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Structure Project

Productivity Growth and Industrial Structure in the Pacific Region

Japan Committee for Pacific Economic Outlook

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Productivity Growth and Industrial Structure in the Pacific Region

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PREFACE

This report on "*Productivity Growth and Industrial Structure in the Pacific Region*" is the seventh report in a series of studies conducted by the Pacific Economic Outlook/Structure (PEO/Structure Project).[1] The PEO/Structure Project, which is one of the Project Groups under the Pacific Economic Cooperation Council (PECC), deals with longer-term structural issues in the Pacific region.

The last study dealt with domestic savings, in particular, their past trends and future prospects. Mobilization of domestic savings, which supports investment, constitutes a basis for long-term economic growth. In this study, we discuss the results of allocated savings; that is, productivity growth and its impact on changes in industrial structure.

Recently there have been a vast amount of literature and debate on aggregate productivity growth and its determinants in developed as well as in developing economies. The debate has been so intense that outsiders may wonder why *the so-called East Asian miracle was attained without productivity growth*, as has been alleged at one time or another.

Relative to this line of debate, however, we have even less information and observations on the microeconomic aspects of productivity growth, that is, sectoral productivity growth and its impact on changing industrial structure. Recognizing the difficulty involved in obtaining relevant data for estimating sectoral productivity growth, the purpose of this report is to examine the following:

- Patterns and trends of aggregate productivity growth;
- Patterns and trends of changes in industrial structure;
- Patterns and trends of sectoral productivity growth;
- Interactions between changes in industrial structure and sectoral productivity growth.

This report is a summary of studies conducted by specialists under the coordination of Dr. Akira Kohsaka.[2,3] The first part of the report provides an overview, prepared by Dr. Kohsaka, of the issues in the Pacific region as a whole. The second part consists of executive summary reports of individual countries/regions submitted by specialists from each PECC member economy.

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[1] The previous studies published were The Emerging Role of the Private Sector in the Asia Pacific Region (1991); Changing Patterns of Foreign Direct Investment in the Pacific Region (1992); Changing Patterns of Trade in Goods and Services in the Pacific Region (1994); Capital Flows in the Pacific Region: Past Trends and Future Prospects (1995); Exchange Rate Fluctuations and Macroeconomic Management (1997); and Domestic Savings in the Pacific Region: Trends and Prospects (1998).

[2] The PEO/Structure project will publish three volumes in 2000. The first volume is a Summary (this report), the second volume consists of background papers which are full reports of individual countries/regions, and the third volume is the Japanese translation of the overview.

[3] Akira Kohsaka, Ph.D., is Professor of Economics at the Osaka School of International Public Policy, Osaka University, Osaka, Japan.

The PEO/Structure Project held two International Specialists Meetings in March and September 1999 in Osaka. These meetings were hosted by the Japan Committee for Pacific Economic Outlook which has been housed in the Kansai Economic Research Center (KERC).[4] The Committee has been sponsored by the Ministry of Foreign Affairs in Japan and the business communities in the Kansai region.

Ambassador Nobuo Matsunaga serves as Chairman of the Japan Committee for Pacific Economic Outlook. Mr. Katsutoshi Kojima directed the work on the PEO/Structure Project as the Executive Director, and Mr. Shinji Hoshina and his successor, Mr. Shinichi Numata, as the Deputy Executive Director coordinated the management of the PEO/Structure Project. Dr. Janis Kea supported the PEO/Structure Project by checking and editing reports.

The PEO/Structure Project presents this report to the meetings of PECC, the Ministerial meetings of the Asia Pacific Economic Cooperation (APEC) forum of government officials, and individuals in business, government and academic sectors who are interested in economic problems of the Asia-Pacific region.

For more information on the PEO/Structure Project or the Kansai Economic Research Center (KERC), contact the Japan Committee for Pacific Economic Outlook, 29th Floor Nakanoshima Center Bldg., 6-2-27 Nakanoshima, Kita-ku, Osaka 530-6691, Japan,
Email : kerc@ks.kiis.or.jp,
Phone : 81-6-6441-5750, Fax : 81-6-6441-5760.

[4] The Kansai Economic Research Center (KERC) is a nonprofit research organization established in Osaka in 1964, and is supported by the business and academic communities of the Kansai region centered around Osaka, Kobe and Kyoto. The objective of KERC is to contribute to the development of the economy as well as the advancement of social science in Japan.

PACIFIC ECONOMIC COOPERATION COUNCIL

The Pacific Economic Cooperation Council (PECC) was founded in 1980 at the initiative of the Prime Ministers of Japan and Australia.

PECC is the only organization in the Pacific region that brings together senior government, academic and business representatives from 24 Asia-Pacific economies[1] to share perspectives and expertise in search of broad-based answers to regional economic problems. Though it has an independent agenda, PECC maintains direct links to governments in the region to enable its work to be channeled to Ministers and policymakers.

PECC advocated the need for a formal, intergovernmental organization in the Pacific from the time of its creation. The regional ministerial process of the Asia Pacific Economic Cooperation (APEC) has realized that goal and now provides PECC with a formal channel by which its practical recommendations can be implemented. PECC is the only non-governmental official observer of APEC since the APEC's formation. PECC provides information and analytical support to APEC ministerial meetings and working groups.

PECC's substantive work is carried out through a range of forums, task forces and project groups. These cover trade and investment policy, Pacific economic outlook, financial and capital markets, human resource development, minerals, energy, small and medium enterprises, science and technology, telecommunications, transport, tourism, fisheries, food and agriculture.

PECC member committees and PECC work groups send tripartite delegations to the PECC General Meeting every two years. In the interim, policy matters are handled by a Standing Committee[2], and day-to-day administrative and coordinating functions are carried out by the International Secretariat based in Singapore.

For more information on PECC, contact the PECC International Secretariat,
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Email : peccsec@pacific.net.sg
Phone : 65-737-9823
Fax : 65-737-9824
website : www.pecc.net

[1] The PECC economies include Australia, Brunei Darussalam, Canada, Chile, China, Colombia, Hong Kong, China, Ecuador, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Pacific Island Nations, Peru, the Philippines, Russia, Singapore, Chinese Taipei, Thailand, the United States and Vietnam. France (Pacific Territories) is an Associate Member. The Pacific Basin Economic Council (PBEC) is the regional business organization, and the Pacific Trade and Development Conference (PAFTAD) is the regionwide organization of academic economists, are institutional members.

[2] The Standing Committee is PECC's governing body, which meets several times a year. It includes the Chairs of PECC Committees in each of the 23 full member economies. PBEC and PAFTAD also have seats on Standing Committee.

OVERVIEW

BY AKIRA KOHSAKA

1. INTRODUCTION

As past experiences have shown, even adequate investments are not enough to guarantee sustained economic growth. They must be combined with productivity growth in the economy as a whole as well as in specific sectors. At the same time, the faster is economic growth, the larger is the change in industrial structure. This partly reflects changes in demand structure and changes in sectoral productivity growth, both of which are part of the process of increasing income levels. Patterns and speeds of change in industrial structure depend on various factors including the initial conditions and policy designs of each individual economy.

Recently there have been a vast amount of literature and debate on aggregate productivity growth and its determinants in developed as well as developing economies. The debate has been so intense that outsiders might wonder why the so-called East Asian Miracle (World Bank 1993) was attained without productivity growth, as has been alleged by some economists (for example, Kim and Lau (1994), Krugman (1994) and Young (1995)).

Compared to this line of debate, however, we have less information and observations on the microeconomic aspect of productivity – that is, sectoral productivity growth and its impact on changing industrial structure. While we are aware of the difficulty in obtaining relevant data for analyzing sectoral productivity growth, the purpose of this report is to examine the following:

a. Patterns and trends of aggregate productivity growth;
b. Patterns and trends of changes in industrial structure;
c. Patterns and trends of sectoral productivity growth;
d. Interactions between changes in industrial structure and sectoral productivity growth.

In the next section, we review the debate surrounding sources of aggregate economic growth. We summarize what we have learned on the patterns and trends of aggregate growth in East Asia based on the study by Collins and Bosworth (1996). In the third section, we show and summarize our updated results of the growth accounting exercises on national data sets for aggregate growth. Patterns specific to groups of economies are examined.

In the fourth section, changes in the shares of value-added over time are demonstrated for an overall economy as well as for the manufacturing sector. Here too, we can characterize sub-regional patterns of structural changes for the groups. Sectoral productivity growth by industry and by subsector within manufacturing is shown and we try to find some correspondence between structural changes and differential sectoral TFP growth in the fifth section. In the concluding remarks, we summarize the discussion and cursorily touch upon factors related to future sustainability of economic growth in the region.

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* Coordinator, PEO/Structure Project.

2.AN ENGINE OR AN END OF THE MIRACLE?

After the Asian economic crisis in 1997, the debate over whether the Asian economic growth experience was a myth or a miracle had appeared to run out of steam. Some may want to jump to the conclusion that the so-called East Asian miracle (World Bank 1993) turned out to be a mirage and that economic growth based on capital accumulation could not evade eventual diminishing returns. Yet, it is far from clear whether the high-performers in Asia have, in fact, experienced zero or negligible productivity growth. Second, microeconomic evidence at the firm and industry levels describe significant improvements in productivity (Pack 1999).

In fact, the World Bank (1993) has already noted that the high-performer Asian economies (HPAE), particularly Korea and Chinese Taipei, attained significantly higher productivity (TFP) growth than other developing economies, although the relative contribution of TFP to their real economic growth might have been smaller than that of industrial countries.

In the standard neoclassical framework of economic growth based on an aggregate production function, economic growth can be divided into two parts—namely, a movement along the production function and an upward shift in the function itself to a more productive level. In the simplest form, capital accumulation (that is, an increase in the capital-labor ratio or *capital deepening*) could increase output per labor (or *labor productivity*) along the production function, but at a decreasing pace due to diminishing returns to capital. That is, without shifts in the production functions (or *Total Factor Productivity (TFP)* growth), capital accumulation could not sustain the high growth rates of these economies indefinitely. Shifts in the production functions, referred to as *technical change*, however, could offset diminishing returns to capital. Adopting new, more productive production functions is akin to replacing existing trains with newer and faster trains.

It has become well known that TFP growth has played an important role in economic growth in East Asia. Whether these economies will encounter diminishing returns to capital or successfully "change trains" for new capital after having attained remarkable economic growth with unprecedented capital accumulation, could have rich implications for other developing economies. So far, empirical estimates of the contributions of factor inputs and TFP growth to East Asia differ widely (see Table 1). The IMF (1998) summarizes that, while capital accumulation was generally found to have made the largest contribution, productivity growth is found to have made smaller but still significant contributions in East Asia.

It should be noted that since various authors estimated TFP growth of various economies over various subperiods with various methods of measurement, it is difficult to make any generalization about TFP growth performance based on these past studies. Estimates of TFP growth are known to be very sensitive not only to differences in empirical methods and assumptions, but to choice of periods.[1] Nevertheless, thanks to Collins and Bosworth (1996), we can examine growth performances from the perspective of international comparison in Figure 1.

Table 1. Various Estimates of Total Factor Productivity Growth for East Asia
(annual growth, percent)

	Period	Hong Kong, China	Korea	Singapore	Chinese Taipei	Indonesia	Malaysia	The Philippines	Thailand
Young (1995)	1966–90	2.3	1.7	0.2	2.6				
Bosworth et al. (1995)	1960–80		0.7	0.3	1.3	1.0	0.7	0.5	1.1
	1986–92		1.9	4.0	2.5	0.8	2.8		4.0
Sarel (1996)	1975–90	3.8	3.1	1.9	3.5				
Sarel (1997)	1979–96			2.5		0.9	2.0	-0.9	2.0

Source: International Monetary Fund (1998), Table 3.2.

[1] For a detailed analysis of the various reasons for the wide-ranging estimates and their implications, see IMF (1997, pp. 82-83.)

Figure 1. GDP, Capital-labor Ratio and TFP, 1960–1994

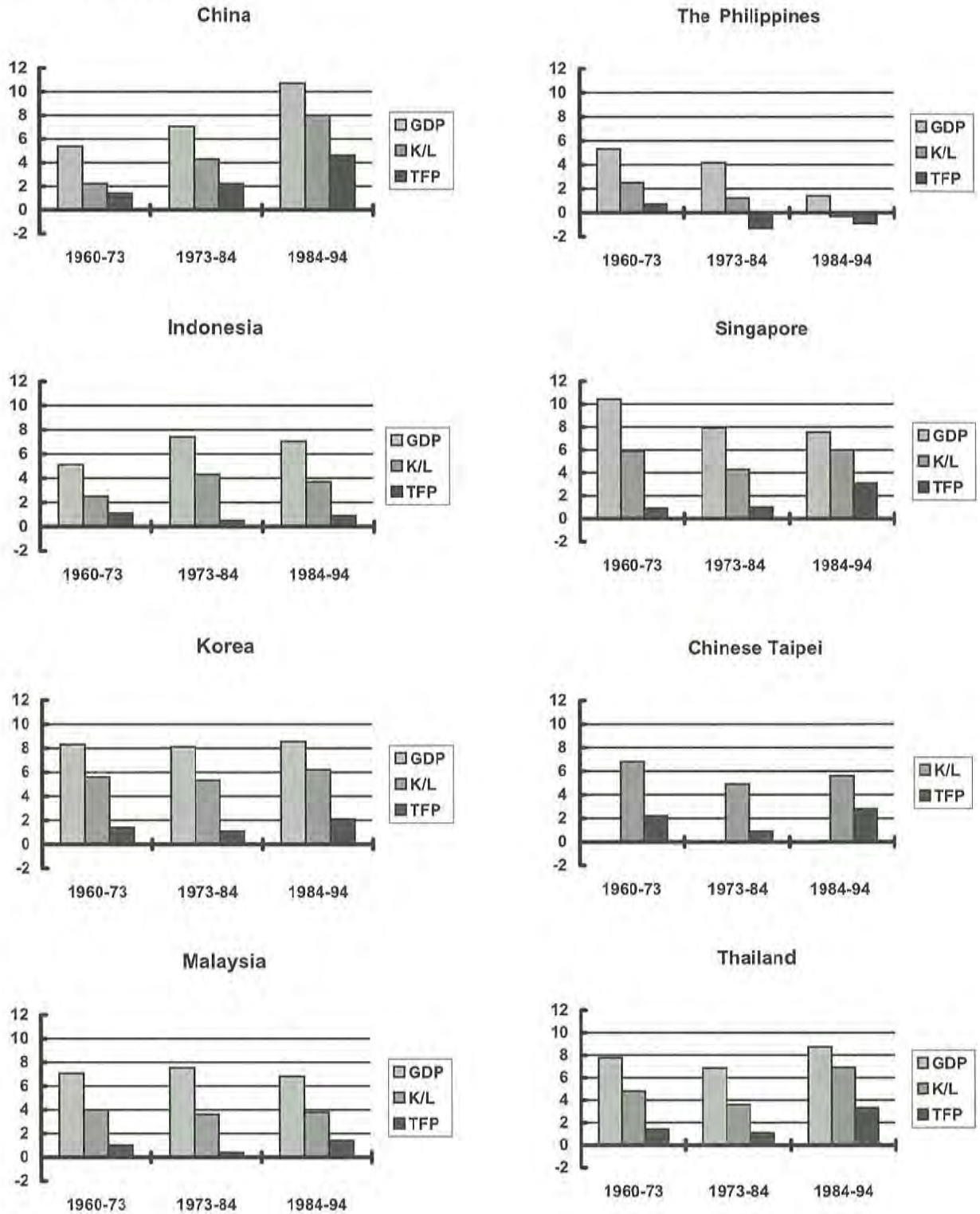
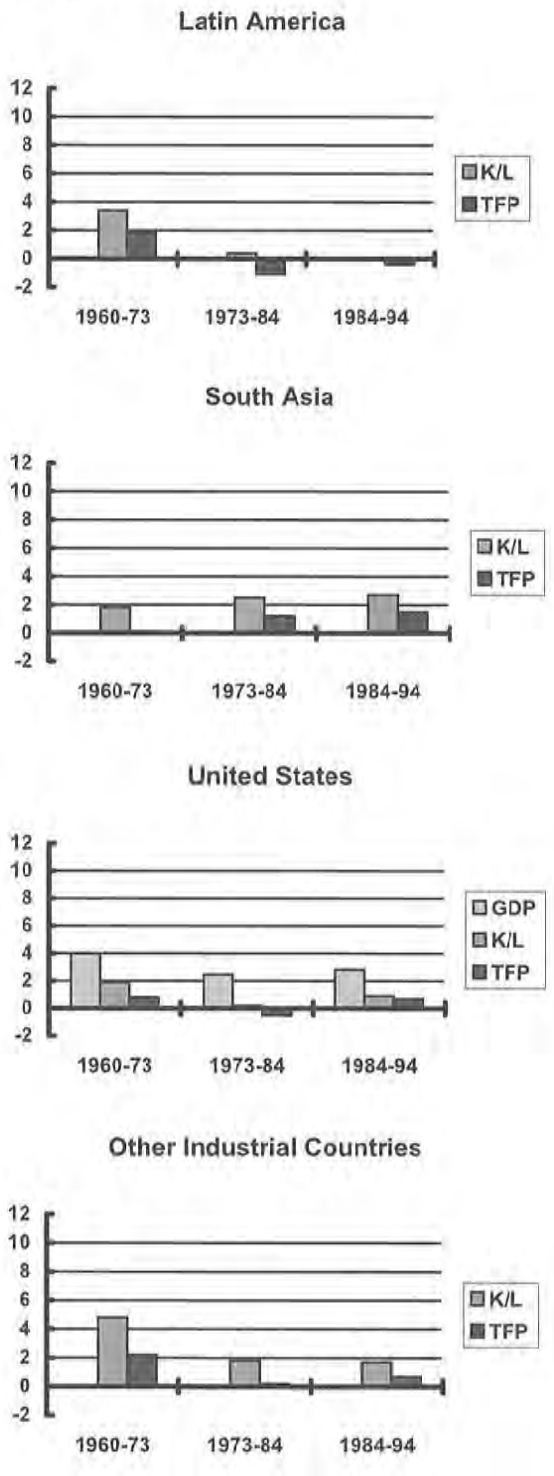


Figure 1. Continued



Source: Collins and Bosworth (1996) and World Development Indicator CD-ROM (1999)

From Figure 1, we can summarize the following:

1. Capital deepening throughout the period 1960-1994 was astounding in East Asia (except for the Philippines) as compared to developed countries (i.e., the United States and other industrial countries) and other developing economies (such as the Philippines, Latin America, and South Asia);

2. As a result, for the East Asian economies, the contribution of TFP to GDP growth relative to capital deepening was occasionally smaller than in other economies. However, this is not because their TFP growth was low relative to other economies;

3. In fact, their levels of TFP growth were significantly higher than those of not only developing, but also industrial economies in all subperiods, except for other industrial countries in 1960-1973;

4. Both the relative contributions to growth and levels of TFP growth appear to follow increasing trend over the three observation subperiods.[2]

[2] Sarel (1998) also ascertained from re-examining Young (1995) and other studies on TFP growth in East Asia.

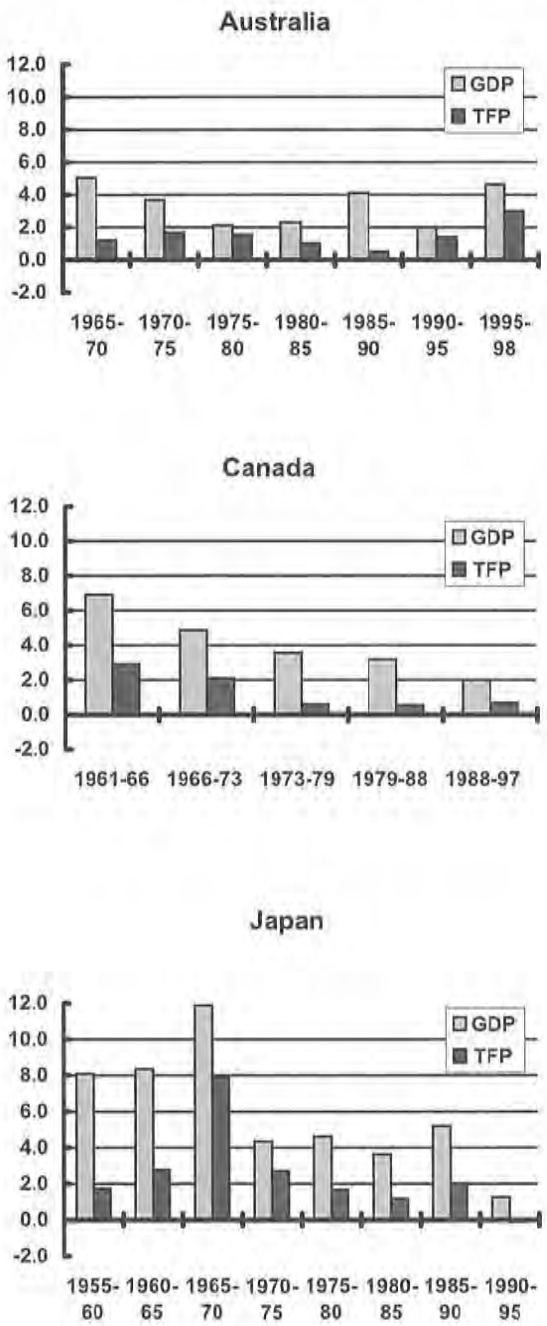
3.AGGREGATE TFP GROWTH

With updated national data sets, Figures 2 through 4 (and Appendix) show long-term trends in both GDP and TFP growth in the Pacific region. Because there are differences in measurement of TFP across economies, cross-economy comparisons of TFP growth rates may not be reliable. Nevertheless, their time profiles provide us with long-term trends of relative contributions among sources of economic growth.[3] We will discuss these trends by groups of economies.

The 1970s represented an important turnaround in terms of growth patterns in industrial economies—namely, Australia, Canada, Japan, New Zealand and the United States (Figure 2). In the Pacific region, except for Australia, the industrial economies suffered from significant declines in both GDP and TFP growth. On average, since the 1970s, TFP growth has been far lower than 2 percent, while it constitutes a significant portion of value-added growth due to the relatively modest real growth rates in these economies. The pace of TFP growth decline was faster in Canada and the United States compared with Australia and Japan.

From the 1990s onward, TFP growth appeared to pick up in the industrial economies in the region, with the exception of Japan which has been in a deep recession. Deregulation measures have been said to motivate the change in Australia, Canada and New Zealand, and the IT revolution must have had some impact on this change in the United States (though this is difficult to prove).[4]

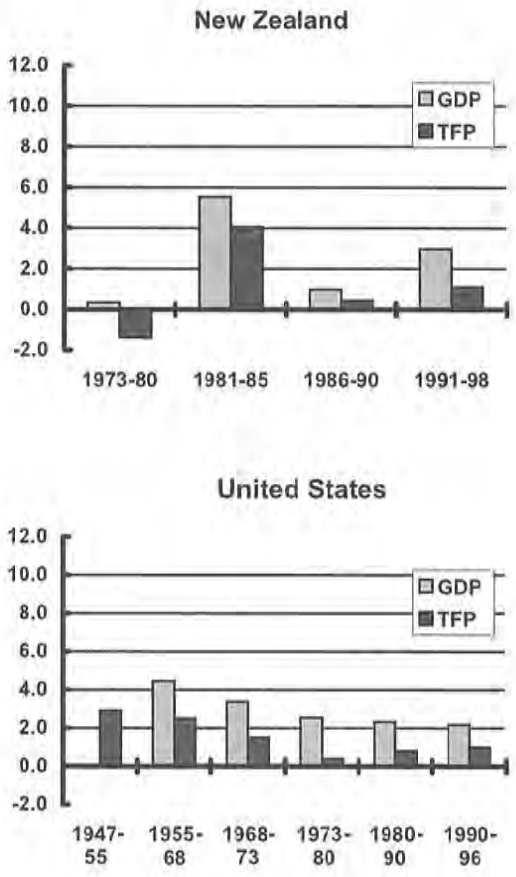
Figure 2. Growth of Aggregate GDP and TFP in Industrial Economies



[3] TFP measurements were provided by the delegates from PECC member economies. For detailed information on these measurements, readers should refer to a volume of background papers (Kohsaka 2000).

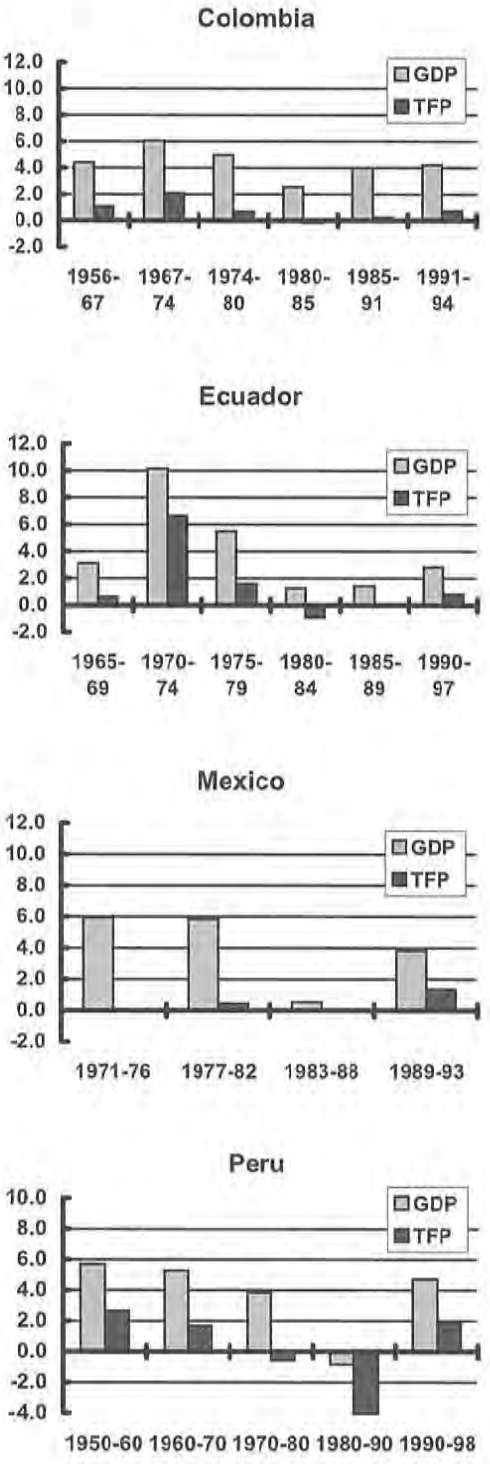
[4] For example, after finding little evidence for a revival of TFP growth in the 1990s in the United States, Jorgenson and Stiroh (1999) conclude that the IT revolution has not been accompanied by TFP growth.

Figure 2. Continued



In Latin America – i.e., Colombia, Ecuador, Mexico, and Peru – TFP growth has been typically lower than 1 percent except for Ecuador in the early 1970s (Figure 3). The lost decade of the 1980s is most clearly represented in the zero or negative TFP growth in these economies, along with poor performance in real GDP growth. At least in the first half of the 1990s, however, there seems to be signs of recovery in TFP (as reported by delegates in the PEO Structure Group) as well as GDP growth across all the economies.

Figure 3. Growth of Aggregate GDP and TFP in Latin America

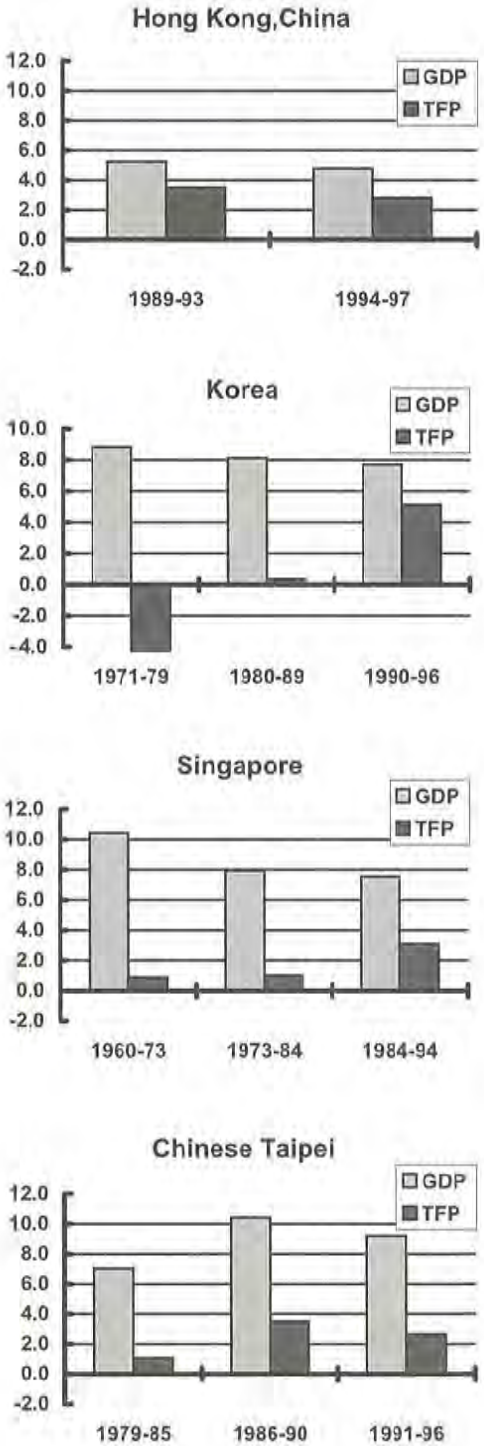


Even in the Asian developing economies, cyclical downturns in the early 1980s affected TFP performance (Figure 4). Though they recorded positive real economic growth of more than 5 percent, TFP growth apparently slowed down across the region. By contrast, the late 1980s witnessed strong growth in both real GDP and TFP, except for the Philippines which was undertaking serious structural adjustments. Most of the Asian developing economies recorded more than 3 percent TFP growth on average, constituting a significant part of real growth. Thus, these economies appear to have bid farewell to zero productivity growth.

In the 1990s, however, we report mixed results for TFP performance in East Asia. Even before the Asian economic crisis in 1997, our results showed poor performance in TFP growth in Indonesia, Malaysia, the Philippines and Thailand, and TFP growth was almost equivalent to that of the early 1980s. In fact, there is some evidence that suggests that in East Asia, the efficiency of investment had declined (IMF 1998) and World Bank (1998). We find increasing ICORs in these economies in the early 1990s, which points to the same direction as our TFP estimations.
Meanwhile, the Asian NIEs – i.e, Hong Kong,China, Korea and Chinese Taipei – successfully maintained their growth momentum in TFP.[5] While one may initially have the impression that these economies "broke through" in some mysterious way, historically, this trend is not surprising to the extent that their strong growth performance resembles that of Japan in its postwar rapid growth period of 1955-1972 (see Figure 2).[6]

According to Collins and Bosworth (1996), China has demonstrated remarkable real economic growth accompanied by strong TFP growth, which has also appeared to have strengthened in recent years. The estimates derived by the PEO delegate from Vietnam suggests that Vietnam might have improved its TFP growth along with its rapid real economic growth since the mid-1990s, though data problems remain serious both in terms of quality and quantity.

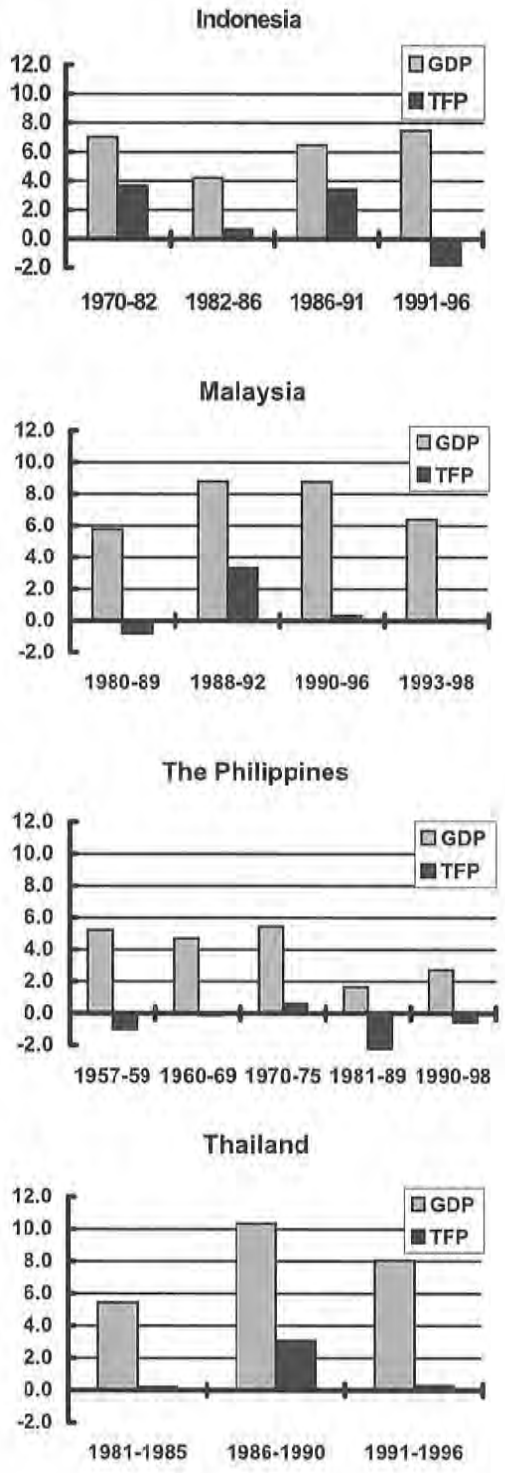
Figure 4. Growth of Aggregate GDP and TFP in Asia



[5] This seems to be the case in Singapore (Collins and Bosworth 1996).

[6] Similar miraculous postwar economic recovery could be traced partially in Figure 1 for other industrial economies.

Figure 4. Continued



4. CHANGES IN INDUSTRIAL STRUCTURE

Suppose shifts in the aggregate production functions or technical change offset diminishing returns to capital; then, how can we interpret these shifts? What happens in the real world in the process of these shifts? As aggregate TFP growth is a weighted average of sectoral TFP growth, changes in aggregate TFP growth are constituted by changes in sectoral TFP growth as well as by their weights, namely, changes in sectoral composition or industrial structure.

Differences in sectoral growth, even if they remain constant, would change aggregate growth as the industrial structure in the economy changes. For example, when agriculture dwindles and manufacturing expands in terms of value-added shares, and when the TFP growth of the former is smaller than that of the latter, the mere shift in value-added shares would increase aggregate TFP growth. In practice, dramatic shifts in product mix have been attained, away from simple agricultural and labor intensive industrial products to sophisticated, capital—and knowledge—intensive industrial as well as post-industrial products in the Pacific region.

Historically we have witnessed a typical pattern of industrialization where in the beginning phase, the share of manufacturing first increases and then declines over time. This pattern is also found across economies in terms of per capita income (World Bank 1987). Determinants of this pattern include technological changes on the supply side and preference changes on the demand side along with income growth.

Figures 5 through 8 (in the end of the Overview) demonstrate sectoral shares in terms of value-added overall by industry as well as within manufacturing by subsector in the Pacific region over time. Industrial economies in the Pacific region have shown more or less a typical pattern of the late industrialization phase (Figure 5). On the one hand, agriculture continued to dwindle (except for New Zealand) from less than 10 percent of GDP and the share of manufacturing declined dramatically, while the services sector increased its share. Although the share of manufacturing as a whole declined, the manufacturing subsectors showed a wide variety of patterns. Since the 1970s, food, textiles, primary metals, and metal products kept

reducing their shares explicitly and commonly within the group. Nevertheless, there are some subsectors that maintained their shares-for example, machinery, particularly general and electric machinery in Japan, and printing, chemicals, and electronic and electric equipment in the United States. Among services, finance, insurance and real estate, or FIRE, and other services increased their value-added shares across the group, constituting a major driving force towards a service economy in the industrial economies.

The Asian NIEs, especially Korea and Chinese Taipei, appeared to follow the same pattern of industrialization as the industrial economies with some time lags (Figure 6). The share of agriculture dwindled sharply, the share of manufacturing as a whole appeared to peak out, and the share of services picked up in the 1980s. One main characteristic of the Asian NIEs that is distinct from the industrial economies is that though overall manufacturing began to decrease, the Asian NIEs continue to have rapidly expanding manufacturing subsectors. In Korea, these subsectors are chemicals, metal products, electric and electronic equipment, and transportation equipment, and in Chinese Taipei, they are basic metal and electric and electronic equipment. In both cases, food and textiles are losing their shares as is the case in industrial economies. Along with sustained income growth, like in developed economies, there is also some evidence of movement towards a services economy in the Asian NIEs, or a slight, but explicit increase in social and other services.

Hong Kong, China and Singapore faced similar deindustrialization, though earlier than in Korea and Taipei. Particularly in Hong Kong,China, the share of manufacturing dropped to less than 10 percent of GDP in the 1990s. The share of finance, insurance and real estate (FIRE) led the increasing trend of the services sector in Hong Kong,China as well as in Korea and Chinese Taipei. Singapore is more manufacturing-driven than Hong Kong,China; thus chemicals, including pharmaceuticals, and machinery, including electronics, increased their shares despite the general decline in manufacturing. The industrial structure and its changes in Indonesia, Malaysia, and Thailand are very different from those of the Asian NIEs (Figure 7). First, these ASEAN economies have a relatively large agricultural sector, though the relative share of this sector is falling. Second, manufacturing as a whole has continued to expand and remains a very dynamic sector. Third, services have not yet shown an explicit rising trend. In Indonesia, for example, the textiles, garment, wood product, non-electrical machinery and electrical equipment sectors have grown rapidly. In Malaysia, the industrial, electrical and transport machinery subsectors are growing quickly along with more traditional ones such as leather and wood products.

While we were not provided with enough statistical evidence, very little changes in industrial structure appears to have characterized the Latin American economies in the Pacific region (Figure 8). Mexico and Peru are good examples of this. These countries never experienced a rapid surge in overall manufacturing, i.e., industrialization, though there were some shifts among subsectors within manufacturing. In Mexico, the traditional subsector, textiles, lost its share while chemicals gained, but these changes were far less dramatic than in Asia. It may be too early to find effects of structural changes in these Latin American economies, particularly after their experience of the lost decade as well as historical macroeconomic instability. We will discuss these next when examining sectoral TFP growth.

5.PRODUCTIVITY GROWTH AND INDUSTRIAL STRUCTURE

As aggregate TFP growth is a weighted average of sectoral TFP growth, changes in sectoral TFP growth will change aggregate growth even if the industrial structure remains unchanged. For sectoral TFP growth, there may occur technological progress within individual industries, whether it be through borrowing of known technologies in the case of developing economies or of inventing new technologies in the case of developed economies. In addition, we have observed organizational changes in the process of economic growth.

In the past two centuries, large firms using modern technology have increased in importance and have generally replaced small firms as well as the informal sector that use conventional technology. Today, however, it may be the other way around; that is, new small efficient firms sometimes kick out the "old dinosaurs."[7] These organizational

[7] The role of entry and exit of firms in sectoral TFP growth is discussed for the case of Japan in Kawai (2000).

changes constitute part of sectoral TFP growth.

Given the changes in industrial structure shown in the previous section, how can we relate differences in sectoral TFP growth to aggregate TFP growth? (Figures 9 through 12 in the end of the Overview) In industrial economies, while its value-added share kept declining, TFP growth in manufacturing as a whole has been higher than aggregate TFP growth (Figure 9). Within manufacturing, however, the subsectors show a variety of patterns in TFP growth. TFP growth is either low or slowing down in some subsectors such as food and textiles, while it has remained high in other subsectors such as machinery and electric and electronic equipment. One may be able to say that growing subsectors tend to have higher TFP growth within manufacturing.

One may wonder why we cannot trace any impact of the information technology (IT) revolution within the manufacturing sectors. In fact, while electric and electronic equipment or machinery shows robust and relatively high TFP growth, it is not necessarily remarkable and does not show any particular upsurge in more recent periods except for electronic and other electric equipment in the United States for 1990-1995. For the latter, we are not confident whether in fact IT explains the rise in TFP, since other studies suggest that most of the impacts of the IT revolution are embodied in capital goods and do not take the form of technological progress as evidenced in TFP growth (e.g., Jorgenson and Stiroh 1999).

Somewhat surprisingly, while the share of agriculture in terms of value-added is becoming increasingly smaller (except for New Zealand), TFP growth in this sector is relatively high in Australia, New Zealand and the United States. It is said that deregulation for Australia and New Zealand and R&D for the United States can account for this. In the services sector, in general, while communications shows relatively high TFP growth except for Japan, we do not find any other general tendency across the subsectors. This may be partly due to measurement difficulties that are intrinsic to the services sector. For example, TFP growth in the FIRE subsector appears to be relatively high in Australia and Japan, but negative in Canada, New Zealand and the United States, but few would believe that Japan has more productive financial institutions than the United States.

In the 1980s, both Korea and Chinese Taipei experienced a turning point from increasing to decreasing trends of manufacturing in terms of the share of value-added. Nevertheless, manufacturing as a whole shows significantly high TFP growth in Korea and Chinese Taipei, while that of services is in many cases low and/or negative in Korea but high in Chinese Taipei (Figure 10). Within manufacturing, it is obvious that declining subsectors (for example, food and textiles) tend to have lower TFP growth and emerging sectors tend to have remarkably high TFP growth (e.g., chemicals, machinery, electronic equipment, transportation equipment, etc.). Because of the measurement difficulties, we cannot discern the reasons for differences in TFP growth in the services subsectors between these two NIEs. Again, we find that declining sectors tend to have lower TFP growth and emerging ones higher TFP growth within manufacturing.

Due to severe business cycles, volatile capacity utilization appeared to lead to underestimation of TFP growth in Singapore for the first half of the 1980s. Taking this into account, we see a similar positive correlation between TFP growth and share growth within the manufacturing subsectors in Singapore, as well.

In contrast to the NIEs, which showed increasing trend in manufacturing value-added, manufacturing as a whole has shown more or less significant positive TFP growth in Indonesia, Malaysia and Thailand (Figure 11). In agriculture, whose value-added share is declining, we see either low or negative TFP growth. There seems to be little evidence of significant TFP growth in the services subsectors. For Indonesia and Malaysia, our estimates suggest that there is more or less positive correspondence between share growth and TFP growth across subsectors within manufacturing.

Macroeconomic instability makes it difficult to obtain reliable TFP estimates in Latin America. This instability is also the reason for the relatively poor performance in growth of value-added as well as productivity growth. Measurement difficulties may be exaggerated particularly for disaggregated

TFP estimates. Admitting this and knowing the limitations of our results, we nevertheless undertake a comparative approach to estimation of sectoral TFP growth in those economies. One of our findings is that manufacturing appeared to eventually gain non-negligible TFP growth in the 1990s (Figure 12).

In Colombia, non-agriculture recorded positive TFP growth for the first time in the past two decades. This is also the case for Peru. Within manufacturing, textiles, wood, metals and machinery show positive TFP growth in both economies. Ecuador has also shown positive TFP growth in metals and machinery in recent years. Colombia has shown robust TFP growth in agriculture, but Peru has not.

TFP growth of manufacturing subsectors appears robust in food, textiles, wood, paper, chemicals, metal and machinery in Mexico. Apparently, TFP growth in manufacturing as a whole is significantly higher than that of the rest of the economy. We find some positive correlation between relative TFP growth and share growth within manufacturing as was the case in the industrial economies and the Asian NIEs, but resulting structural changes were surprisingly less dramatic than in those economies.

6. CONCLUDING REMARKS

Most of the debate on the sources of postwar economic growth has focused on the relative contribution that factor inputs (capital deepening) and technological progress have made to the persistently high rates of growth in aggregate production. A popular approach has been to deduct from growth in output per worker the accumulation of (physical and human) capital, and to interpret the residual as total factor productivity (TFP) growth. This TFP growth is regarded as coming from technological progress and improvements in organizational efficiency.

Why is there such concern for TFP growth? The answer to this question is that TFP growth appears to eventually become the main source of economic growth in industrial economies. This would also imply that without TFP growth, economic growth would eventually slow down in developing economies. If this is the case, greater effort should be devoted to structural changes that enhance the role of technological and efficiency gains.

As we noted earlier, aggregate TFP growth is the result of a combination of TFP growth in the sectors and the composition of the sectors (i.e., industrial structure). Thus, changes in industrial structure play an important role in determining aggregate TFP as well as real economic growth. In fact, higher TFP growth seems to be correlated with faster structural changes.

In our exercise of estimating TFP growth at the aggregated and disaggregated levels in the Pacific region, the main observations we obtained can be summarized as follows:

1. The industrial economies (i.e., Australia, Canada, Japan, New Zealand and the United States) appears to have succeeded in checking a declining trend in TFP growth since the 1970s, and reverting to a new higher productivity growth path in the 1990s.[8] De-industrialization – that is, an ever-dwindling agriculture and a declining trend for manufacturing – characterized these industrial economies, while some services subsectors with relatively lower TFP growth also experienced increases in their value-added shares.[9] Within manufacturing, however, subsectors with higher (lower) TFP growth tended to increase (decrease) their shares, which must have helped to support aggregate TFP growth.

2. The Asian NIEs (i.e., Korea, Chinese Taipei, Hong Kong, China and Singapore) succeeded in maintaining their TFP growth momentum since the late 1980s. They appeared to go through a transition from industrialization to deindustrialization in the 1980s.[10] These economies are distinct from the industrial economies in that they have had rapidly growing manufacturing subsectors with remarkably high TFP growth, which without a doubt, helped to support the high aggregate TFP growth.

3. In contrast to the Asian NIEs, after the recovery of TFP growth in the late 1980s, the high-performance ASEAN economies (Indonesia, Malaysia and Thailand) appear to have experienced a slowdown in their TFP growth in the

[8] Japan is the exception because of a serious recession in the 1990s.

[9] New Zealand is an exception because agriculture is increasing its share.

[10] Hong Kong,China is an exception because its manufacturing had dwindled.

early 1990s. Distinct from the Asian NIEs, ASEAN manufacturing in total kept increasing its shares. While the ASEAN countries have growing subsectors within manufacturing, their TFP growth appears to be modest relative to those of the Asian NIEs. TFP growth in the Philippines is disappointing both in terms of the aggregate and sectoral figures since the 1980s, while aggregate TFP growth appears to be significantly positive for Vietnam in the recent period and for China since the 1980s.

4. After the lost decade of the 1980s, the Latin American economies (Colombia, Ecuador, Mexico and Peru) eventually saw a recovery in TFP growth in the 1990s. We can generally characterize these economies as having had very little change in industrial structure. Some symptom of positive TFP growth, nevertheless, can be found in some subsectors within manufacturing in the early 1990s.

With disaggregation, we can identify two distinct sources of productivity growth – namely, changes in industrial structure and changes in technological and organizational efficiency. In view of the past experiences in the Pacific region, the more rapid economic growth appears to go hand in hand with rapid structural changes among industries, as well as with rapid technological advances within industries. Then, what can we say about the sustainability of real economic growth in the region in the future?

First, though capital deepening and TFP growth has been higher in East Asia than in the industrial and other developing economies, even their levels of capital stock and TFP are said to be still significantly lower than those of industrial economies (Kim and Lau 1994, Collins and Bosworth 1996). Thus, there remains ample room for catching up in terms of both levels of capital stock and TFP in developing economies such as those in Asia and Latin America.

Second, since economic growth is a process associated with significant structural changes and since these changes have just begun in the postwar period in these developing economies, there is ample room for further structural changes. There is no need to remind us here that these catching-up processes are never automatic. Technology transfer cannot be attained without costs and deliberate efforts, and structural changes cannot be realized without costs and efforts to enhance factor mobility. Last, but not least important, macroeconomic stability is an important precondition for all of the above.

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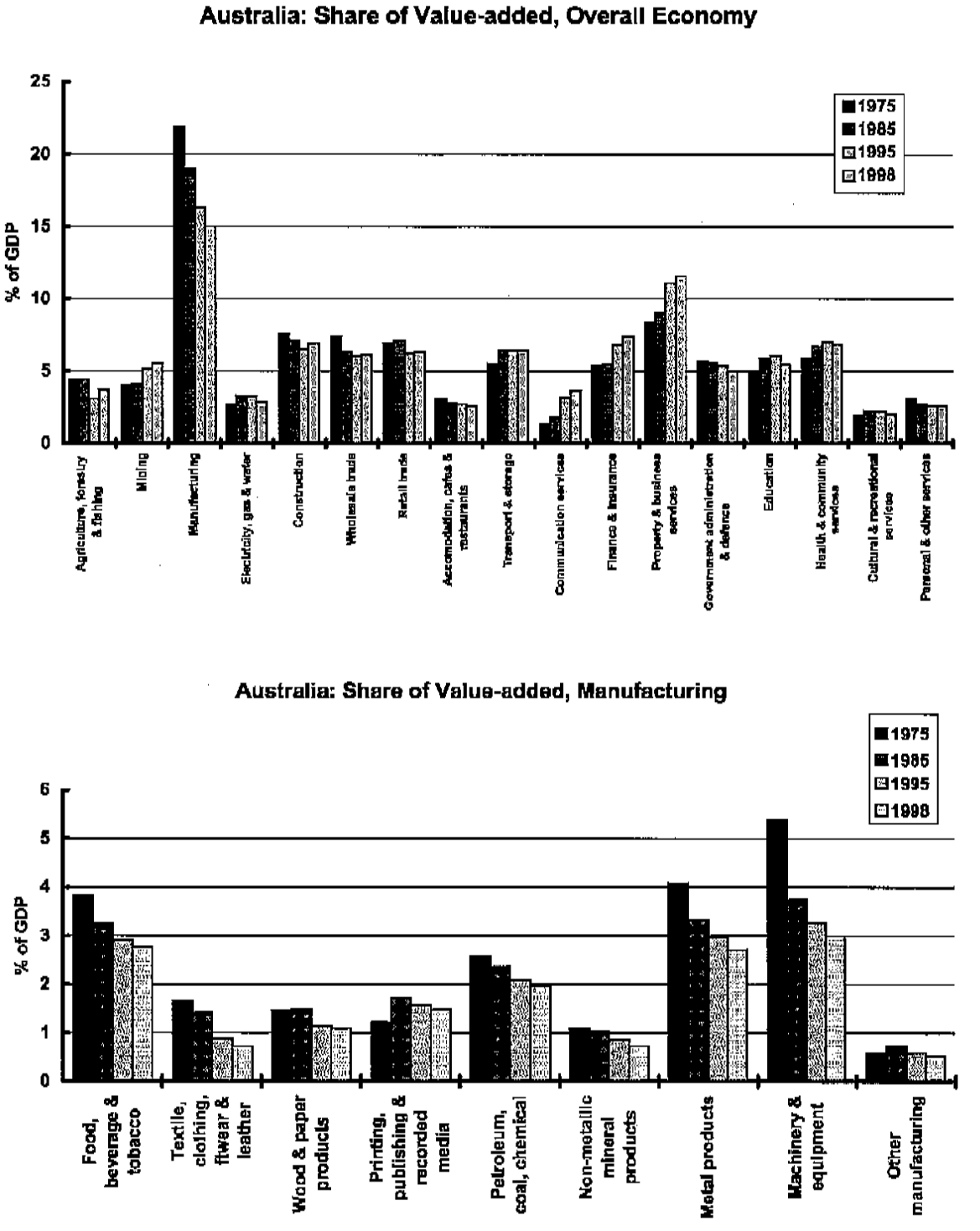
Figure 5. Changing Industrial Structure in Industrial Economies



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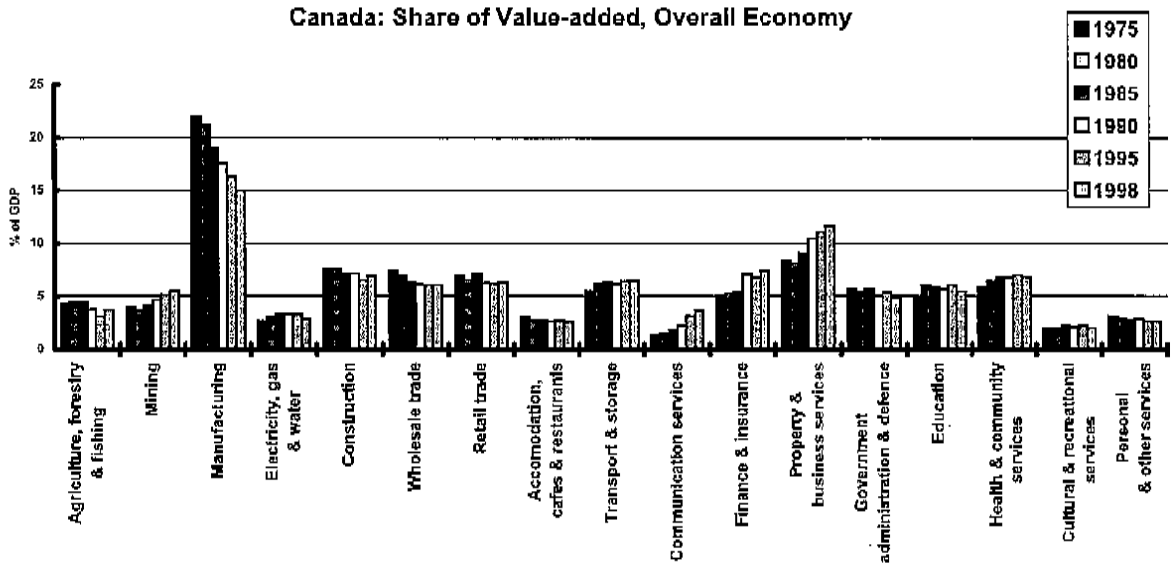

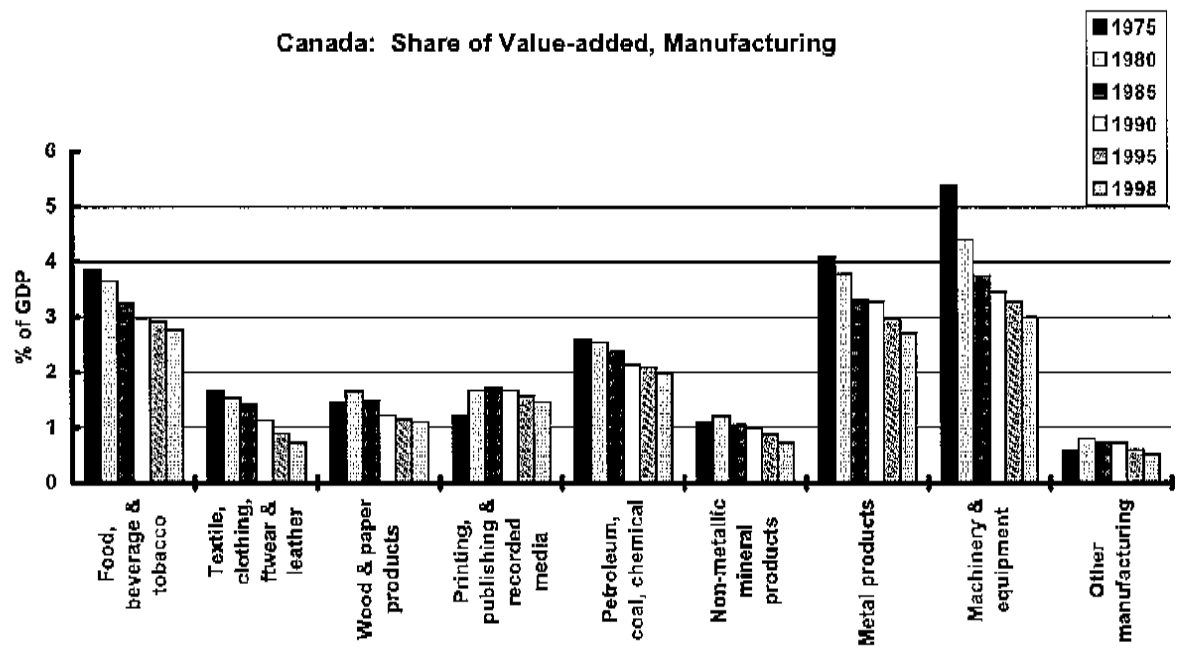

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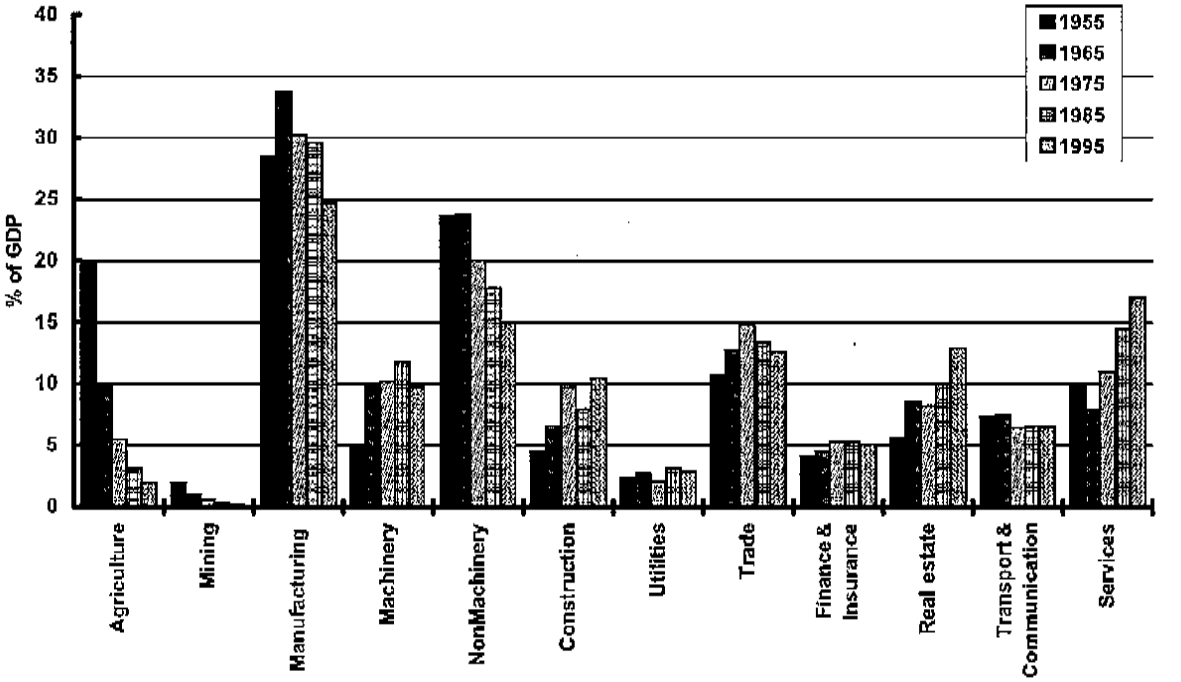
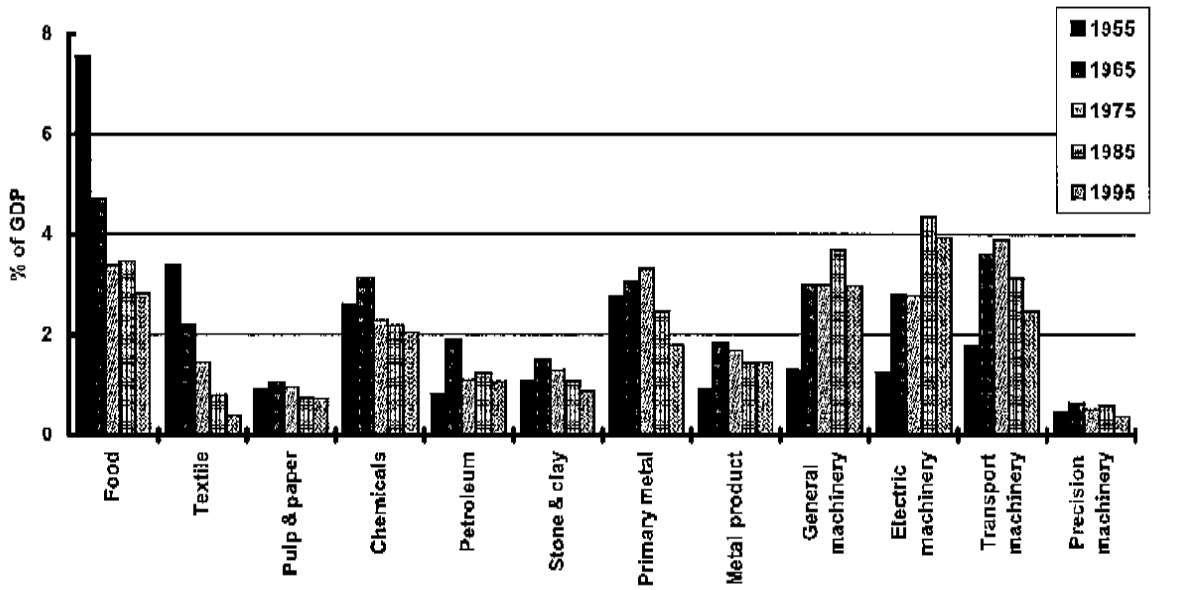
Japan: Share of Value-added, Non-manufacturing



Japan: Share of Value-added, Manufacturing



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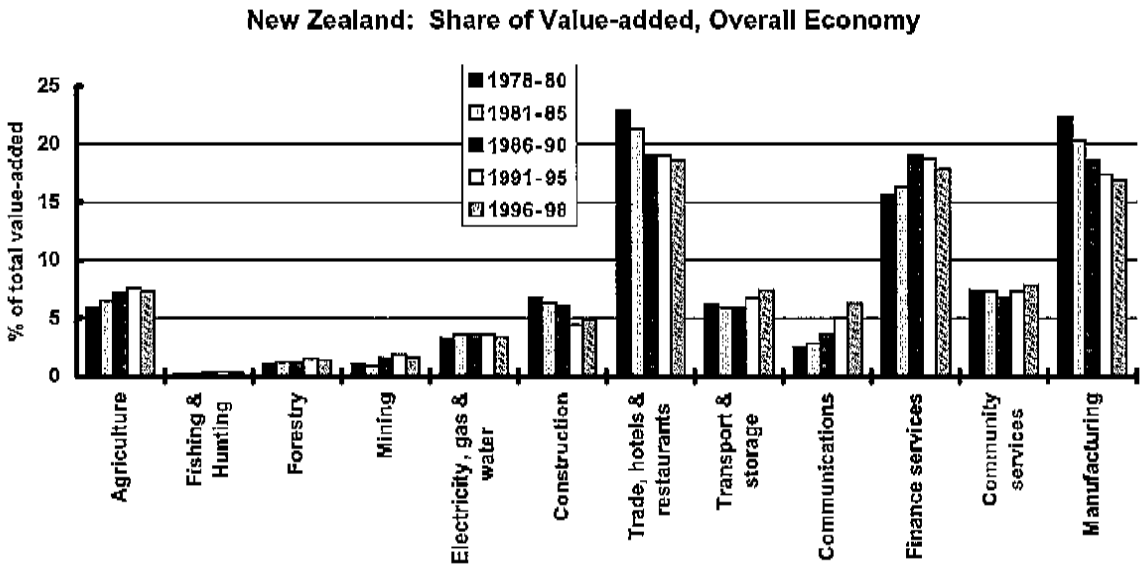

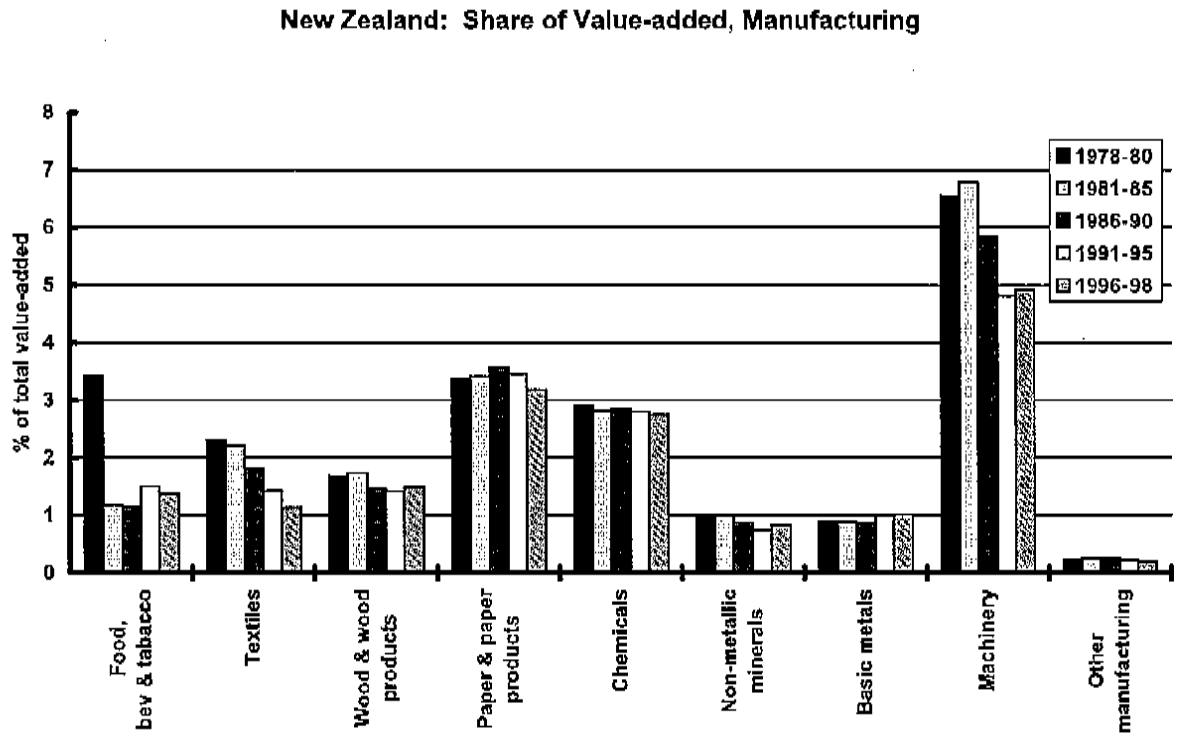

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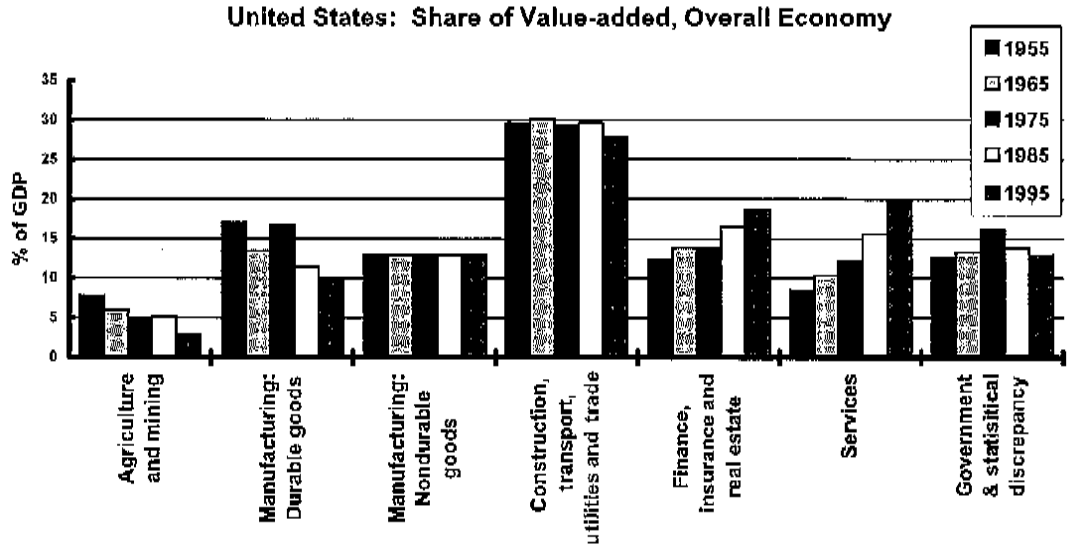

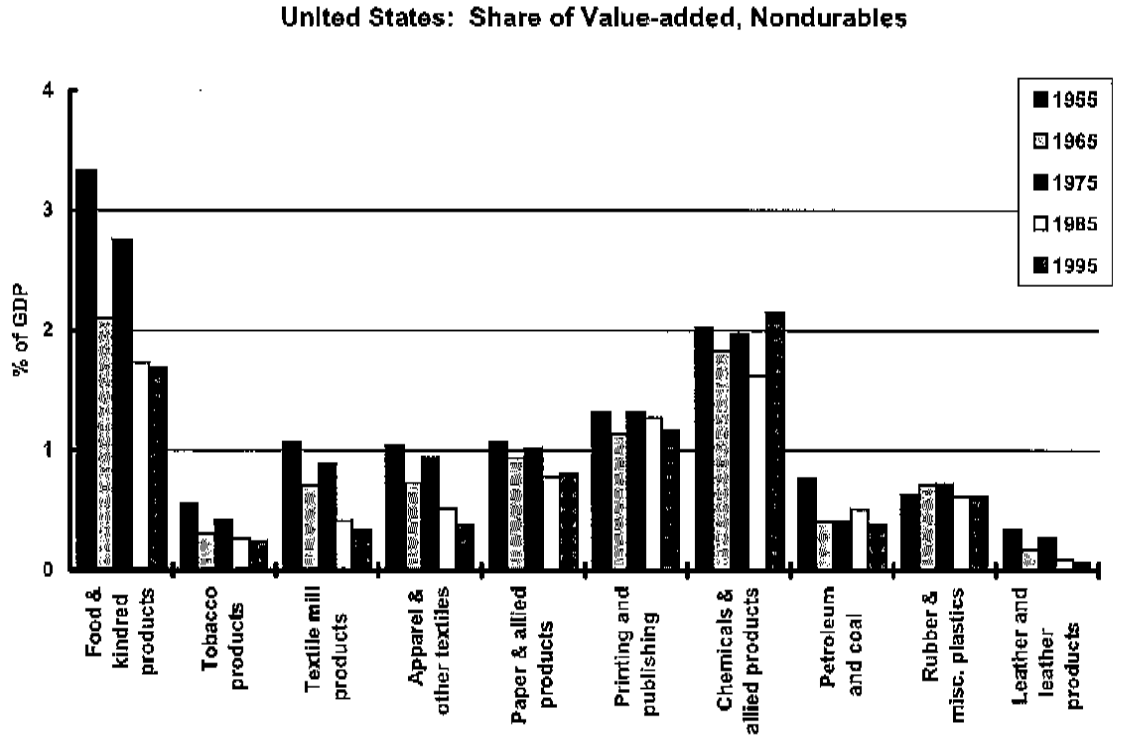

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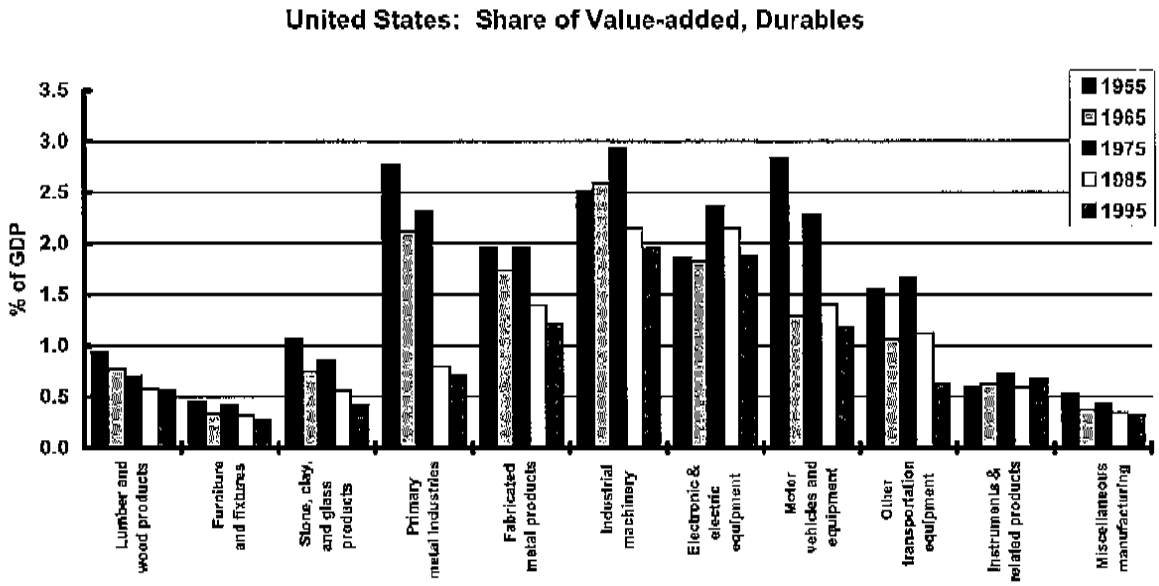
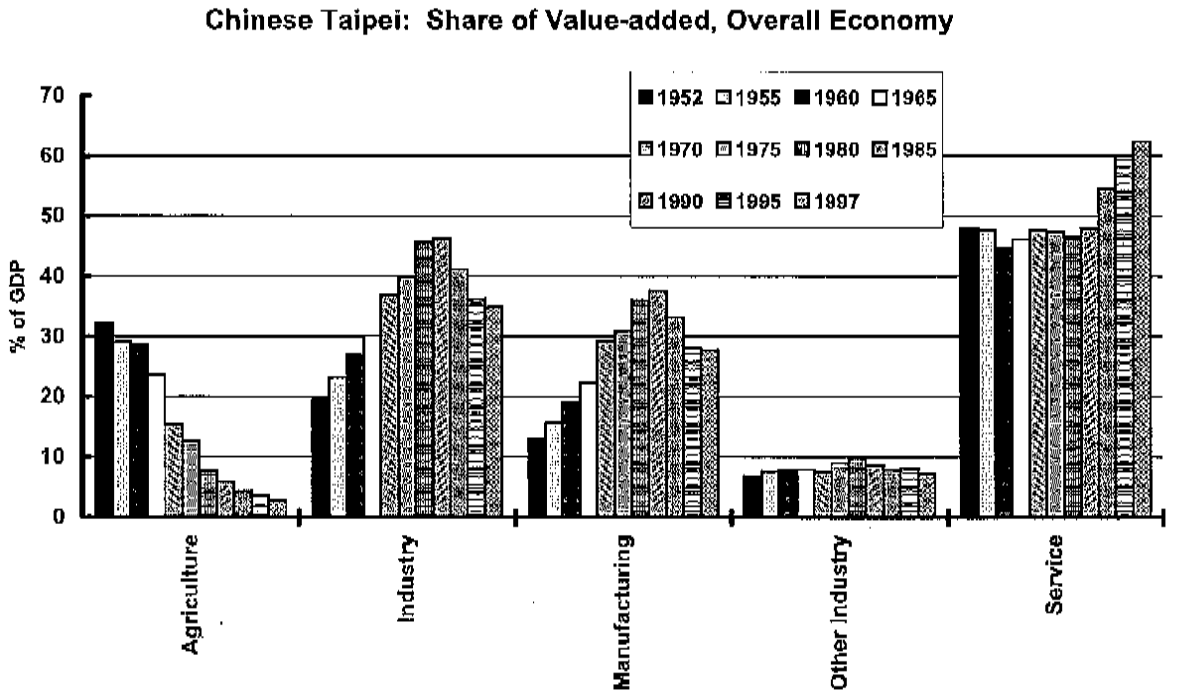
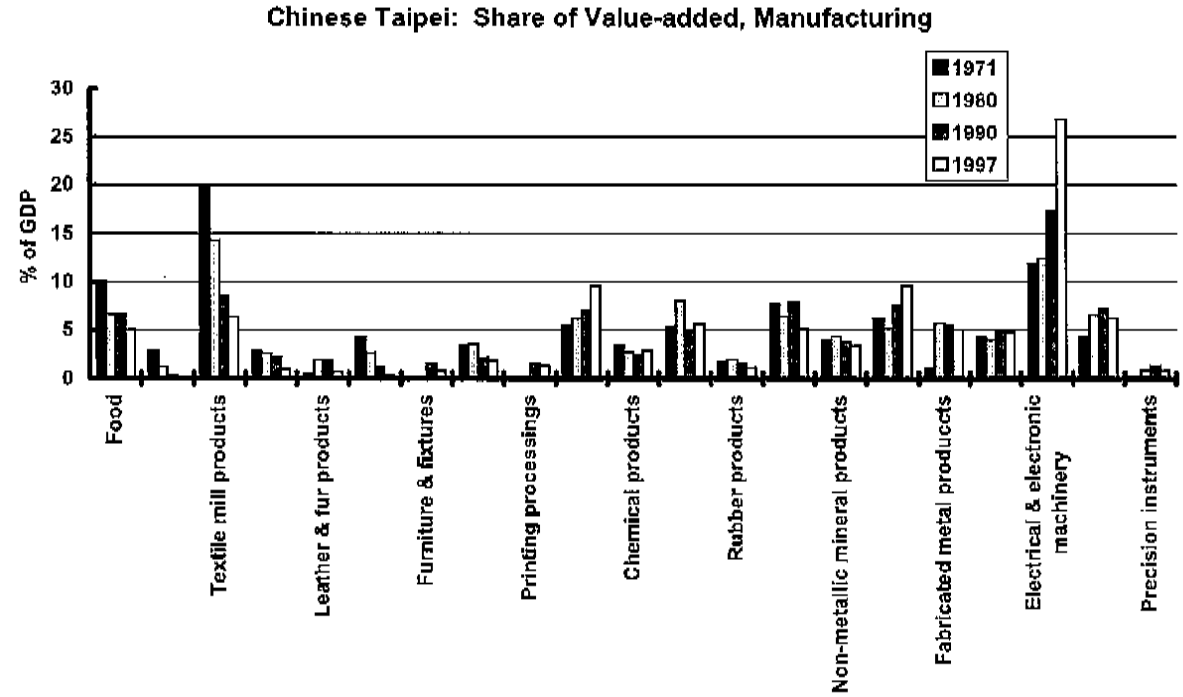


Figure 6. Changing Industrial Structure in the Asian NIEs





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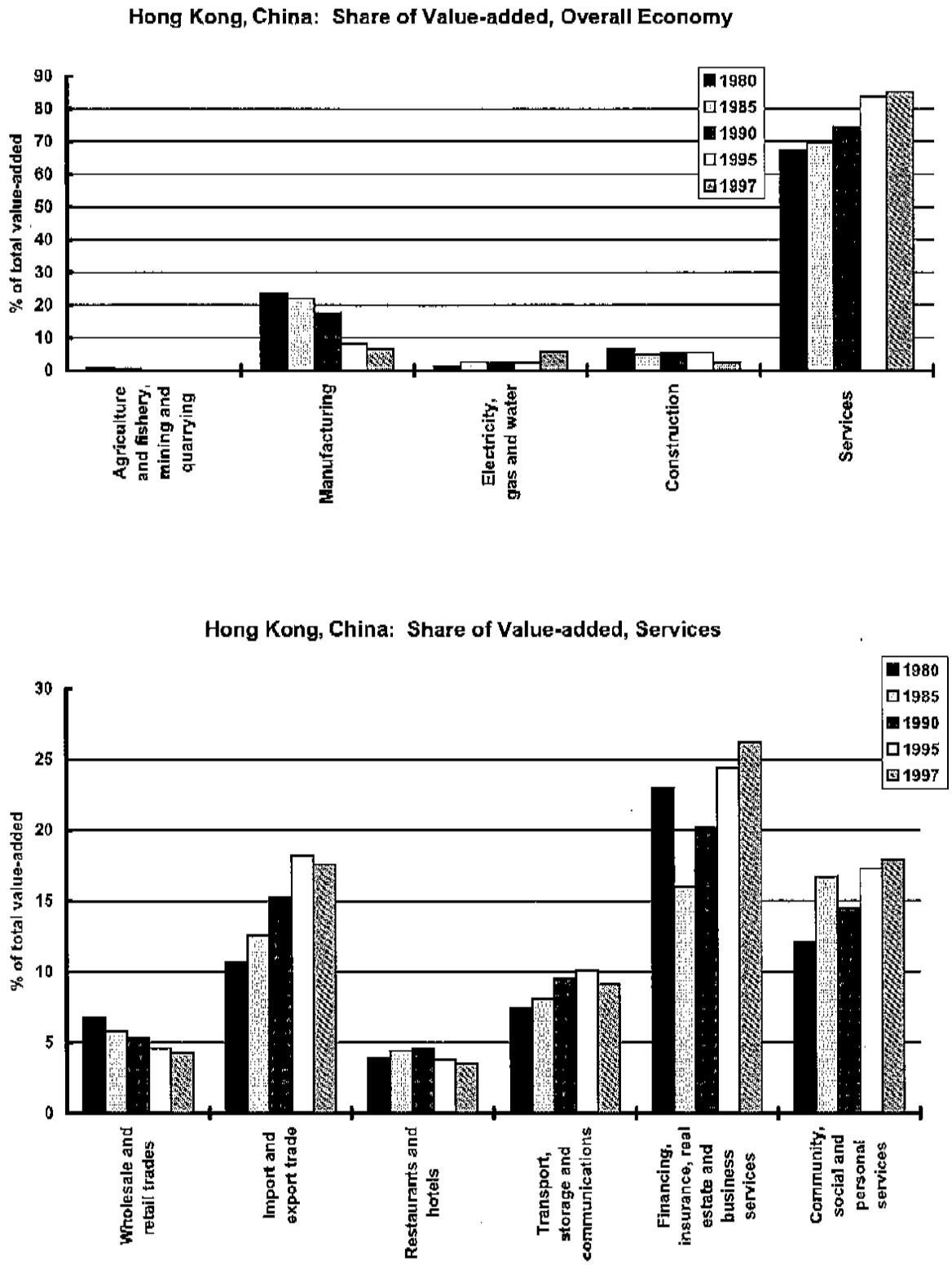

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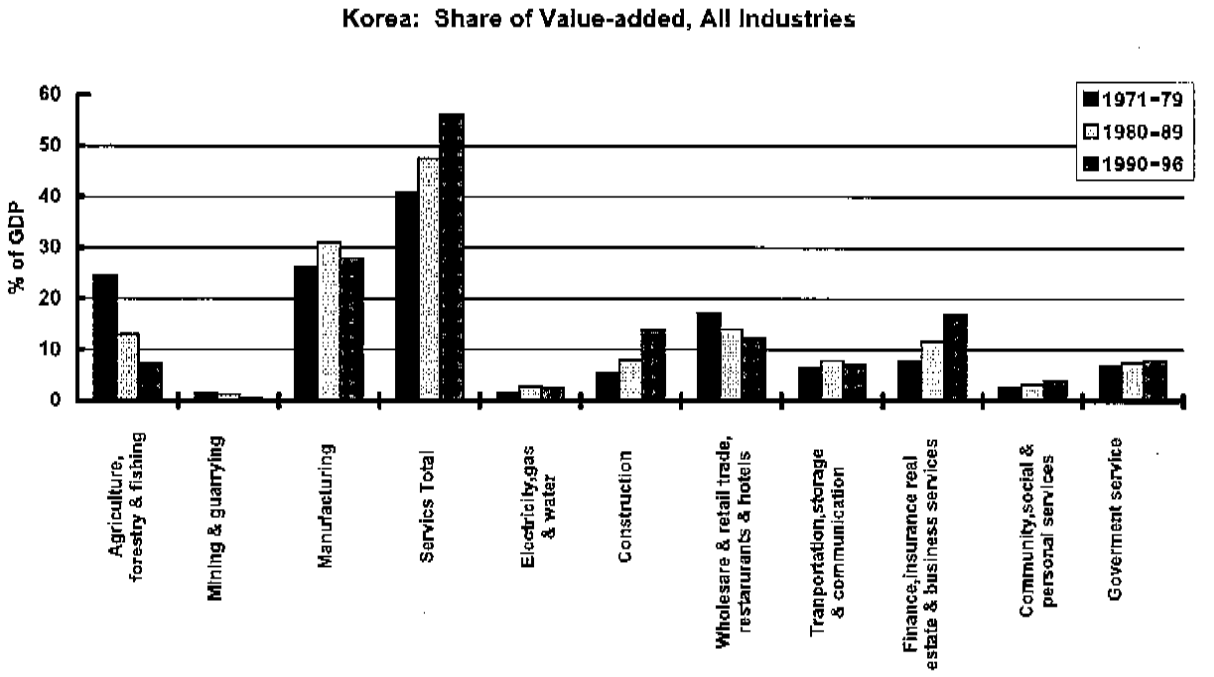

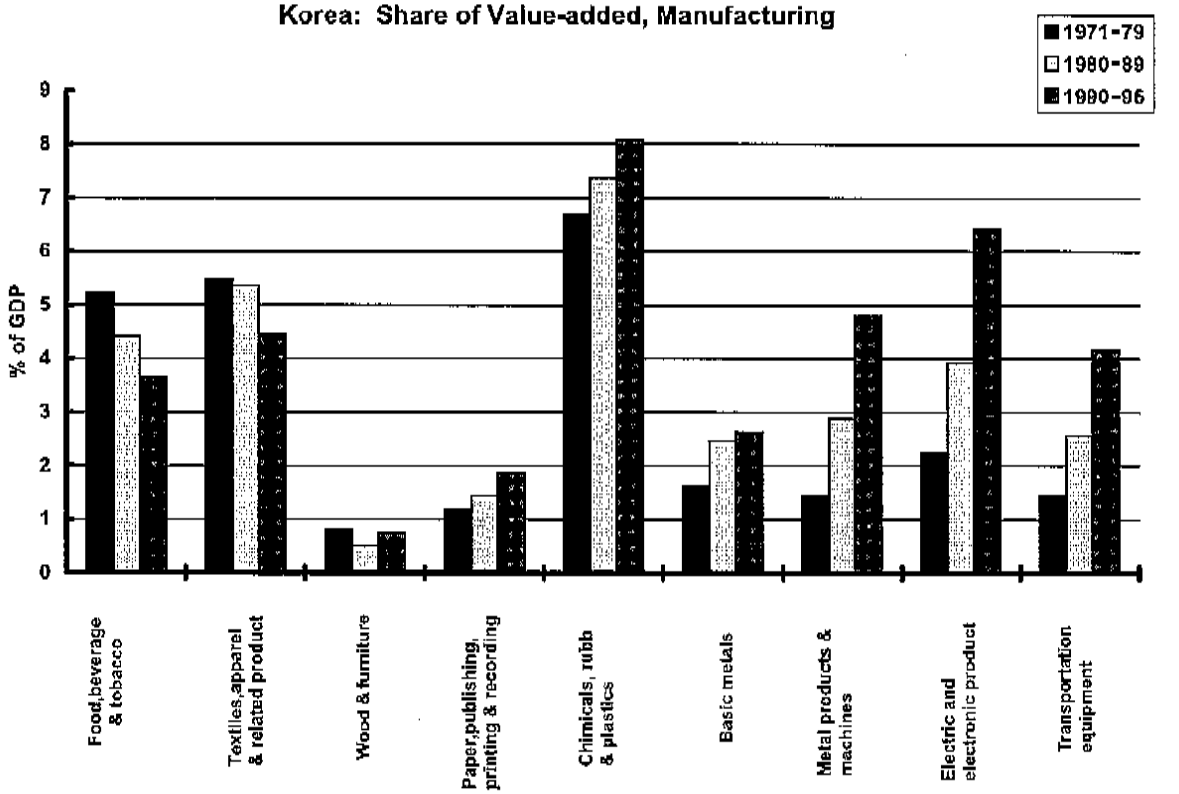

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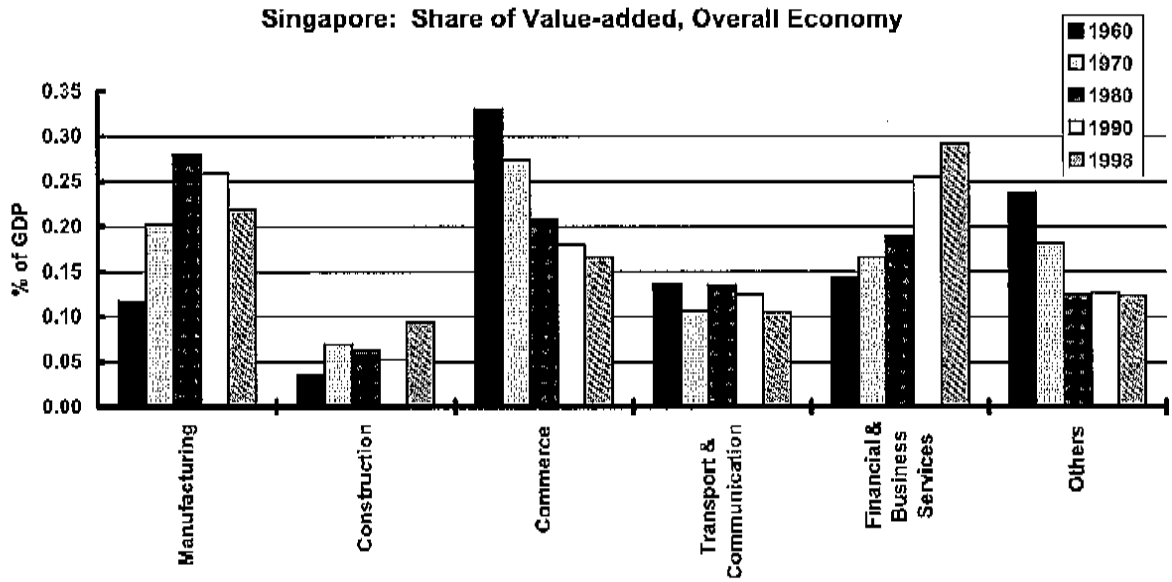
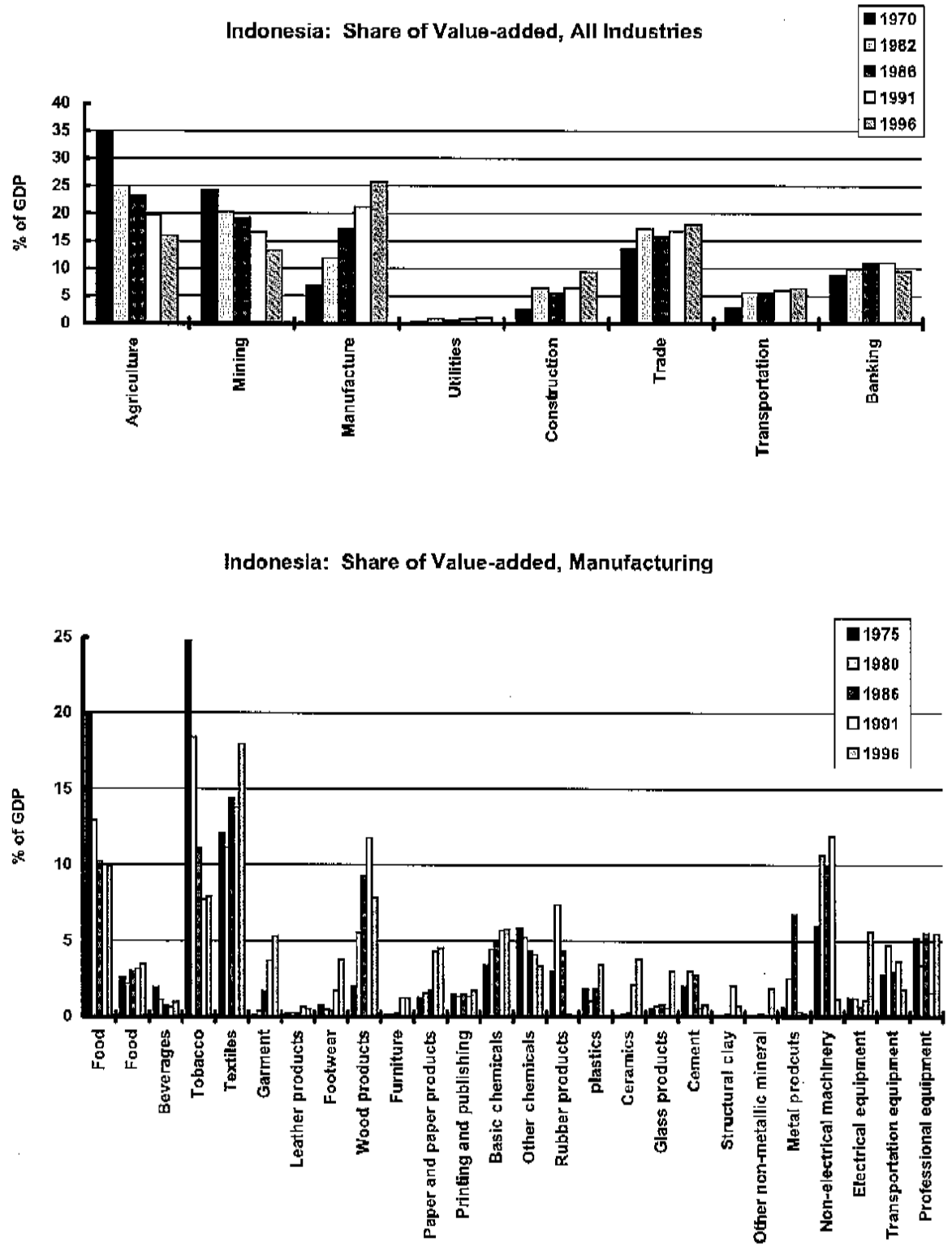


Figure 7. Changing Industrial Structure in Other Asian Economies



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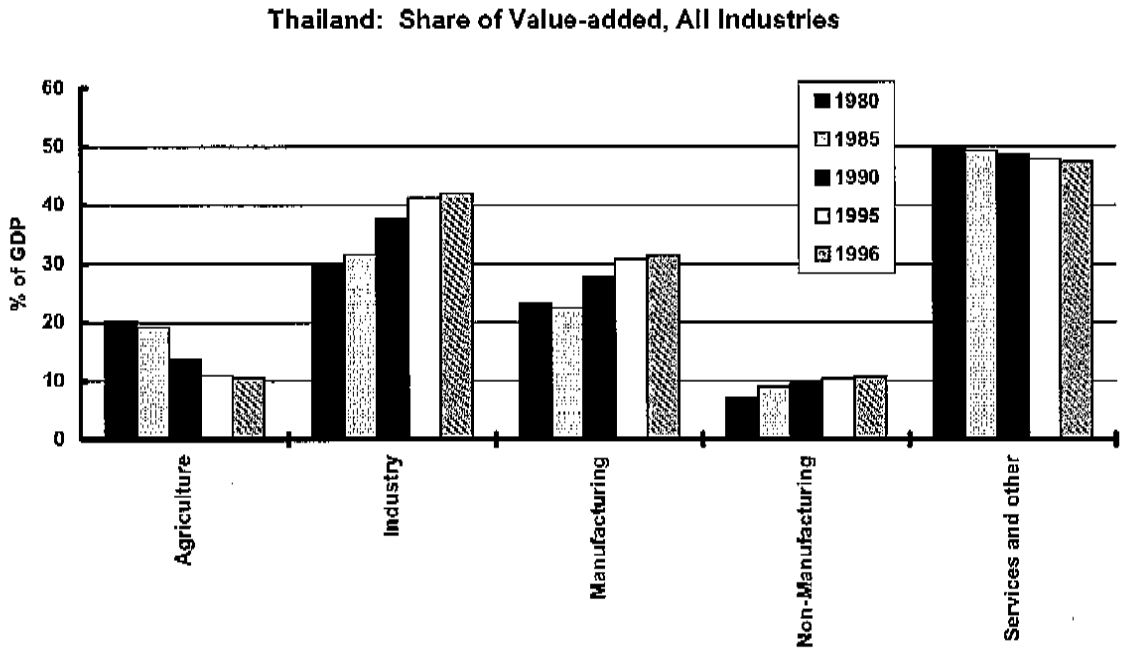


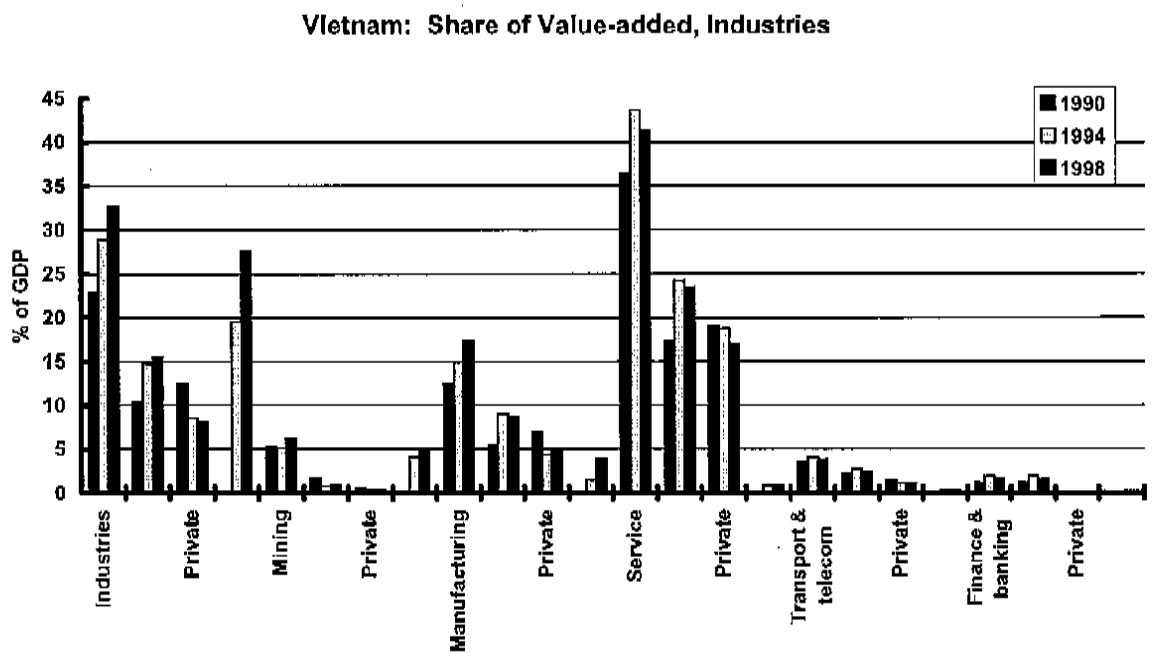
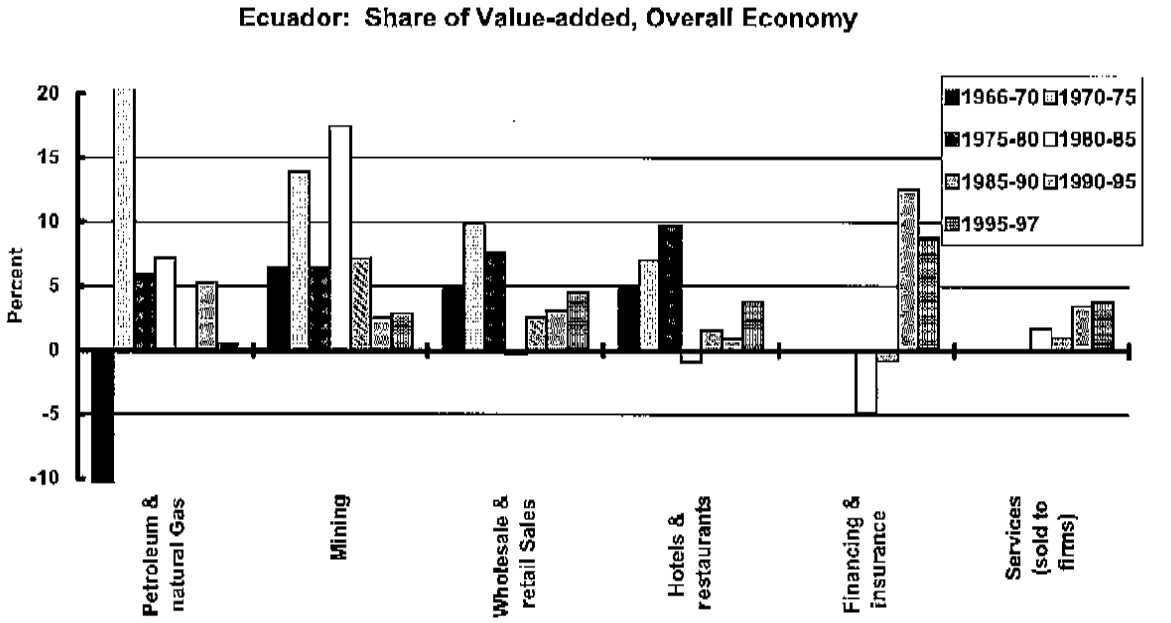
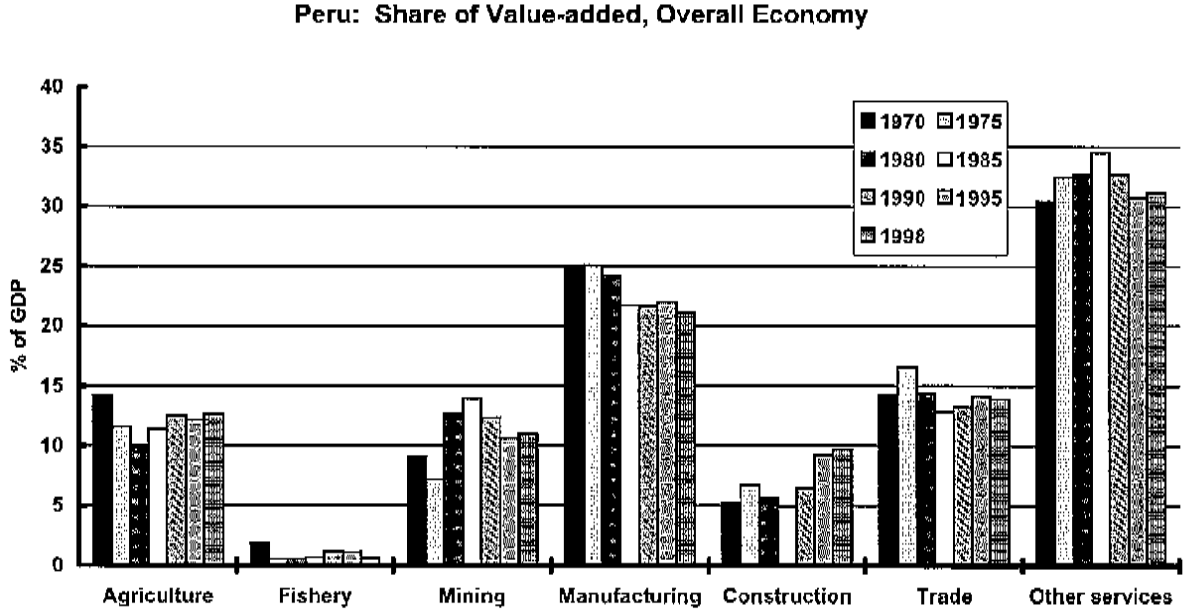


Figure 8. Changing Industrial Structure in Latin America





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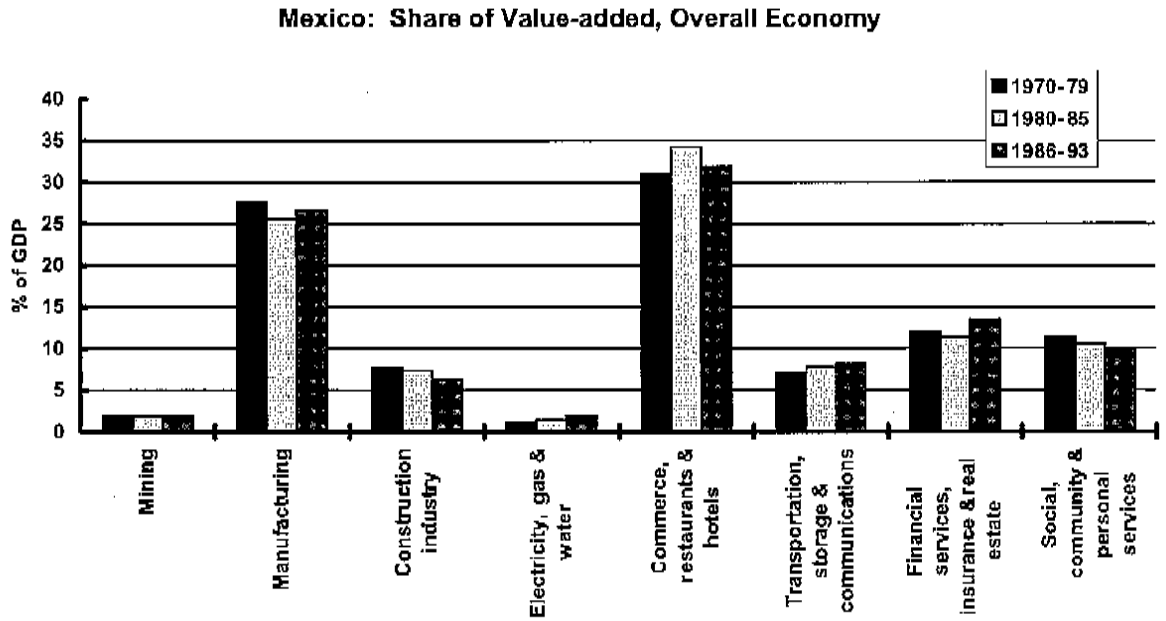


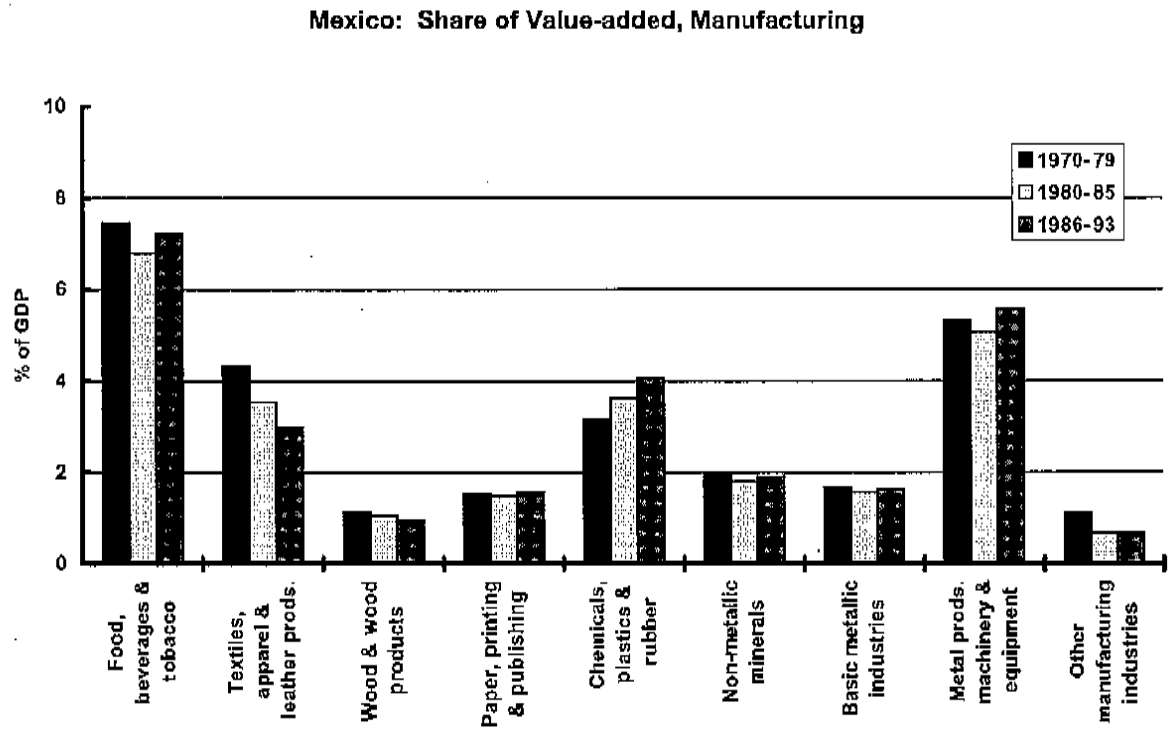
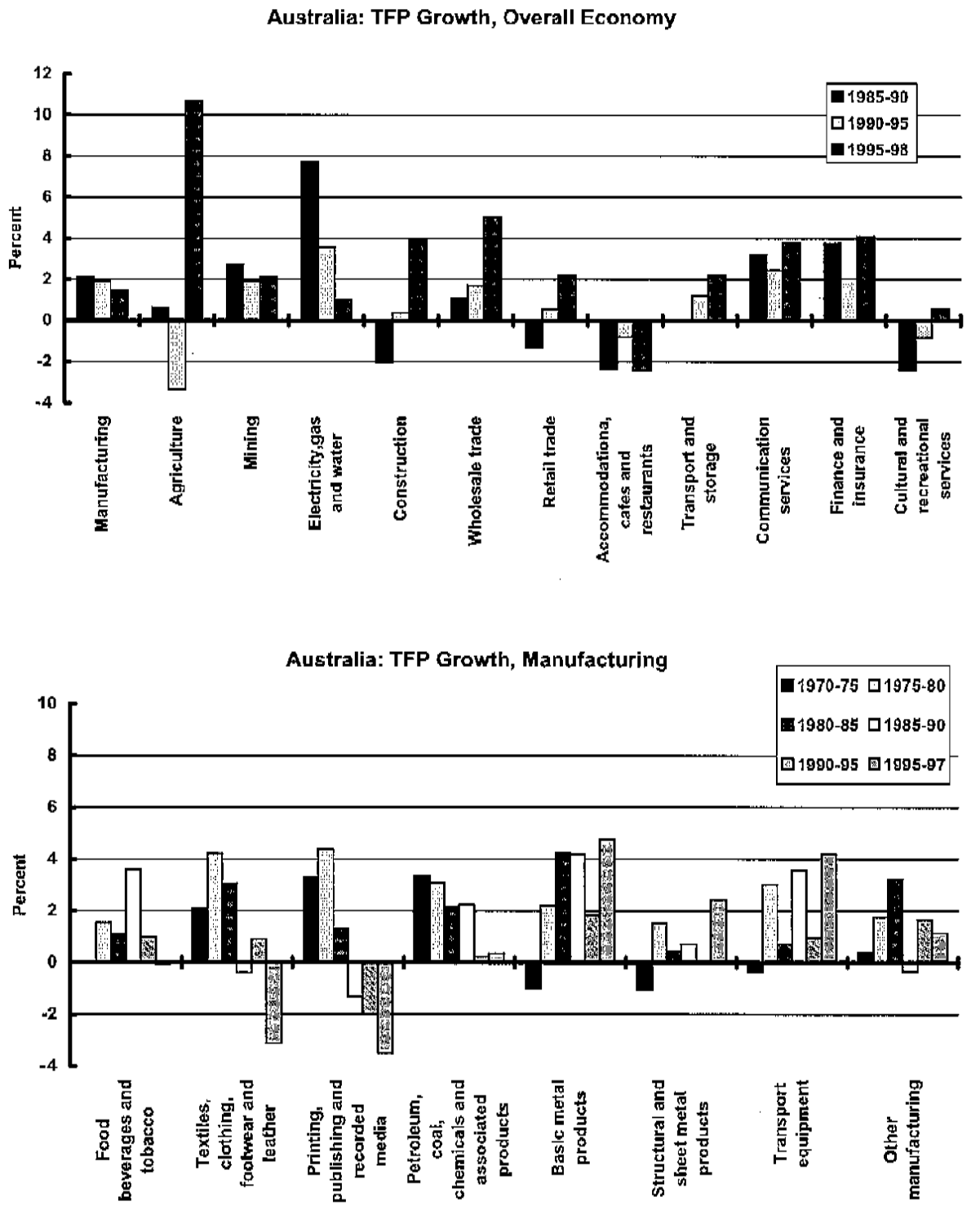


Figure 9. Sectoral TFP Growth in Industrial Economies



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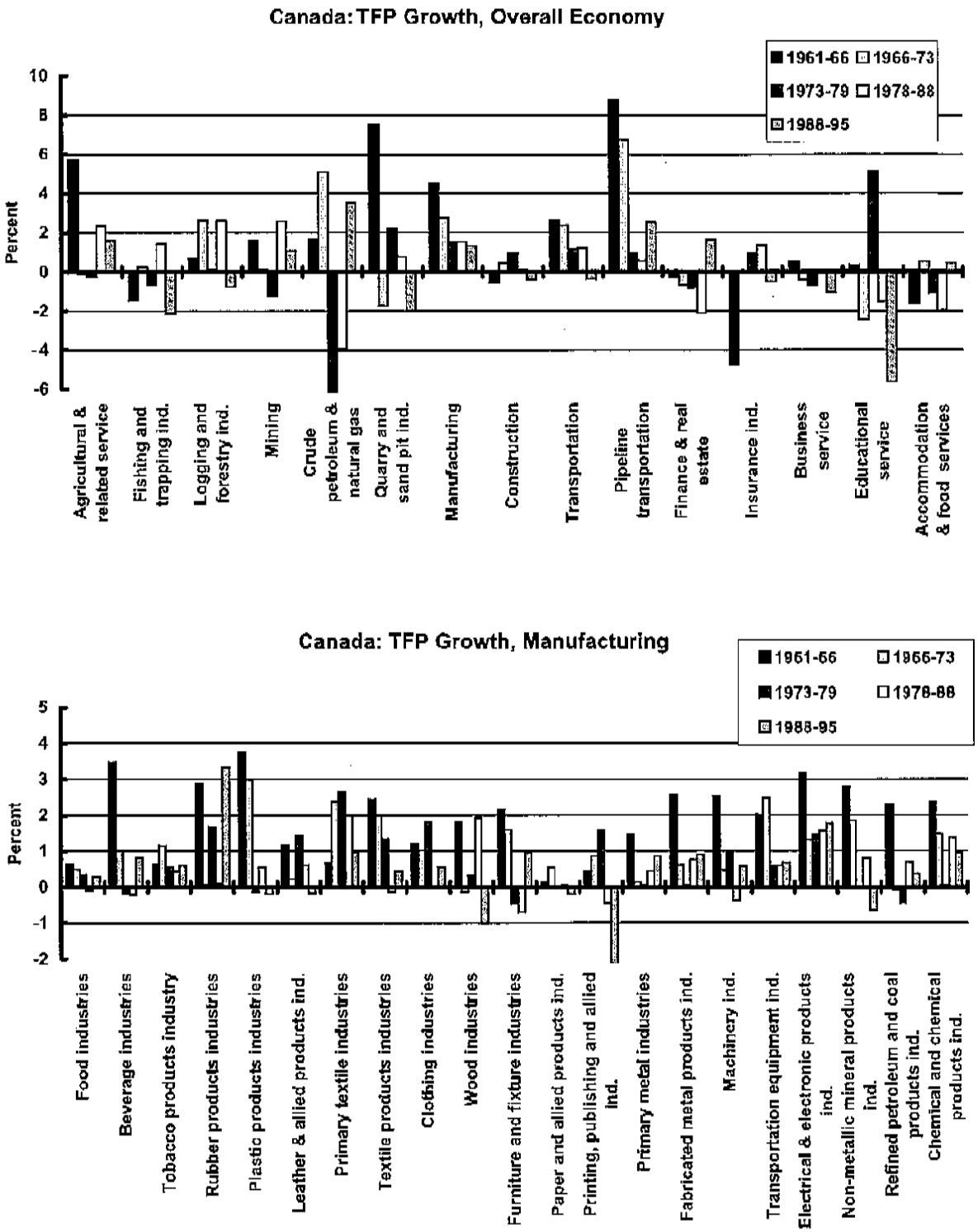

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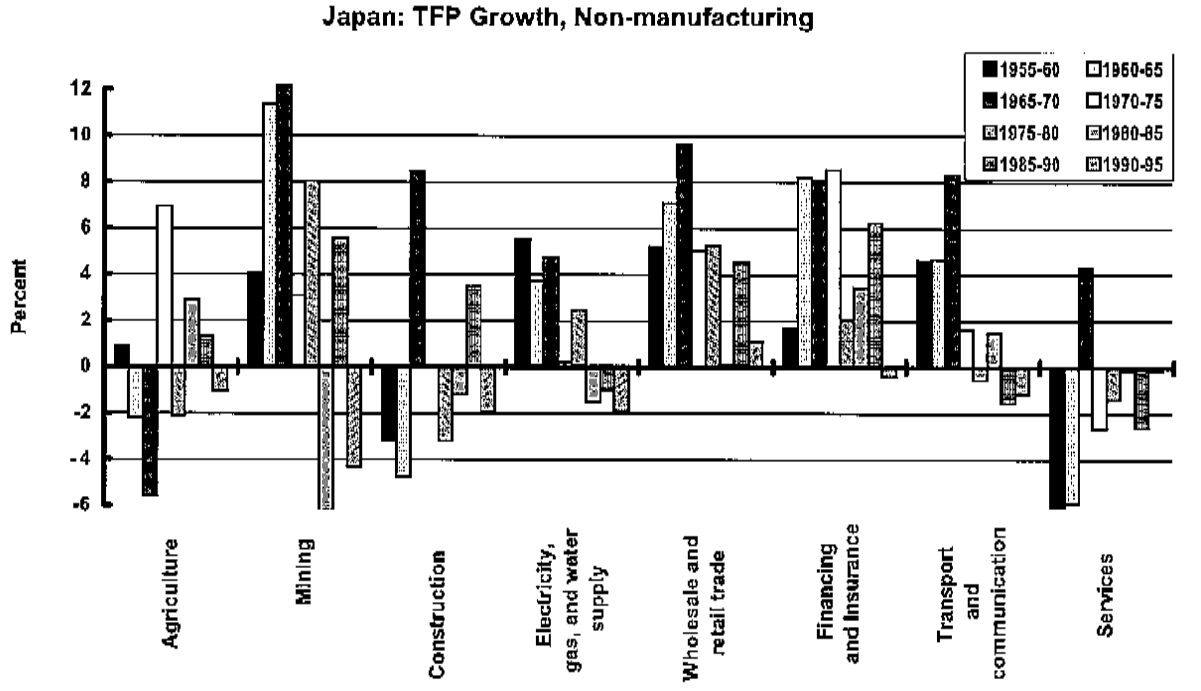

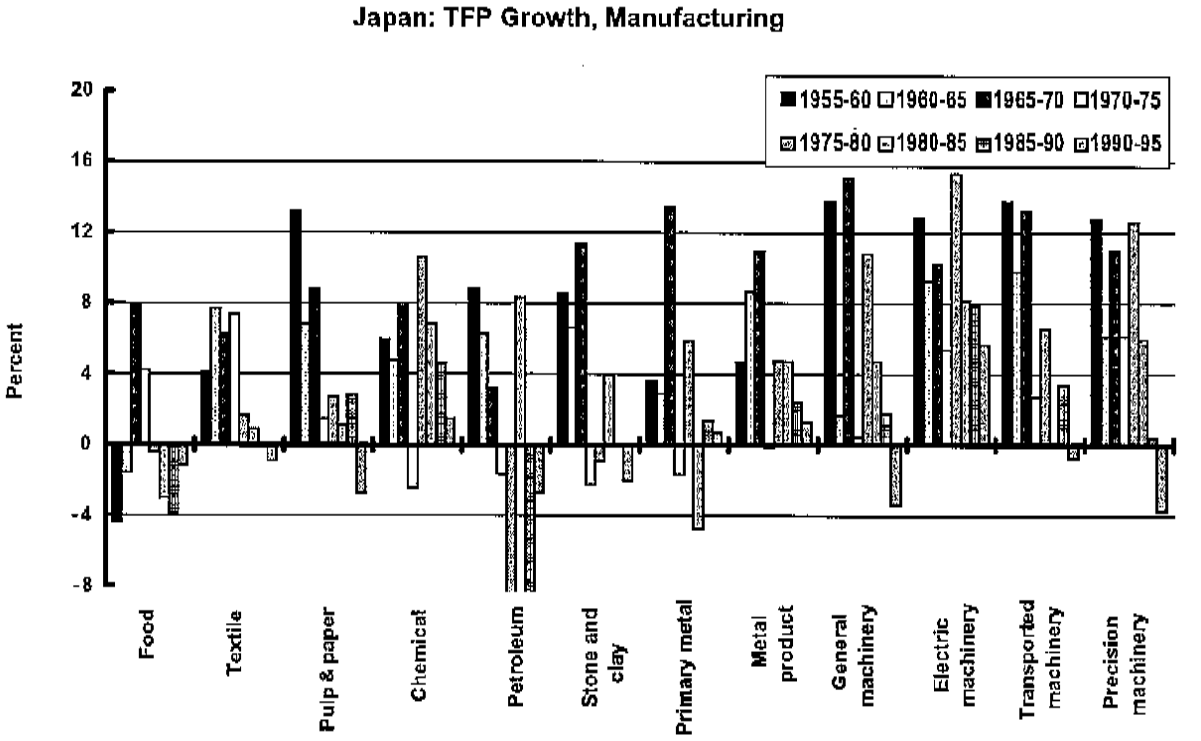

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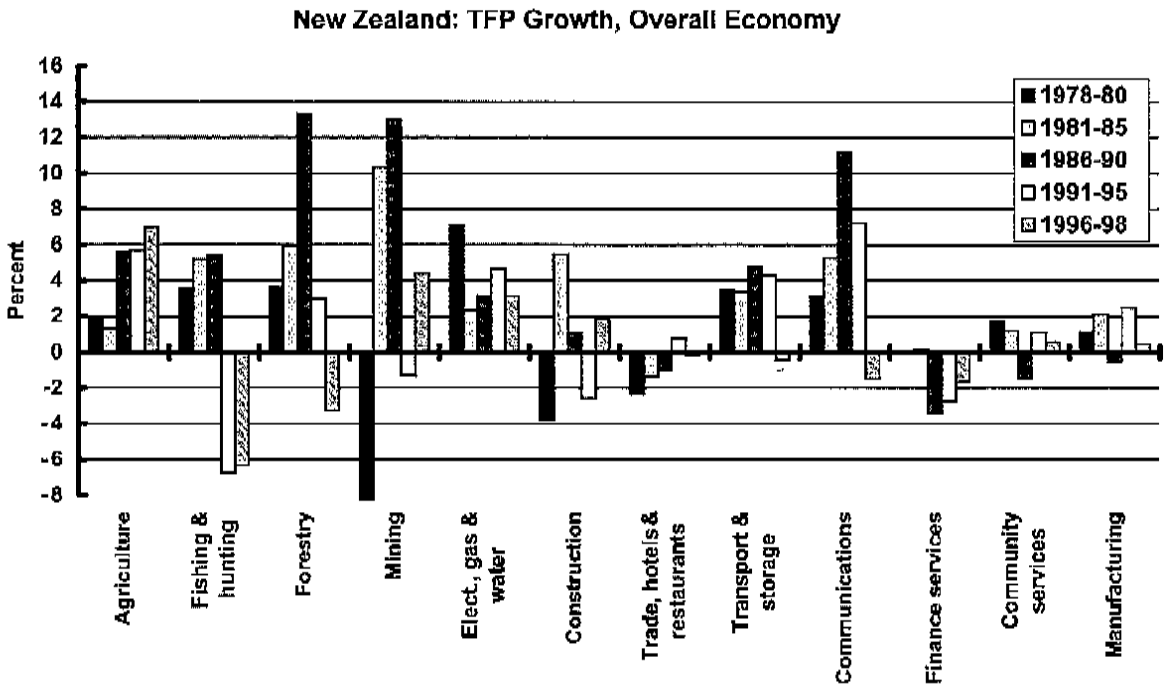

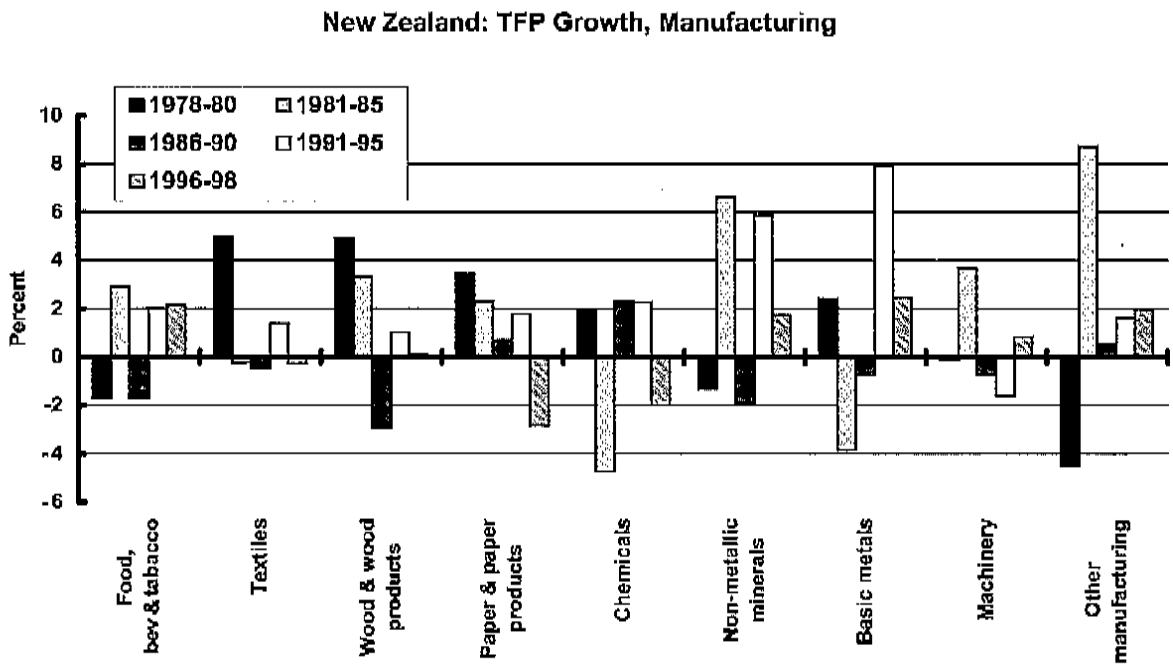

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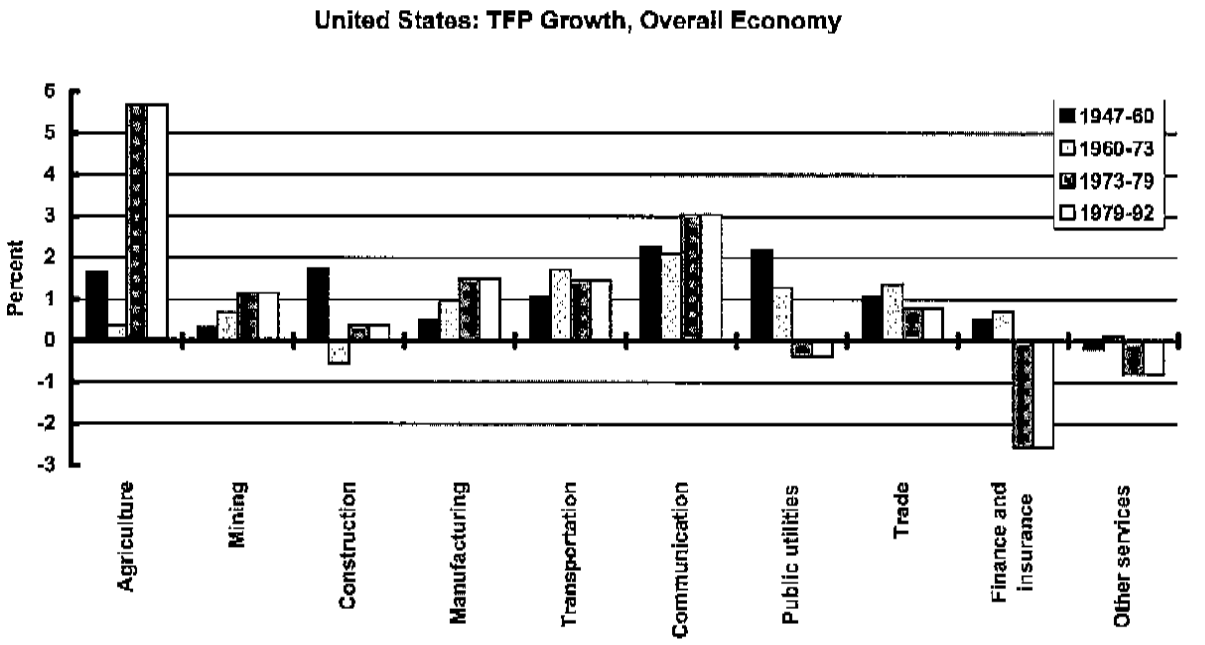

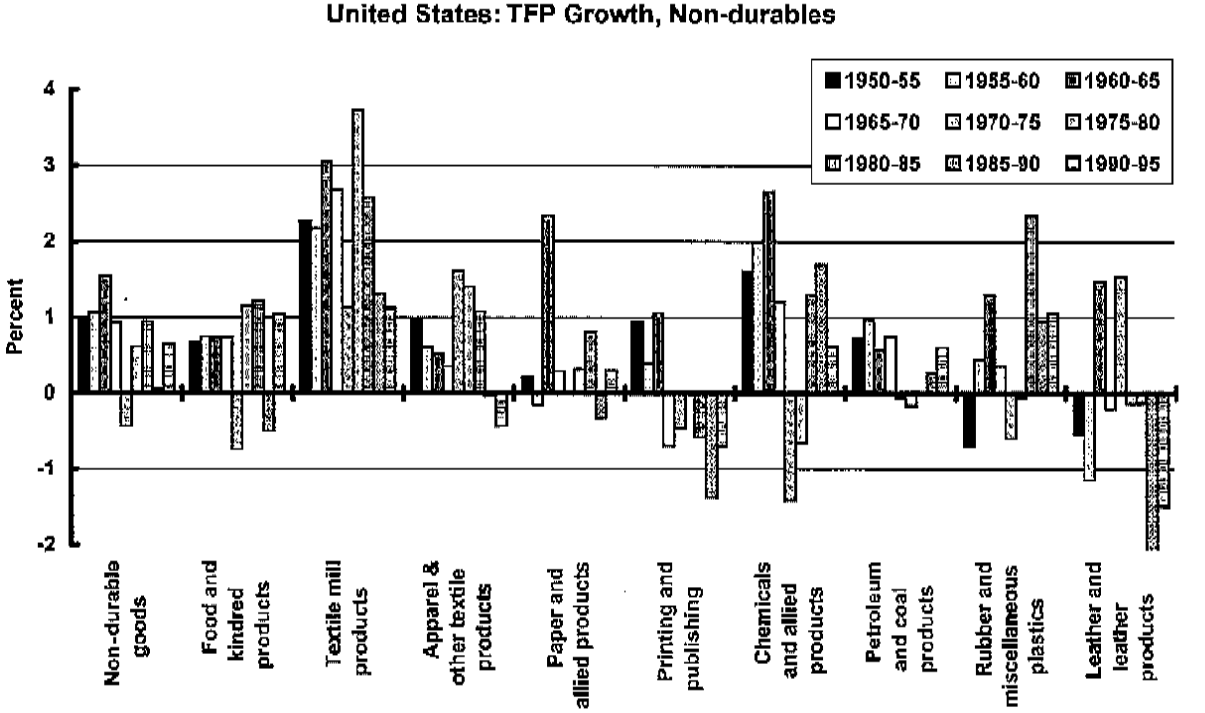

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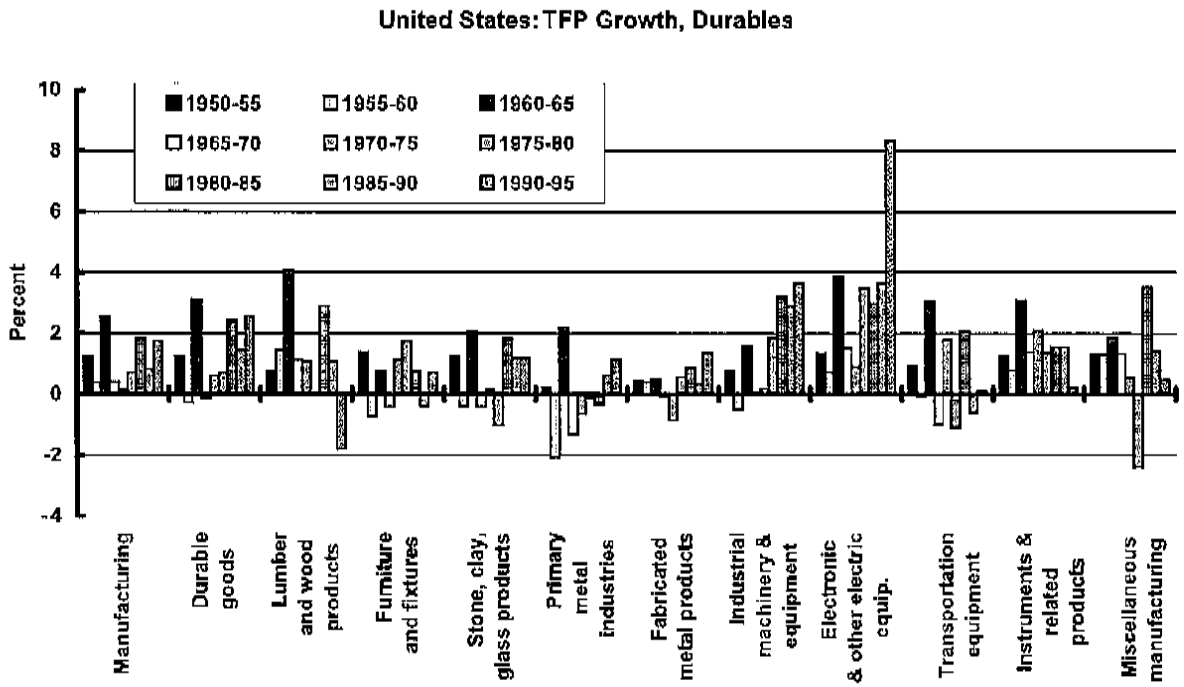
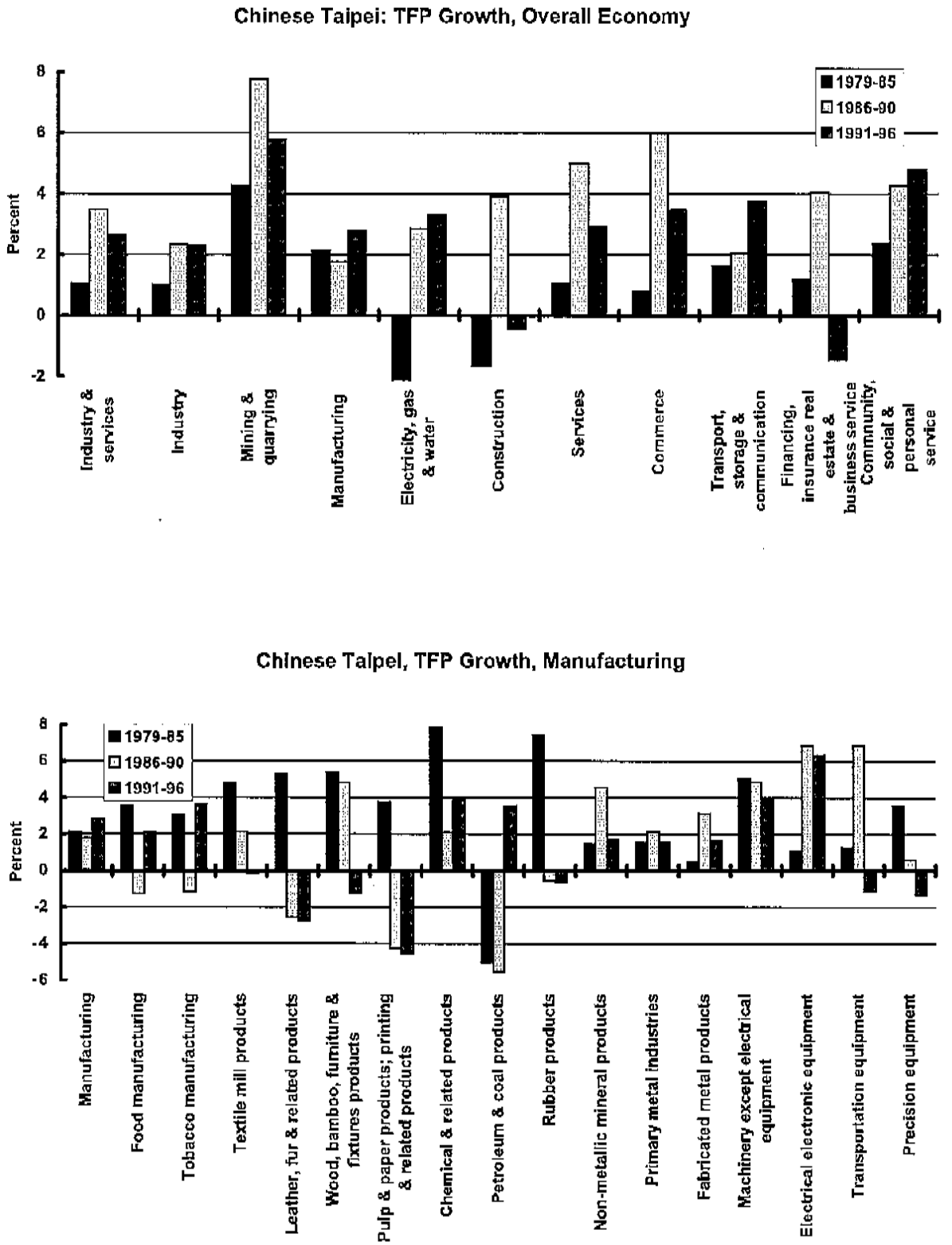


Figure 10. Sectoral TFP Growth in the Asian NIEs



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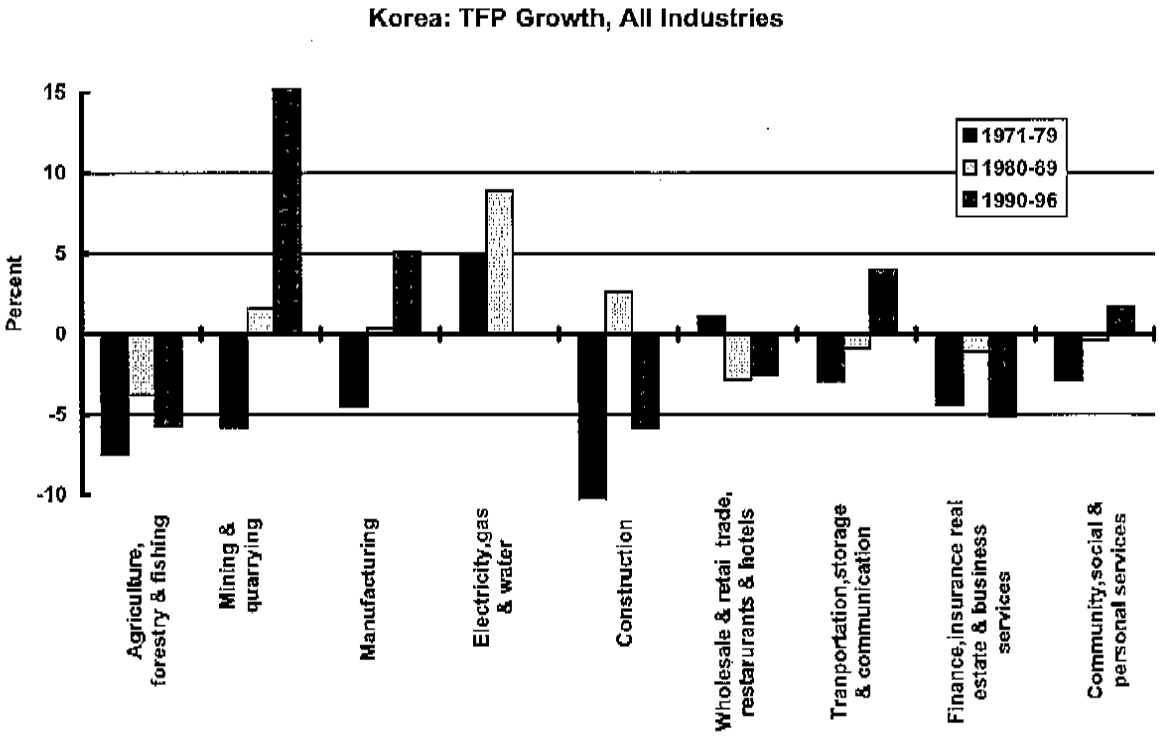

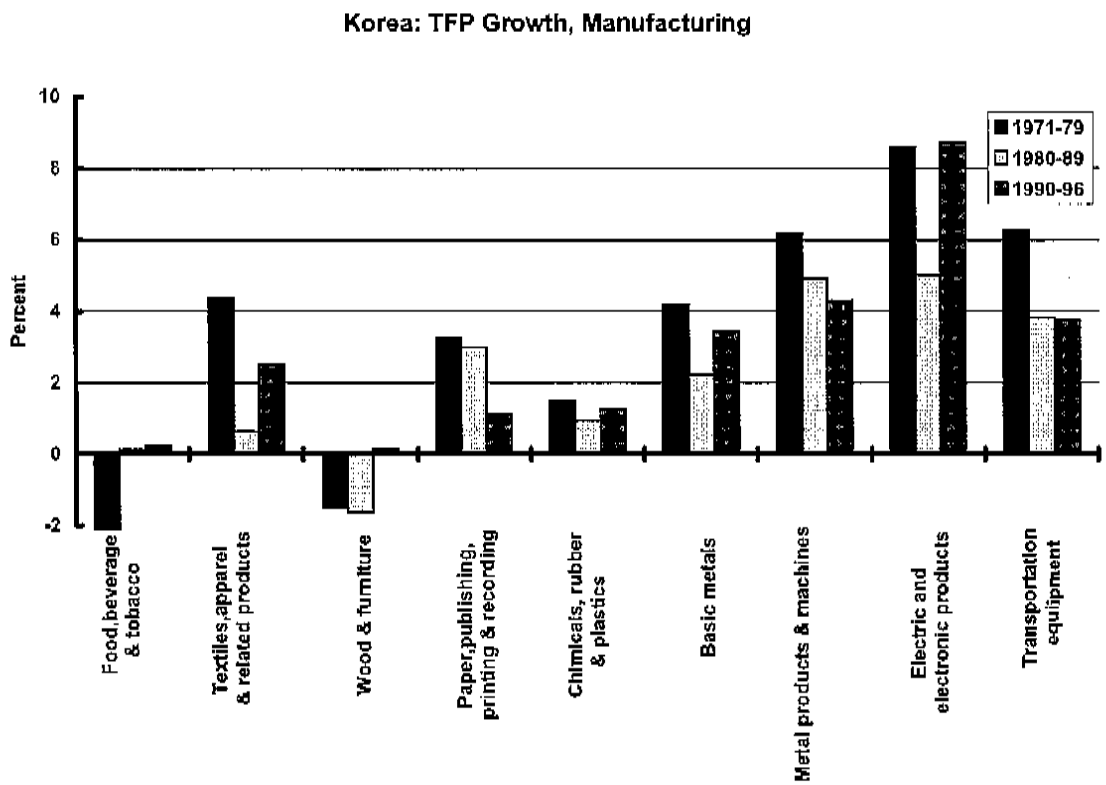

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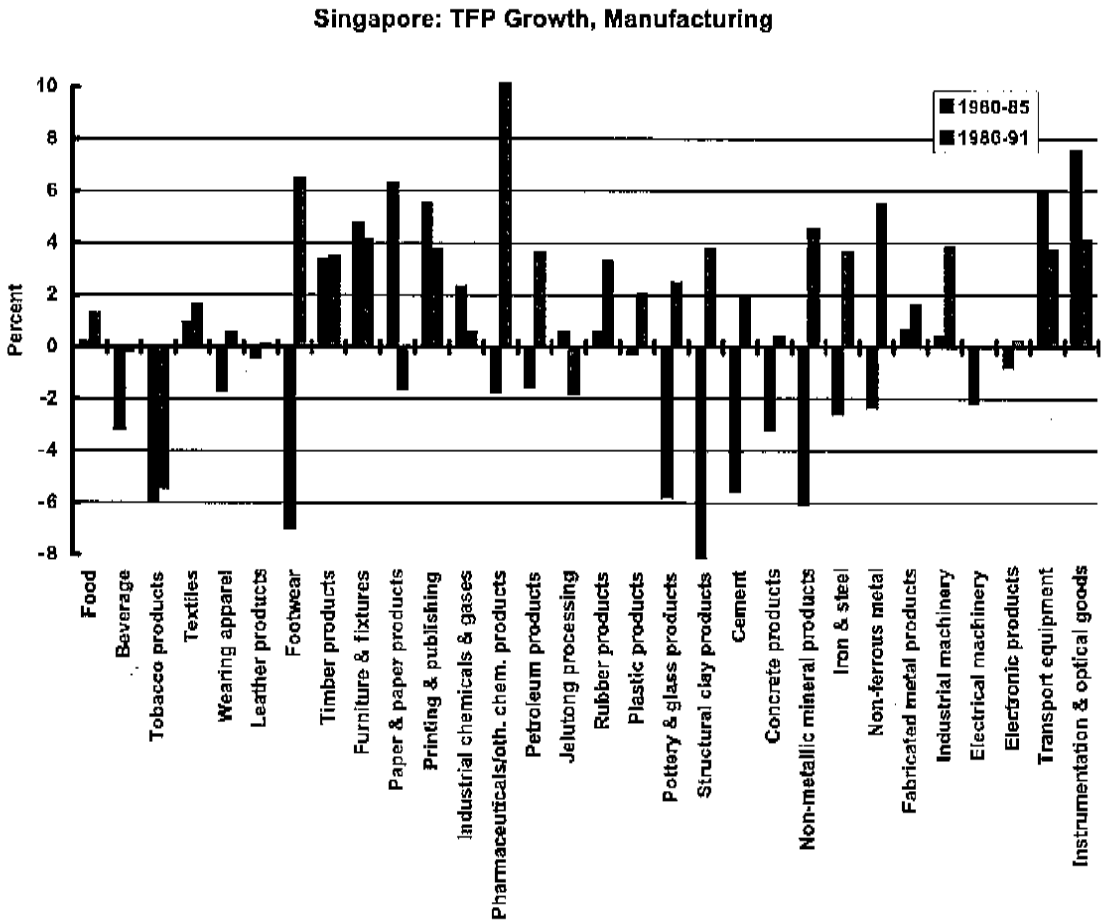
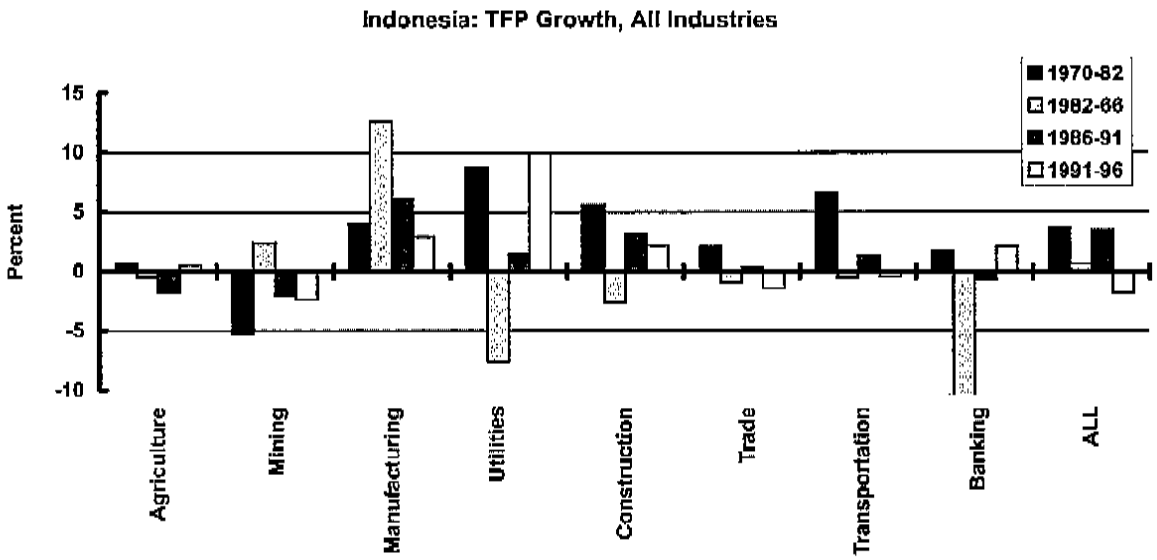
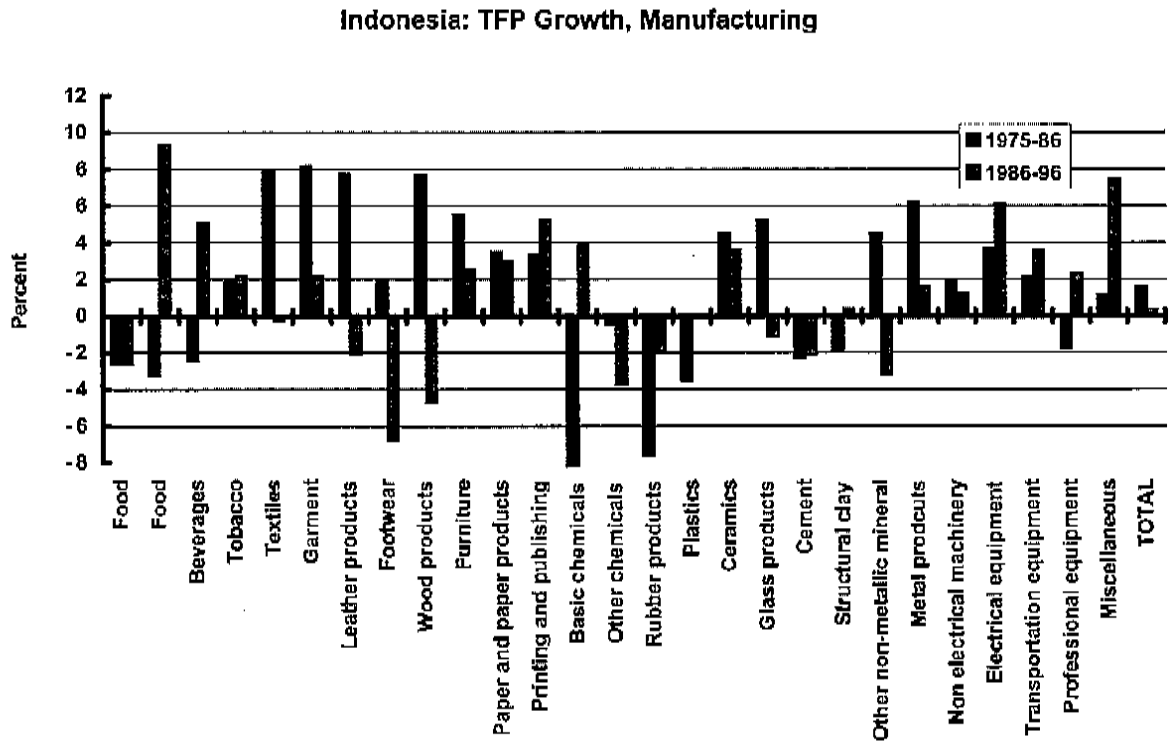


Figure 11. Sectoral TFP Growth in Other Asian Economies





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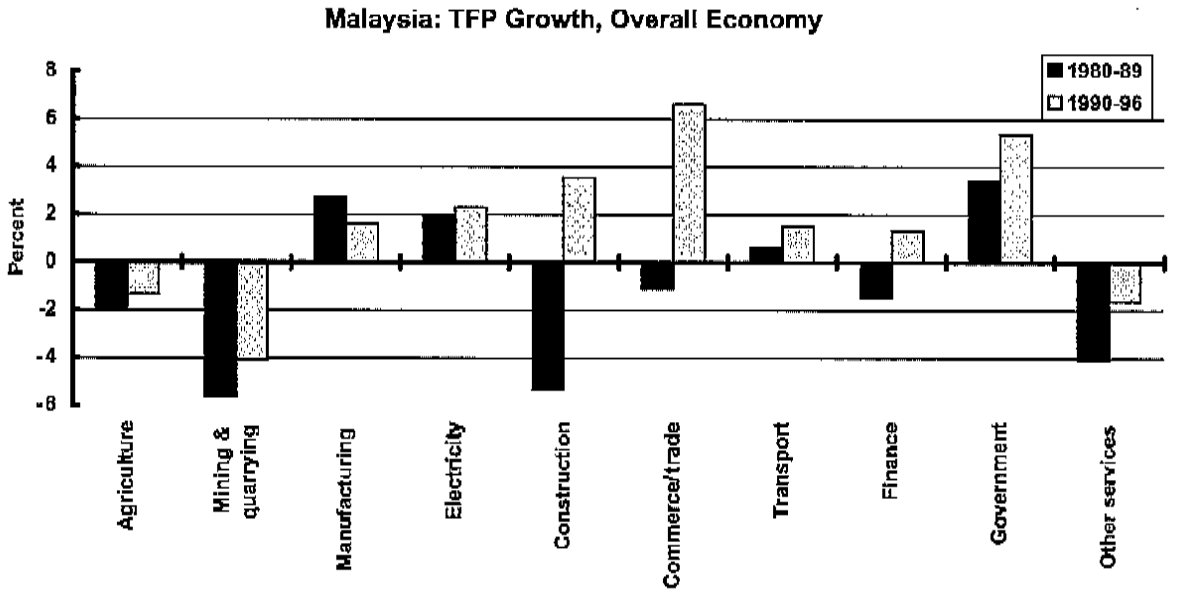

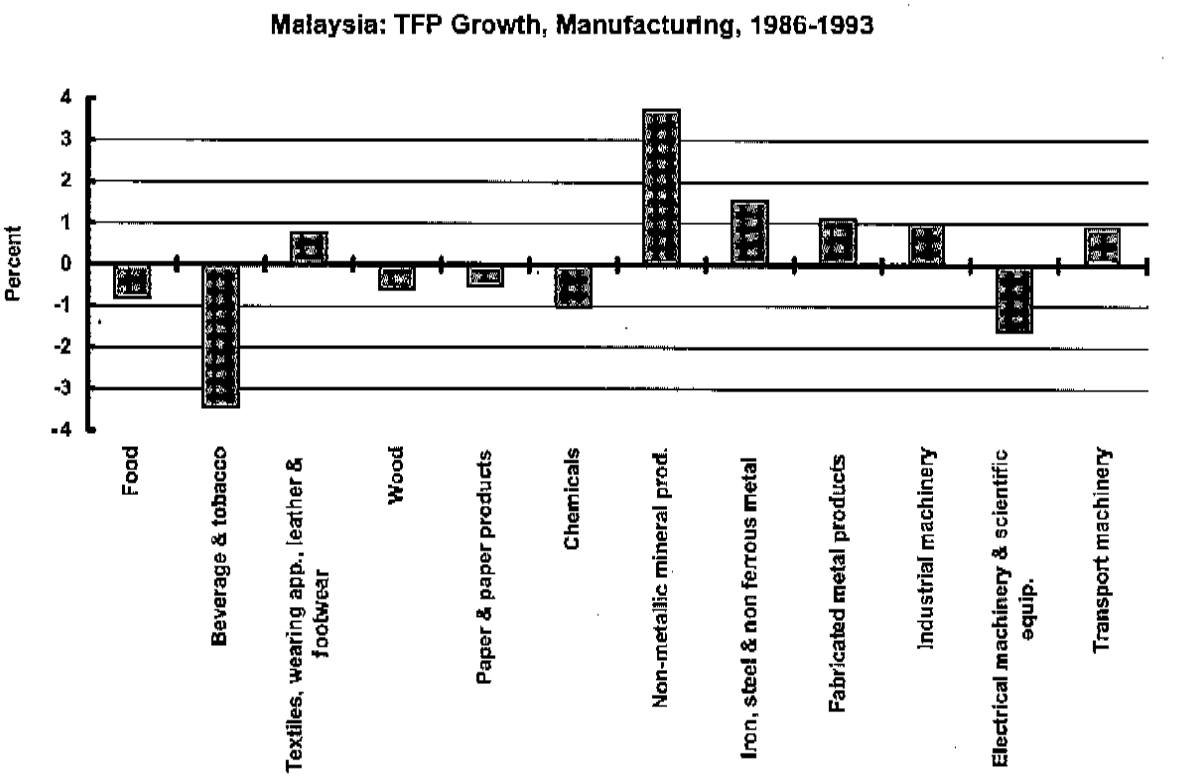

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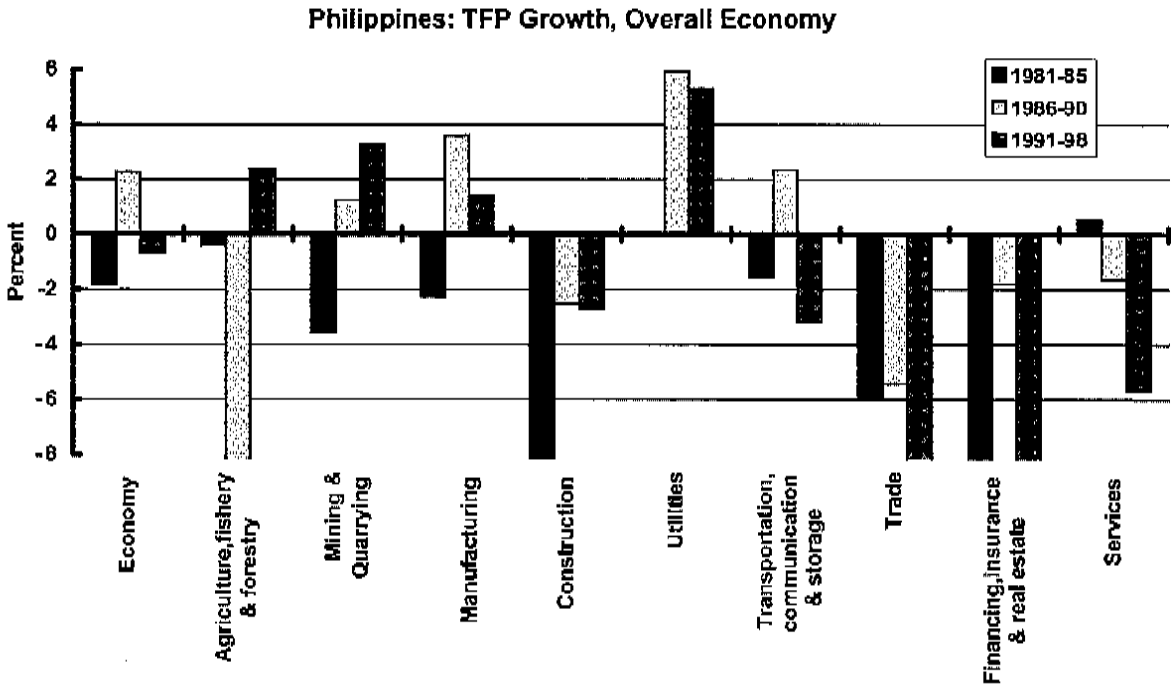

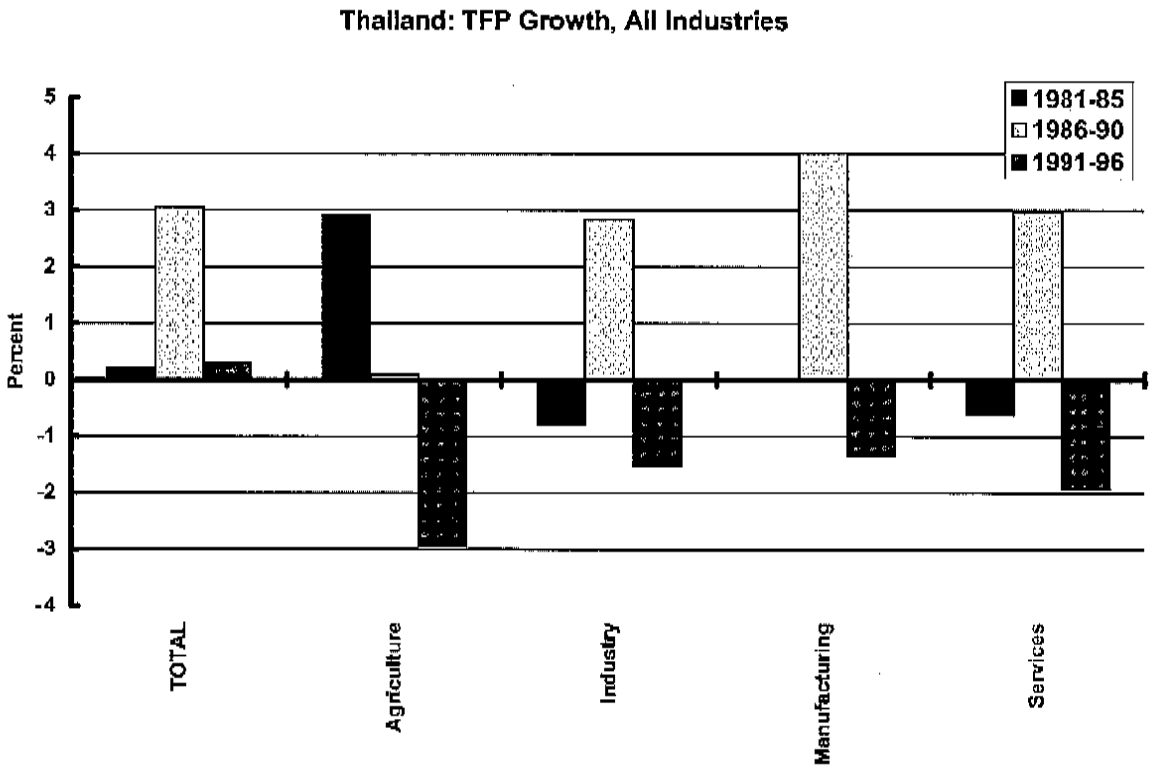

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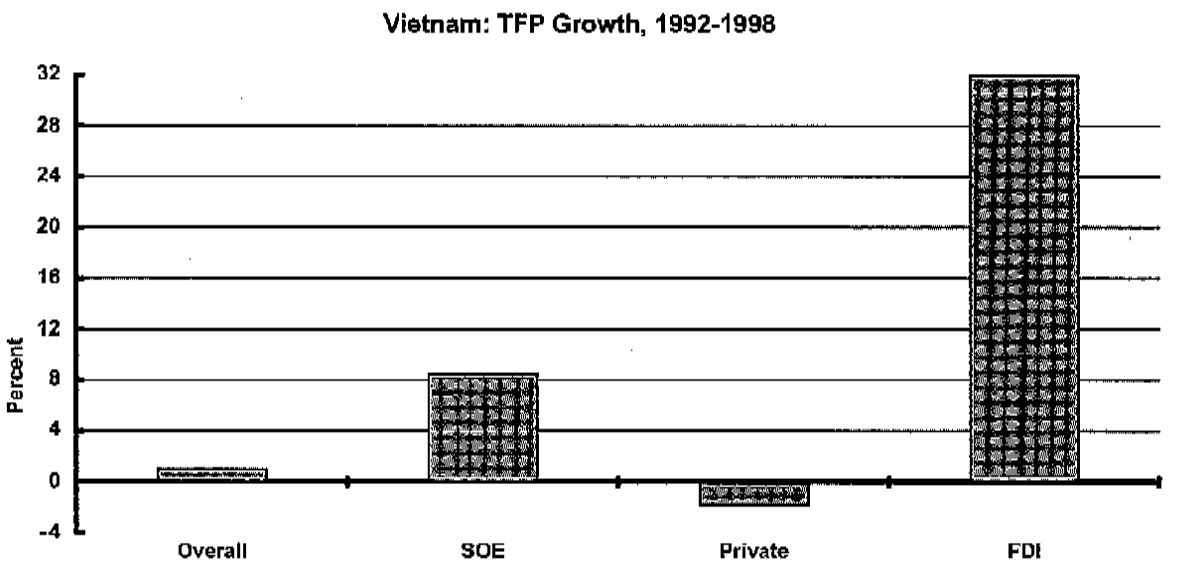
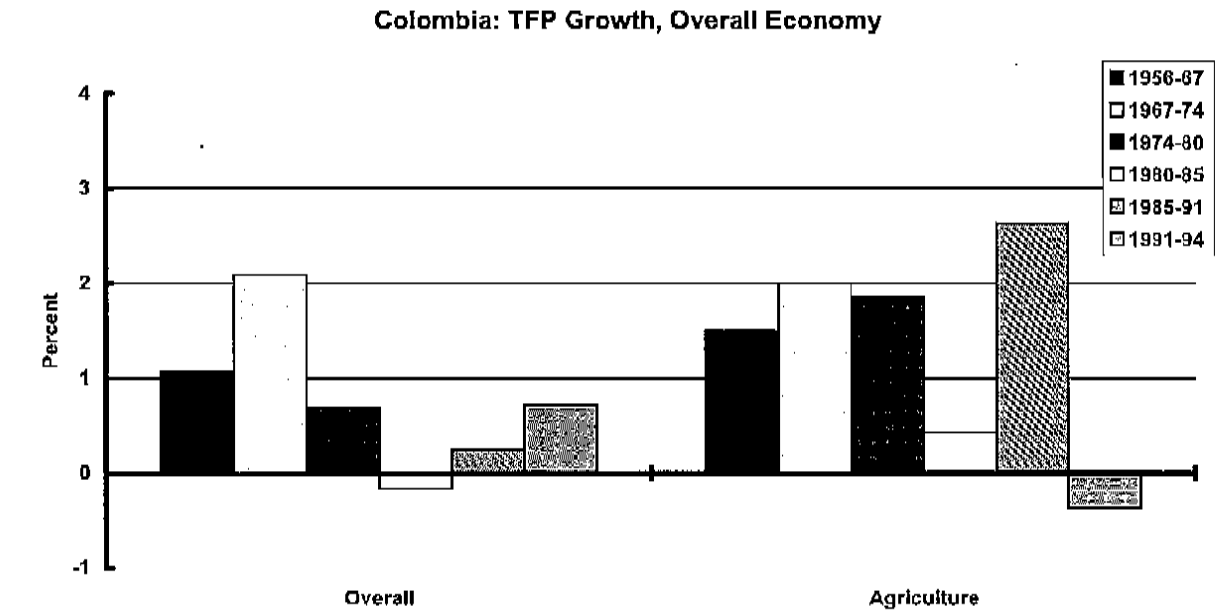
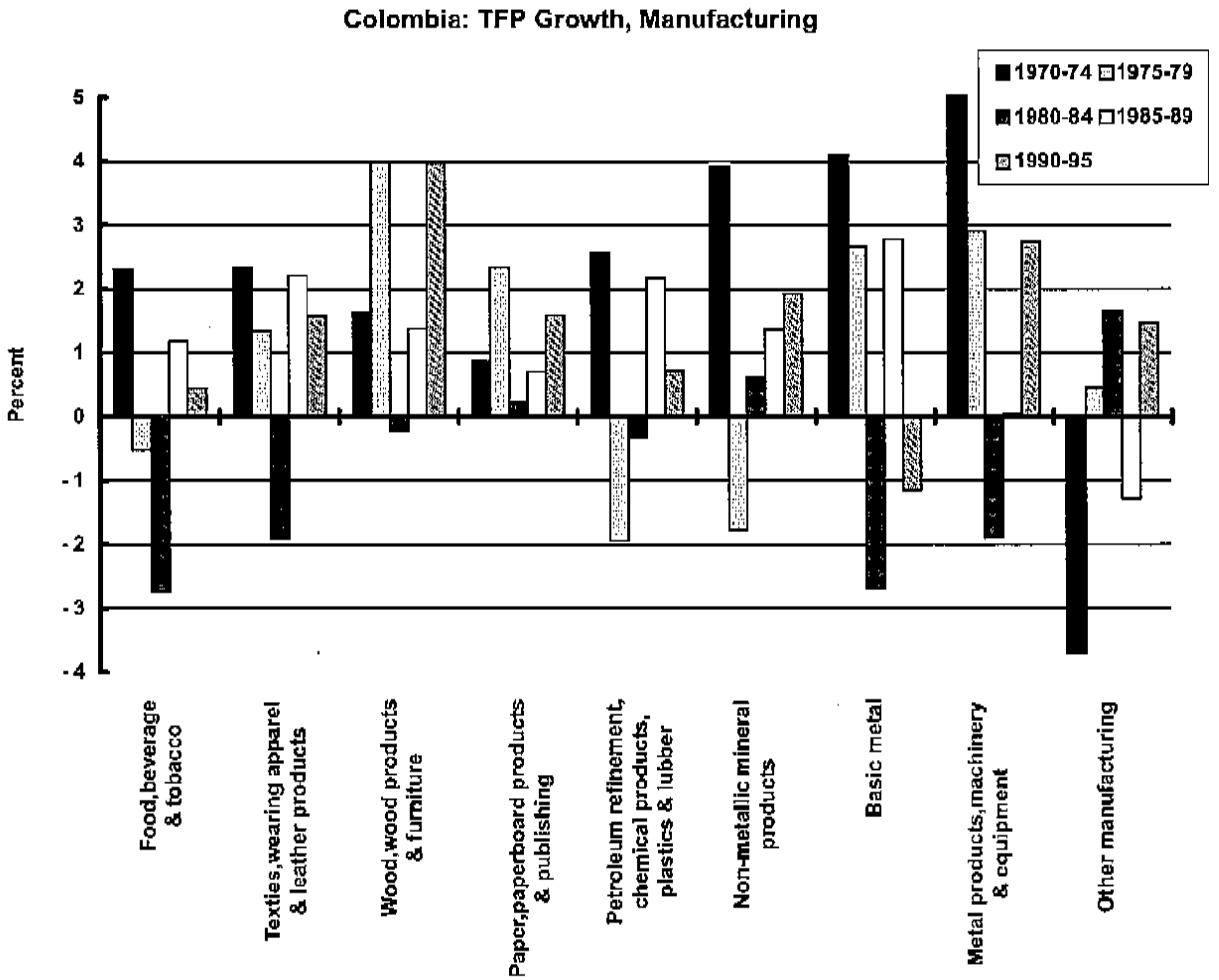


Figure 12. Sectoral TFP Growth in Latin America





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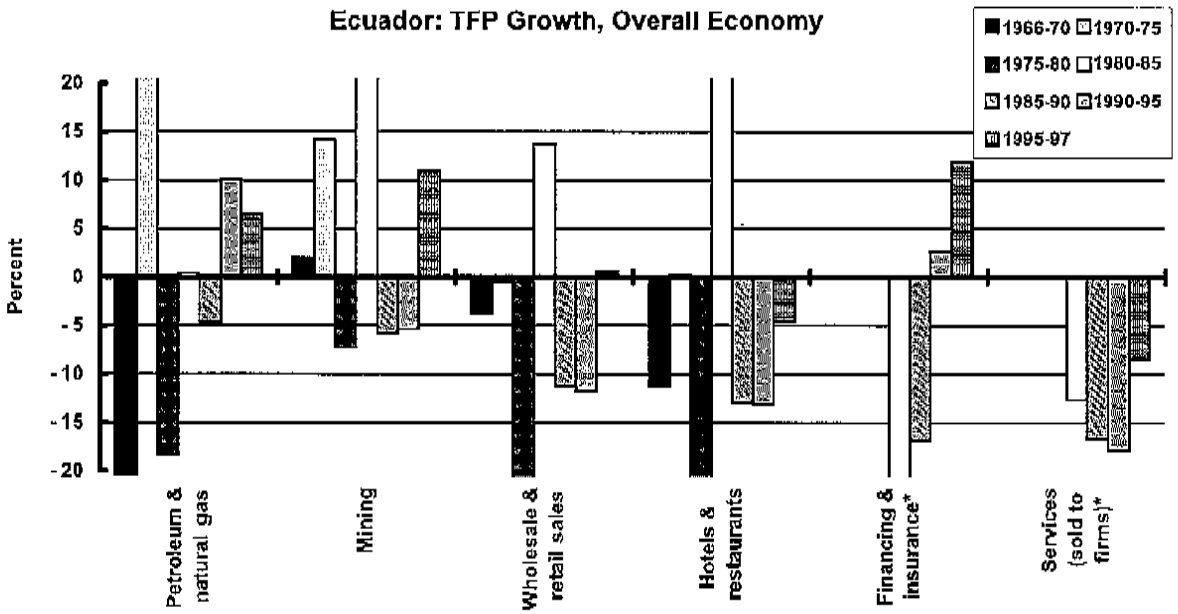

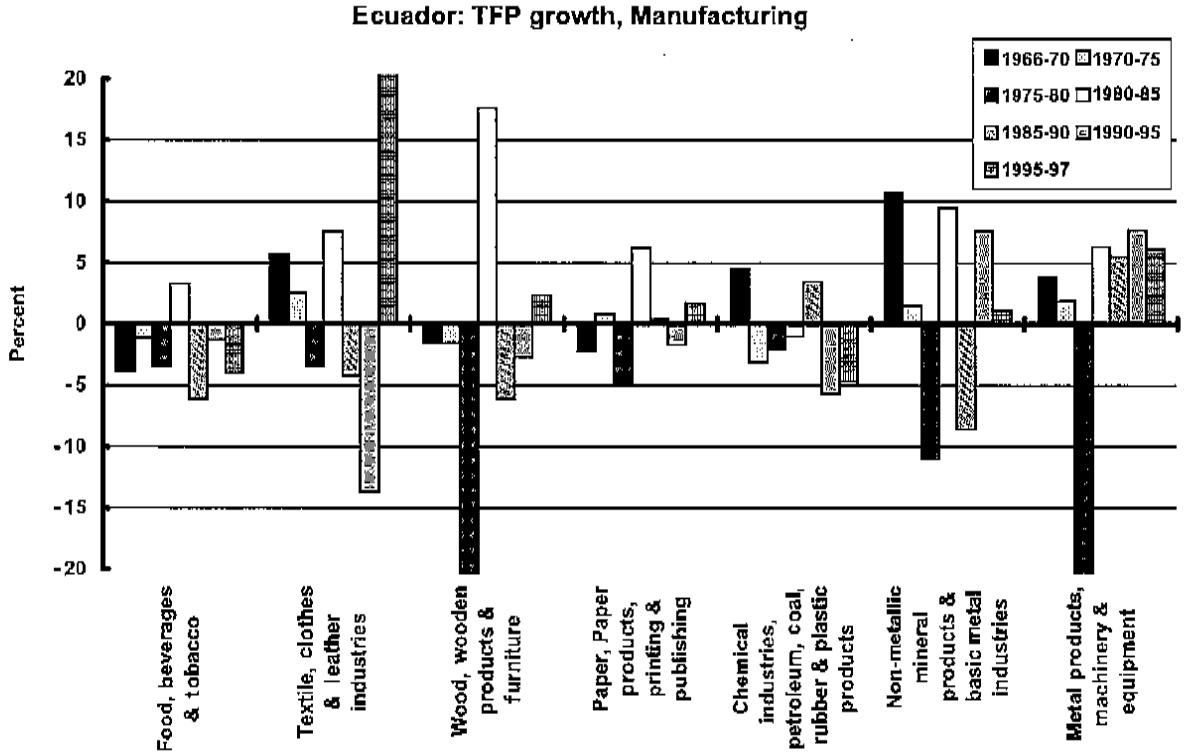

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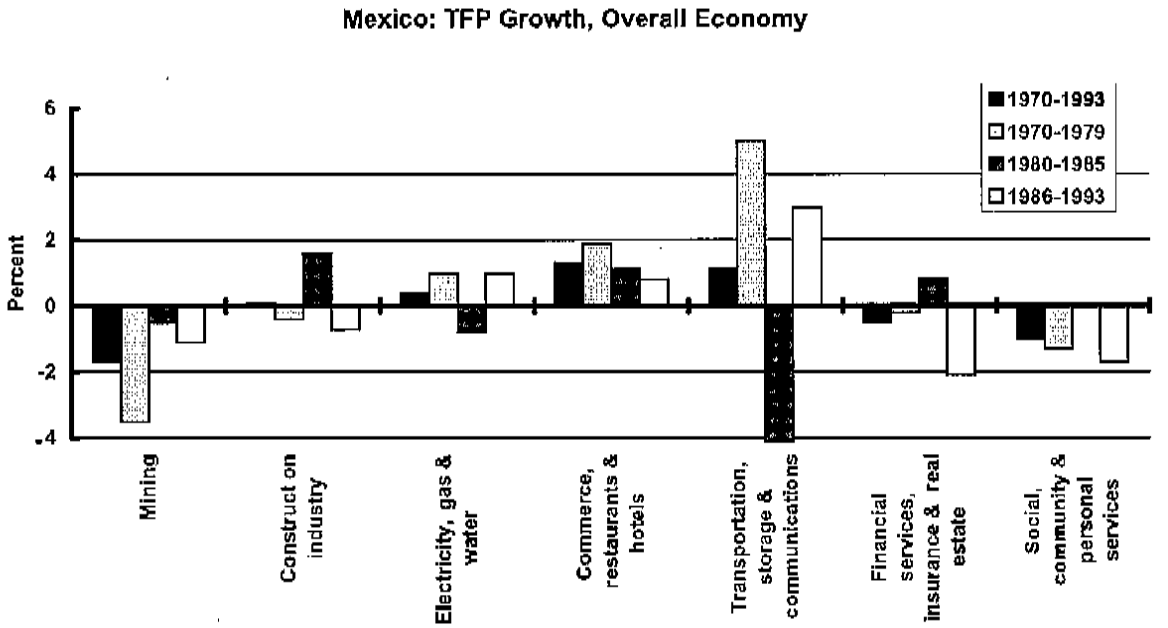

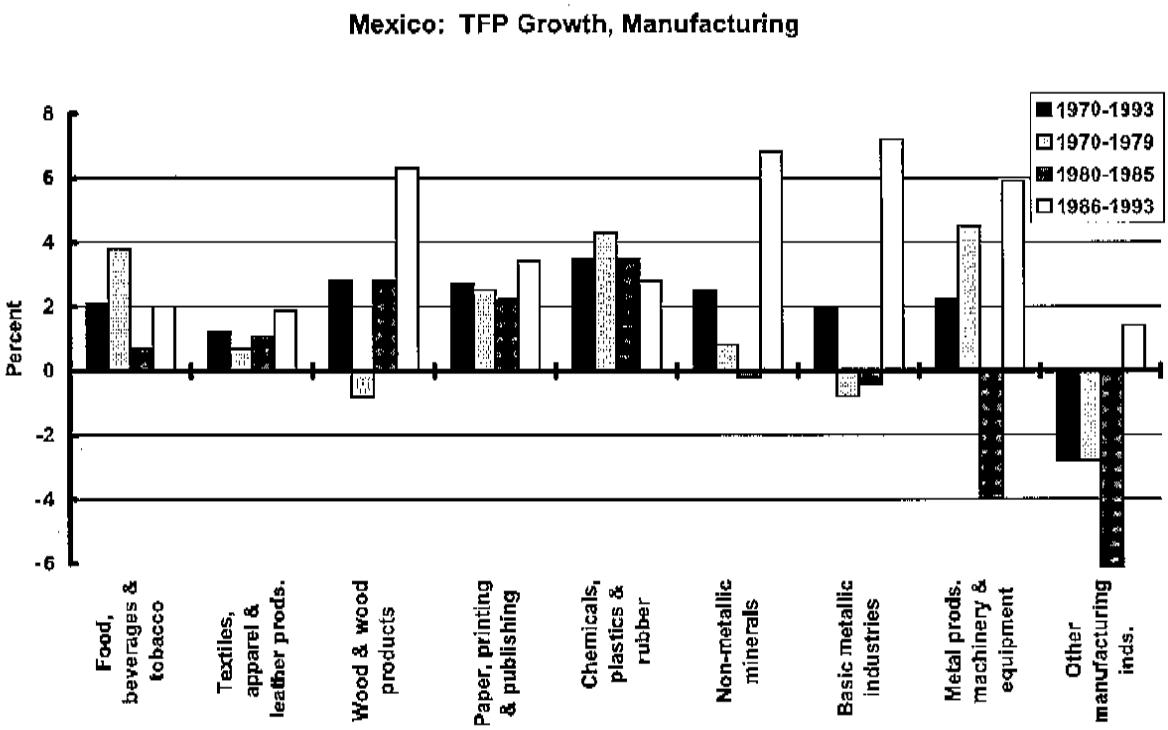

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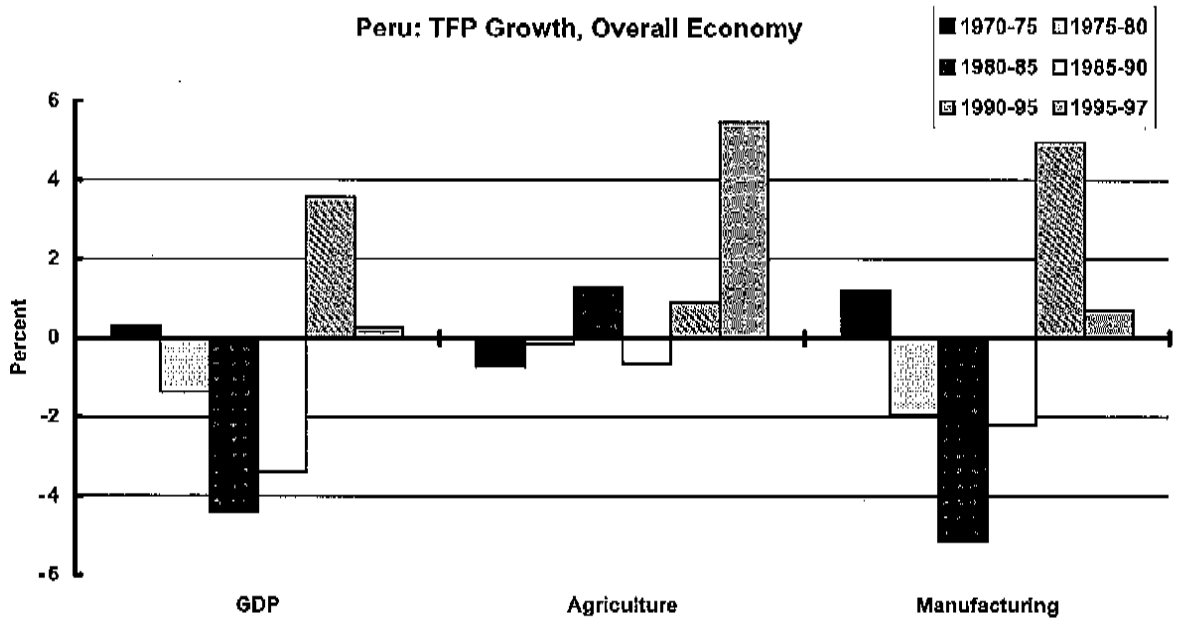
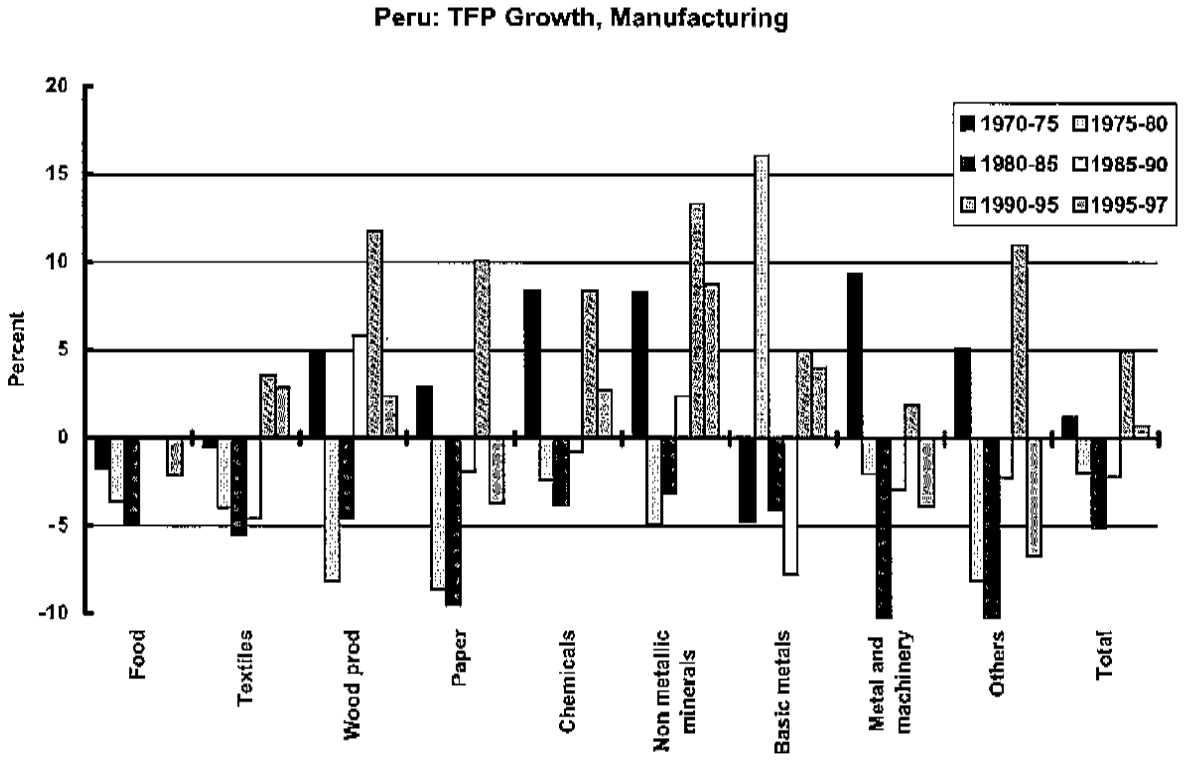




Appendix. Value-added and Total Factor Productivity Growth in the Pacific Region
(percent)

Australia	GDP	TFP
1965–1970	5.04	1.19
1970–1975	3.68	1.67
1975–1980	2.11	1.57
1980–1985	2.31	1.03
1985–1990	4.11	0.51
1990–1995	2.00	1.40
1995–1998	4.63	2.99

Canada	GDP	TFP
1961–1966	6.91	2.91
1966–1973	4.86	2.09
1973–1979	3.56	0.61
1979–1988	3.17	0.55
1988–1997	2.00	0.67
1995–1996	2.48	0.14
1996–1997	5.17	2.92
1961–1997	3.78	1.21

China	GDP	TFP
1960–1973	5.4	1.4
1973–1984	7.1	2.2
1984–1994	10.7	4.6
1960–1994	7.3	2.6

Colombia	GDP	TFP
1956–1967	4.40	1.07
1967–1974	6.06	2.09
1974–1980	4.97	0.69
1980–1985	2.55	-0.16
1985–1991	4.00	0.25
1991–1994	4.23	0.72
1956–1970	4.84	1.24
1970–1994	4.49	0.83

Ecuador	GDP	TFP
1965–1969	3.11	0.63
1970–1974	10.16	6.65
1975–1979	5.49	1.58
1980–1984	1.27	-0.90
1985–1989	1.44	-0.05
1990–1997	2.82	0.84
1990–1994	2.97	1.26
1965–1997	4.64	1.54

Hong Kong, China	GDP	TFP
1989–1993	5.25	3.50
1994–1997	4.76	2.80
1989–1997	4.73	3.20

Indonesia	GDP	TFP
1970–1982	7.03	3.67
1982–1986	4.20	0.65
1986–1991	6.48	3.43
1991–1996	7.48	-1.81

Japan	GDP	TFP
1955–1960	8.1	1.7
1960–1965	8.3	2.8
1965–1970	11.9	7.9
1970–1975	4.3	2.7
1975–1980	4.6	1.7
1980–1985	3.6	1.2
1985–1990	5.2	2.0
1990–1995	1.3	-0.1

Continued on next page

Appendix. Continued

Korea	GDP	TFP
1971–1979	8.82	-4.45
1980–1989	8.12	0.35
1990–1996	7.72	5.13

Malaysia	GDP	TFP
1980–1989	5.77	-0.82
1988–1992	8.80	3.32
1990–1996	8.77	0.34
1993–1998	6.40	0.06

Mexico	GDP	TFP
1971–1976	5.95	0.04
1977–1982	5.86	0.46
1983–1988	0.53	0.05
1989–1993	3.81	1.36

New Zealand	GDP	TFP
1973–1980	0.33	-1.38
1981–1985	5.53	4.06
1986–1990	0.98	0.45
1991–1998	2.97	1.11

Peru	GDP	TFP
1950–1960	5.7	2.7
1960–1970	5.3	1.7
1970–1980	3.8	-0.6
1980–1990	-0.8	-4.0
1990–1998	4.7	1.8
1950–1998	3.7	0.2

The Philippines	GDP	TFP
1957–1959	5.22	-1.01
1960–1969	4.69	-0.12
1970–1975	5.45	0.6
1981–1989	1.66	-2.21
1990–1998	2.72	-0.55

Singapore	GDP	TFP
1960–1973	10.4	0.9
1973–1984	7.9	1.0
1984–1994	7.5	3.1
1960–1994	8.7	1.5

Chinese Taipei	GDP	TFP
1979–1985	7.03	1.06
1986–1990	10.42	3.50
1991–1996	9.19	2.66

Thailand	GDP	TFP
1981–1985	5.45	0.21
1986–1990	10.34	3.06
1991–1996	8.05	0.29
1981–1996	7.95	1.13

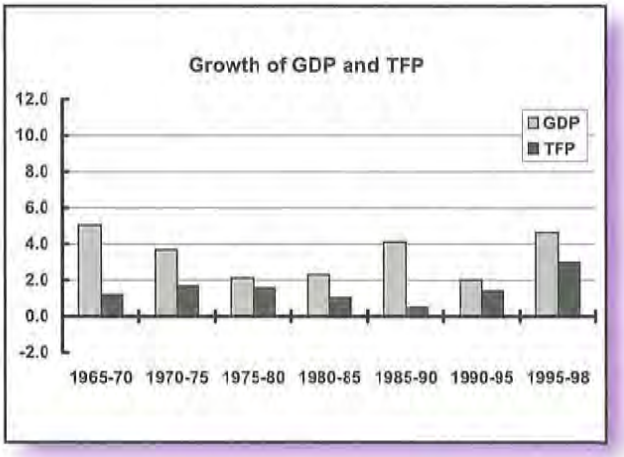
United States	GDP	TFP
1947–1955		2.9
1955–1968	4.46	2.5
1968–1973	3.37	1.5
1973–1980	2.55	0.4
1980–1990	2.33	0.8
1990–1996	2.18	1.0

Vietnam	GDP	TFP
1992–1994	8.52	-1.68
1994–1998	8.36	2.75

Source: Kohsaka (2000) and Bosworth and Collins (1996) for China and Singapore.

AUSTRALIA

BY DEAN PARHAM
TONY MAKIN



Australia's productivity performance, a key determinant of standard of living, improved markedly in the 1990s and this has enabled the economy to sustain non-inflationary growth at rates not experienced since the 1950s and 1960s. This productivity improvement is a result of numerous influences that have improved the allocation and use of resources. These include opening the economy to competition and overseas trade and investment, improving the policy and institutional environment, stabilizing macro conditions, and raising the quality of human capital.

Australia recorded a long-term historical average rate of productivity growth of 1.2 percent from the mid-1960s until the early 1990s. But since the early 1990s, the average annual rate of productivity growth has risen to 2.4 percent. This productivity improvement has produced a turnaround in Australia's long-standing poor performance compared with other countries. It has also reversed the secular decline in capital productivity, implying a far more efficient use of the capital stock.

At the sectoral level, productivity in the electricity, gas and water industry has strengthened markedly since the early 1980s. Enterprises in this sector have been the subject of quite fundamental reforms from the mid-1980s. Among other things, these reforms have led to greater commercial focus in government-owned enterprises (including privatization in a number of cases) and rationalization of operations that previously served a series of exclusive regional markets, but are now beginning to serve competitive national markets.

Productivity in the mining sector has been variable, with negative growth in the 1970s. This was offset by positive growth in the early 1980s.

The finance and insurance industry has also achieved productivity gains since the mid-1980s, following introduction of a new regulatory and institutional environment, new technology, new products, and more domestic and foreign competition.

Strong productivity growth in the communication services industry is consistent with technological advance and a response to an increasingly open regulatory environment that increased competitive pressure in the late 1980s and into the 1990s.

The manufacturing sector has experienced steady productivity growth, although this has slowed somewhat since 1993-1994 and masks considerable diversity. For instance, productivity growth has been relatively strong at different times in textiles, clothing and footwear; printing, publishing and recorded media; petroleum, coal, chemicals and associated products; and basic metal products.

Agriculture, a sector with a long history of improvement in technology, has also shown overall productivity growth, although with short-term fluctuations.

Among the remaining service industries, productivity growth has been flat or sometimes negative.

There is not a simple industry story underlying the

aggregate productivity trends. Industries have their own cycles that ebb and flow, and different factors appear to underlie the productivity performances in different industries. The productivity surge of the 1990s may be as much or more of a firm-based phenomenon than due to conditions particular industry sectors.

The reallocation of resources between these broad industry sectors does not appear to have been a major factor influencing aggregate productivity as there have not been dramatic changes in the allocation of resources at this level. Although allocation effects may still be important within these broad industry sectors, it is probable that technical and dynamic efficiency effects within firms and industries account for most of the change in aggregate productivity performance.

It is highly likely that policy reforms have had the major influence on Australia's productivity performance. Prior to the 1990s, key policies included industry development based on import replacement, redistribution and social objectives through centralized wage determination and industrial relations processes, national and regional development, and social objectives through government ownership of major economic infrastructure (for example, energy, transport, water, communications).

By the mid-1980s, the costs of these policies in terms of forgone living standards were becoming more apparent and a broad economic reform program was initiated to improve resource allocation and productivity, among other things.

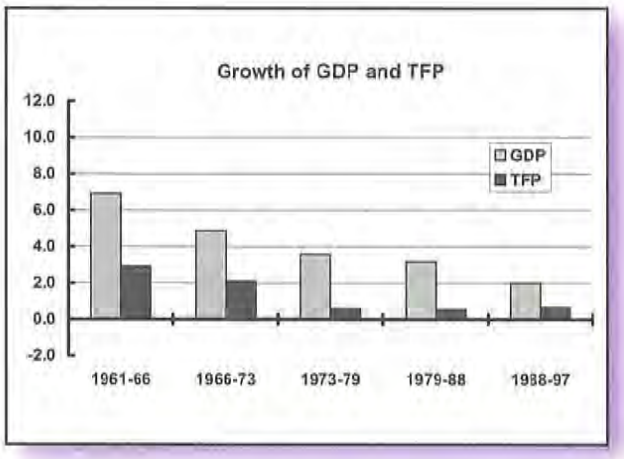
Major themes in economic reforms have been:

- targeting monetary policy on reducing inflation;
- fiscal consolidation to reduce budget deficits and public debt;
- "internationalizing" the economy by reducing barriers to trade and investment (e.g., lower tariffs, liberalization of exchange controls and reduction in foreign investment restrictions);
- increasing competition, both from overseas (through lower trade barriers and foreign entry into domestic markets) and domestic firms (by extending the oversight and regulation of anti-competitive behavior to previously shielded parts of the economy, especially in non-tradable services);
- amendments to the industrial relations system to provide greater flexibility and enterprise focus in labor markets;
- greater flexibility in production through removal of unnecessary regulatory interference;
- greater commercial focus in government business enterprises, from simple "administrative" changes through to privatizations; and
- initiatives to raise the technology and skills base of the economy.

The Australian experience points to the importance of structural reforms. In principle, all areas of the economy are involved and a wide range of government policies and institutions can be scrutinized. Creating a competitive and open operating environment for business, together with a stable and consistent policy environment, have been important in establishing a firmer commitment to productivity improvement and the capacity to realize productivity gains.

CANADA

BY RENÉ DURAND



Productivity of the Canadian business sector grew at approximately the same rate in the (peak-to-peak) periods 1973-1979, 1979-1988 and 1988-1997 at 0.7 percent each year. However, productivity growth remains well below that posted during the 1961-1973 period, when it averaged over 2.4 percent per year.

Output growth of the business sector has also fallen over the historical period 1961-1997, both because of reductions in inputs and declines in productivity growth. Productivity, capital and labor contributed equally to the growth of output during that period.

Productivity growth of the services-producing sector has consistently trailed that of the goods-producing sector. Manufacturing industries led all other industries throughout the period under consideration, accounting for nearly half of aggregate productivity growth.

Technical progress was seen as a major force behind structural changes over the long run. In accordance with competitive market behavior (with factor mobility across industries), it was observed that industries with relatively high productivity growth rates were also those whose relative output prices fell.

In addition, little changes were observed in the distribution of nominal wages across industries, indicating that technical progress had little impact on income distribution. Hence, the benefits of productivity gains, rather than being appropriated by the workers of the high productivity gains industries through rises in their relative nominal income, were, to the contrary, largely diffused across all workers through changes in relative output prices.

Technical progress has been the major determinant of real income growth in the long run. Induced changes in relative prices and real income, in turn, impacted on the demand side of the economy and on its resource allocation.

The direct relationship between productivity growth differentials across industries and relative output changes was found to be weak. Nevertheless, high output – growth industries were also high productivity – growth industries in a few cases, such as the pipeline transport industry and the communication industry. Although less noticeable, the transportation equipment industry is also above-average both in terms of output and productivity growth. This is also the case for the plastic products industry, which has been the fastest-growing industry in the Canadian business sector.

The Canadian economy has been shifting out of goods production into services over the last 40 years. Upward shifts in the demand curves for services would have dominated the downward moves along these demand curves as the relative prices of services increased. The share of the business sector GDP in the primary goods sector has fallen by 3.9 percentage points; in manufacturing, by 4.6 percentage points; and in other goods, by 1.0 percentage point. On the other hand, the share of business sector GDP has risen by 9.5 percentage

points in services.

Primary industries lost ground, with the exception of crude petroleum and services incidental to mining. Manufacturing industries also lost in importance except for the few listed above. On the other hand, growth of the services industries was above-average, except for storage and warehousing and the industries mainly servicing households, such as owner-occupied dwelling, private education, accommodation and food, and personal and recreational services. Health services were an exception due to the aging of the population. Finally, the construction industry has been a relatively low performer both in terms of relative output and multi-factor productivity growth.

Relative capital input growth was observed to be more uniform across large industry groupings than was the case for labor input. There were several exceptions worth noting. Rapid growth in capital input occurred in a few services industries that can be accounted for by the gradual expansion of leasing activities. Insurance industries, as well as business services industries, increasingly buy more capital goods that are leased to other industries.

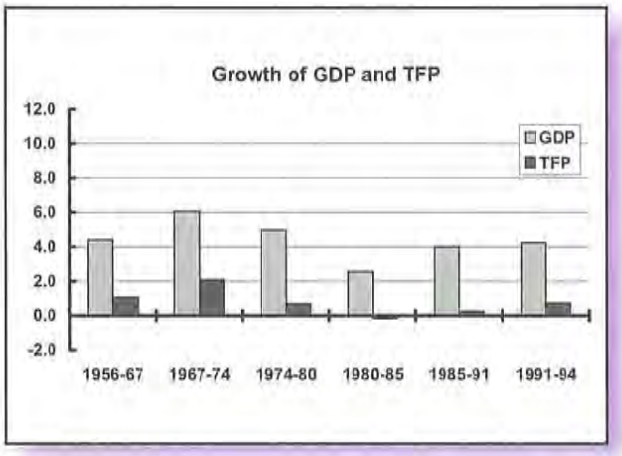
Hours worked have shifted away from primary and manufacturing industries to services industries, except for those same industries that exhibit the highest relative growth in output listed above. It seems that relative changes in capital intensity have had little impact in the shift in hours worked across major industry groupings. Rather, growth in hours worked was largely dictated by output and productivity growth differentials across industries.

The Canadian context seems to suggest that policies aimed at shifting resources from low to high productivity-growth industries may have little impact. In a highly competitive world, the allocation of resources and productivity growth would be close to optimal.

Attempts to link growth in the industries' nominal wages to productivity growth in those industries would disrupt the market mechanisms of price and real wage adjustments with potentially important consequences on growth, structural changes, and the size distribution of income of workers.

COLOMBIA

BY CARLOS POMBO
MARIA TERESA RAMIREZ



Similar to the rest of the world, industrial productivity in Colombia began to exhibit a slowdown beginning in the mid-1970s and turned negative by 1980. The productivity crisis lasted for five years. One of the reasons for this crisis was the overinvestment in fixed capital combined with a general stagnation in aggregate demand. By the mid-1980s, recovery had begun and the economy experienced moderate productivity gains. The gains have been around 1.3 percent per year up to 1995.

In general, except for the first half of the 1980s, growth in industrial productivity has steadily followed an upward trend. In fact, total factor productivity has contributed to almost 20 percent of industrial output growth during the period of study (i.e., 1970-1995). This trend is explained by productivity growth of the various factors. The rate of growth of labor was negative (-2.0 percent) during the first half of the 1980s and only grew 1.7 percent in 1990-1995. However, productivity of capital grew by 4.1 percent during that period. The appreciation of the exchange rate and the decline in import tariffs were some of the factors that contributed to the decline in the relative price of capital goods. At the same time, labor became more expensive due to an increase in labor costs as a consequence of the labor reform of 1993. By intensive factor classification, we found that industries that are intensive in human capital and technology promote industrial productivity on a larger scale than do industries that are intensive in unskilled labor. On the other hand, industries that are intensive in natural resources show a decline in productivity.

The results from the growth accounting decomposition exercise by ISIC two-digit classification indicate that the large TFP contribution to output growth came from the wood products and furniture; textile; wearing apparel and leather products; and metal products, machinery and equipment sectors. In the latter years of study, technical change in the Colombian manufacturing sector has been led by industries with greater technological complexity. Moreover, the results, which show the TFP growth rates for industrial sectors by ISIC four-digit classification, corroborate the notion that the sectors that are intensive in human capital and technology have been the most dynamic sectors in TFP growth. In contrast, those sectors intensive in natural resources — such as tobacco manufactures, wine industries, and manufacture of foods, among others — are less dynamic in contributing to TFP growth. These results indicate that the contribution to the TFP growth from the newer industries is larger than the contribution of the traditional ones.

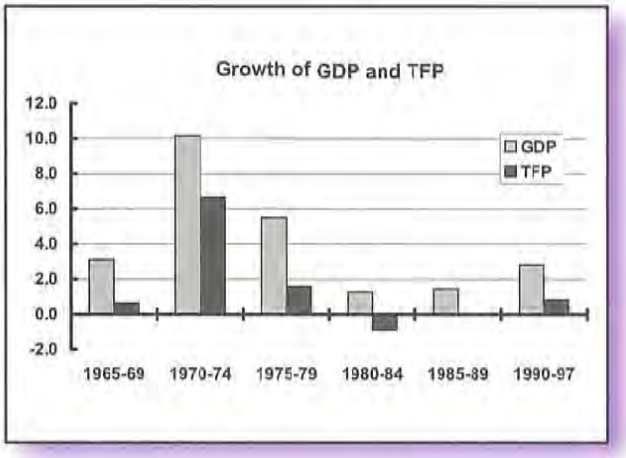
The results suggest two implications for industrial and technological policies. First, the overall performance of TFP growth for total manufacturing was less than 1 percent per year. This is well below the optimal growth in productivity to sustain any process of industrial deepening. In fact, successful processes of industrial restructuring have shown TFP rates above 3 percent per year in its long-run trend. Thus, there is a need to coordinate efforts — both private and public — to raise TFP growth rates.

Second, the econometric exercise suggests that in-

dustry-characteristic variables are natural arguments for TFP performance. The exercise leads one to conclude that the promotion of innovation activities that enhance learning-by-doing processes is a good strategy to raise productivity levels in the medium run. Licensing and labor training programs will increase labor productivity and know-how levels within firms. The role of the economic authorities and private producer associations could be to finance and sponsor technical education institutions, as well as technology transfer centers. They could also serve as information nodes concerning patents and licensing contract clauses. In addition, the expansion of markets that promote intra-industry trade flows will increase firm TFP through gains in specialization in the production of new varieties. Thus, the consolidation of regional free-trade areas will play a strategic role in enhancing productivity levels in manufacturing.

ECUADOR

BY GUSTAVO ARTETA



Marked by changing trends in economic performance, the decomposition of output growth yielded significant differences in the contribution made by total factor productivity (TFP) in Ecuador. Growth accounting methodology suggests that in the 1970s, TFP was the largest explanatory factor of economic growth. However, in the 1980s, TFP was negative and what scant growth existed was explained mostly by increased labor participation and capital accumulation. Meanwhile, in the 1990s, TFP helps account for about a third of economic growth. However, labor participation still explains most of the growth.

Analysis of the contribution of TFP at the sectoral level yields similar conclusions to the aggregate TFP trends. In all the sectors for which data are available, the most common characteristic is the high volatility of TFP over time. Some sectors — such as manufacturing and petroleum — show positive and improving TFP in the 1990s compared to earlier periods. Conversely, wholesale and retail services, and financial services show very little improvement in productivity growth. The growth in output in these sectors is mostly explained by factor accumulation.

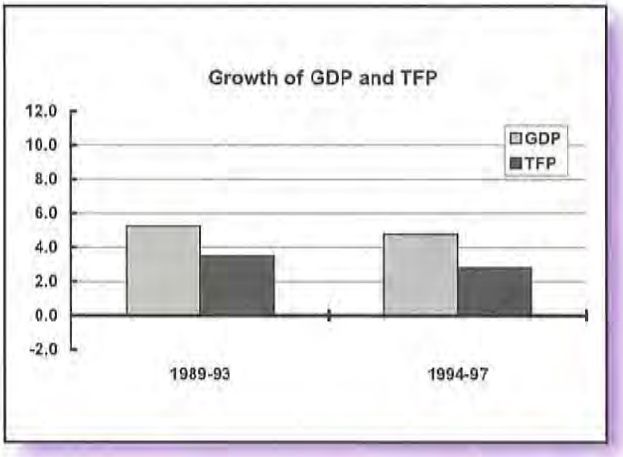
Interestingly, in some sectors labor growth is the highest contributor to output growth, while in others it is capital that leads output growth. In industrial manufacturing, TFP played the most significant role, contributing over 69 percent to value-added in the sector, although there are important differences across subsectors.

An effort is made to explain the trends in aggregate TFP. Regression analysis suggests that over 45 percent of the variation in TFP over time is explained by petroleum production that commenced (in large scale) in 1972. In addition, natural disasters explain another 40 percent of TFP growth. Taking these factors into consideration and incorporating them into a parametric estimate of TFP reveals that there has been no aggregate productivity growth since 1965. TFP estimates were found to be statistically indifferent from zero. At the same time, the results yield input shares of 0.30 for capital and 0.70 for labor.

Overall, we can conclude that growth in TFP may explain only a small proportion of economic growth in Ecuador. In particular, some sectors such as manufacturing, seemed to have benefited from improvements in TFP. However, recognizing that the country has not been able to sustain prolonged periods of high growth, it is also possible to conclude that lack of factor productivity may be the source of the scant growth in Ecuador.

HONG KONG, CHINA

BY TANG KWONG YIU



Total factor productivity (TFP) in Hong Kong, defined broadly as productivity growth from sources other than increased deployment of factors of production, is estimated to have increased at 3.3 percent per annum from 1989-1998. From 1989-1993, TFP increased an average 3.4 percent per annum, and from 1994-1998, it dropped 3.2 percent per annum. Due to data limitations, the productivity analysis in this study was done only at the overall level. Sectoral disaggregation of the production function is not yet feasible.

Improvement in TFP, on average, contributed around two-thirds, or 3.2 percentage points, to Hong Kong's 4.7 percent average annual real GDP growth from 1989-1997. The contribution of TFP to overall economic growth was more remarkable in the earlier years when TFP rose at a faster rate. TPF contributed 3.5 percentage points to the 4.7 percent average annual real GDP growth from 1989-1993. In the subsequent period from 1994-1997, TFP contributed a distinctly reduced 2.8 percentage points to the 4.8 percent average annual real GDP growth. Against a small moderation in the TFP increase, a concurrent pick-up in growth of capital stock and labor input supported the economic growth in the latter period.

A major contributor to TFP growth in Hong Kong has been the profound structural transformation of the economy in the past two decades. The rapid expansion of the service sectors, benefiting from the opening of China's economy and increased economic liberalization in East Asia, has successfully shifted productive resources to the higher value-added service activities such as trading, finance, communications and business services. Concurrently, massive relocation of production processes, predominantly to mainland China, has enabled the local manufacturing sector to concentrate on the higher value-added core activities such as order acquisition, material sourcing, product design, quality control and overall production management and marketing.

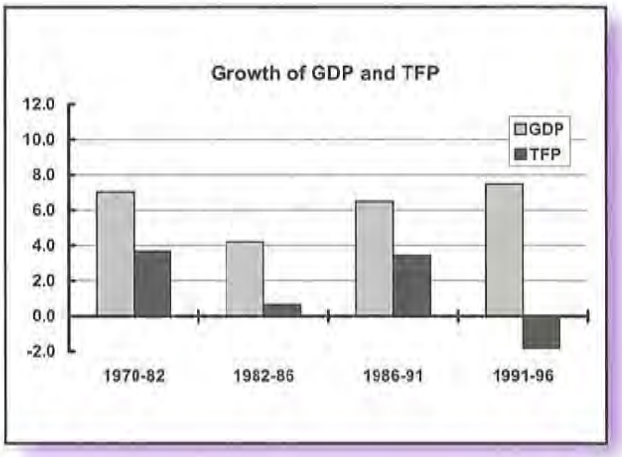
Effective mobilization of productive resources to raise TFP is fundamentally rooted in proper policy support and sound institutional framework. Hong Kong's long-standing economic policy of free market and free competition, with the role of the government confined to that of a facilitator of business activities within the market framework, is sustaining a strong push by market forces for greater cost-effectiveness, higher productivity, and better quality of output. Also contributing significantly are the dedicated efforts of the government in promoting industrial and service sector development, as well as in investing heavily in human resources and infrastructure facilities, and in upgrading of technology and know-how.

To meet the challenges of the future, Hong Kong must strive for further productivity advancement, inasmuch as it is the cornerstone for sustained economic growth in the longer term. TPF growth will continue to be essential as economic activities become increasingly knowledge-based and quality-oriented. For industrial development, this involves active acquisition of new technical knowledge and skills, and adaptation to the latest innovation. For

service sector development, this involves nourishing a high level of service skills, effective systems, and proactive and responsive service attitudes that will fully suit the clients' needs.

INDONESIA

BY MIRANDA S. GOELTOM
ARI KUNCORO



This study examines the factors behind Indonesia's phenomenal economic growth during the 1980-1996 period. Some economists challenge the interpretation of the East Asian success by giving greater credit to the influx of capital flows as the cause of East Asia's phenomenal growth. Paul Krugman, for example, pointed out that there was no miracle in the East Asian spectacular growth. Rather than being the result of technological progress, he argues that growth in East Asia was driven primarily by the accumulation of inputs. As a result, in the long-term, the economic growth is expected to diminish due to slower expansion of labor and investment.

Another interesting point to study is the sustainability of productivity growth itself. The Indonesian economy is very dependent on imported inputs. As shown by countries or areas like Japan, Singapore and Hong Kong, China, this does not pose any problem to the current account sustainability as long as the country has a sufficiently high degree of export orientation. However, because Indonesia possesses a large domestic market, any excessive domestic orientation that may be the result of domestic demand expansion and distorted trade and industrial policies will create a problem of an unsustainable current account deficit (which is one factor responsible for the current economic crisis). To address this issue, the concept of competitiveness was broadened in this study to include both productivity growth and current account sustainability.

Competitiveness is defined as an economy's ability to grow and raise the standard of living of its population without being constrained by balance-of-payment difficulties. In other words, competitiveness is defined as the capacity to increase productivity without generating a balance-of-payment crisis.

In the 1970s and the early 1980s, oil and gas dominated in the Indonesian economy. The structure of Indonesian exports was heavily dependent on oil, gas and natural resource products and this made the current account very vulnerable to international price fluctuations. The oil boom had a positive impact on TFP growth. Most of the proceeds from the boom were spent on basic infrastructure development, which resulted in TFP growth of 3.67 percent per annum during the period 1970-1982. The fall in oil prices in 1982 and again in 1986 had negative impacts on TFP growth, which slowed considerably to 0.65 percent per annum during the 1982-1986 period.

The economic reforms starting in 1986, which was in response to the plummet in the price of oil, marked major changes in trade and industrial policy. From an import substitution industrial policy with an emphasis on development of capital-intensive manufacturing in the upstream and resource-based industries, policy shifted to promote more labor-intensive, export-oriented industries. The series of reforms since 1986 had a positive impact on TFP growth.

Although the 1986 economic deregulation measures were mainly conducted in the manufacturing

sector, TFP growth for manufacturing in the post-1986 period is not as impressive as expected. Nevertheless, the economy as a whole seems to have benefited from the more liberal trade and industrial policies. During the period 1986-1991, TFP growth averaged 3.43 percent per annum.

The impact of the economic reforms after 1986 is very apparent in the structure of Indonesian exports. Exports of manufactured goods such as textiles, processed woods, electronics and shoes began to rise. In 1991, the share of non-oil exports to total exports exceeds oil and gas exports. However, until the mid-1990s, the Indonesian manufactured export base remained very narrow and consisted mainly of wood products, textiles, garments, and footwear. These industries exploit low-cost labor rather than productivity as its source of competitiveness. There was an indication that the economic liberalization seemed to reinforce this pattern of specialization. Indonesia is locked into the pattern of specialization in the production of low-productivity goods with a high dependency on imported raw materials. The emergence of unskilled labor-intensive industries as foreign exchange earners creates a new problem for Indonesia's current account. This is because these industries are very dependent on imported inputs and are thus vulnerable to exchange rate fluctuations, as is happening in the current economic crisis.

One possible explanation why TFP growth for manufacturing after 1986 is not as impressive as expected is that the liberalization of investment in 1986 coincided with the relocation effort of labor-intensive industries from the East Asian economies including Japan, Korea, Chinese Taipei and Hong Kong, China. The appreciation in real exchange rates and the rising cost of labor forced manufacturers of labor-intensive products in these countries to seek cheaper locations, and Indonesia was among the list. Since 1986, labor-intensive products such as textiles, garments, footwear, and wood products gradually overtook the importance of oil and gas in Indonesian total exports. Most of these products were destined for low-end consumption, where competitiveness was primarily based on low labor costs rather than productivity.

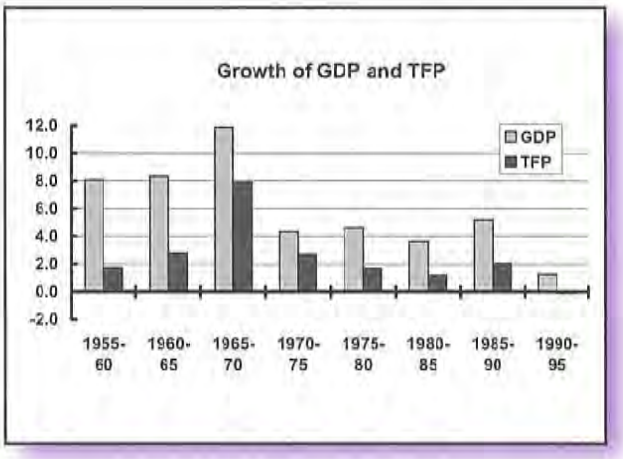
The years after 1991 is known as the period of reform fatigue, since the pace of economic deregulation slowed down. One indication of this is that the nominal tariff, which had exhibited a decreasing trend in the 1986-1991 period, hardly changed during 1991-1994. This seemed to have had an impact on several macroeconomic variables. After managing to grow at around 21.0 percent a year in 1985-1991, export growth fell to 12.4 percent in 1993 and 8.0 percent in 1994. This slowdown in export performance could be attributed to the disappointing performance of manufactured exports, which recorded 15.0 and 12.0 percent growth in 1992 and 1993, respectively, in comparison to an average growth of 30.0 percent per annum during 1985-1991.

Although it was argued that the dismal performance of several economic indicators was caused by a slowdown in the pace of economic deregulation, it was also argued that this downward trend reflected a global phenomenon. This argument was based on the observation that other Asian tigers – including Malaysia, Thailand and Korea – also experienced similar trends of a slowdown in growth. Another reason behind the slowdown of manufactured exports was the nature of the products, which were basically destined for low-end consumption and relied on low-cost labor. With successive increases in national minimum wages, the competitiveness of Indonesian labor-intensive exports appears to have eroded.

The slowdown in economic reforms is reflected in the performance of TFP growth. In the 1991-1996 period, TFP growth turned negative at -1.81 percent per annum. How important this negative TFP growth was for the 1997 economic crisis is unclear. However, one thing is clear: while excessive reliance on short-term foreign borrowings, domestic overheating and a weak banking system were factors, erosion of Indonesia's competitiveness in its main exports also contributed to the country's huge current account deficit in 1995 through 1997. In the face of large capital inflows that financed the deficit, the huge current account deficit itself was very susceptible to a reversal expectation, which is precisely what happened in mid-1997.

JAPAN

BY HIROKI KAWAI



Higher productivity for economic growth is one of the important issues for developed countries like Japan. In analyzing Japan's long-term economic growth using consistent input and output data at the macro, sectoral, and micro level, it is clear that structural change played an important role in productivity growth in Japan.

The sources of aggregated economic growth are decomposed to the contribution of factor inputs and that of total factor productivity (TFP) growth. In the higher-growth era (i.e., 1955-1975), the role of factor inputs is more important even in Japan. However, after 1975, the role of TFP growth becomes more important in explaining Japan's economic fluctuations. After 1990,the negative growth rate of TFP is accompanied with a depression in economic growth in this period.

TFP growth at the macro level is approximately explained as the weighted sum of the TFP growth in individual sectors. This sectoral pattern of TFP growth shows some similarities and contrasts. Most sectors show some diminishing trend of TFP growth from the high-growth era to the low-growth era. However, there is a contrast between the high-growth sectors (for example, machinery) and the low-growth ones (i.e., primary sectors and services). After 1990, the growth rate of TFP is negative in half of the manufacturing sectors.

The diminishing pattern of TFP growth, especially after 1990, seems to derive from the existence of excess capacity. The factor utilization rate apparently decreased in this period. This excess capacity of resources must be reallocated and utilized efficiently in order for TFP growth to recover in the future.

At the same time, the reallocation of resources (or structural change) is shown to play an important role historically in our study. Structural change is defined as the resource reallocation among sectors and the firms' evolution, especially firms' entry, within its market. The former is analyzed using sectoral data and the latter is analyzed using micro panel data.

The contribution of structural change among sectors on TFP growth is measured as the difference between the growth rate of macro data and the weighted sum of the sectoral TFP growth rates. In the study's estimates, the index of sectoral reallocation indicates a positive value historically and its contribution to TFP growth tends to be greater in the low-growth era. Especially in the period after 1990, the reallocation index is positive while the TFP growth of manufacturing and non-manufacturing sectors is negative. These results indicate that factor reallocation has played an important role, both in the previous and future periods.

This structural change among sectors is derived from the firms' new entry and exit (turnovers) in the markets. In this paper, the effect of new entries was analyzed and found to have positive effects on TFP growth, both directly and indirectly.

Firms' new entry accelerates TFP growth directly, depending on the relatively efficient new entrants.

In previous studies, this direct effect tended to be depreciated and this study also found new entrants to have a trivial effect on current TFP growth. However, the TFP levels of new entrants appears to grow rapidly within several years and they eventually surpass the level of incumbents due to their learning effect. These results show that the direct effect of new entrants is important from the dynamic point of view.

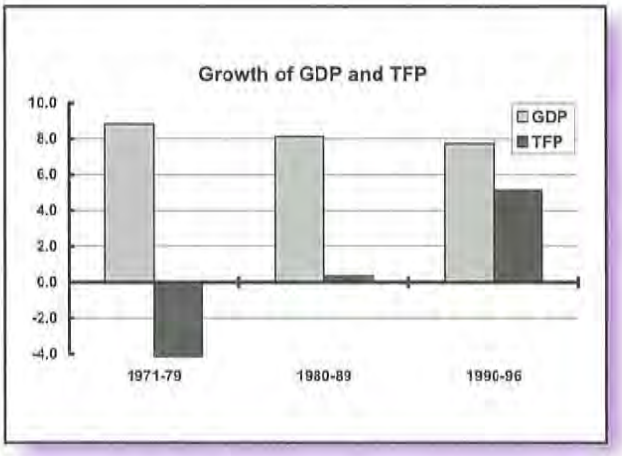
The indirect effect (externality) of firms' new entry is much more important in explaining its accelerated effect on TFP growth. In previous studies, this indirect effect also tended to be depreciated.

However, the competitive pressure of newentrants on the incumbents turns out to be statistically significant and according to this study's econometric estimations, its magnitude is not small.

Our analysis of structural change in Japan indicates the importance of resource reallocation through firms' turnovers. However, some government policies, especially the policy loan, actually play anti-competitive roles in the market. The government should induce new entries through some adequate policy instruments, which may contribute to accelerating TFP growth. Now is not the time to back off structural reform, particularly with the pressures that are emerging from the aging Japanese society. The Japanese government should commit to assuring a vital market structure.

KOREA

BY SANG-YIRL NAM



Total factor productivity (TFP) measures overall efficiency in production activities including technical progress. The average annual productivity (TFP) growth rates of major Korean industries for 1971-1996 varied widely, ranging from a high of 3.33 percent in the heavy and chemical industries to -6.62 percent in agriculture, forestry and fishing. Of the other industries, mining and quarrying revealed negative productivity growth of -0.94 percent, which may have been due to the rapid draining of resources. Relatively labor-intensive and traditional, light industry also recorded negative productivity growth of -1.34 percent for similar reasons. The services sector as a whole, excluding government services, recorded negative productivity growth of -3.09 percent with a relatively rapid inflow of resources relative to output growth.

Productivity growth in Korea's manufacturing sector, as a whole, averaged 1.67 percent for the period 1971-1996, with explicit consideration of material inputs as well as capital and labor. This sector showed continual improvement with growth rates of 0.89 percent, 1.19 percent, and 3.37 percent for the subperiods 1971-1979, 1980-1989, and 1990-1996, respectively. Labor productivity growth contributed about 60 percent to overall growth in productivity.

There exists huge discrepancies in productivity growth between light industries (such as food, beverage and tobacco; textiles, apparel and related products; wood and furniture; and paper, publishing, printing and recording) and the heavy and chemical industries (such as chemicals, rubber and plastics; basic metals; metal products and machines; electric and electronic products; and transportation equipment). The former recorded consistently negative productivity growth (-2.23 percent, -0.60 percent, and -1.25 percent for 1971-1979, 1980-1989, and 1990-1996, respectively) and the latter recorded relatively high positive productivity growth (3.54 percent, 2.56 percent, and 4.16 percent for the same subperiods, respectively). The high productivity growth of the heavy and chemical industries was primarily attributable to the rapid increase in investment.

Each industry revealed different trends in their share of GDP and total employment. Agriculture, forestry and fishing, and mining and quarrying experienced sharp decreases in their shares. The manufacturing sector, as a whole, showed a moderate increase in its share of GDP and total employment. Light industry experienced a decreasing trend in its share. In contrast, the heavy and chemical industries showed rapid increases in their shares. The services sector also revealed rapid growth in its share of GDP and total employment.

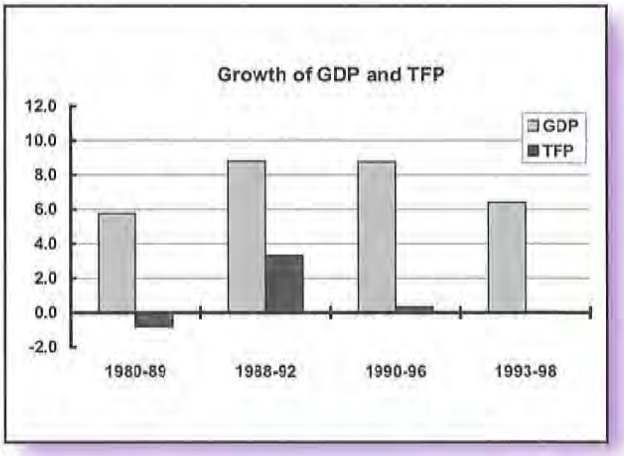
Productivity growth and industrial structure changes seem to have been closely interrelated. Resources, the factors of production, shifted from the primary sectors to light industry and then to the heavy and chemical industries. Those sectors receiving resources experienced relatively high productivity growth over time. However, most of the services sectors, which received a rapid inflow of resources, recorded negative productivity growth. This negative trend was also observed in the manufacturing

sectors during the early stages of development, a time of influx of resources. However, when the data were examined by subperiods, productivity growth in some services sectors (such as transportation, storage and communications; community, social and personal services) improved, having changed from negative to positive values over time.

Exports have generally been regarded as one of the most important "engines of growth" in East Asian emerging economies. For Korea's manufacturing sectors, the correlation coefficient between productivity growth and adjusted export growth was calculated to be 0.93, and therefore, highly correlated. It may be concluded that productivity growth had a close relationship, not only with technological factors as denoted in the production function, but also with market demand conditions, especially exports, in the Korean economy which still has a relatively small domestic market demand.

MALAYSIA

BY ONG HONG CHEONG
DENIS HEW WEI-YEN



Total factor productivity (TFP) growth gained official recognition in Malaysia in 1996, replacing the previous concept of "Third Factor Growth" which was first mooted by economic planners in the 1970s. However, no attempt was made at that time to measure this extra productivity growth that is not explained by higher inputs of capital and labor. This could be due to the lack of quality statistical data, particularly sectoral and manufacturing data published by the Malaysian Department of Statistics in the annual survey of manufacturing companies in Malaysia. The most important deficiency is the lack of published data on hourly worker's wage and hourly output per worker.

TFP growth is currently viewed by the government as the most critical element of sustained productivity growth, as well as being the most reliable country indicator of international competitiveness. It is viewed as being far more useful than other indicators such as the level of industrial production, the real effective exchange rate, the export market share, or the stock market index.

Growth of TFP for Malaysia is officially estimated at only 1.2 percent over the 1971-1990 period, rising to 2.5 percent during the Sixth Malaysia Plan period of 1991-1995. In the Seventh Malaysia Plan period of 1996-2000, TFP growth is forecast to be lower at an average of 0.1 percent. The lower TFP growth forecast is due to the Asian financial crisis which resulted in the Malaysian government revising downwards its economic growth forecast (the original GDP growth forecast for 1996-2000 was 8 percent).

According to official TFP data for the 1988-1998 period, the Malaysian economy achieved annual TFP growth of 1.54 percent against GDP growth of 6.6 percent. It was found that economic growth was driven mainly by capital investments during this period. From the available TFP data, there appears to be some inconsistency and a cause of concern. There is a declining trend in TFP growth over the past 5-6 years, with growth of TFP declining to only 0.06 percent in the subperiod 1993-1998. This directly conflicts with the expectations of stronger TFP growth, in view of the active government encouragement for state-of-the-art technology investments by both foreign and domestic investors, particularly in the electronics and information technology industries.

Based on official TFP data at the sectoral level for the subperiods 1980-1989 and 1990-1996, it is of interest to note that national TFP growth rates vary from -0.82 percent during the 1980-1989 period to a marginally positive 0.34 percent in the 1990-1996 period. While the TFP growth rate for manufacturing is 2.79 percent between 1980 and 1989, five sectors – namely, agriculture, mining and quarrying, construction, commerce and trade, and finance – register negative TFP growth. This can be explained by the impact of the very severe economic recession in 1985, which saw a virtual collapse of all export commodity prices, a stock-market meltdown, the collapse of the property market, and non-performing loans rising to about one-third of total bank loans. The surprisingly strong performance of the manufacturing sector between 1990-1996 can be attributed to the exceptionally robust

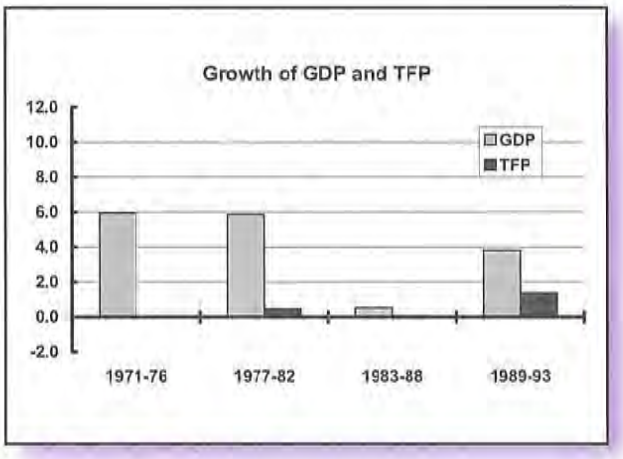
expansion of the electrical and electronics subsector.

A major impact of the Asian financial crisis of 1997 was a severe economic recession in Malaysia resulting in economic growth of-7.5 percent in 1998. Moreover, the price effects on economic activity and productivity are clearly substantial. Consequently, economic contraction has led to a sharp decline in productivity growth. The government's original forecast of an average annual TFP growth of 3.3 percent over the period 1996-2000 (from the Seventh Malaysia Plan, 7MP) was revised significantly downwards to 0.1 percent in the mid-term review of the 7MP.

Findings from recent TFP studies on Malaysia's manufacturing sector in the 1990s show that there is negligible TFP growth in terms of efficiency gains from technical progress. Therefore, improvements in TFP at the national level and for the manufacturing sector will require investments in local R&D and improving the quality of human resources. Most of Malaysia's high technology exports of electronic products were not derived from homegrown technology, but by the strong presence of foreign direct investments and the high import content of technology-based intermediate inputs.

MEXICO

BY SERGIO A. LUNA



The economic history of Mexico in the second half of the 20th century is full of contrast. For an observer in the 1950s, it was viewed as simply a matter of time before Mexico would attain a standard of living that was on a par with the developed nations. Yet, a few decades later, the picture is radically different. By the time Mexico had reached the infamous "lost decade" of the 1980s, the deterioration in economic conditions could no longer be attributed to temporary and/or exogenous factors. It was apparent that at some point, something had gone terribly wrong.

It can be argued that a proper understanding of what went wrong necessarily involves an assessment of long-term total factor productivity (TFP) trends. Indeed, such an approach offers valuable insights into the nature of Mexico's problems. Our findings in this study are consistent with those of the very few available studies on the topic. Specifically, from 1970-1985, economy-wide TFP growth shows a declining trend. Nonetheless, in the final years of the period of analysis (i.e., 1986-1993), there appears to be a timid recovery of aggregate TFP growth.

An additional feature of the decline in TFP during the 1970-1985 period is the substantial level of volatility which cannot be attributed to similar rates of variation in the availability of factors of production. Erratic rates of capacity utilization are important in explaining unsatisfactory TFP performance. Moreover, a cyclical pattern that coincides with the six-year presidential term in Mexico seems to arise. Further evidence on this hypothesis at the sector-specific level is inconclusive, but it does open the way for further, more detailed studies on this fascinating topic.

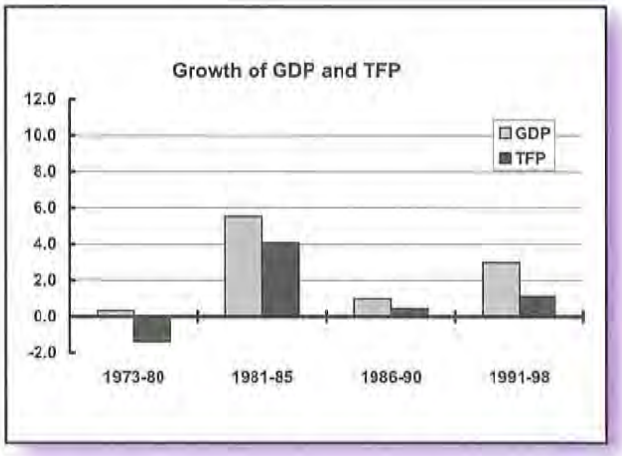
Sector-specific results are also crucial for the identification of another key factor behind TFP performance. Mexico's failure to sustain solid TFP growth has to do with inefficient resource (re)allocation. Our results suggest that the price system has played a limited role in the organization of economic activity. The reasons are diverse. "Dutch Disease" effects during the late 1970s – which is the result of inefficient policy management, particularly during the "oil boom" – combine with demographic trends to create long-lasting distortions in factor markets. Thus, opening of the economy in the late 1980s and early 1990s has allowed the recovery of TFP rates in the tradeable sector (i.e., manufactures) which is behind the aggregate results. Still this improvement has had a limited influence on standards of living and non-manufacturing TFP rates as the restoration of equilibrium in factor markets requires the elimination of distortions in all activities, whether they face foreign competition or not.

Therefore, the Mexican TFP experience has important implications for policy design. Our results suggest that sound economic policy must meet two preconditions in order to promote the kind of TFP gains that are necessary for an improvement in the standard of living. The first condition has to do with providing macroeconomic stability to allow steady rates of capacity utilization. It can be argued that, as in any evolving system, the economy

would nevertheless display productive fluctuations as a result of changes in industrial structure. While such an argument is certainly valid, nonetheless, a second lesson from past TFP performance in Mexico suggests that attempts to induce those changes via the manipulation of market signals constitute a dangerous approach. The distortions that arise as a consequence are serious enough as to become a major obstacle to the materialization of TFP gains into benefits for the society as a whole.

New Zealand

BY DONNA PURDUE



This paper presents results on the measurement of total factor productivity (TFP) at both the aggregate and sectoral levels for the New Zealand market sector over 1972-1998, which includes a period of major economic reforms undertaken in the New Zealand economy (1984-1991)[1]. The paper also provides some discussion on the impact of economic liberalization on both New Zealand's productivity performance and the reallocation of resources across sectors of the economy.

The overall picture that emerges from the Diewert and Lawrence study is that New Zealand's aggregate TFP performance has improved slightly since 1979, and is attributable to bursts of growth in the early 1980s and mid-1990s. More specifically, for the decade from 1972 onwards, TFP growth was poor; this coincided with a period of high assistance to industry and a relatively rigid economy. TFP levels recovered strongly in 1984 with across-the-board growth in the output of consumption and investment goods and exports, and only modest growth in input usage. However, between 1984 and 1993, the TFP level changed little. Output growth was variable and was matched fairly evenly by input growth. A productivity surge of 6 percent in 1994 was followed by TFP growth of around 2 percent in 1995 and 1997. TFP fell by 0.5 percent in 1998 due to a reduction in total output.

From a sectoral perspective, TFP performance has varied widely over the period 1978-1997. Overall, the results show a strong improvement in the productivity of primary industries, and an outstanding improvement in utilities. However, the manufacturing, services and construction sectors were generally found to have performed poorly.

In terms of the primary industries, agricultural TFP increased at an annual rate of 3.9 percent, while forestry TFP increased at an annual rate of 6.4 percent. Much of this strong growth may be attributed to substantial restructuring in these sectors during the 1980s. Privatization and deregulation of many of New Zealand's utilities also resulted in robust TFP growth in this sector. For example, the communications industry has a very high annual rate of TFP growth of 6.8 percent, while the electricity, gas and water industries have an annual rate of increase of 3.5 percent.

Of the nine manufacturing sectors studied, the star performer was non-metallic minerals, with annual growth in productivity of just 2.4 percent over the entire 20-year period. The worst performer in manufacturing sector was fabricated metals. This sector showed no change in the annual growth rate over the 20-year period, despite a small pickup in TFP in the early 1980s.

In terms of the service sector, the results obtained by Diewert and Lawrence (1999) highlight the significant problems associated with measuring TFP. In particular, estimates of productivity growth in the financial services sector showed a progressive decline in TFP over the period 1978-1998. However, given the reforms that occurred in this sector during the 1980s, combined with the rapid change in the range and quality of the services offered by this sector, these results seem totally implausible.

[1] This paper draws extensively on recent productivity research carried out by E. Diewert and D. Lawrence, "*Measuring New Zealand's Productivity*", a report prepared for the Department of Labour, Reserve Bank of New Zealand and Treasury, 1999.

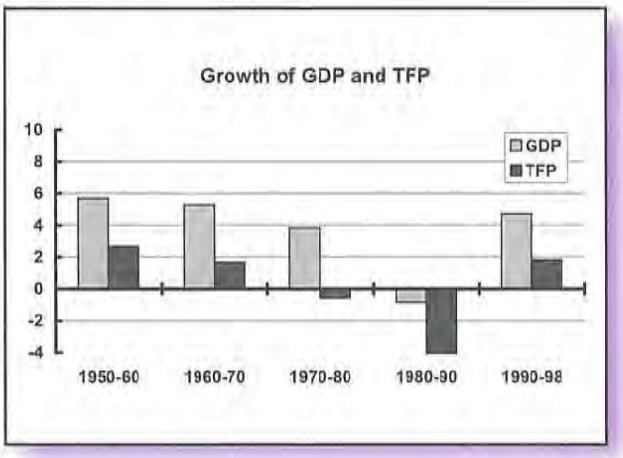
As such, Diewert and Lawrence note that the sectoral estimates need to be addressed with caution.

Having presented the evidence on New Zealand's TFP performance, the paper moves on to consider the question, "Has economic liberalization generally raised the growth rate of TFP in various sectors of the economy?", and "Has it improved resource allocation between sectors?" While there is some marginal evidence to suggest that liberalization has been associated with a rise in TFP growth across sectors, the evidence is far from conclusive. Moreover, given the rapid pace of reform, one may have expected much greater gains than has been the case. In terms of resource allocation, our analysis shows that during 1980-1997, there was effective reallocation of resources across sectors, which contributed positively to New Zealand's aggregate TFP performance. However, it is difficult to conclude that the reforms were a key factor in this reallocation.

Finally, the paper notes that the findings presented need to be considered against the backdrop of significant difficulties associated with measuring productivity. Throughout the paper, various problems related to the methodologies and data used to calculate estimates of TFP are alluded to, as such problems are likely to lead to large sources of measurement error. As a result, the TFP estimates provided in this paper should be addressed with caution.

PERU

BY LUCY VALLEJOS
LUIS VALDIVIA



Several studies have shown that growth, and to a greater extent development depends on the ability to use production factors more efficiently. This ability is also known as productivity. This paper analyzes the evolution of productivity in Peru for the period 1950-1998 and attempts to establish the main determinants of that productivity growth. The operational concept of productivity used in the paper is total factor productivity (TFP), the residual of total GDP growth that is not explained by incremental increases in capital and labor.

For Peru, growth in productivity has evolved erratically. In the 1950s and 1960s, productivity grew at relatively modest but positive rates. In the following 20 years, however, productivity decreased sharply, particularly in the 1980s when productivity declined at an annual rate of 4.0 percent. This pattern of growth was reversed in the 1990s, with productivity growing at an annual rate of 1.8 percent. As a consequence of these pronounced fluctuations, the productivity levels in 1998 were only slightly superior to the 1950 levels. In all cases, the movements in the rate of growth of GDP are explained basically by productivity changes, since both the capital and labor rates of growth were positive and stable.

Manufacturing productivity has followed approximately the same path as the aggregate productivity. Comparison of the 1970 levels of productivity with the 1997 levels shows that there has been a reduction in productivity in the manufacturing sector. Agriculture productivity follows a path with smaller fluctuations, increasing slightly in 1997 with respect to the 1970 level. In both sectors, the decline in productivity in the 1980s is responsible for this stagnation.

Global and manufacturing productivity were calculated using a Cobb-Douglas production function, whereas agriculture productivity was calculated estimating an econometric model that employed cultivated land, use of machinery, and fertilizers as explanatory variables for agricultural output. The results are consistent with the evolution of labor productivity by sectors.

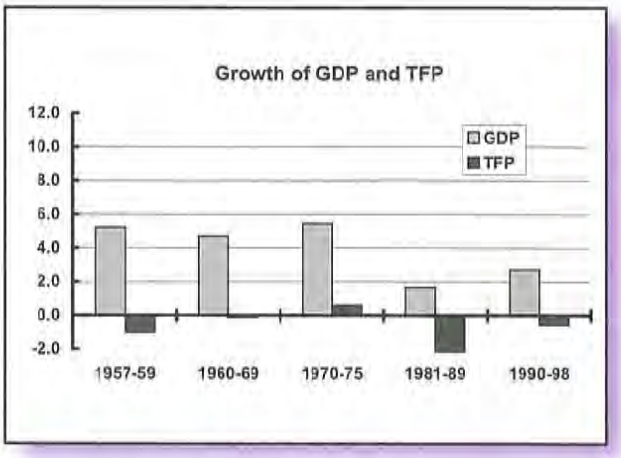
The analysis of the determinants of productivity is based on correlations between TFP and a set of variables. The results indicate that there is a positive correlation between TFP and the savings and investment rate, the terms of trade, and public investment. On the other hand, inflation (an indicator of macroeconomic stability) is negatively related with productivity. The signs of the relationships are as expected according to economic theory.

The evolution of productivity in Peru in the last decades is also explained by differences in the prevailing economic regimes. In the 1950s and 1960s, Peru's economic environment was characterized by conditions that were favorable to private initiative and a stable macroeconomic environment. This scenario changed dramatically in the beginning of the 1970s. During this period, large fiscal deficits, high inflation, a balance-of-payments crisis and growing public intervention in resource allocation produced a reduction in the rate of investment and

the level of productivity. In 1990, a program of stabilization and a vast array of structural reforms were carried out in order to restore the macroeconomic balances and to promote the development of a market economy. These transformations led to a reduction in inflation and an increase in public and total investment, which, in turn, caused a resurgence in productivity.

THE PHILIPPINES

BY CAYETANO W. PADERANGA, JR.



The record of the Philippines in terms of growth in income per person has been deficient. The search for reasons behind this has occupied numerous researchers and observers. A substantial part of the reason has been its poor record in productivity growth.

Productivity is the determining factor for economic growth in the long run. Labor productivity is the main determinant of wages in the industrial sector and of income per person in the whole economy, given constant or little change in household size. Total factor productivity (TFP) over the long run determines the economy's ability to grow over and above the growth of factors of production, and has a profound impact on the economy's long-term savings and investment rates.

This paper examines the developments in productivity in the Philippines since World War II. The record indicates that labor productivity — computed by simply dividing output (i.e., value-added) of each sector by the number of workers — for the Philippines has practically stood still over the 45-year period from 1955-1999. In some industries, such as construction and services, labor productivity in 1998 is lower than what it was in the mid-1950s in real terms. In most other industries, it has practically been constant. In no industry has labor productivity doubled in real terms over the last four-and-one-half decades.

Using the framework of unit labor cost (ULC), Philippine competitiveness was found to be decreasing. Between 1984 and 1994, there were three years where substantial falls in the ULC in dollar terms were registered (1984, 1986 and 1991) implying that there were gains in the country's competitiveness during those years. However, because labor productivity was declining during these periods, the decline in ULC was brought about by large falls in real earnings. At the same time, during these years, the wage-led fall in the wage-productivity gap was augmented by sharp exchange rate depreciations. It was only in one year (1988) that the fall in ULC was brought about by an increase in labor productivity.

To analyze productivity trends in the Philippines since World War II, four equations were used in this study to estimate aggregate TFP. By whichever measure used, the estimates show that except in the 1970s, TFP did not contribute to economic growth at all. In fact, its contribution to growth has been negative since the late 1950s. This is most evident in the 1980s when TFP contributed from -2.0 to -2.2 percent to economic growth. It remained a drag to economic growth in the 1990s.

Several studies that have directly or indirectly touched upon productivity in the Philippines invariably arrive at the same conclusion — namely, TFP in the country has been stagnant if not declining.

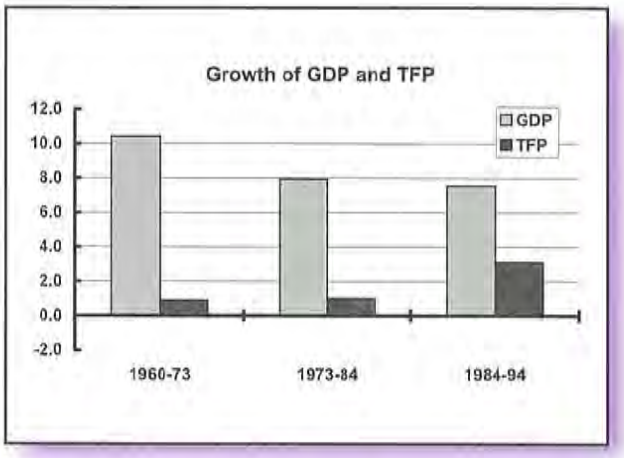
There are two overall findings of the study. First, there has been an overall decline in partial labor productivity in the period following World War II and a consequent loss of competitiveness of Philippine products. This can be attributed to the low

investment and, therefore, slow growth in capital per worker in the Philippines. Another major reason for the decline in output per worker, and the second major finding of this study, is the secular trend of overall decline in TFP throughout the period. This trend is consistent with the findings of previous studies.

The results of this and previous studies also appear to be unanimous in ascribing the disappointing record in TFP to the protectionist trade regimes and lack of macroeconomic discipline in the past. Further, this study concludes that the slow growth in the capital-to-labor ratio of the country is another significant explanation for the low productivity per worker. This can be traced to the low savings rate of the economy. This low output per worker leads to low income for the country. If economic growth is to be experienced by the Philippines, it must make radical changes in both policy and savings habits in the future.

SINGAPORE

BY RANDOLPH G. K. TAN
ASHISH LALL
MELVYN C. H. TAN



Generally speaking, the results of this paper for the manufacturing sector overall are in agreement with previous studies. These have usually implied that total factor productivity (TFP) growth in Singapore's manufacturing sector over the period 1966-1990 has had a negligible contribution to output growth. The same evidence suggests that the small figures were largely due to negative productivity growth during the one-and-a-half decades through the 1970s and early 1980s.

Using data on disaggregated manufacturing at the three-digit SSIC level, for the years 1980-1991, we found that the average annual output growth of manufacturing was 5.93 percent. The contribution of TFP growth for this period accounted for 1.07 percentage points, amounting to 18.0 percent of output growth. More than four-fifths of output growth over this 12-year period is attributable to growth in the inputs of capital (1.02 percentage points), labor (-0.05 percentage points), energy (0.17 percentage points), and materials (3.72 percentage points).

Analysis of the first half of the sample period alone shows that output grew by 3.61 percent, out of which -0.7 percentage points was made up by TFP growth. Without the negative impact of TFP, output growth would have been higher by almost one-fifth. Another way of looking at this is that the combined effect of input growth actually exceeds the final growth in output; that is, six-fifth of the growth in output is attributable to growth in the inputs of capital (1.74 percentage points), labor (-0.60 percentage points), energy (0.35 percentage points), and materials (2.82 percentage points).

For the second subperiod, i.e., 1986-1991, TFP was much higher, contributing 2.27 percentage points or almost one-quarter of output growth of 9.16 percent. The remaining three-quarters are made up of growth in inputs of capital (0.99 percentage points), labor (0.63 percentage points), energy (0.16 percentage points), and materials (5.12 percentage points).

Most studies do not distinguish materials as a separate input for Singapore's manufacturing sector. This constitutes a significant aspect of the present study, since we found that the growth of material inputs contributed a substantial proportion of output growth in both subperiods, 1980-1985 and 1986-1991.

Eleven of the 30 industries experienced negative average TFP growth over the period 1980-1091. In 1980-1985, the performance was worse with 17 industries experiencing negative TFP growth rates. By 1986-1991, however, only four had negative TFP growth rates.

The pharmaceuticals and other chemical products industry had -1.71 percent TFP growth in the first subperiod, but posted a turnaround performance of 10.12 percent TFP growth in the second subperiod.

Since the mid-1970s, manufacturing has accounted for a quarter of the Singapore's total GDP. Within the sector itself, however, there has been an overhaul from low-technology, labor-intensive manufacturing to high-technology, high value-added processes. In 1965, commodities such as food, crude materials and oil together made up 51 per-

cent of all exports. In 1990, machinery and transport equipment exceeded half the export share, and by 1995, they comprised fully two-thirds of exports.

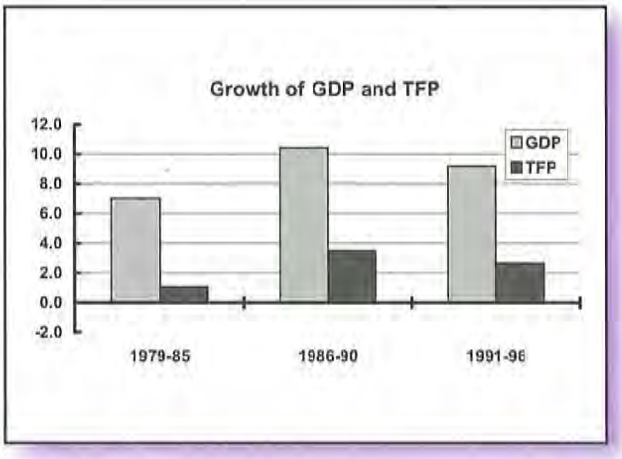
In order to analyze the influence of dynamic factors on TFP performance, we looked at changes in the rates of capacity utilization in the manufacturing sector. By defining capacity output to occur at the tangency of the short- and long-run average total cost curves, the values of the ratio of actual-to-capacity output below and above unity are interpreted as under- and over-utilization of installed capacity, respectively. The resulting measure of economic capacity utilization computed from the estimated short-run cost function exhibits a high degree of volatility.

When there is capacity underutilization, the growth accounting measure of TFP is biased downwards. In cases where capacity utilization rates tend to vary, possibly as a result of short-term restructuring adjustments, use of the growth accounting measure alone may lead to substantially different conclusions about the long-term growth prospects of the economy. Alternatively, the capacity utilization ratios provide a perspective of adjustments at the industry level.

This suggests that another important determinant of TFP growth at the industry level is the adjustment cost of a fairly volatile restructuring process. Such costs may potentially wipe out the gains from being in the right industry. An illustration is provided in the case of the all-important electronic products sector (384). For this industry, it is compelling to offer the following explanation for the poor overall performance of adjusted TFP growth in the sample period: the excess capacity experienced in 1989-1990 occurred because of delays in responding to market demands. Once the correct response had been achieved by 1991, TFP resumed positive growth (which it had experienced from 1983-1988) and excess capacity all but dissipated.

CHINESE TAIPEI

BY WAN-WEN CHU



Chinese Taipei's industrial structure has been changing swiftly over the last few decades. The transformation from a predominantly agricultural society to an industrialized one took place in the 1950s and 1960s. The light industries grew rapidly from the late 1960s to the mid-1980s, and then began to grow much more slowly or even contracted or simply moved offshore since the late 1980s. Heavy industries emerged gradually in the late 1960s, then picked up speed in the 1970s, and took over the dominant position in the 1980s.

The high-tech industry was in its infancy in the 1970s, then began to grow quickly in the 1980s and became the dominant industry in the 1990s. The decline of labor-intensive industries and the increasing dominance of the high-tech industries took place at a remarkably fast pace after the liberalization in the late 1980s and especially in the 1990s. The speed of transformation of Chinese Taipei's industrial structure quickened in the 1990s. This transformation is largely reflected in the changing composition of Chinese Taipei's exports.

Some economists have argued that East Asian NICs achieved little technical progress in their so-called miracle growth. This study, which uses the conventional method of measurement, found respectable rates of growth in total factor productivity (TFP) for Chinese Taipei's industrial sectors from 1978-1996; this result is similar to results obtained from other studies. Since Chinese Taipei has successfully transformed itself into an economy that relies heavily on high-tech industries, it is difficult to reconcile this fact with the argument that no technical progress has taken place.

As expected from our understanding of the Verdoorn effects, growth in the output level and labor productivity of Chinese Taipei's manufacturing industries has been found to be highly correlated during this period under study. As output grows faster, learning then takes place more rapidly, and the growth in labor productivity also accelerates.

However, when we examine the relationship between TFP and other growth variables, the correlation appears to be much weaker and the pattern of changes is less clear-cut. It is possible that the usual problems with data and the inherent difficulties in distinguishing between an increase in capital or labor (i.e., a movement along a production function) and an increase in knowledge (i.e., a shift in a production function) have led to this result. Nonetheless, the overall level of TFP growth obtained in this study shows that Chinese Taipei has indeed experienced an acceptable rate of technical progress during this period.

The role of policy must have had some influence on Chinese Taipei's TFP, because the industrial policy was responsible for setting up the forerunner of Chinese Taipei's semiconductor industry in the 1970s, and for promoting and upgrading this sector every step of the way since then. The policy of subsidizing R&D and sponsoring cooperative research, of course, is likely to have helped as well. The effects of all these industrial policy measures are evident in the growth record of Chinese Taipei's high-tech industries.

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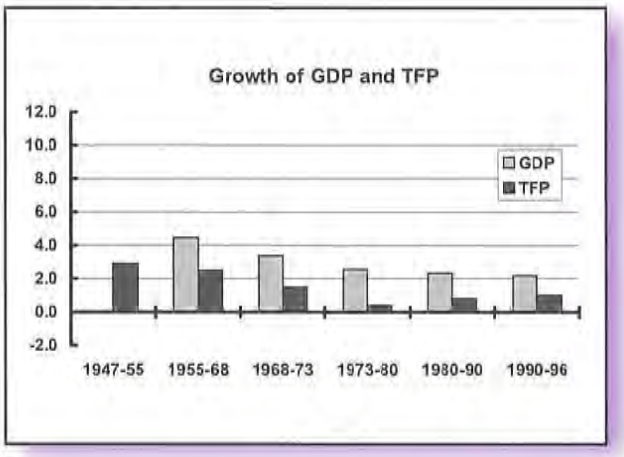

Total factor productivity (TFP) growth is believed to have contributed significantly to U.S. economic growth since the late 19th century. The magnitude of that contribution – both in absolute terms and in relation to aggregate growth – has varied from one period to another. There is evidence that TFP growth contributed quite substantially to aggregate growth between 1896 and the late 1960s. In particular, between 1948 and 1973, even after accounting for improvements in labor and capital quality, growth in aggregate TFP averaged almost 1.4 percent per annum, accounting for more than one-third of aggregate GDP growth.

Despite a short-lived resuscitation in TFP growth between about 1980 and 1986, however, there was a very substantial decline in the rate of TFP growth to about 0.34 percent per annum from 1973-1996, accounting for only about 15 percent of aggregate growth during this period. Both the brief resuscitation in TFP growth in 1980-1986 and the overall TFP growth performance in the post-1973 period have varied considerably in strength and in direction from sector to sector. TFP growth was strongest in agriculture and durable goods manufacturing and worse (even negative) in mining and most services.

There occurred some increase in TFP growth, especially in labor productivity growth, beginning in the mid-1990s. This event has been interpreted by many as a sign that the much-anticipated impact of the information technology revolution is beginning to show up on aggregate growth. Yet, in view of evidence suggesting that the increase in information technology has mainly substituted for more traditional forms of capital, it is by no means clear that U.S. TFP growth will ever re-attain the rates that characterized the 1948-1973 period.

From a sectoral perspective, when the sectors are broadly defined – that is, agriculture, mining, manufacturing, other industries and services – it is quite clear that since 1973, TFP growth has been highest in agriculture and lowest in mining and services, with manufacturing and other industries somewhere in between. Because both labor and land inputs have been declining in agriculture, TFP growth has accounted for more than 100 percent of the output growth in that sector. Within the U.S. manufacturing sector, as in other countries, durable goods manufacturing and especially electric machinery have enjoyed more rapid TFP growth than non-durables manufacturing. Within services, communications has been the star performer with rates of TFP growth well over 3 percent per annum. By contrast, finance, insurance and real estate, and other services have experienced negative TFP growth since the mid-1970s. Given the large and increasing contribution of services to the U.S. gross domestic product, the rather dismal performance of TFP growth in the services sector is a matter of concern. Nevertheless, because of severe methodological problems in distinguishing the effects of quality changes from cost changes in services, and the fact that the U.S. is well behind European and other countries in mitigating these measurement problems, it is certainly possible that the U.S. TFP growth performance in services, and hence the whole economy, is somewhat underesti-

mated.

There is some indication that annual rates of TFP growth are positively related not only to annual rates of growth of GDP contemporaneously, but also to the next year's rate of growth of GDP. In contrast to several other countries studied in this volume, the U.S. experience has shown that TFP growth tended to be higher in years of dollar appreciation (nominal as well as real). This may suggest that the pressure imposed by currency appreciation may induce firms to seek methods that increase competitiveness and hence productivity.

As might be expected for a large and mature country, another factor contributing to TFP growth and to overall growth in the U.S. is the share of R&D expenditures in aggregate GDP, especially in communications services, electric machinery and equipment, and agriculture.

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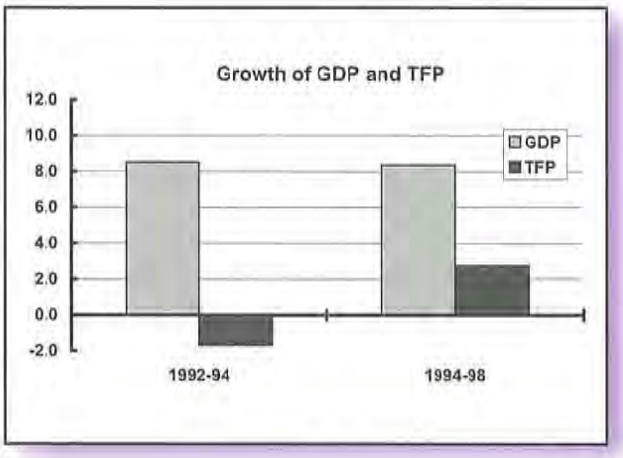

Estimates of total factor productivity (TFP) are not familiar in Vietnam, primarily because a longer time series and a perfect statistical system which are necessary to properly calculate TFP do not exist in Vietnam at this time. Because the time-series data are not long enough to undertake an econometric estimation approach, the growth accounting approach was used in this study to calculate TFP in Vietnam.

Three assumptions are made in this study. First, the shares of aggregate factors in total payments are assumed to be changing smoothly and following an upward trend from 1989-1996. In addition, the coefficients (as a share) used refer to the value of the inputs for one year instead of a two-year average. The second assumption is that total capital assets in 1994 prices are calculated from the current price multiplied by the rate of the GDP deflator. Capital, expressed in domestic Vietnam dong, in the foreign direct investment sector is calculated as the total value of the investment expressed in US$ multiplied by the current exchange rate. Moreover, total assets of state-owned enterprises (SOEs) are calculated on the basis of the total assets of SOEs that reregistered since 1992. Furthermore, only capital assets of enterprises and companies are taken into account while capital assets of the administrative and government management sectors are not. The third assumption is that people involved in the economy are fully employed (where employment does not include government employees). It is also important to note that the number of man-hours, although an important term in studying TFP, is not considered in this study.

The primary results are as follows. First, in the economy as a whole, TFP is rather significant and there are only two years (1992 and 1993) when TFP is negative. In some years, TFP contributes from 18 to 51 percent of GDP growth.

It is particularly important to note that the trend in TFP growth is the same as that of GDP growth. In 1996, for example, when the GDP growth rate was at its highest level, TFP contributed the highest percentage to the GDP growth rate (51 percent). It can therefore be said that in 1996, the economy was in an ideal situation not only in real terms, but also in productivity terms.

Looking at TFP by ownership—that is, the state-owned enterprise (SOE) sector, the private sector, and the foreign direct investment (FDI) sector—it was found that for the SOE sector, the share of TFP in GDP growth is very high. For several years, it is more than 65 percent (except for 1993, when it was 59 percent). The situation is a bit different in the case of the private sector. After two years of contributing negatively to GDP growth, private sector TFP contributed the highest to GDP growth in 1994 (though the value was negative); thereafter, the contribution of this sector follows a smoothly declining trend. In 1995, in absolute value terms, the growth rate of GDP in this sector was at the highest (8.98 percent) at the same time that the TFP value was at the highest (5.2 percent). It is necessary to note that in the first three years before 1995, TFP growth rates were negative and in some

years after 1995, TFP growth rates went downward. TFP for the FDI sector growth rate is going up. Though in 1998, the TFP was negative (this sector is the one that has been most affected by the financial crisis in the region), TFP is considered to have increased. In 1992, TFP in this sector was 3.34, and increased to 61.1 in 1995, and then fell to 22.6 and 27.9 in 1996 and 1997, respectively. Contribution of TFP to GDP growth increased from 6.9 in 1992 to 81.1 in 1997 (there was only a slight decease in 1994 as compared to 1993). Though more observations are needed for conclusive results, this study nevertheless preliminarily shows that productivity of the FDI sector is significant.

The study also found that the contribution components, changes in industrial structure and policies affect productivity. Labor productivity in 1988-1995 of the economy continuously increased an average of 4.9 percent each year, and the highest rate occurred in 1995 at 7.8 percent. Meanwhile, labor productivity in the industrial sector increased an average of 6.2 percent annually and the highest rate also occurred in 1994 (10.8 percent) and only increased at a positive rate since 1991. By 1998, the average of GDP per labor is 1.47 compared to that of 1990. On average, GDP per labor increased about 5 percent per year. However, the rise in labor is lower than that of GDP per capita over the past 10 years. In addition, the incremental capital-output ratio (ICOR) of the Vietnam economy in 1991 was 2.7, but by 1998 it had almost doubled to 5.03.

After twelve years of the reform, the structure of the economic sector has changed. The share of agriculture has been decreasing, while the shares of industry and services have been rising. Besides, the change in the structure of the industrial sector has tended to raise the share of industries that have been financed from foreigners. About US$18 billion in investments have been implemented in Vietnam. By 1995, total assets of the SOE sector was 63.3 percent of total assets of companies, while the domestic private share was 5.3 percent and the foreign sector share was 31.2 percent. However, the share of state-owned enterprises (SOE) in both industry and services has increased over the last 10 years. The share of the SOE sector in industry increased from 47.62 percent in 1990 to 56.73 percent in 1998. Meanwhile, the share of SOE in the services sector has risen from 45.2 percent in 47.62 percent in 1998.

There is no doubt about the role of investment in the growth of productivity. In Vietnam, there are four main sources of investment: official development assistance (ODA), foreign direct investment, government and domestic private sector. Currently, commercial loans for investments and portfolio resources remain limited. Other factors that also contributed to Vietnam productivity include education; the opening of the economy, population growth, improvement in the health of the population, and marketization.

Substantial progress has been made in TFP and structural change in Vietnam since the reforms which have been directed toward reliance on market signals. To improve productivity and structural change for more effective and productive growth in the future, greater emphasis should be placed on the market mechanism. The economy and companies should move toward greater competitiveness. There is also a need for a more perfect and complete market-based data system to provide the data sources to undertaken a comprehensive study of productivity in Vietnam. Above all, TFP of the economy should be considered an important and official criteria to value progress.

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