the African countries, are also adversely affected by rapid population growth (see Table 14).

Also like those of the African countries, the per-capita incomes of the Latin American countries (with the exception of Brazil, Columbia, Mexico, and Paraguay) grew at a significantly slower pace than did those of the industrialized countries, thus falling further behind the income levels of the United States and the other industrialized countries (see Table 15). As in the case of

African and Asian countries, the growth in per-capita incomes of the Latin American countries is not negatively related to their levels as predicted – the poorer countries did not experience faster growth than the richer countries.[10] Their per-capita incomes, on average, grew by a mere 1.1 per cent per year during the period 1965-87, compared to about 2.5 per cent in the industrialized countries and 5.6 per cent in Asia. However, many of them enjoyed decent growth performance during the period 1965-80, closing some of the per-capita income gap. This suggests that the poor performance of their per-capita incomes during the period 1965-87 can be attributed in large part to their dismal growth performance in the 1980s.

The sharp deterioration in the terms of trade of the Latin American states, the worsened export demand, the substantial increase in real interest rates, the large depreciation of the U.S. dollar, and the corresponding ballooning of balance-of-payment deficits have created a vicious cycle of persistent inflation, sluggish economic growth, and increased foreign debt and debt-service payments in the 1980s. These problems were exacerbated by ineffectual economic policy reforms and by drastic fluctuations in policy due to a lack of social consensus and frequent changes in government. Rural landlords and urban organized labour have played a considerable political role in opposing economic policies. Under these circumstances, policy conflicts have often occurred, resulting in frequent and destabilizing shifts in political alliances and changes in economic policy [see Lin, 1988]. In addition, like the other developing countries, most of the Latin American countries have suffered from rapid population growth (see Table 15).

Many of the EMENA countries enjoyed strong growth in output during the period 1965-80 and improved their relative per-capita incomes thanks to dramatic improvements in their terms of trade, mainly due to the rise in the real price of oil (see Table 16).[11] However, in the 1980s there has been a drastic reduction in the real price of oil and reduced demand for oil exports, due to the decline in economic growth in the industrialized countries and the sharply reduced energy requirements per unit of output. This has substantially reduced growth rates in all the EMENA countries and increased their income gaps relative to the United States and the other industrialized countries. In other words, the modest improvements in their real per-capita incomes during the period 1965-87 were entirely due to their strong growth performance during the period 1965-80, which was in turn a result of a substantial improvement in their terms of trade.

In summary, during the period 1965-87, contrary to the predictions of the convergence hypothesis and except for a small number of the Asian countries, most of the developing countries did not enjoy growth rates in output and per-capita income that were significantly faster than those of the industrialized countries. Among the developing countries, the richer countries performed

better than the poorer countries, again inconsistent with the convergence hypothesis. There is somewhat more but by no means consistent support for the convergence hypothesis in this period in Latin America and the Middle East.

Determinants of Growth Performance

What has caused this vast divergence in economic performance among the developing countries? Why were the countries of the Far East and Southeast Asia able to take advantage of the favourable global economic environment of the postwar period and establish a sustainable pattern of economic growth, while most of the other developing countries were not?

Research done for the IMF and the World Bank suggests that high savings and investment ratios, export expansion, small public sectors, competitive labour markets, a well-educated labour force, outward orientation with respect to trade and foreign investment, and the neutrality and the stability of investment and savings incentives are largely responsible for the success of the Asian NICs [see World Bank, 1987; Otani and Villanueva, 1988; Balassa, 1988; and Lin, 1988]. However, all these factors are interrelated. For example, while export expansion requires well-functioning labour and capital markets, the neutrality and stability of the incentive system will improve the operation of factor markets.

A recent unpublished IMF paper examines the per-capita income performance of 55 developing countries for the period 1970-85 [see Otani and Villanueva, 1988]. The cross-section regression results strongly suggest that the large divergence in growth performance among developing countries can be explained fairly well by the following factors: export performance, domestic savings and investment ratios, population growth, and budgetary allocations to improve human capital. Among these factors, export performance, the domestic savings ratio, and population growth seem to have played a major role (see Tables 18 to 21). The results of the IMF paper suggest that a 10-percentage-point increase in the domestic savings ratio (the ratio of domestic savings to GNP) increases the long-term growth rate of per-capita income by 1 percentage point. Export performance is also very important for the growth process. The results of the study indicate that a 10-per-cent increase in export volume annually will raise the growth rate of per-capita output by 4 to 5 percentage points a year. Our own research findings also strongly support the importance of export performance, domestic savings, human capital, and population control for economic development.

Our estimated per-capita income growth rate (cross-section) equations for the Asian, Latin American, and African countries are:

$$g^{AS}_{PCGDP} = \underset{(3.7)}{6.2} + \underset{(2.8)}{0.10}\, g^{AS} + \underset{(4.2)}{0.12}\, DSAR^{AS} - \underset{(4.2)}{2.72}\, g^{AS}_{POP} \qquad (1)$$

$$\bar{R}^2 = 0.87.$$

$$g^{LA}_{PCGDP} = \underset{(0.7)}{0.90} + \underset{(2.8)}{0.17}\, g^{LA} + \underset{(2.6)}{0.09}\, DSAR^{LA} - \underset{(0.4)}{0.15}\, g^{LA}_{POP} \qquad (2)$$

$$\bar{R}^2 = 0.29.$$

$$g^{AF}_{PCGDP} = \underset{(0.0)}{0.1} + \underset{(1.9)}{0.13}\, g^{AF} + \underset{(1.0)}{0.07}\, EDU^{AF} - \underset{(0.4)}{0.21}\, g^{AF}_{POP} \qquad (3)$$

$$\bar{R}^2 = 0.10,$$

where

g_{PCGDP} = average annual growth rate of per-capita income;

g_{EXP} = average annual growth rate of exports;

$DSAR$ = domestic savings rate (the ratio of domestic savings to GDP in 1980);

EDU = initial education level (1965) (percentage of age group enrolled in secondary education); and

g_{POP} = the growth rate of the population.

These results imply that a 1-percentage-point increase in the average annual growth rate of exports will lead to about a 0.13-percentage-point increase in the per-capita income growth rate per year over the longer term, suggesting a lower payoff from export promotion than proposed in a recent IMF study (0.4 to 0.5 percentage points). This discrepancy between the two sets of estimates could be due in part to the large inter-country group variation. It should be noted that the IMF results refer to all 55 developing countries studied, whereas our equations only capture variations within the group, not variations among the country groups. Hence, one could argue that our results, in general, are consistent with the findings of the IMF study. In addition, like the IMF study, our regression results also suggest that an increase in the domestic savings rate will have a significant positive impact on the per-capita income growth rate.

The large differences in the constant term among the three per-capita income growth-rate equations imply marked differences among the total factor-

productivity growth rates of the three groups of countries. What factors could account for such large differences in total factor-productivity growth rates? It seems that the large differences in education levels and population growth rates could explain the poor performance of the African countries compared to that of the Asian countries, as in the following aggregate per-capita income growth equation:

$$g_{PCGDP} = \underset{(0.8)}{1.22} + \underset{(3.5)}{0.15}\, g + \underset{(2.3)}{0.06}\, DSAR - \underset{(1.5)}{0.72}\, g + \underset{(1.0)}{0.022}\, EDU \qquad (4)$$
$$EXP \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad POP$$

$$\bar{R}^2 = 0.45.$$

For instance, the average level of education (proxied by the secondary-school enrollment rate) in African countries is substantially lower (less than one fifth) than the education levels of Asian countries (see Tables 13 and 14). Similarly, the average population growth rate is also significantly higher in Africa than in Asia. However, the large differences in education levels may account for the differences in the population growth rates. Therefore, an adequate level of education (a proxy for the social capabilities discussed in the second section) is essential to successfully exploit the technologies already employed by the more advanced countries [see Abromovitz, 1979 and 1986; and Baumol, 1986].

Differences in export performances, domestic savings rates, population growth rates, domestic economic policies – particularly with respect to inflation control, governments' fiscal prudence, trade and investment strategies, and external borrowing – and political climates and social consensus could explain the poor performance of Latin American countries [Lin, 1988]. The difference in the constant term in the per-capita income growth of the Asian and Latin American countries (equations 1 and 2) is consistent with this diagnosis.

Economic Development and Trade Strategy

Trade strategy has a great influence on industrial performance and economic development. Economic growth rates appear to be significantly positively correlated with the growth in exports. For example, the Asian NICs and the Southeast Asian countries, which had the highest GDP growth rates of the developing countries, also attained much more rapid rates of export expansion than the other developing countries during the last 25 years or so (see Tables 18 to 21).

What is the mechanism by which an expansion in exports improves productivity and per-capita income performance? Export expansion could increase total factor productivity by several means such as:

1 better allocation of resources, leading to production efficiency;

2 exploitation of scale economies;

3 stronger inducements for technology diffusion;

4 increased capacity utilization; and

5 a favourable impact on capital accumulation, because of the relaxation of foreign exchange constraints [see Otani and Villanueva, 1989].

The World Bank research suggests that the economic performance of the outward-oriented economies has been broadly superior to that of inward-oriented economies in terms of GDP, per-capita income, gross domestic savings rate, manufactured exports, and inflation.[12] For instance, GDP growth rates show a clear descending pattern from the strongly outward-oriented to the strongly inward-oriented economies. For the 1963-73 period, the average annual growth rate was 9.5 per cent for the strongly outward-oriented economies, compared to a mere 4.1 per cent for the strongly inward-oriented economies. Furthermore, during the period 1973-85 the performance gap widened. This research indicates that the differences in total factor-productivity improvement account for a large part of the divergence in growth performance between the two groups of countries (see Chart 1, p. 51).

In addition, it seems that the countries with outward-oriented economies have also fared better in terms of industrialization – in other words, growth of manufacturing and agricultural value-added, the share of manufacturing value-added in GDP, the share of the labour force employed in industry, and the growth of employment in manufacturing. For instance, the average annual growth rate of manufacturing value-added during the 1963-73 period was 15.6 per cent in the strongly outward-oriented economies, compared to 5.3 per cent per annum in the strongly inward-oriented economies (see Table 22). These results imply that the gains from freer trade are seriously underestimated by existing economic models (including the general equilibrium models), because these models are not capable of adequately capturing the dynamic gains in productive efficiency from increased trade.

In short, all the available evidence strongly suggests that outward-oriented trade strategies will set in motion a virtuous cycle of export expansion, higher productivity and real incomes, increased capacity utilization, final demand expansion, rises in savings and investment ratios, improved resource allocation, and industrialization. This strategy seems to have worked extremely well for Hong Kong, Singapore, South Korea, and Taiwan. In contrast to the experience of the Asian NICs, the Latin American countries, which had attempted to increase domestic growth through enlarged external borrowing

and renewed inward orientation, ended up in the 1980s with much worsened growth prospects.[13]

Conclusions

The main objective of this paper has been to examine in detail the theoretical rationale of the convergence hypothesis and review the historical experience of the industrialized and the developing countries. We have discussed the theoretical aspects of the convergence thesis and pointed out some of the empirically testable predictions of this concept. We then reviewed the historical experience of the industrialized and the developing countries vis-à-vis the convergence hypothesis. An analysis of the factors determining the realization of the growth potential and the degree and the rate of convergence in the two sets of countries was the subject of the fifth section. In this final section we will summarize the main findings of our paper and analyse some of their policy implications.

Economic convergence is a relatively new concept. It is a long-term phenomenon, but the convergence of productivity and per-capita income levels in the follower countries with that of the leader is by no means automatic. Nevertheless, our findings indicate that in the postwar period the performance of aggregate labour productivity and per-capita income in the industrialized countries has been generally consistent with the predictions of the convergence hypothesis. But these findings should be treated as tentative, because a more definite verdict would require an analysis of international productivity (preferably total factor productivity) comparisons at a more disaggregated level.

In addition, the convergence hypothesis is not very relevant for the longer-term performance (over 100 years or so) of the industrialized countries. In its simplest form, it does not anticipate changes in economic leadership nor, indeed, any changes in the ranks of countries' relative levels of productivity. Yet there have been many changes in ranking over the last 100 years or so, notably the changes in economic leadership – for example, from the Netherlands to the United Kingdom, and from the United Kingdom to the United States [see Maddison, 1982; and Table 5]. Moreover, De Long [1988] has argued that a more complete unbiased sample of nations that are relatively rich, well integrated into the world economy and thus well positioned to utilize modern technology as of 1870 (*ex ante* sample) has not converged. This suggests that long-run technology transfer is neither automatic nor inevitable, or if it occurs it does not have the effect posited by the convergence theory.

As for the developing countries, only a small number of Asian countries (especially the Asian NICs and the Southeast Asian countries) enjoyed significantly faster growth in real income than the industrialized countries

during the postwar period. Moreover, contrary to the prediction of the convergence hypothesis, among the developing countries the growth rates of output and per-capita income are positively correlated with their levels – in other words, the richer developing countries grew faster than the poorer developing countries.

In summary, the empirical evidence on the convergence hypothesis is mixed. Per-capita income and aggregate labour productivity and manufacturing labour productivity level differentials have steadily narrowed among the industrialized countries during the postwar period.[14] On the other hand, except for the countries of Southeast Asia, the experience of the developing countries in the same period is not, in general, consistent with the convergence thesis.[15]

The historical experience of both the developed and the developing countries strongly suggests that the realization of growth potential, and the degree and rate of convergence critically depend on favourable international economic conditions, social capability and technical competence, transportation and communications infrastructure, flexible factor and product markets, outward-looking and market-oriented domestic economic policies, and political stability.

The rate of convergence in the industrialized countries seems to be highly correlated with the performance of investment expenditure in plant and equipment, export growth, and the growth of R&D expenditure.

All the available research suggests that the important quantifiable determinants of output and per-capita income performance in the developing countries include: 1) growth in exports; 2) the domestic savings ratio (the ratio of domestic savings to GNP); 3) the population growth rate; and 4) the level of education. As expected, other things remaining constant, faster population growth retards the growth of real incomes.

It seems that the outward-looking and market-oriented domestic economic policies of the Asian NICs, in conjunction with their improved social capabilities and the favourable global economic environment, have resulted in a virtuous cycle of export expansion, increased investment in plant and equipment, improved productivity and real incomes, industrialization, final demand expansion, increased capacity utilization, and outward orientation. These have led to a remarkable expansion of their output and per-capita incomes during the last 25 years or so.

Policy Implications

The convergence theory implies that the faster growth in output, productivity, and per-capita income in Canada and the other industrialized countries during the postwar period, relative to the United States, has been largely the

result of a "catch-up" bonus [see Helliwell et al., 1985; Helliwell and Chung, 1988; and Maddison, 1987]. Since Canadian productivity and per-capita income levels are currently about 90 to 95 per cent of the U.S. levels, the catch-up bonus is going to be very small from now on. Consequently, medium- to longer-term growth expectations in Canada may have to be scaled down. This argument also applies to the other industrialized countries.

However, the Canada-U.S. Free-Trade Agreement is expected to significantly narrow the sizable manufacturing productivity gap between the two countries (Canadian manufacturing productivity is about 25 per cent lower than that of the United States), due to the realization of product and plant scale economies and the diffusion of state-of-the-art technologies. This should raise the growth potential of the Canadian economy over the next 10 years by at least 2.5 per cent [see Economic Council of Canada, 1988; and Rao, 1988].

Since Japan's aggregate labour productivity is still only about 70 per cent of the U.S. level, its medium- to longer-term growth prospects are significantly brighter than those of Canada and the other industrialized countries. In addition, Japan has taken a substantial lead in many of the frontier and emerging technologies (for example, telecommunications, electronic equipment, lasers, semiconductors and superconductors, and bio-technology). Today there is a widely held opinion that Japan will take over the economic leadership from the United States, judged by per-capita income and technical capability, in the next 25 years or so. In that case, the longer-term growth prospects for Canada and the other industrialized countries (including the United States) need not be scaled down, because these countries could continue to benefit from the catch-up dividend, only with a different leader.

The remarkable improvements in output, productivity, and per-capita incomes in the Far East and the Southeast Asian countries during the last 25 years strongly suggest that there are several conditions whose existence will help the developing countries to realize their growth potential over the medium to longer term. These include: outward-looking trade strategies, market-oriented domestic economic policies, political stability, a neutral but stable incentive system to encourage domestic savings and investment, fiscal prudence by government, appropriate macroeconomic policies, and well-functioning labour and capital markets, in conjunction with a more open and liberal international trading regime and a stable international economic climate. In particular, internal and external economic conditions are ripe for a substantial takeoff in South Korea, Taiwan, and the Southeast Asian countries. The medium-term growth prospects are also bright for Hong Kong, Singapore, India, and China [see World Bank, 1990].

The convergence thesis, with its implications for the medium- to longer-term economic prospects of the industrialized and the developing countries,

has implications for future world trade patterns and thus for Canada's future trade orientation. Our analysis suggests that the share in world trade of Asian countries in general and the Asian Pacific Rim countries in particular will increase substantially in the 21st century. Therefore, the future performance of Canadian exports critically depends on Canada's ability to penetrate the rapidly growing Asian markets. In addition, the competitive pressures from these countries on Canadian industries at home and abroad will intensify over the next decade.

The trend in the postwar period towards the convergence of productivity and per-capita income levels in the industrialized countries and the Asian NICs has been mainly due to the liberalization of world trade and foreign direct investment, facilitated by the increased role of multinationals in a global economy. Hence, the fulfilment of the growth aspirations of the developing countries and the sustainability of the postwar trends towards economic convergence in the industrialized countries and the Asian NICs will critically depend on an open and liberal global trading system and a stable international economic climate. The outcome of the current Uruguay Round negotiations will be an important element in the realization of the growth potential of both developed and developing countries. However, greater interdependency among nations due to increased world trade and international capital flows will restrict the effectiveness of domestic fiscal and monetary policies, and intensify the pressures for harmonization of economic policies among the world's economies.

A favourable world economic environment, combined with proper structural adjustment policies and outward-looking and market-oriented economic initiatives in the developing countries, could turn the current vicious cycle of poverty, low savings and investment, weak growth performance, and inward orientation of many Third World countries into a virtuous cycle of strong economic growth and high savings and investment.

In addition to appropriate domestic economic policies, the developing countries should also pay adequate attention to the distribution of the benefits of economic growth among various income groups and/or regions. If the benefits of economic development are not distributed equitably across the population, there could be social unrest and tension among the various groups. This in turn could result in a deterioration in the political and economic climate, despite a good economic performance, and could reduce future growth prospects [see World Bank, 1987 and 1988*b*].

Since education, transportation and communications infrastructure, and population control are the essential ingredients of economic development and the transfer of technology, the Canadian government could increase the effectiveness of its development assistance to Third World countries by

focusing its economic assistance to these countries on improving their social capabilities and family planning programmes.

In conclusion, the economic convergence of the industrialized countries and the Asian NICs in the postwar period, and our findings about the determinants of the degree and rate of convergence, have important implications for the future growth potential of the developed and the developing countries, for the outlook for freer international trade, for future trade patterns, and for the importance of macroeconomic policy coordination among nations.

Tables and Chart

Table 1

Basic Economic Indicators, Industrialized Countries, 1960-86

	Average annual growth rate			Education (percentage of age group, approximately 12-17 years, enrolled in secondary education, 1965)
	GNP per capita, 1965-86	GDP		
		1965-80	1980-86	Population, 1960-86
	(Per cent)			(Total)
Spain	2.9	5.2	1.8	0.9	38
Ireland	1.7	5.1	0.7	0.9	51
New Zealand	1.5	3.1	2.6	1.2	75
Italy	2.6	3.9	1.3	0.6	47
United Kingdom	1.7	2.2	2.3	0.3	66
Belgium	2.7	3.9	0.9	0.3	75
Austria	3.3	4.3	1.8	0.3	52
Netherlands	1.9	3.7	1.0	0.9	61
France	2.8	4.4	1.3	0.7	56
Australia	1.7	4.0	3.1	1.6	62
Germany (Fed. Rep.)	2.5	3.3	1.5	0.4	–
Finland	3.2	4.1	2.7	0.4	76
Denmark	1.9	2.7	2.8	0.4	83
Japan	4.3	6.3	3.7	1.0	82
Sweden	1.6	2.8	2.0	0.4	62
Canada	2.6	4.4	2.9	1.4	56
Norway	3.4	4.4	3.5	0.6	64
United States	1.6	2.8	3.1	1.1	–
Switzerland	1.4	2.0	1.5	0.7	37

SOURCE World Bank [1988*a*]; and OECD [1988].

Table 2

Real Gross Domestic Product per-Capita Comparisons, 1870-1987

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
	(US$, 1986 prices)	(United States = 100)										
1870	2,150	76.0	30.0	96.0	65.0	67.0	59.0	77.0	102.0	55.0	46.0	118.0
1950	9,035	70.4	16.1	46.1	52.0	42.7	36.0	33.4	51.3	50.0	59.2	60.4
1960	10,474	72.9	28.8	50.4	62.7	52.6	61.1	47.3	61.3	56.8	66.7	66.2
1970	13,389	79.2	55.7	60.4	69.8	63.7	67.8	60.3	69.2	61.7	76.4	64.5
1980	15,738	93.4	66.0	69.7	71.2	73.0	74.2	66.4	72.3	79.1	76.3	65.7
1987	18,360	94.1	72.1	66.6	72.4	70.0	73.0	66.5	67.2	84.9	75.7	67.4
Change in index												
1987-1870	. . .	18.1	42.1	–29.4	7.4	3.0	14.0	–10.5	–34.8	29.9	29.7	–50.6
1987-1950	. . .	23.7	56.0	20.5	20.4	27.3	37.0	33.1	15.9	34.9	16.5	7.0

SOURCE Authors' estimates based on unpublished data, U.S. Bureau of Labor Statistics, Department of Labor; and Maddison [1982].

Table 3

Real Gross Domestic Product per Employed Person Comparisons, 1870-1987

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
	(US$, 1986 prices)	(United States = 100)										
1870	5,951	86.0	26.0	99.0	63.0	50.0	63.0	61.0	111.0	53.0	44.0	111.0
1950	22,627	77.1	15.2	46.8	43.0	36.8	34.4	31.0	55.4	44.6	55.0	53.9
1960	27,723	80.1	23.2	50.2	53.5	46.0	49.1	43.9	63.3	52.0	51.9	54.3
1970	33,542	84.2	45.7	62.0	60.1	61.7	61.8	66.4	77.0	58.5	62.7	58.0
1980	35,348	92.8	62.6	79.7	66.6	80.1	77.4	80.9	89.5	75.2	66.6	65.9
1987	38,020	95.5	70.7	82.3	67.2	85.3	81.1	85.5	86.7	78.9	69.8	71.9
Change in index												
1987-1870	. . .	9.5	44.7	–16.7	4.2	35.0	18.1	24.5	–24.3	25.9	25.8	–39.1
1987-1950	. . .	18.4	55.5	35.5	24.2	48.5	46.7	54.5	31.3	34.3	14.8	18.0

SOURCE Authors' estimates based on unpublished data, U.S. Bureau of Labor Statistics, Department of Labor; and Maddison [1982].

Table 4

Output per Employed Person in Manufacturing, 1950-87

	United States	Canada	Japan	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
						(1950 = 100)					
1950	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1960	119.7	139.0	268.6	123.3	161.3	188.2	180.9	161.3	134.3	131.7	121.4
1970	130.3	205.8	679.4	191.0	297.6	302.0	326.6	282.2	183.1	222.2	163.4
1980	194.7	258.1	1,144.1	295.2	432.8	415.0	459.5	441.9	208.7	266.1	190.6
1987	261.7	324.4	1,701.2	311.4	517.4	482.7	639.3	537.6	256.5	328.9	279.7

SOURCE Authors' estimates based on unpublished data, U.S. Bureau of Labor Statistics, Department of Labor.

Table 5

Comparative Levels of per-Capita Income and Labour Productivity of the Relatives of 11 Industrialized Countries, 1870-1987

	Mean		Coefficient of variation	
	Per-capita income	Productivity	Per-capita income	Productivity relatives
		(United States = 100)		
1870	..	77	..	0.51
1890	..	68	..	0.48
1913	..	61	..	0.33
1929	..	57	..	0.29
1938	..	61	..	0.22
1950	47	45	0.32	0.36
1960	57	52	0.21	0.27
1970	66	63	0.11	0.16
1980	73	76	0.10	0.13
1987	74	79	0.12	0.11

SOURCE 1870-1938: Abromovitz [1986]; 1950-87: authors' estimates based on unpublished data, U.S. Bureau of Labor Statistics, Department of Labor.

Table 6

Population Aged 15-64 as a Percentage of Total Population, 1870-1986

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
							(Per cent)					
1870	57.8	54.7	61.0	61.7	60.8	65.5	61.4	62.4	60.9	58.5	60.5	58.9
1950	65,0	62.6	59.4	68.1	64.7	65.9	67.1	65.5	63.0	66.0	66.3	66.9
1960	59.7	58.7	63.9	64.5	64.2	62.0	67.8	67.6	61.0	63.2	65.9	64.9
1970	61.1	60.5	69.1	63.1	64.4	62.2	63.8	67.0	62.4	62.8	65.8	63.5
1980	66.2	67.5	67.4	65.6	64.7	63.7	66.3	66.7	66.6	63.3	64.1	64.1
1986	66.4	68.1	68.4	67.4	66.6	65.9	70.1	69.6	68.7	64.4	64.5	65.7

SOURCE Authors' estimates based on OECD [1988]; and Maddison [1982].

Table 7

Unemployment as a Percentage of Labour Force, 1950-86

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
							(Per cent)					
1950	5.2	3.6	1.9	5.0	4.0	2.3	8.2	6.9	2.8	1.2	1.7	2.5
1960	5.3	6.8	1.7	3.3	2.1	1.8	1.0	3.9	1.2	2.3	1.7	3.0
1970	4.9	5.6	1.1	1.8	0.7	2.4	0.6	4.9	1.6	1.5	1.5	3.1
1980	7.0	7.4	2.0	7.7	6.5	6.3	3.3	7.5	6.0	1.6	2.0	5.6
1986	6.9	9.5	2.8	11.3	5.5	10.4	8.0	10.9	10.4	2.0	2.7	11.6

SOURCE Authors' estimates based on OECD [1988].

Table 8

Volume of Exports, 1870-1986

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
							(1913 = 100)					
1870	13.0	17.9	3.0	16.9	21.0	31.1	17.7	38.7	24.5	26.1	26.7	31.1
1950	224.6	331.0	210.1	111.8	239.5	149.2	34.8	126.5	171.2	269.5	275.9	100.0
1960	387.9	460.8	924.4	216.5	469.7	298.4	154.7	366.9	445.1	463.5	480.3	120.0
1970	680.6	1,151.8	4,202.0	555.5	921.2	678.2	386.6	1,265.0	1,141.3	1,078.0	1,021.8	192.0
1980	1,214.5	1,783.1	8,794.8	1,118.3	1,439.2	1,318.9	678.7	2,442.0	1,995.5	2,046.0	1,381.1	319.4
1986	1,397.0	2,494.6	13,658.3	1,376.6	1,842.2	2,228.9	883.0	2,835.1	2,394.6	2,661.8	1,758.1	370.8

SOURCE Authors' estimates based on Maddison [1982]; and OECD [1988].

Table 9

Gross Non-Residential Fixed Capital Stock per Person Employed, 1950-86

	United States	Canada	Japan	France	(Fed. Rep.) Germany	Italy	United Kingdom
				(1950 = 100)			
1950	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1970	163.6	182.8	493.3	228.6	284.8	273.3	192.5
1980	173.1	206.1	699.7	278.4	371.6	328.0	227.4
1986	182.8	230.6	797.6	274.5	371.6	346.4	248.1

SOURCE Author's estimates based on OECD [1988].

Table 10

National R&D Expenditures as a Percentage of GDP, 1960-86

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	United Kingdom
						(Per cent)					
1960	2.7	1.0	1.4	1.0*	–	1.4	1.2	0.7*	–	–	2.5
1970	2.6	1.3	1.9	1.3	1.0	1.9	2.1	0.9	2.0	1.1	2.3
1980	2.3	1.1	2.2	1.4	1.0	1.8	2.4	0.9	1.9	1.3	2.3
1986	2.7	1.3	2.8	–	1.3	2.4	2.7	1.3	2.0	1.5	2.2

*1965.
SOURCE OECD [1988].

Table 11

Change in Average per-Capita Educational Experience of the Population Aged 25-64, Average Annual Compound Growth Rate, 1950-80

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
						(Per cent)						
1950-60	0.8	0.6	1.1	0.6	0.3	0.5	–	1.1	0.4	0.3	–	0.3
1960-70	0.9	0.8	1.1	0.8	0.5	0.6	0.5	1.4	0.7	0.6	0.8	0.4
1970-80	0.9	0.9	0.8	0.9	0.6	1.0	0.2	1.6	1.0	1.2	1.2	0.6
						(Average years)						
Formal education of 25-64 age group, 1976	11.6	10.5	10.4	10.3	9.7	9.9	9.4	6.9	9.1	9.3	9.3	10.4

SOURCE Maddison [1982].

Table 12

Employment in Agriculture as a Percentage of Total Civilian Employment, 1870-1986

	United States	Canada	Japan	Belgium	Denmark	France	(Fed. Rep.) Germany	Italy	Netherlands	Norway	Sweden	United Kingdom
							(Per cent)					
1870	50.0	53.0	72.6	43.0	51.7	49.2	49.5	62.0	37.0	53.0	53.9	22.7
1950	32.3	21.8	48.3	–	–	28.5	22.2	–	13.9	–	–	5.1
1960	8.5	13.2	30.2	8.7	18.2	22.5	14.0	32.6	9.8	21.6	15.7	4.7
1970	5.1	8.6	19.8	5.5	12.7	15.6	9.9	22.9	6.8	15.4	9.1	3.5
1980	3.6	5.4	10.4	3.0	7.1	8.7	5.6	14.3	4.9	8.3	5.6	2.6
1986	3.1	5.1	8.5	2.8	5.9	7.3	5.3	10.9	4.9	7.2	4.2	2.5

SOURCE Authors' estimates based on OECD [1988]; and Maddison [1982].

Table 13

Basic Economic Indicators, Africa, 1965-87

	GNP per capita, 1987	Average annual growth rate				Education (percentage of age group, approximately 12-17 years, enrolled in secondary education, 1965)
		GNP per capita, 1965-87	GDP		Population, 1965-87	
			1965-80	1980-86		
	(US$)	(Per cent)				(Total)
Benin	300	0.2	2.3	3.6	2.8	3
Botswana	1,030	8.6	14.3	11.9	3.5	3
Burundi	240	1.7	3.6	2.3	2.1	1
Burkina Faso	170	1.2	3.5	2.5	2.2	1
Cameroon	960	3.8	5.1	8.2	2.9	5
Central African Republic	330	–0.3	2.6	1.1	2.1	2
Chad	150	–2.0	0.1	–	2.1	1
Congo, People's Republic of	880	3.3	5.9	5.1	3.0	10
Côte d'Ivoire	750	1.0	6.8	–0.3	4.2	6
Ethiopia	120	–0.1	2.7	0.8	2.6	2
Ghana	390	–1.7	1.4	0.7	2.5	13
Guinea	–	–	3.8	0.9	2.1	5
Kenya	340	1.8	6.4	3.4	3.8	4
Lesotho	360	4.9	6.6	0.9	2.4	4
Liberia	440	–1.6	3.3	–1.3	3.1	5
Madagascar	200	–1.9	1.6	–0.1	2.7	8
Malawi	160	1.5	6.1	2.4	3.0	2
Mali	200	1.6	4.1	0.4	2.2	4
Mauritania	440	–0.4	2.0	1.0	2.5	1

Table 13 (cont'd.)

	GNP per capita, 1987	Average annual growth rate				Education (percentage of age group, approximately 12-17 years, enrolled in secondary education, 1965)
		GNP per capita, 1965-87	GDP		Population, 1965-87	
			1965-80	1980-86		
	(US$)	(Per cent)				(Total)
Mauritius	1,470	3.1	5.3	4.4	1.3	26
Mozambique	150	–	–	–9.0	2.5	3
Niger	280	–2.2	0.3	–2.6	2.8	1
Nigeria	370	1.0	8.0	–3.2	2.7	5
Rwanda	310	1.4	5.0	1.8	3.3	2
Senegal	510	–0.6	2.1	3.2	2.7	7
Sierra Leone	300	0.1	2.6	0.4	2.1	5
Somalia	290	–0.3	2.5	4.9	2.7	2
South Africa	1,890	3.1	4.0	0.8	2.3	15
Sudan	330	–0.4	3.8	0.3	2.9	4
Tanzania	220	–0.4	3.7	0.9	3.3	2
Togo	300	0.1	4.5	–1.1	3.0	5
Uganda	260	–2.7	0.8	0.7	2.9	4
Zaïre	160	–2.2	1.4	1.0	3.0	5
Zambia	240	–2.1	1.8	–0.1	3.2	7
Zimbabwe	590	1.1	4.4	2.6	3.2	6
Excluding South Africa	310	0.9			2.8	
Including South Africa	410	1.3			2.8	

SOURCE World Bank [1988*a* and 1988*b*].

Table 14

Basic Economic Indicators, Asia, 1965-87

	GNP per capita, 1987	Average annual growth rate				Education (percentage of age group, approximately 12-17 years, enrolled in secondary education, 1965)
		GNP per capita, 1965-87	GDP		Population, 1965-87	
			1965-80	1980-86		
	(US$)		(Per cent)			(Total)
Bangladesh	160	0.5	2.4	3.7	2.6	13
Bhutan	150	–	–	–	1.8	0
Burma	220	–	3.9	4.9	2.1	15
China	300	5.2	6.4	10.5	1.8	24
Hong Kong	8,260	6.3	8.5	6.0	2.0	29
India	300	1.8	3.7	4.9	2.3	27
Indonesia	450	4.5	7.9	3.4	2.3	12
Kampuchea	–	–	–	–	–	9
Korea, Republic of	2,690	6.8	9.5	8.2	1.7	35
Laos, PDR	160	–	–	–	1.5	2
Malaysia	1,800	4.2	7.4	4.8	2.5	28
Nepal	160	0.5	2.4	3.5	2.5	5
Papua New Guinea	730	–	4.1	1.8	2.2	4
Philippines	590	1.8	5.9	–1.0	2.7	41
Singapore	7,940	7.2	10.4	5.3	1.5	45
Sri Lanka	400	2.9	4.0	4.9	1.7	35
Taiwan*	4,310	6.8	9.2	. . .	2.4	–
Thailand	840	3.9	7.4	4.8	2.5	14
Asia	400	5.6			2.1	

*Taiwan figures refer to the period 1965-85.
SOURCE World Bank [1988*a* and 1988*b*].

Table 15

Basic Economic Indicators, Latin America, 1965-87

	GNP per capita, 1987	Average annual growth rate					Education (percentage of age group, approximately 12-17 years, enrolled in secondary education, 1965)
		GNP per capita		GDP		Population, 1965-87	
		1965-87	1980-86	1965-80	1980-86		
	(US$)	(Per cent)					(Total)
Argentina	2,370	0.1	–2.4	–3.4	–0.8	1.6	28
Bolivia	570	–0.7	–	4.5	–3.0	2.6	18
Brazil	2,020	4.1	0.5	9.0	2.7	2.4	16
Chile	1,310	–0.2	–1.7	–1.9	0.0	1.7	34
Colombia	1,220	2.7	0.5	5.7	2.4	2.1	17
Costa Rica	1,590	1.4	–1.1	–6.2	1.3	2.6	24
Dominican Republic	730	2.3	–1.3	–7.3	1.1	2.6	12
Ecuador	1,040	3.2	–1.1	–8.7	1.8	3.0	17
El Salvador	850	–0.4	–2.2	–4.3	–1.0	2.2	17
Guatemala	940	1.1	–4.1	–5.9	–1.2	2.8	8
Haiti	360	0.5	–2.5	–2.9	–0.7	1.9	5
Honduras	780	0.2	–3.0	–4.2	0.6	3.3	10
Jamaica	960	–1.4	–1.5	–1.3	0.0	1.3	51
Mexico	1,820	2.5	–1.8	–6.5	0.4	2.8	17
Nicaragua	830	–2.5	–3.2	–2.6	0.2	3.1	14
Panama	2,240	2.4	0.4	5.5	2.6	2.5	34
Paraguay	1,000	3.4	–2.1	–6.9	1.1	3.0	13
Peru	1,430	0.1	–2.7	–3.9	–0.4	2.7	25

Trinidad and Tobago	4,220	1.3	–7.8	5.1	–6.3	1.5	36
Uruguay	2,180	1.3	–3.0	2.4	–2.6	0.4	44
Venezuela	3,230	0.2	–3.8	5.2	–0.9	3.4	27
Latin American	1,730	1.1				2.4	

SOURCE World Bank [1988*a* and 1988*b*].

Table 16

Basic Economic Indicators, EMENA,[1] 1965-87

	GNP per capita, 1987	Average annual growth rate				Education (percentage of age group, approximately 12-17 years, enrolled in secondary education, 1965)
		GNP per capita, 1965-87	GDP		Population, 1965-87	
			1965-80	1980-86		
	(US$)		(Per cent)			(Total)
Afghanistan	–	–	2.9	–	–	2
Algeria	2,760	3.3	7.5	4.4	3.1	7
Egypt, Arab Republic of	710	3.5	6.7	4.7	2.5	26
Greece	4,350	3.3	5.6	1.5	0.8	49
Hungary	2,240	3.8	5.6	1.6	0.2	–
Iran	–	–	6.2	–	3.1	18
Iraq	–	–	–	–	3.6	28
Israel	6,810	2.5	6.8	2.0	2.5	48
Jordan	1,540	4.3	–	5.1	2.8	38
Kuwait	14,870	–3.9	3.1	–0.9	6.3	52
Lebanon	–	–	–1.2	–	0.8	26
Libya	–	–	4.2	–	4.4	14
Morocco	620	1.8	5.4	3.3	2.5	11
Oman	5,780	8,0	12.5	5.7	4.0	–
Pakistan	350	2.5	5.1	6.7	3.1	12
Poland	1,920	–	–	1.5	0.8	58
Portugal	–	3.3	5.5	1.4	0.7	42
Romania	–	–	–	–	0.9	39

Saudi Arabia	–	–	10.9	–3.4	4.7	4
Syriam Arab Republic	1,820	3.7	8.7	1.5	3.4	28
Tunisia	1,210	3.7	6.6	3.7	2.2	16
Turkey	1,200	2.7	6.3	4.9	2.4	16
United Arab Emirates	15,680	–1.7	–	–3.8	12.4	–
Yemen Arab Republic	580	5.6	–	4.3	2.8	0
Yemen, PDR	420	–0.3	–	1.7	2.3	11
Yugoslavia	2,480	3.7	6.0	1.2	0.9	65
EMENA	1,510	0.2			2.3	

1 This region comprises developing countries in Europe, the Middle East, and North Africa.
SOURCE World Bank [1988*a* and 1988*b*].

Table 17

Real per-Capita GDP Level Comparisons, Selected Asian Countries, 1950-85

	Hong Kong	Singapore	South Korea	Taiwan	Malaysia	Thailand	Indonesia
				(United States = 100)			
1950	–	–	8.7	5.2	14.7	9.8	–
1960	25.2	25.7	9.9	11.6	16.2	10.5	6.5
1970	36.3	32.3	12.6	16.0	14.6	11.4	3.2
1980	63.7	51.0	20.8	25.6	27.3	14.9	9.3
1985	70.4	70.0	23.3	27.5	25.2	14.4	9.7

SOURCE Summers and Heston [1984].

Table 18

Important Determinants of Growth Performance, Africa, 1965-87

	Gross domestic savings as a percentage of GDP			Gross domestic investment as a percentage of GDP			Current account balance/GDP,*	Average annual growth rate of exports volume	
	1967	1980	1987	1967	1980	1987	1987	1965-80	1980-86
					(Per cent)				
Benin	0.1	–6.3	4.4	14.5	18.6	13.9	–13.3	–2.3	–3.5
Botswana	–8.4	28.9	–	23.3	41.5	–	36.0	–	–
Burundi	5.8	0.3	7.7	6.9	13.9	19.9	–14.7	3.0	11.6
Burkina Faso	–0.4	–9.0	–7.7	10.8	20.3	15.7	–	4.0	1.6
Cameroon	11.8	15.7	14.6	13.8	18.9	18.2	–8.8	5.2	13.8
Central African Republic	1.2	–9.6	–2.5	21.8	7.0	13.9	–19.9	–0.4	2.0
Chad	–	–	–	–	–	–	–	–	–
Congo, People's Republic of	6.2	35.7	21.2	31.5	35.8	23.6	–13.8	12.5	5.4
Côte d'Ivoire	27.2	22.2	18.6	19.8	28.2	13.0	–6.3	5.6	3.5
Ethiopia	11.7	3.7	0.5	14.3	10.0	12.4	–6.0	–0.5	–2.5
Ghana	7.8	4.9	7.8	10.3	5.6	10.8	–5.4	–1.8	–7.1
Guinea	–	–	–	–	–	–	–	–	–
Kenya	19.3	18.7	19.6	20.2	30.0	24.6	–8.0	0.3	–0.9
Lesotho	–30.1	–66.2	–73.3	10.5	33.9	25.2	–28.7**	13.9	–2.4
Liberia	40.5	27.3	–	23.1	27.3	–	–	4.5	–2.0
Madagascar	11.6	6.5	8.9	14.6	23.5	14.4	–13.6	0.7	–3.7
Malawi	2.7	10.6	10.0	13.5	24.5	12.3	–4.1	4.3	1.1
Mali	5.2	–1.9	–0.4	18.4	17.0	16.5	–16.0	11.0	7.2
Mauritania	32.1	6.9	13.7	21.4	36.2	20.5	–21.8	2.7	13.6

Table 18 (cont'd.)

	Gross domestic savings as a percentage of GDP			Gross domestic investment as a percentage of GDP			Current account balance/GDP,*	Average annual growth rate of exports volume	
	1967	1980	1987	1967	1980	1987	1987	1965-80	1980-86
					(Per cent)				
Mauritius	11.4	10.5	27.8	16.5	20.7	25.2	2.8	3.4	10.4
Mozambique	–	–	–	–	–	–	–	–	–
Niger	2.7	22.6	4.5	8.7	36.6	9.2	–9.3	12.8	–13.4
Nigeria	9.4	29.5	19.9	12.0	20.5	15.8	–1.5	11.4	–6.0
Rwanda	2.4	4.2	5.1	7.3	16.1	16.7	–11.9	5.9	1.3
Senegal	8.0	–0.5	6.0	11.2	15.5	13.2	–12.9	2.4	8.7
Sierra Leone	8.5	2.1	7.0	12.5	16.2	3.7	–	–3.9	–3.1
Somalia	3.4	–12.2	–	12.0	4.8	–	–	3.8	–7.9
South Africa	–	–	–	–	–	–	–	6.1	–0.4
Sudan	14.5	3.4	6.2	12.9	15.1	11.2	–8.1	–0.3	6.9
Tanzania	18.2	9.8	–5.9	17.9	23.0	17.0	–17.3	–4.0	–9.8
Togo	13.3	15.0	5.5	12.6	29.9	17.3	–11.9	4.5	–6.6
Uganda	14.2	4.6	4.8	13.3	6.1	12.0	–5.3	–3.9	4.4
Zaïre	19.3	13.7	9.8	10.1	14.9	13.0	–14.7	4.6	–4.3
Zambia	40.4	19.3	19.5	34.2	23.3	14.9	–0.6	1.7	–2.1
Zimbabwe	19.0	15.8	23.6	19.4	18.8	18.5	–0.4	3.5	–2.7

*Current account balance excluding net official transfers.
**Refers to 1986.
SOURCE World Bank [1988*a* and 1988*b*].

Table 19

Important Determinants of Growth Performance, Asia, 1965-87

	Gross domestic savings as a percentage of GDP			Gross domestic investment as a percentage of GDP			Current account balance/GDP,* 1987	Average annual growth rate of exports volume	
	1967	1980	1987	1967	1980	1987		1965-80	1980-85
					(Per cent)				
Bangladesh	3.5	2.1	2.2	10.7	15.1	11.5	–5.5	–	5.6
Bhutan	–	–	–	–	–	–	–	–	–
Burma	10.4	17.6	11.3	12.2	21.5	14.5	–3.3	–2.1	–0.2
China	20.3	28.7	37.7	19.9	30.0	37.6	0.1	5.5	11.7
Hong Kong	21.7	31.4	30.7	21.0	36.0	25.3	–	9.5	10.7
India	15.5	20.6	22.3	17.7	24.2	24.2	–1.6	3.7	3.8
Indonesia	2.3	37.1	29.1	9.3	24.3	26.3	–3.1	9.6	2.0
Kampuchea	–	–	–	–	–	–	–	–	–
Korea, Republic of	11.6	23.3	36.8	22.3	31.1	29.5	8.1	27.3	13.1
Laos, PDR	–	–	–	–	–	–	–	–	–
Malaysia	22.7	32.9	36.9	20.3	30.4	23.3	6.9	4.4	10.2
Nepal	4.9	11.1	11.4	5.0	18.3	21.0	–7.1	–2.3	6.7
Papua New Guinea	–0.3	15.1	18.7	21.9	25.2	24.1	–18.1	12.8	3.2
Philippines	19.0	25.0	15.4	20.9	30.7	14.5	–2.1	4.7	–1.7
Singapore	13.7	37.5	39.9	22.2	46.3	39.4	2.8	4.7	6.1
Sri Lanka	10.3	11.2	12.8	14.4	33.8	23.3	–8.6	0.5	6.4
Taiwan	22.6	33.1	38.8	24.7	34.3	19.6	19.2	19.0	12.7
Thailand	21.5	20.1	23.9	23.7	26.4	23.8	–1.5	8.5	9.2
Vietnam	–	–	–	–	–	–	–	–	–

*Current account balance excluding net official transfers.

SOURCE World Bank [1988*a* and 1988*b*].

Table 20

Important Determinants of Growth Performance, Latin America, 1965-87

	Gross domestic savings as a percentage of GDP			Gross domestic investment as a percentage of GDP			Current account balance/GDP*		Average annual growth rate of exports volume	
	1967	1980	1987	1967	1980	1987	1980	1987	1965-80	1980-86
						(Per cent)				
Argentina	21.7	20.0	10.1	18.3	22.2	9.9	–8.4	–5.3	4.7	1.5
Bolivia	16.3	19.3	–	19.3	14.1	9.5	–1.7	–13.4	2.8	0.0
Brazil	16.6	20.7	22.7	17.0	22.9	19.7	–5.4	–0.4	9.4	4.3
Chile	17.3	16.8	20.1	16.1	21.0	16.9	–7.3	–4.7	7.9	3.9
Colombia	17.5	19.7	25.8	17.0	19.1	19.0	–0.6	0.7	1.5	4.9
Costa Rica	13.2	16.2	18.0	19.4	26.6	21.2	–13.6	–8.7	7.1	1.2
Dominican Republic	8.6	13.7	–	15.5	26.7	–	–11.7	–	3.7	–3.6
Ecuador	13.5	25.9	16.8	17.4	26.1	23.4	–6.0	–11.8	15.2	8.4
El Salvador	11.4	14.2	7.8	14.4	13.3	14.0	0.0	–4.1	2.4	–6.3
Guatemala	9.6	13.1	7.3	12.9	15.9	13.8	–2.1	–7.9	4.9	–2.5
Haiti	3.1	8.1	4.8	6.7	16.9	12.5	–9.6	–7.0	6.8	3.4
Honduras	17.6	17.3	12.7	19.7	24.5	15.4	–13.0	–8.2	3.1	2.6
Jamaica	28.5	13.6	22.9	29.3	15.7	22.6	–6.6	–5.6	–0.2	–7.2
Mexico	18.2	24.9	17.5	20.4	27.2	15.5	–4.3	2.5	7.7	7.7
Nicaragua	13.2	–2.7	–	21.0	15.4	–	–24.5	–	2.4	–3.2
Panama	20.2	24.4	–	21.0	27.7	–	–10.6	4.2	–	–2.0
Paraguay	13.1	18.3	8.0	16.5	31.7	23.8	–13.5	–9.2	6.6	1.6
Peru	30.3	27.5	–	35.1	27.5	–	–1.2	–3.1	2.3	0.1

Trinidad and Tobago	26.1	42.1	–	17.6	30.6	–	5.7	–4.2	–5.5	–8.1
Uruguay	15.0	11.7	11.3	13.8	17.3	9.3	–7.1	–1.8	4.6	0.9
Venezuela	33.0	32.9	22.2	22.6	24.7	20.2	8.0	–0.7	–9.5	–1.4

*Current account balance excluding net official transfers.
SOURCE World Bank [1988*a* and 1988*b*].

Table 21

Important Determinants of Growth Performance, EMENA, 1965-87

	Gross domestic savings as a percentage of GDP			Gross domestic investment as a percentage of GDP			Current account balance/GDP,*	Average annual growth rate of exports volume	
	1967	1980	1987	1967	1980	1987	1987	1965-80	1980-86
					(Per cent)				
Afghanistan	–	–	–	–	–	–	–	–	–
Algeria	25.1	43.1	31.1	23.5	39.1	31.2	–0.6	1.5	0.9
Egypt, Arab Republic of	11.3	14.1	9.0	14.4	29.5	23.9	–9.9	2.8	7.4
Greece	14.9	19.7	–	23.3	25.0	–	–	12.0	4.6
Hungary	–	28.5	26.3	–	30.7	26.8	–2.6	–	–
Iran	–	–	–	–	–	–	–	–	–
Iraq	–	–	–	–	–	–	–	–	–
Israel	4.7	10.0	–	16.9	21.5	–	–12.8	8.9	6.4
Jordan	–	–9.0	–3.3	–	41.1	26.4	–19.1	13.6	5.7
Kuwait	–	–	–	–	–	–	–	–1.9	–3.8
Lebanon	–	–	–	–	–	–	–	–	–
Libya	–	–	–	–	–	–	–	3.3	–4.9
Morocco	11.0	11.5	–	13.3	22.6	–	–1.4	3.6	3.8
Oman	42.5	47.3	–	31.2	23.3	–	–	–	6.7
Pakistan	10.3	6.9	10.5	16.7	18.5	17.0	–2.0	4.3	6.2
Poland	–	23.4	–	–	26.3	–	–1.4	–	–
Portugal	24.6	19.0	18.5	26.9	34.1	24.0	0.9	3.4	11.0
Romania	–	–	–	–	–	–	–	–	–

Saudi Arabia	–	–	–	–	–	–	–	8.8	–19.2
Syrian Arab Republic	8.1	12.1	–	11.5	27.3	–	–	11.4	1.5
Tunisia	15.3	24.0	19.9	24.8	29.4	21.1	–1.5	8.5	–0.6
Turkey	16.4	14.1	23.5	17.4	21.9	25.5	–2.0	5.5	19.9
United Arab Emirates	–	–	–	–	–	–	–	10.9	–1.0
Yemen Arab Republic	–	–19.7	–20.5	–	45.8	13.3	–3.8	–0.3	1.9
Yemen, PDR	–	–	–	–	–	–	18.0	–13.7	3.2
Yugoslavia	28.6	35.6	39.7	30.0	39.9	38.6	1.3	5.6	1.5

*Current account balance excluding net official transfers.
SOURCE World Bank [1988*a* and 1988*b*].

Table 22

Characteristics of Industrialization for 41 Developing Economies Grouped by Trade Orientation, 1963-85

	Average annual growth of real manufacturing value-added		Average annual growth of real agricultural value-added		Average share of manufacturing value-added in GDP		Average share of labour force in industry		Average annual growth of employment in manufacturing	
	1963-73	1973-85	1963-73	1973-85	1963	1985	1963	1980	1963-73	1973-84
					(Per cent)					
Trade strategy										
Strongly outward-oriented	15.6	10.0	3.0	1.6	17.1	26.3	17.5	30.0	10.6	5.1
Moderately outward-oriented	9.4	4.0	3.8	3.6	20.5	21.9	12.7	21.7	4.6	4.9
Outward-oriented (average)	10.3	5.2	3.7	3.3	20.1	23.0	13.2	23.0	6.1	4.9
Moderately inward-oriented	9.6	5.1	3.0	3.2	10.4	15.8	15.2	23.0	4.4	4.4
Strongly inward-oriented	5.3	3.1	2.4	1.4	17.6	15.9	12.1	12.6	3.0	4.0
Inward-oriented (average)	6.8	4.3	2.6	2.1	15.2	15.8	12.7	14.1	3.3	4.2

SOURCE World Bank [1987].

E R R A T U M

WORKING PAPER NO. 13 E -- ECONOMIC CONVERGENCE, TECHNOLOGY TRANSFER, AND FREER TRADE, by Rao and Magun

Page 51, Chart 1

REFERENCE: CHART ENTITLED INCREMENTAL CAPITAL-OUTPUT RATIO

Please replace the following chart with the one that appears on page 51. The smaller bar should read 1963-73 and the larger bar should read 1973-85 and not the other way around.

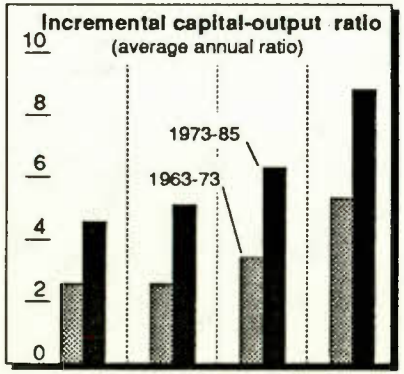
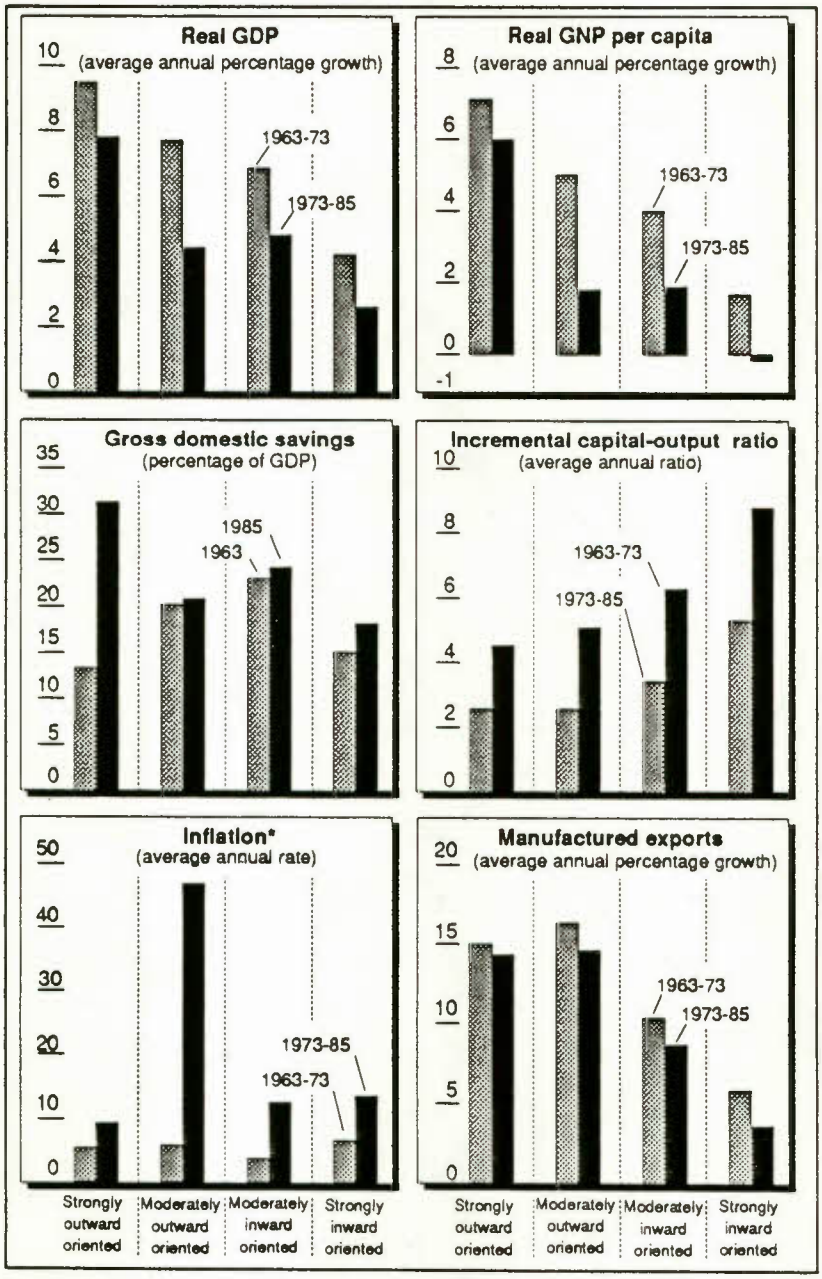


Chart 1

Macroeconomic Performance of 41 Developing Economies Grouped by Trade Orientation, 1963-85



NOTE Averages are weighted by each country's share in the group total for each indicator.
*Inflation rates are measured by the implicit GDP deflator. Values are group medians.
SOURCE World Bank [1987].

Notes

1 These measures are based on the purchasing power parity (PPP) exchange rates. The U.S. Bureau of Labor Statistics used the 1985 OECD multilateral price weights for computing the PPP exchange rates.

2 The estimated (cross-section) relationship between the per cent change in the relative productivity index and the initial level of the relative productivity index in 1950 is:

$$PCHIND = 69.70 - 0.78\ RPINDEX\ 1950$$
$$\qquad\quad (0.8)\ \ (4.7)$$

$$\bar{R}^2 = 0.68.$$

3 The estimated (cross-section) equation for the absolute change in the per-capita income gap index is:

$$CHPCI = 0.573\,CHPRI + 16.26\,CHSWAPOP - 4.17\,CHUR$$
$$\qquad\quad (3.6) \qquad\qquad (2.1) \qquad\qquad (2.5)$$

$$\bar{R}^2 = 0.73,$$

where *CHPCI* is the absolute change in the per-capita income gap (index); *CHPRI* is the absolute change in the labour productivity gap (index); *CHSWAPOP* is the change in the share of the working-age group in total population; and *CHUR* is the change in the unemployment rate.

4 The estimated (cross-section) relationship between the aggregate labour productivity gap and the manufacturing labour productivity gap is:

$$CHPRI = 11.5 + 0.4138\,CHMPRI$$
$$\qquad\quad (1.7)\ (3.7)$$

$$\bar{R}^2 = 0.56,$$

where *CHPRI* is the change in the aggregate labour productivity gap (index), and *CHMPRI* is the change in the manufacturing labour productivity gap (index). This equation implies that a 1-percentage-point reduction in the manufacturing productivity gap will reduce the aggregate labour productivity gap by 0.41 percentage points over the longer term.

5 For instance, the correlation coefficients between the change in the aggregate labour productivity gap and the change in exports, R&D

expenditure, and the share of agricultural employment in total employment are 0.97, 0.73, and –0.80, respectively.

6 One of the referees suggested that the reconstruction efforts after World War II have greatly helped Europe and Japan to bring their economies back to the prewar levels and closer to the level of the United States.

7 The estimates given in Table 17 are based on the PPP exchange rates. However, the figures in Tables 13 to 16 are based on the market exchange rates (the average of the past two years).

8 The relationship between the growth rates of GDPs and the per-capita GDP levels for African countries is positive, contrary to the prediction of convergence thesis. The estimated equation is:

$$g_{PCGDP} = \underset{(1.8)}{-\ 0.9533} + \underset{(3.9)}{0.0034}\ PCGDP$$

$$\bar{R}^2 = 0.31,$$

where g_{PCGDP} is the rate of growth of per-capita GDP, and $PCGDP$ is the level of $PCGDP$ per-capita GDP.

9 As in the African countries, the growth rate of per-capita GDP in Asia is positively related to the level of per-capita output, inconsistent with the convergence hypothesis. The estimated equation is:

$$g_{PCGDP} = \underset{(4.5)}{2.7292} + \underset{(3.5)}{0.0006}\ PCGDP$$

$$\bar{R}^2 = 0.49,$$

where g_{PCGDP} and $PCGDP$ are as defined in note 8.

10 The estimated per-capita income growth-rate equation for Latin America is:

$$g_{PCGDP} = \underset{(0.2)}{0.2339} + \underset{(1.0)}{0.0005}\ PCGDP$$

$$\bar{R}^2 = 0.00$$

where g_{PCGDP} and $PCGDP$ are as defined in note 8.

11 This region comprises developing countries in Europe, the Middle East, and North Africa, but it is economically dominated by the Middle East.

12 The World Bank has classified the developing countries' trade strategies according to the following qualitative and quantitative indicators: effective rate of protection, use of direct controls such as quotas and import licensing schemes, use of export incentives, and the degree of exchange rate overvaluation. For details, see World Bank [1988, Chapter 5].

13 Political stability could also have played a significant positive role in the economic development of developing countries.

14 But, we should also examine the evidence on the relative total factor productivity levels in the traded-goods sectors (especially in the manufacturing industries), before coming to definite conclusions about economic convergence in the industrialized countries during the postwar period.

15 Romer [1986] argues that in a competitive equilibrium model, with endogenous technical change and increasing returns, the level of per-capita output in different countries need not converge even in the long run.

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