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AIMS AND SCOPE OF *INDUSTRY AND DEVELOPMENT*

Industry and Development attempts to provide a link between practitioners and theorists working on economic and related aspects of industrialization. The focus of the journal is on applied economics, particularly in areas emphasized in the Lima Declaration and Plan of Action on Industrial Development and Co-operation.

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The Supervisory Panel of *Industry and Development* welcomes readers' opinions and comments, and will be glad to consider for possible publication articles relevant to the aims and scope of the journal (see "Information for contributors", back cover).

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THE DEVELOPMENT OF THE MOTOR VEHICLE INDUSTRY IN POST-SECOND-WORLD-WAR JAPAN

Shujiro Urata*

Introduction

The motor vehicle industry plays a crucial role in the Japanese economy.** For example, 6.2 per cent of the manufacturing output of Japan in 1985 and 20.4 per cent of total exports in 1986 came from that industry. Even those large figures underestimate the role of the motor vehicle industry in the Japanese economy, because they do not take into account the extensive and intensive forward and backward linkages between the motor vehicle and other industries. As an illustration, in 1985 the motor vehicle industry employed 201,135 workers, or only 0.4 per cent of the total labour force. But if the motor vehicle parts industry is included, the number of employees jumps to 764,851, or about 1.5 per cent of the labour force. Furthermore, if the scope is widened to include other related industries, such as distribution of motor vehicles and transport services, total employment in the motor vehicle and related industries amounted to 5.25 million, or 10.2 per cent of the total labour force.

Globally, Japan has been the largest motor vehicle producer since 1980 (see figure I). In 1985 the number of vehicles produced in Japan was over 12.2 million, a 27.7 per cent share of world production. Of that number, 54.8 per cent were exported. The exports represented 42.1 per cent of the world export total in 1985. Japan imported, however, only 53,151 motor vehicles in 1985, a mere 0.2 per cent of total world imports of motor vehicles.

Such statistics reflect the significance of the industry, not only to the Japanese economy, but also to the world market. Despite its present size, the industry was a small one only four decades ago. In 1950 Japan produced 225,497 motor vehicles, only 2.1 per cent of world production. Although the annual average growth of production reached rates as high as 18.6 per cent between 1950 and 1985, difficult challenges, such as technology improvement and sales promotion, had to be overcome in order to achieve high growth. After the successes of the 1960s and 1970s, the Japanese industry has been confronted with a variety of new challenges in the 1980s. They include protectionism abroad and an appreciation

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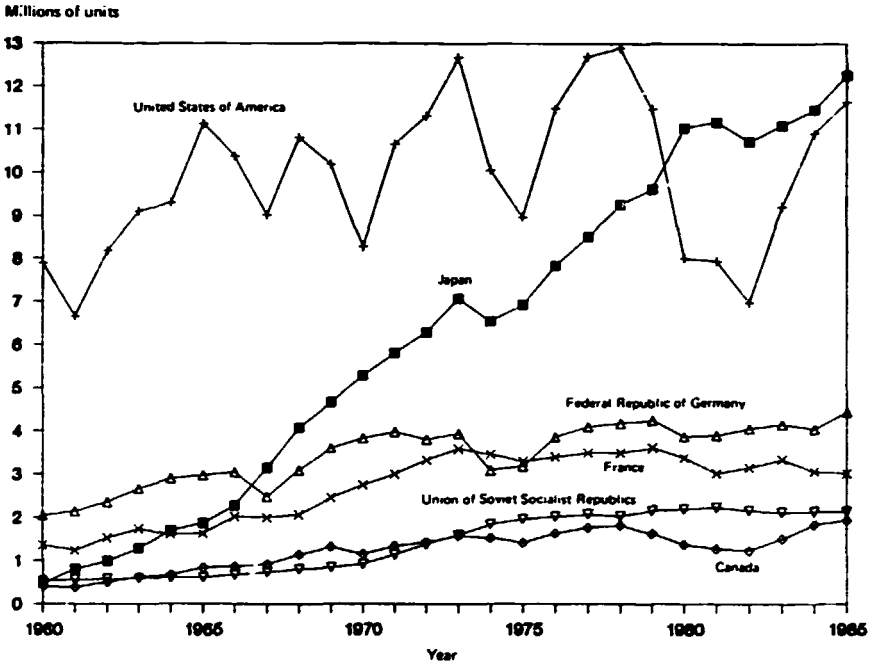
**Throughout the paper, the term motor vehicle is used to indicate the category consisting of passenger cars, trucks and buses, whereas the term automobile is used to indicate passenger cars.

of the yen, which loom as the biggist obstacles to Japanese producers.

Figure I. Motor vehicle production in selected countries



Source: [1] and [2].

This paper examines the factors that led to the rapid expansion of the Japanese motor vehicle industry during the period following the Second World War. The period is divided into three parts corresponding to three stages of development suggested by the catching-up-product-cycle hypothesis, namely the import-substitution stage, the export-expansion stage and the mature stage. In the analysis of each stage, the development pattern followed by the motor vehicle industry and the factors important in that stage of development will be detailed.

A. The catching-up-product-cycle hypothesis

The catching-up-product-cycle (CPC) hypothesis, first proposed by Akamatsu and further refined by Kojima and Yamazawa, describes the evolution of an industry in a developing country.* According to

*Akamatsu's first works on the subject appeared during the mid-1930s in Japanese. The literal translation of the pattern of development of an industry coined by Akamatsu is the "wild-geese-flying" pattern. For an English presentation of his hypothesis, see Akamatsu [3]. For later developments of this hypothesis, see Kojima [4] and Yamazawa [5].

the hypothesis, in a developing country engaged in the process of catching up with developed countries, the evolution of an industry follows a sequential pattern, which begins with the import of a new product that gives rise to domestic demand for that product. The newly created demand induces domestic production. As domestic production expands to meet growing domestic demand, unit production costs decline, mainly through scale economies and technological improvements. The realization of scale economies and technological improvements are often facilitated by the protection of the industry from imports and by the introduction of foreign technologies. That is the stage at which import substitution occurs in the catching-up-product-cycle, that is, imports are gradually replaced by domestic manufactures.

Empirically, a declining import surplus marks the import-substitution stage, in which the ratio of domestic production to domestic consumption is less than unity but increasing. Once the unit cost of production reaches the internationally competitive level, export begins. Export expansion proceedr as unit costs decline even further as a result of factors such as learning-by-doing and output expansion. Output expansion, in turn, is mainly due to export expansion as domestic demand stagnates. Thus the export-expansion stage is characterized by a ratio of domestic production to domestic consumption that is greater than unity and increasing. At that point, direct foreign investment increases as sales networks are established to expand exports. Export expansion slows down, however, as the cost of production increases owing to various factors such as increasing labour and environmental costs. The slow-down of export expansion is also prompted by declining demand as other developing countries initiate the import-substitution stage in the CPC pattern. The stage thus reached is called the maturity stage, which is characterized by a ratio of domestic production to domestic consumption still greater than unity but declining. During that stage an industry that is losing comparative advantage transfers resources through direct foreign investment to a country where the corresponding industry is gaining comparative advantage. During the final stage, the reverse import stage, the now developed country begins to import from developing countries that are entering their export expansion stage.*

Although the CPC hypothesis and the product-cycle hypothesis developed by Vernon [7] share many similarities, they differ in several respects. The product-cycle hypothesis attempts to explain the pattern of development by starting with a new product (product innovation) and examining the changes that take place in the patterns of production and trade. In the product-cycle scenario a country with abundant skilled labour and advanced technology invents a new product. The new product is then exported. As the technology required to manufacture the product is standardized, production starts in other countries, even though they are endowed with unskilled rather than skilled labour. As the latter countries

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*Shinohara [6] called the reverse import effect the "boomerang effect".

gain comparative advantage, they start exporting the product to the country that originally invented it. The key element in the product-cycle hypothesis is the technology required for the product as it goes through its life cycle, including highly intensive research and development technology as well as standardized mass-production technology. The CPC hypothesis, however, is based more on comparative advantage along the lines of the Heckscher-Ohlin principle. In other words, the changing pattern of production and trade generally follows changes in factor endowments, while industrial technology remains more or less unchanged. But unlike the Heckscher-Ohlin principle, the CPC hypothesis emphasizes the importance of learning-by-doing and scale economies during the development of an industry. With regard to the pattern of direct foreign investment, the product-cycle hypothesis assumes that the oligopolistic market structure of the industry encourages such investment, whereas in the Kojima model direct foreign investment is undertaken in response to changes in factor endowments within the framework of the competitive market. It therefore seems that the product-cycle hypothesis may be suitable for explaining the development pattern of an industry in a developed country, whereas the CPC hypothesis appears better suited to explaining the development pattern of an industry in a developing country.

Because motor vehicles were first introduced into Japan through imports, the CPC hypothesis best fits the development pattern of the motor vehicle industry in Japan.* The changing patterns of production, consumption and trade are shown in figures II and III. Figure II shows the changing patterns of the following five variables for the Japanese motor vehicle industry: domestic production, domestic consumption, exports, imports and overseas production. Figure III shows the ratio between domestic production and domestic consumption. As the figures illustrate, Japan started as a net importer but became a successful exporter during the 1960s and 1970s.** The figures also show that towards the end of the 1970s the rate of export expansion began to decrease while overseas production increased. Those trends show that the Japanese motor vehicle industry had gone through the successive stages of import substitution, export expansion and maturity.

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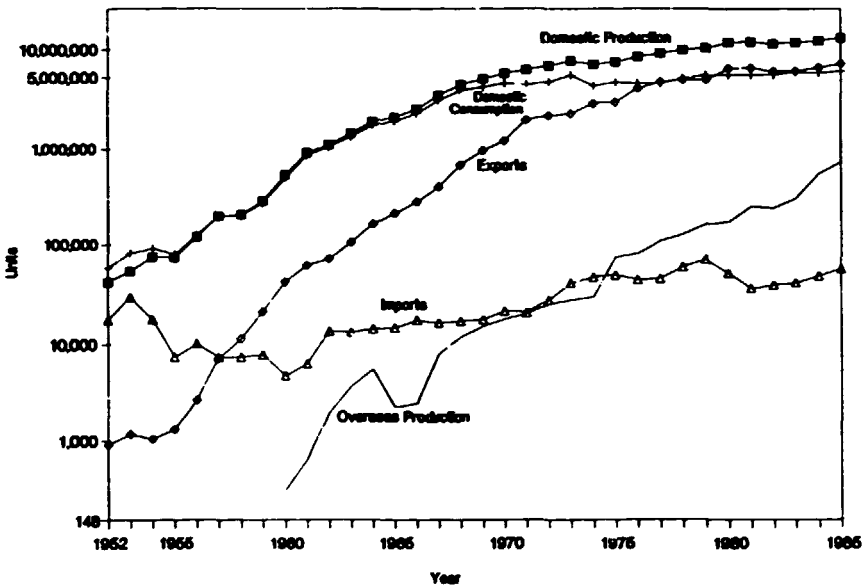
*Yamazawa [8] analysed the catching-up development patterns of the cotton textile and steel industries in Japan.

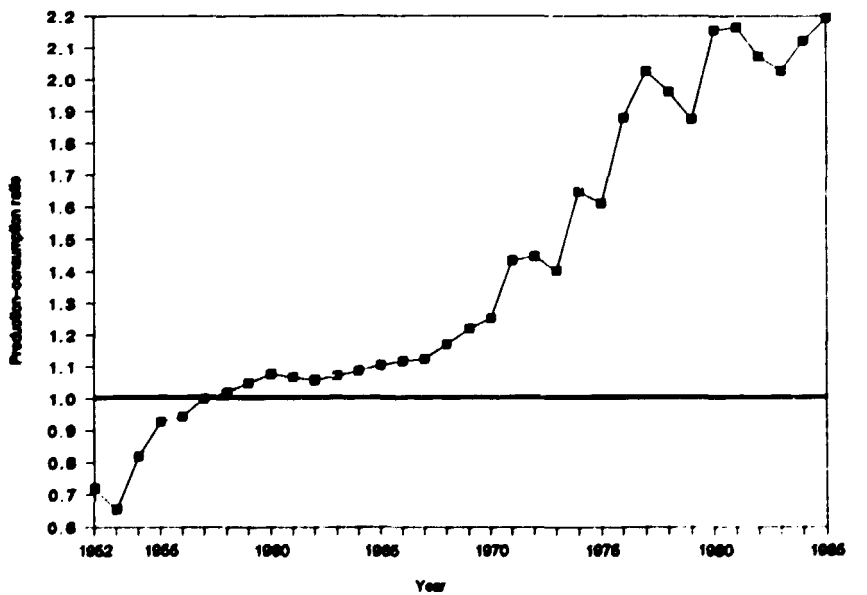
**Although the analysis in this paper is confined to the development of the motor vehicle industry during the post-Second-World-War period, for which ample data are available, the import-substitution period in fact began before the Second World War, when domestic demand for motor vehicle production was satisfied by imports and by domestic production based mainly on the assembly of imported knock-down kits. For further discussion of the development of the Japanese motor vehicle industry before the Second World War, see Adachi, Ono and Odaka [9] and United States Department of Commerce [10].

Figure II. Development pattern of the Japanese motor vehicle industry



Sources: [1], [2], [11] and [12].

Figure III. Domestic production consumption ratios



Source: [1].

B. Import substitution: the end of the Second World War through the mid-1960s

The period from the early post-Second-World-War years until the mid-1960s was the time when the Japanese motor vehicle industry completed the import-substitution stage and laid the foundation for the export-expansion stage of the late 1960s and 1970s. Between 1946 and 1965 Japanese motor vehicle production increased more than 120 times, from 14,921 to 1.9 million vehicles, while world motor vehicle production increased slightly over sixfold, from 3.8 million to 24.3 million vehicles. Since production in Japan grew at a much faster rate than that of the world as a whole, Japan rapidly increased its share of world production from 0.4 to 7.8 per cent during the period 1946-1965, and by 1965 ranked fourth in the world behind the United States of America, Germany, Federal Republic of, and the United Kingdom of Great Britain and Northern Ireland. Despite a rapid increase, from 5 per cent in 1950 to 37 per cent in 1965, in the share of automobiles in the domestic production of Japan, trucks continued to represent a large share of its motor vehicle production in 1965; it ranked sixth among world automobile producers, but higher for total motor vehicle production.

The ratio of domestic production to domestic consumption increased rapidly from 0.72 in 1950 to over 1.0 by 1958. The ratio hovered around the 1.1 level until the mid-1960s (see figures II and III). The pattern of change in the ratio of domestic production to domestic consumption shows that the import-substitution stage in the production of motor vehicles in Japan was completed by the mid-1960s. The completion of the import-substitution stage was defined in section A as the time at which the ratio of domestic production to domestic consumption reaches 1.0, which occurred in 1957 in Japan. Since, however, imports of motor vehicles were heavily restricted, it is reasonable to assume that true import substitution was not completed until the mid-1960s. In this section the factors that led to a rapid increase in Japanese motor vehicle production, thereby enabling the industry to complete the import-substitution stage, will be analysed.

The rapid expansion of motor vehicle production during the post-Second-World-War period appears to have resulted from the following four factors: special procurement by the United States military; government protection and promotion policies; an increase in domestic demand; and strong competition among domestic firms.

The first push toward the recovery of the Japanese motor vehicle industry from the Second World War was provided by the United States military.* Immediately after the War, "operation roll-up" was undertaken to rehabilitate motor vehicles abandoned by United States forces throughout the Pacific during the conflict.

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*Motor vehicle production in Japan in 1940 amounted to 37,772 units, representing 0.8 per cent of world production. Most of the production was trucks, about half of which were for military use.

Demand was thus created for the products of the Japanese motor vehicle industry.* Subsequently, special procurement by the United States military caused by the outbreak of hostilities in Korea gave a needed impetus to the Japanese motor vehicle industry, which was suffering from a recession at the time. As a result, motor vehicle production almost doubled during the period of hostilities in Korea. In addition to creating a demand for motor vehicles, the United States military transferred technologies and skills, such as the quality circle system, to Japanese producers.

To catch up with the West, whose economic and technological superiority over Japan had increased during the war, the Ministry of Commerce and Industry (later the Ministry of International Trade and Industry (MITI)) designated motor vehicles in the early 1950s as a strategic industry targeted for rapid development.** Two types of measures were adopted for the purpose, namely protection measures and promotion measures.*** Protection measures included import protection through high tariffs and import quotas and high excise tax rates for expensive passenger cars, all of which were foreign-made. Promotion measures included preferential loans, a special depreciation allowance and exemption of import duties on necessary machinery and equipment. Both motor vehicle producers and parts producers benefited from those measures. Indeed, successful development of the parts industry was to become one of the most important factors in the success of the Japanese motor vehicle industry.

In addition to the parts industry, other industries supporting the motor vehicle industry, such as the iron and steel and the electronics industries, were also protected and promoted. Protection and promotion measures were, in fact, applied to a wide range of industries. There are two ways of assessing the policy of targeting specific industries for development. The more favourable assessment focuses on the policy part of a well-co-ordinated development strategy that seeks to maximize the benefits of forward and backward linkages among industries. Critics emphasize the ineffectiveness of such policies, an ineffectiveness which results from their wide coverage. The views of both advocates and critics of such policies appear to be validated to some extent by the development of the motor vehicle industry in Japan. Protection

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*For further discussion of the impact of the United States military, see Chang [13].

**Two opposing views were expressed within the Government regarding the promotion of the motor vehicle industry. Relying on the infant industry argument, MITI favoured promotion, whereas the Governor of the Bank of Japan, on the basis of the comparative advantage existing at the time, was against it. See Ueno and Muto [14] for details.

***Another type of measure may be included, namely support measures, the main feature of which was road construction. See Muto [15] for further discussion.

policies began to be liberalized during the early 1960s when Japan joined international organizations such as the General Agreement on Tariffs and Trade, the International Monetary Fund and the Organisation for Economic Co-operation and Development (OECD).

Domestic demand provided the major impetus for the growth of motor vehicle production between the early 1950s and mid-1960s (see tables 1 and 2). Coupled with the cost reduction due to technological progress and scale economies, an increase in personal income resulted in the expansion of automobile purchases. Despite the rapid increase in Japanese automobile consumption, by the mid-1960s the ratio of population to automobiles in Japan in 1965 was 12.4, much higher than the corresponding ratio for Western countries, where it was around 4.5 (see [14]). Hence there was room for further increases in automobile consumption in Japan.

Cost reduction was achieved through improving technologies, learning-by-doing and scale economies. In addition to substantial research and development efforts by domestic producers, foreign technology, which could be imported only with government approval, contributed to technology upgrading. Four licensing agreements with foreign motor vehicle manufacturers were concluded in the early 1950s: in 1952, Nissan-Austin (United Kingdom); and in 1953, Hino-Renault (France), Isuzu-Roots (United Kingdom) and Shinmitsubishi*-Willys (United States). Within five years of the conclusion of the agreements, the foreign technologies were completely assimilated, mainly as a result of the considerable effort made by Japanese producers.

Subsequently, scale economies were brought about through investments by domestic firms. Around 1960 a number of factories with capacities comparable to those in Western countries were established. Factories specializing in certain stages of production were set up, and active technology import and investment resulted from strong competition among domestic producers seeking primarily to expand market shares. Competition between domestic producers was one of the most important factors in the rapid development of the Japanese motor vehicle industry during both the import-substitution and later stages, a point that will be examined in greater detail below.

In this section four factors that contributed to the rapid expansion of the Japanese motor vehicle industry in the early post-Second-World-War period have been emphasized, namely United States military procurement, government protection and promotion policies, the expansion of domestic demand and strong competition among domestic producers. The rapid output growth enabled the Japanese motor vehicle industry to complete the import substitution stage by the mid-1960s. The following statement by a managing director in charge of technical affairs at a major automobile company supports that view: "I think that it was in 1965 that the

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*Later Mitsubishi.

Table 1. Selected indicators of the Japanese motor vehicle industry

Year	Production		Exports		Imports		Domestic consumption	
	Number of units (thousands)	Growth rate a/ (percentage)	Number of units (thousands)	Growth rate a/ (percentage)	Number of units (thousands)	Growth rate a/ (percentage)	Number of units (thousands)	Growth rate a/ (percentage)
1955	68.9	-	1.2	-	6.7	-	74.4	-
1960	481.6	47.5	38.8	100.4	4.3	-8.5	447.1	43.1
1965	1 875.6	31.1	194.2	38.0	13.3	25.3	1 694.7	30.5
1970	5 289.2	23.0	1 086.8	41.1	19.6	8.1	4 222.0	20.0
1975	6 941.6	5.6	2 677.6	19.8	46.1	18.7	4 310.1	0.4
1980	11 042.9	9.7	5 967.0	17.4	47.9	0.8	5 123.8	3.5
1985	12 271.1	2.1	6 730.5	2.4	53.2	2.1	5 593.8	1.8

Source: [16].

a/ Compound annual growth rate for 1955-1960, 1960-1965 etc.

Japanese automobile industry reached the international standard both in the scale of mass production of passenger cars and their performance" (cited in [14]).

Table 2. Percentage share of domestic and export sales in output growth in selected periods

Period	Domestic sales	Export sales
Import-substitution stage (1952-1965)	90.9	9.1
Export-expansion stage (1965-1980)	38.4	61.6
Before oil shock (1965-1973)	63.2	36.8
After oil shock (1973-1980)	1.7	98.3
Maturity stage (1980-1985)	39.1	61.3

Source: [16].

Note: Decomposition was performed by using the following formula:

$$\frac{\dot{X}}{X} = \frac{D}{X}\frac{\dot{D}}{D} + \frac{E}{X}\frac{\dot{E}}{E}$$

where X = output
D = domestic sales (= X-E)
"." indicates the time derivative

The weights associated with $\frac{\dot{D}}{D}$ and $\frac{\dot{E}}{E}$ are computed as a simple average of the values from the end years.

C. Export expansion: the mid-1960s through the 1970s

In the second half of the 1960s and throughout the 1970s the growth of Japanese motor vehicle output and exports accelerated substantially, resulting in a rapid gain in the shares of Japan in world motor vehicle production and exports (see figures I and II and tables 1 and 2). The production of Japan increased at an average annual rate of 12.6 per cent from 1.9 million in 1965 to 11 million in 1980, increasing the share of Japan in global production from 18.1 per cent to 28.7 per cent during that period. Indeed, Japan surpassed the United States in the number of motor vehicles produced for the first time in 1980. The share of automobiles exceeded 50 per cent in 1968, and by 1980 had increased to 65.8 per cent.

During the same period, the exports of Japan increased more than thirty times, from slightly less than 200,000 in 1965 to 6 million in 1980, rapidly expanding the share of Japan in total

world exports from 5 per cent to 43.7 per cent. The Federal Republic of Germany was the largest exporter in 1965 (about 1.5 million units), but Japan had overtaken it by 1975. In 1980, although the Federal Republic of Germany ranked second among world exporters, its 2.1 million exports lagged far behind those of Japan. Two changes in the pattern of Japanese exports during the period from 1965 to 1980 should be mentioned. First, the regional distribution of Japanese exports shifted from Asia to North America and Europe. Between 1965 and 1980 the share of exports to Asia declined from 33.5 per cent to 9.7 per cent, while the shares for North America and Europe increased respectively from 20.8 per cent and 8.8 per cent to 43.4 per cent and 20.4 per cent. Secondly, the share of automobiles in total motor vehicle exports increased from 51.9 per cent in 1965 to 66.2 per cent in 1980.

Although the period covering the mid-1960s until the end of the 1970s may be characterized as the export expansion stage in the catching-up product cycle, it was after the first oil shock during 1973-1974 that the export-to-production ratio increased markedly. From 10.4 per cent in 1965 the export-output ratio steadily increased to 29.2 per cent in 1973, but then jumped to 51.1 per cent by 1977. Similarly, the ratio of domestic production to domestic consumption slowly increased from 1.1 in 1965 to 1.4 in 1973, and then grew rapidly to 2.1 in 1977 (see figure III). As a result of those changes, the contribution of export sales to output growth increased markedly from 36.8 per cent in the pre-oil-shock period to 98.3 per cent in the post-oil-shock period (see table 2), in contrast to developments during the period from 1950 to 1965, during which the increase in domestic demand was a major cause of output growth.

D. Before the first oil shock: reorganization of the motor vehicle industry

For the most part, reorganization in the motor vehicle industry during the second half of the 1960s took the form of mergers, joint production arrangements or stockholding arrangements. For example, Price Motors, specializing in the production of medium-sized cars, was taken over by Nissan. Toyota acquired a portion of the stocks of Hino (current share of about 10 per cent) and Daihatsu (current share of about 12 per cent), both of which specialized in the production of trucks and buses. Hino and Daihatsu started the production of Toyota cars, in addition to those under their own names, after the conclusion of those arrangements. As a result of the reorganization, Toyota and Nissan increased their market shares and established dominant positions in the industry.*

There are three reasons for the reorganization of the industry during the latter half of the 1960s. First, the recession in 1964-1965 created a sense of uncertainty about the future in the

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*Between 1965 and 1970 the market share of Nissan increased from 18.4 per cent to 26 per cent, while that of Toyota rose from 25.5 per cent to 30.4 per cent.

industry, especially among the small firms. Secondly, a change in the structure of demand from trucks and buses to automobiles, especially small- and medium-sized automobiles, put the producers of buses and trucks in a difficult position. Thirdly, the forthcoming liberalization of foreign capital inflows prompted firms to attempt to strengthen themselves both financially and technically. Faced with such changes, some small firms decided to merge with the large firms.

MITI carried out government policy by providing financial support for industry reorganization through the Japan Development Bank (see [14]). Although there is little doubt that MITI support helped the industry to reorganize, a crucial factor appears to have been, not government policy, but recognition by the firms of the need for reorganization. Indeed, the attempt by MITI to reorganize the industry during the early 1960s had failed because of the strong demand for motor vehicles at that time, a demand which created a sense of optimism among producers.

Reorganization of the industry continued into the 1970s, and with the liberalization of foreign capital inflow, United States firms began participating in the management of some Japanese firms. Chrysler and Mitsubishi started a joint venture in 1971. General Motors acquired 34.2 per cent of the capital of Isuzu in 1971. Negotiations on participation of Ford in Mazda broke off in 1971, but an agreement was later reached, under which Ford acquired 25 per cent of Mazda capital in 1979. It is noteworthy that Isuzu, Mazda and Mitsubishi, all significantly smaller than Nissan or Toyota, opted for joint ventures with United States firms, rather than with Nissan or Toyota. According to Hashimoto [17], the decisions appear to have been influenced by the keiretsu banks or intragroup banks, including the Mitsubishi-Mitsubishi Bank, the Mazda-Sumitomo Bank and the Isuzu-Daiichi Bank (later Daiichi-Kangyo Bank). As a result of the reorganization, six or seven groups existed in the motor vehicle industry in Japan in the early 1970s, a substantial reduction from the 11 operating in the early 1960s. Despite the smaller number of firms and groups, the intensity of competition did not decline. On the contrary, the level of competition appears to have increased, while the ratio of profits to sales for most Japanese motor vehicle manufacturers continued through the early 1970s a decline begun in the mid-1960s (see [14]). The reorganization of the industry intensified the level of competition as smaller firms increased their potential market power as a result of the participation of United States firms in their management. Such participation also led to the expansion of exports by joint venture firms of the United States and Japan during the 1970s.

Efforts by Japanese firms to promote export expansion during the period are also worth noting. The first marketing experiences of Japanese car manufacturers in the United States during the late 1950s and early 1960s were not encouraging. In fact, Toyota, after starting to sell in the United States in 1957, decided to halt its exports temporarily because of poor sales. In addition to improving the quality of their products and the level of productivity, the Japanese firms stepped up their sales promotion efforts in the

United States during the mid-1960s. For example, Toyota introduced a new model after conducting extensive market research on consumer preferences (Winham [18]). Toyota and Nissan purchased cargo ships specially made for motor vehicle shipment. Moreover, both Toyota and Nissan increased the capital of their sales companies in the United States. Unlike sales in the United States, those in Europe did not increase until the 1970s.

E. After the first oil shock: factors leading to rapid export expansion

The 1970s witnessed two major oil price increases, one in 1973-1974 and the other in 1979-1980. The oil crises caused a slow-down in the world economy, which until the first oil shock had been growing rapidly. Not only did the oil shocks influence the world economy at the macro-economic level, but they also affected the structure of demand for automobiles.

Specifically, the oil price increase and the recession it caused changed consumer preferences in automobiles.* As a result of oil price increases, United States consumers began to put more emphasis on factors such as purchase prices and fuel-economy. That change in United States consumer tastes resulted in an increased demand for small cars. Although United-States-made small cars were available, domestic supply was limited and it could not satisfy the total demand for small cars. One of the reasons for the slow response by United States firms to the shift in consumer demand was the lower profitability of producing small cars as compared with large cars. But even when United-States-made small cars were available, United States consumers appeared to prefer imported (especially Japanese) cars for several reasons. First, the price of a Japanese subcompact car was lower than that of its United States counterpart. Since a large part of the price differential is attributable to cost differentials, the issue is examined later in the discussion of supply factors. Secondly, Japanese cars were more fuel-efficient than their United States counterparts; the fuel-efficiency of Japanese cars improved significantly after the United States Government implemented requirements for improved petrol mileage. Moreover, the reputation of United-States-made small cars among United States consumers seems to have suffered from controversies over safety and pollution control during the late 1960s (Abernathy [19]).

With regard to export supply, stagnant Japanese demand for automobiles, improvements in production efficiency and the aggressive export strategy adopted by Japanese producers were important factors. The average annual growth rate of domestic demand declined sharply from 25.2 per cent during the period from 1960 to 1970 to 2 per cent from 1970 to 1980. Stagnant demand for automobiles

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*Since the major market for Japanese automobiles has been the United States, the discussion here focuses on the preferences of United States consumers. The same arguments appear applicable to consumers in other countries as well.

during the 1970s appears to have stemmed from two factors. First, slow overall economic growth as a result of the first oil shock and its aftermath led to slow growth in personal income, which caused a slow-down in demand for automobiles. Secondly, automobile consumption appears to have approached the saturation point, as reflected in the increasing importance of replacement as the motive for purchasing cars. In 1960 and 1965, respectively, 47.8 per cent and 58 per cent of purchases were to replace old cars, but the ratio increased to 70.9 per cent in 1970 and to 73.6 per cent in 1980 (see [17]).

Improvement in production efficiency is evident from figure IV. Total hours of employment required for automobile production in Japan was much higher than that of the United States in 1970, but the difference quickly diminished, and by 1980 the picture looked completely different. In 1981 it took about 140 hours to produce an automobile in Japan and about 210 hours in the United States. In addition to the reversal of the positions of the two countries in the ranking of labour productivity, the latter continued to increase in Japan, but started to decline in that country in 1976-1977, and thereafter in the United States. Sizable gains in productivity and relatively low wages in Japan led to a significant cost advantage of Japanese automobile producers over United States producers. There have been several estimates of the cost advantage enjoyed by Japanese producers; in 1980 the advantage averaged around $1,700 per unit (Cohen [20]). Economists have proposed several reasons for the improvement in labour productivity in Japan. The factors most often cited are high growth in research and development expenditures, a favourable relationship between management and labour unions and the close relationship between automobile manufacturers and parts manufacturers.*

According to OECD [22], between 1967 and 1977 the average annual growth rate of research and development expenditures in Japan was 13.2 per cent, twice as high as that in the United States or the Federal Republic of Germany, but the amount of research and development expenditures in Japan in 1977 was still only about one third of that of the United States. With regard to its share of the number of patents registered in the United States for motor vehicle production, Japan ranked first in 1980 at 31.1 per cent, followed by the United States (25 per cent) and the Federal Republic of Germany (20.9 per cent), a substantial change from the situation in 1970 when the Japanese share, at only 10 per cent, lagged far behind the shares of the United States and the Federal Republic of Germany (see [22]).

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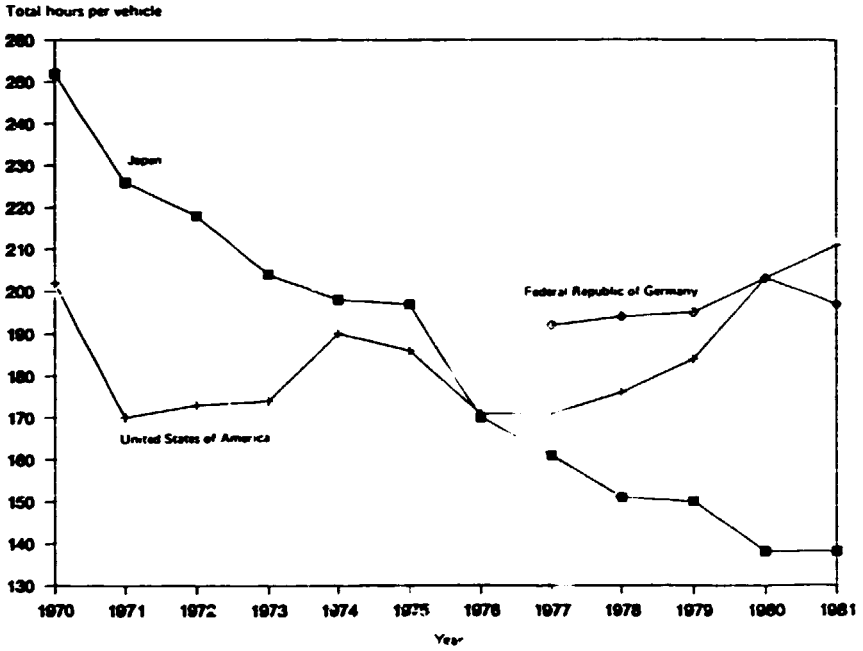
*See Chang [13] for further examples of factors generating high growth. The influence of the keiretsu or intragroup banks may also be included as an important factor contributing to the efficiency of the Japanese motor vehicle industry (Altshuler and others [21]).

Figure IV. Labour productivity in the motor vehicle industry: selected countries



Source: Reproduced from Altshuler and others [21].

Two features of Japanese labour unions in the motor vehicle industry set them apart from their counterparts in western countries. First, Japanese unions function in companies with guaranteed lifetime employment. Unlike trade unions in western countries, company unions in Japan accept the proposition that the level of worker benefits is linked to company performance. Japanese unions therefore do not make demands that management would find unrealistic and do not resort to long strikes to gain their demands. Secondly, the nation-wide Automotive Labour Union Association (Jidosha Soren) plays an active role in labour management on behalf of company management. For example, the union organizes and oversees efficiency-improving activities such as the quality circle system. Although such features, characteristic of the labour unions in Japan, benefit management and result in high labour productivity, workers also gain job security. There is, however, still the question of who (management or employees) benefits more from the system.

Because the production of an automobile requires more than 10,000 parts, the efficiency of parts manufacture plays an important role in determining the competitiveness of the automobile manufacturer; cost, quality and timely delivery are three important factors here. The Japanese system of supplying parts is different from that existing in the United States. Unlike the vertically

integrated United States system, the Japanese system, which is called Shitauke (subcontracting), is a three-layered system in which each layer corresponds to a different type of supplier. The latter may be classified as primary, secondary and tertiary subcontractors. Primary subcontractors are generally large firms, whereas the secondary and tertiary subcontractors are medium- and small-sized firms. Tertiary subcontractors supply parts to the secondary subcontractors, and the secondary subcontractors, after contributing their value added, supply parts to the primary subcontractors. The primary subcontractors then supply the parts, including their portion of value added, to the automobile manufacturers.* The subcontracting system was promoted by both the Government and motor vehicle manufacturers. In addition, because of competitive pressure, subcontractors at all levels devote extensive resources to research and development, thus contributing to the development of an efficient parts-supplying system.**

The production efficiency generated by the system was combined with aggressive export strategies by Japanese producers, resulting in a rapid increase in export supply. Sales strategies employed in the United States by Japanese producers emphasized pricing, a distribution system targeting certain geographic regions and good customer service. In addition, participation of United States firms in the management of some Japanese firms created export opportunities for Japanese firms whose exports had not done well because of deficiencies in their distribution systems in the United States.

The factors discussed above led to the rapid output and export expansion of Japanese automobiles during the second half of the 1960s and throughout the 1970s. Those achievements resulted in the successful completion of the export-expansion stage. Among the contributing factors, strong competition among domestic producers and the presence of supporting institutions, such as company labour unions and reliable and efficient parts suppliers, were most important in improving production efficiency. Strong competition led the manufacturers to undertake active research and development and aggressive export strategies. It should be noted that aggressive strategies in those areas were employed mainly by firms without a commanding position in the market. For example, after intensive research and development, Honda successfully introduced the CVCC engine, which excels in fuel-efficiency and pollution-control. Such innovation, coupled with an active sales effort overseas, resulted in Honda's increasing its share of total Japanese

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*Although most of the subcontractors are grouped under a certain motor vehicle manufacturer, the relationship between motor vehicle manufacturers and subcontractors is not rigid. Indeed, as the manufacturers try to reduce their burden, it is not rare for them to request subcontractors to diversify their business relations.

**For a detailed analysis of the subcontracting system in Japan, see Adachi, Ono and Odaka [9].

automobile exports from 2.2 per cent in 1965 to 16.5 per cent in 1980, while the corresponding shares for Nissan and Toyota declined respectively from 39.1 per cent and 33.1 per cent to 26.4 per cent and 22.1 per cent. The export expansion process was also aided by the increased demand overseas for Japanese automobiles due to oil price increases.

F. Voluntary export restraints

The rapid expansion of Japanese automobile exports resulted in an increase in their market shares in North American and European countries. For example, in the United States the market share of Japanese automobiles, 3.7 per cent in 1970, had increased to 9.4 per cent by 1975, and by 1982 had reached 22.6 per cent. The rapid increase in the market share of Japanese exporters precipitated protectionist sentiments in the United States, culminating in the conclusion of an agreement on voluntary export restraints in 1981 between the Governments of the United States and Japan. The evolution of protectionist policies in the countries of Western Europe followed a similar pattern, but the market share of Japanese exports in most European countries was much lower than that in the United States. As a result of such protectionist policies, export production by the Japanese motor vehicle industry stopped increasing, as indicated by the ratio of domestic output to domestic consumption, which has remained almost constant since 1981 (see figure III). That shows that the Japanese motor vehicle industry was forced into the maturity stage of the catching-up product cycle mainly by the protectionist policies of developed countries. It should also be noted, however, that the appreciation of the yen since September 1985 has contributed to a decline in exports. In this section consideration will be given to the way in which protectionist policies were adopted, particularly in the United States, and to the effects of protectionist policies on various agents in the economy.

Because of the trade imbalance between the United States and Japan during the late 1970s, the United States Congress prepared a number of reports analysing the causes and possible solutions of the problem.* Discussions at that time were mainly concerned with overall trade problems. Some attention was given to the semiconductor industry, but very little to the automobile industry. As the performance of the United States automobile industry deteriorated, however, appeals for government intervention became stronger from both the management of United States firms and the United Automobile Workers (UAW).** In June 1980 UAW filed a petition for import relief before the International Trade Commission, claiming that imports were a substantial cause of serious injury to the domestic industry. Later, Ford Motor Company also filed a petition.

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*For an example of this type of report, see United States House of Representatives [23].

**See Cohen [20] and Haggard [24] for discussions of the political developments leading to voluntary export restraints.

In a three-to-two split decision, the commissioners found that imports were only one of the causes of the industry's problems, and that the decline in demand resulting from the recession and the shift in demand from large to small-sized cars were the main causes (see United States International Trade Commission [25]). Despite the ruling by the Commission against the United States industry and the UAW, calls for import restriction intensified because of the increasing financial problems of the automobile manufacturers. In March 1981, responding to those appeals, the Governments of the United States and Japan reached an agreement to apply voluntary restraints on Japanese automobile exports. The agreement was to last three years, beginning in April 1981. The number of automobiles to be exported was agreed to be 1.68 million units in the first year, a level between those proposed by the Governments of the two countries. In the second year the export level was to increase in accordance with market expansion, and the export level for the third year was to be determined at the end of the second year.

As a result of the voluntary export restraints, Japanese automobile exports to the United States in 1981 declined by 7.7 per cent from the 1980 level. During the following two years the export level stayed at 1.68 million units, the level agreed upon to comply with the export restraints. For 1984 the export level under the agreement was increased to 1.85 million units, because of the favourable financial performance of United States automobile manufacturers. In 1985, although the Government of the United States decided not to request an extension of the export restraints, the Government of Japan, concerned with deteriorating trade relations, unilaterally decided to extend the restraints at an export level of 2.3 million units. Actual automobile exports to the United States in 1985 amounted, however, to only 2.2 million, 0.1 million below the level of agreement, mainly because of the appreciation of the yen.

What were the effects of the voluntary export restraints on the different agents in the economies of the United States and Japan? United States automobile manufacturers gained financially, not only from less competition from Japanese imports, but also from the concessions gained from labour unions in the form of slower increases in wages and other benefits. There were more jobs for United States automobile workers, though in less attractive working conditions. United States automobile consumers suffered from higher prices and from a more limited selection of cars. According to an estimate by Collyns and Dunaway [26], the voluntary export restraints cost United States consumers $16.75 billion during the period from 1981 to 1984. Japanese manufacturers realized high profits by collecting rents accruing from the quantity restriction and from increasing sales of high-quality cars. Although the above observation tends to apply to all Japanese automobile manufacturers, the effects of the export restraints varied between manufacturers. The restraints favoured companies with small export shares and those with collaborative arrangements with United States manufacturers, since export allocations to those companies were more advantageous. Perhaps one of the most important effects of the export restraints was the decision by Japanese producers to start

manufacturing in North America, a topic which will be the main subject of the next section.

Protective measures mainly in the form of voluntary export restraints or import quotas have been applied to Japanese exports in European countries as well.* Compared with the United States restrictions, those applied by the European countries are generally stricter. For example, in addition to a 10.9 per cent tariff of the European Economic Community, higher than the tariffs of either the United States (3 per cent) or Japan (0 per cent), France limits Japanese imports to 3 per cent of the market. Such protective measures have had effects similar to those previously discussed for the voluntary export restraints imposed on Japanese exports to the United States market.**

G. Direct foreign investment

For the most part, direct foreign investment by the Japanese motor vehicle industry has taken two forms. One is the establishment of distribution channels in order to promote exports; the other is the establishment of manufacturing facilities. Direct foreign investment of the first type was undertaken during the 1960s and subsequently expanded, contributing to the rapid export expansion discussed earlier. Direct foreign investment of the second type, the major concern of this section, started in 1958, when Toyota established a plant in Brazil. The number and value of such investments have steadily increased, and their growth has accelerated in recent years. At the end of 1985 there were 185 foreign production facilities created by the investments of Japanese motor vehicle companies in 37 countries.***

In 1985 as many as 2.3 million Japanese motor vehicles, about 35 per cent of exports, were assembled or manufactured in foreign countries. In this section the pattern of direct foreign investment in the motor vehicle industry and the factors determining that pattern are examined. Two types of such investment by Japanese motor vehicle companies can be identified, one in developing countries (including Oceania) and the other in developed countries (excluding Oceania). That distinction generally corresponds to the timing of the investment. In developing countries and Oceania it

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*Altshuler and others [21] discuss protection policies in developed countries, including European countries.

**For the effect of voluntary export restraints on the economy of the United Kingdom, see Greenaway and Hindley [27].

***See Japan Productivity Center [28]. The statistics cover both knock-down assembly and manufacturing operations. The difference between the two, which depends on the amount of local content, is rather ambiguous. In this paper, the classification adopted by the Japan Association of Automobile Manufacturers is followed.

mainly took place during the 1960s and early 1970s, whereas in developed countries it began in the late 1970s.

H. Direct foreign investment in developing countries and Oceania

Until the end of the 1970s almost all direct foreign investment was undertaken in developing countries and Oceania and was concentrated in Asia, especially in the countries of the Association of South-East Asean Nations (see table 3). In addition to direct foreign investment, Japanese firms have been involved with the assembly and manufacture of motor vehicles through other means such as licensing. As a result of the active involvement of Japanese firms in local assembly and production, Japanese motor vehicles came to dominate markets in a number of developing countries in Asia, particularly the ASEAN countries.* In 1982, for example, Japanese motor vehicles captured 83.4 per cent of the ASEAN market (see table 4). The share was over 80 per cent in the individual markets of all ASEAN member countries, with the exception of the Philippines. High market shares were also observed in Australia, New Zealand and the territory of Hong Kong. Although a large proportion of Japanese motor vehicle sales in those markets is still accounted for by exports from Japan rather than local assembly, the share of locally assembled production in total sales has recently been rising.

Table 3. Patterns of direct foreign investment

Country or area	Number of projects			
	1958-1969	1970-1979	1980-1985	1958-1985
Developed countries	1	6	9	16
Australia	1	3	--	4
Italy	--	--	1	1
New Zealand	--	1	--	1
Portugal	--	1	1	2
Spain	--	--	2	2
United Kingdom	--	--	2	2
United States	--	1	3	4
Developing countries or areas	11	6	18	35
Brazil	1	--	--	1
China	--	--	1	1
Colombia	--	--	1	1

continued

*In this study, ASEAN includes Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei, although a member, is not included because of the lack of data.

Table 3 (continued)

Country or area	Number of projects 1958-1969	1970-1979	1980-1985	1958-1985
Costa Rica	--	1	--	1
Egypt	--	--	1	1
India	--	--	3	3
Malaysia	1	--	4	5
Mexico	1	--	--	1
Pakistan	--	--	2	2
Peru	2	--	--	2
Philippines	1	2	2	5
Republic of Korea	--	--	2	2
Saudia Arabia	--	1	--	1
Taiwan Province (China)	--	1	1	2
Thailand	5	1	--	6
Tunisia	--	--	1	1

Source: [16].

Table 4. Motor vehicle market shares in selected Asian countries by country of origin of major producers, 1982 (Percentages)

Country, area or grouping	Producers' country of origin and share of total: Japan	United States	Germany, Federal Republic of	Other countries
ASEAN				
Indonesia	87.7	6.3	2.2	3.8
Malaysia	80.5	9.7	3.4	6.4
Philippines	54.9	41.9	0.8	2.4
Singapore	89.4	3.2	3.3	4.1
Thailand	90.1	2.7	1.3	5.8
Total	83.4	9.7	2.2	4.7
Australia	50.1	45.2	0.5	4.2
Hong Kong	82.7	5.7	5.4	6.2
New Zealand	65.4	30.7	--	3.9

Source: Constructed from tables 6, 7 and 8, in Hashimoto [17].

Japanese manufacturers set up assembly operations in developing countries and Oceania largely because of protectionist policies

adopted in those countries to stimulate the local motor vehicle industries.* Such protectionist measures are employed by a number of developing countries and include import restrictions as well as local content requirements. In addition to those measures, policies promoting direct foreign investment, such as preferential tax treatment and investment assistance, also contributed to an increase in such investment in the countries concerned.** Despite the growth of Japanese direct foreign investment in developing countries and Oceania, most Japanese firms established assembly plants rather than manufacturing plants. Indeed, among those countries, according to World Automotive Market and Nihon Jidosha Kogyokai (Japan Association of Automobile Manufacturers), only Australia, Brazil, India and Mexico actually produce Japanese motor vehicles. New Zealand and the other developing countries import and assemble knock-down kits from Japan. Since assembly operations of that type do not add much local value, they can be considered a close substitute for exports. There are at least two reasons why Japanese manufacturers have opted for assembly operations rather than manufacturing. First, they seek to maximize the use of Japanese-made parts, one of the factors contributing to the high quality of Japanese motor vehicles. Secondly, local markets appear to be too small to justify motor vehicle manufacturing, the efficiency of which depends on scale economies.

Starting around 1980, investments in developing countries began to increase. Japanese motor vehicle companies started 18 investment projects in developing countries during the period from 1980 to 1985, a sharp increase from the six started during the period from 1970 to 1979. From 1980 to 1985 investment projects in ASEAN countries increased from three to six, in the Republic of Korea and Taiwan Province from one to three, and elsewhere from two to nine. In addition to national motor vehicle production policies and related incentives given to Japanese investors, direct foreign investment in those developing countries and areas also seems to have resulted from expectations of a high rate of growth in motor vehicle demand.

Among ASEAN countries, Malaysia attracted the most Japanese direct foreign investment, receiving four out of six investment projects in that group. The strong preference for Malaysia requires an explanation, considering that all ASEAN countries have been pursuing policies to promote local motor vehicle production. Two reasons may explain the large number of investments in Malaysia. One was the favourable economic performance of the Malaysian economy compared with that of the other ASEAN members. During the

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*See Gorden and Lees [29] for discussions of protection policies of developing countries.

**In the study of the determinants of overseas operations of United States motor vehicle and parts companies, Kulchysky and Lipsey [30] found that the existence of local content requirements increased the likelihood of setting up production and assembly operations.

period from 1980 to 1985, real gross domestic product (GDP) in Malaysia increased at an average annual rate of 5.6 per cent, second only to Singapore among ASEAN countries. In particular, the growth rates of real GDP in 1983 and 1984 reached, respectively, 6.1 per cent and 7.9 per cent; such a favourable growth performance undoubtedly attracted direct foreign investment from Japan. Another reason was the selection by the Government of Malaysia of Mitsubishi to participate in the joint production of the "Proton", the national car. As a result of that decision, Mitsubishi receives preferential treatment such as a zero tariff on imports of Mitsubishi-made parts, which are to be used in the production of the national car. That government measure prompted other manufacturers to step up their efforts to establish production facilities. Judging from those developments, the main motive of Japanese direct foreign investment in Malaysia during the 1980s appears to be the capture of a highly protected local market, the same motive observed in the earlier period.

The Republic of Korea and Taiwan Province have already achieved a significant level of heavy industrialization, including the development of motor vehicle industries. Both Governments began promoting the motor vehicle industry in the mid-1970s, and in the 1980s they decided to allow foreign participation that would bring in the necessary factors for local production and export expansion, such as technology and overseas marketing networks. Because of the limited size of their local markets, the strategy was to expand output through export expansion, the same strategy used by both in the development of other manufacturing industries. In contrast to the emergence of the Republic of Korea and Taiwan Province as successful exporters, Japan appears to have been losing its competitive position as an exporter because of high wages and restrictions on its exports imposed by almost all of its trading partners. Mindful of those contrasting trends in the Republic of Korea and Taiwan Province, on the one hand, and in Japan, on the other, Japanese and United States manufacturers have concluded a number of arrangements with manufacturers of the Republic of Korea and Taiwan Province, ranging from capital participation to technical licensing. It is noteworthy that most of the arrangements involve three party participation, that is, an arrangement between parties from Japan, the United States and the Republic of Korea in the case of direct foreign investment in the Republic of Korea, and an arrangement between parties from Japan, the United States and Taiwan Province in the case of investment in Taiwan. For example, under a Mazda-Ford-Kia deal a car is to be produced in the Republic of Korea after a Mazda design, and a large portion of the production will be shipped to and sold in the United States through the Ford sales network. The main motive of direct foreign investment by Japanese and United States companies in the Republic of Korea and Taiwan Province therefore appears to be the establishment of production facilities from which output may be exported to developed countries.

With regard to direct foreign investment in other developing countries, India has received three out of nine such projects. The main factor responsible for the increased attractiveness of India as a host for direct foreign investment is the liberalization of

foreign capital inflows, which started in the early 1980s, and which represents a drastic change in the foreign economic policies of India. Behind a high protective barrier since its independence, India had established a motor vehicle industry as early as the 1960s. However, the production facilities became outdated and until the early 1980s capacity utilization was low, mainly because of the lack of competition. With the liberalization of foreign capital inflow, three Japanese manufacturers began to participate in automobile production. The participation of Suzuki in the Maruti Corporation was a success; the demand for the Suzuki-Maruti car has been so keen that interested buyers have to wait almost a year, even after making a prepayment. Those findings suggest that Japanese direct foreign investment was attracted to India, a potentially enormous market, because of the liberalization of foreign capital inflow.

I. Direct foreign investment in developed countries

Except for those in Oceania, developed countries did not attract Japanese direct foreign investment until the late 1970s. During the 1980s, however, there have been a growing number of projects. Among developed countries, the United States has been the major host for Japanese direct foreign investment. Honda was the first to start production of automobiles in the United States in late 1982, followed by Nissan, NUMMI (a joint venture between Toyota and General Motors) and Toyota. In 1983 Honda and Nissan manufactured approximately 75,000 motor vehicles in the United States, and within three years the production of Japanese motor vehicles by all four companies with Japanese participation increased more than eightfold to over 610,000 in 1986, about 2.3 per cent of the United States market. Including those already in operation, six plants - Honda, Nissan, NUMMI, Toyota, Mazda and a Mitsubishi-Chrysler joint venture - are expected to be operating in the United States by the end of 1988. When the facilities planned in Canada and a proposed joint venture between Suzuki and General Motors in the United States are included, the production capacity of Japanese affiliates in the United States and Canada is likely to exceed 2 million units by 1990. Furthermore, a number of projects have been considered in Mexico, which would put even more Japanese motor vehicles in the North American market.

Nissan has been the most active investor in Italy, Spain and the United Kingdom. Toyota participated in a joint venture with local capital to set up an assembly plant in Portugal, and Honda has concluded a licensing agreement and a joint development agreement with British Leyland. Unlike the favourable results of Japanese direct foreign investment in the United States, developments in Europe have fallen below expectations. Indeed, the production of a Nissan car in a joint venture with the Italian firm Alfa Romeo was stopped because of unexpectedly sluggish sales. In contrast to the predominance of wholly owned subsidiaries in the United States, direct foreign investment in Europe has been mainly in the form of joint ventures or technical co-operation.

Several factors are probably responsible for Japanese direct foreign investment in the United States and Europe. The most

important factor is the emergence of restrictions on Japanese exports and the high probability of their continuation in the foreseeable future. Japanese manufacturers preferred to export rather than produce overseas because, as discussed earlier, the factors that had made the Japanese motor vehicle industry competitive were rooted in institutions specific to Japan (for example, company labour unions and the relationship with parts producers). Japanese manufacturers therefore chose to export to markets where import restrictions were not significant. Because most developing countries and Oceania have been pursuing restrictive policies since the early 1960s, Japanese manufacturers concentrated their export efforts in developed countries. Among developed countries, the United States became the largest overseas market for Japanese exports. When the possibility of expanding exports to the United States was effectively eliminated by voluntary export restraints, direct foreign investment was the only alternative left for Japanese manufacturers striving to maintain or increase their market share in the United States, the largest motor vehicle market in the world. Moreover, at least three factors accelerated the outflow of direct foreign investment to the United States, namely: the possibility of local content legislation; the increasing demand for Japanese technology in the production of small cars by United States manufacturers; and the appreciation of the yen, which started in September 1985.

Despite the general reluctance of Japanese manufacturers to become involved in local production overseas, the reaction of individual manufacturers has been far from uniform.* Honda, with a heavy concentration of sales in the United States, was the first to announce local production in that country in 1980 and the first to start production of automobiles there in 1982.** Following Honda, Nissan announced plans to produce light trucks in 1980 when the nominal tariff rate on cab-chassis vehicles was raised from 4 per cent to 25 per cent; Nissan production of light trucks in the United States then started in 1983. Partly because competition in the light truck market in the United States became tighter as a result of new models launched by Chrysler, Ford and General Motors, Nissan started production of automobiles in 1985. Unlike Honda or Nissan, which established wholly owned subsidiaries, Toyota participated in a joint venture (on the basis of 50 per cent

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*The differences between manufacturers regarding the allocation of voluntary export restraints and their relationships with United States manufacturers as discussed in section F of this paper should be noted. The allocation of market shares among Japanese manufacturers was determined by the export performance of the past three years, but extra allotments were given to firms other than Toyota and Nissan, the two leading exporters. Firms with co-operative arrangements with United States firms also received additional allotments.

**Honda had already started producing motor cycles in the United States in 1979, before making a decision on the production of automobiles.

ownership) with General Motors and started production of automobiles in 1985. Later Toyota announced plans to start a wholly owned manufacturing facility. Other manufacturers then followed suit as described above.

The clustered pattern of entry of Japanese companies into the United States appears attributable to the oligopolistic nature of the Japanese motor vehicle industry. In an oligopolistic market, firms follow the behaviour of rival firms when mutual interdependence among the rival firms is perceived.* Regarding the order of entry into the United States market by different manufacturers, it is interesting to note that Toyota, the largest motor vehicle manufacturer in Japan, was the third manufacturer to undertake direct foreign investment in the United States. The following scenario explains the entry pattern of Japanese direct foreign investment in the United States. First, Honda and Nissan see direct foreign investment in the United States as an opportunity to expand their sales and to reduce the advantage enjoyed by Toyota. Then Toyota decides to postpone its decision until the results of investments by competitors can be examined. After observing that the investments by Honda and Nissan appear to be yielding favourable results in terms of the number of motor vehicles produced, Toyota decides to enter, not by starting production on its own, but by setting up a joint venture with General Motors.**

The pattern of entry of the Japanese manufacturers into Europe appears to follow the clustering pattern observed in the United States, again reflecting the oligopolistic nature of the Japanese motor vehicle industry. However, there are several differences between the pattern of direct foreign investment in Europe and that in the United States, reflecting the importance of different elements in each market. First, as noted earlier, the type of Japanese participation in Europe has been mainly through licensing agreements or joint ventures and not through the establishment of local production facilities by wholly owned subsidiaries as in the United States. That appears to be due to the existence of powerful labour unions and the relative unfamiliarity of Japanese manufacturers with the European markets. Secondly, the speed of entry by the Japanese firms into European countries has been slower than into the United States. That may be due to the difficulty of deciding where to carry out direct foreign investment in Europe, a difficulty arising from the many variables that must be considered, in particular the vast differences in economic and social conditions in the countries concerned. For example, one of the factors that attracted Nissan to the United Kingdom was the subsidies extended by the Government of that country, while direct foreign

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*See Knickerbocker [31] for a more thorough examination of oligopolistic markets.

**As regards profitability, most of the ventures receiving Japanese direct foreign investment in the transport industry in the United States suffered losses in 1984 (see Ministry of International Trade and Industry [32]).

in Portugal and Spain has apparently been undertaken under the assumption that once they become full members of the European Economic Community, affiliates in those countries will be able to export part of their output to the rest of the Community.

J. Assessment of developments in direct foreign investment

Direct foreign investment influences a number of economic factors in both the home and host countries. Those factors include employment, investment, foreign trade, productivity and technology. Examination of the effects of direct foreign investment on each of those factors is important but beyond the scope of this paper. Attention will be concentrated instead on its effects on Japanese trade flows and employment.

The immediate result of the increase in direct foreign investment by motor vehicle companies was an increase in exports of motor vehicle parts. From 1980 to 1984 the value of exports of motor vehicle parts increased by 95 per cent, from $3.8 billion to $7.4 billion, while the value of motor vehicle exports increased by 28 per cent, from $24.9 billion to $31.9 billion. The dramatic rise in parts exports appears all the more remarkable since the percentage increase in exports of both motor vehicles and motor vehicle parts for the preceding four years was about the same, around 55 per cent. In particular, exports of knock-down kits increased rapidly; between 1980 and 1985 the number of exported knock-down kits more than doubled. By region, North America, which has received the major share of Japanese direct foreign investment since the early 1980s, experienced the largest increases in the value of parts imported from Japan - from 1980 to 1984, a rise of 227 per cent - and in the number of imported knock-down kits - from 1981 to 1985, a rise of 5,000 per cent. During the early years of an overseas investment project, foreign subsidiaries rely heavily on parts supplied by producers in the home country. Dependence on parts from Japan was especially strong for Japanese manufacturers, since the high quality of Japanese motor vehicles depended on high-quality parts produced in Japan. There are two explanations for both the increase in direct foreign investment in the United States and the increase in the exports of motor vehicle parts, especially to the United States. First, because the high quality of Japanese motor vehicles was due in large part to high-quality parts, United States manufacturers began to import parts from Japan; and second, because Japanese exports of motor vehicles were maintained at a high level, the demand for replacement parts increased.

A number of concerns have been expressed regarding the potentially adverse effects of direct foreign investment on employment in Japan. Although in most cases the issue has been raised in terms of direct foreign investment in the manufacturing sector as a whole, the significant place of the motor vehicle industry in the Japanese economy means that the effects of such investment on that industry alone could be serious. On the basis of 1984 data, it has been estimated that, taking into account both direct and indirect effects through interindustry linkages, 430,000 employees would become unemployed if 2 million automobile exports to the United

States were replaced by local (United States) production.* That amounts to 0.7 per cent of the total 1984 work-force. The situation would be worse if the loss of parts exports due to increasing direct foreign investment in the parts industry is taken into account.** In the light of the low expected rate of output growth, not only in the motor vehicle industry, but also in other manufacturing industries, the unemployment problem appears likely to become a major issue connected with direct foreign investment by the Japanese motor vehicle industry in the near future.

K. Conclusions

During the period following the Second World War, the Japanese motor vehicle industry grew rapidly through the import-substitution and export-expansion stages. The rapid growth was mainly attributable to the following four factors:

(a) Strong competition among domestic firms, even with protection from foreign producers;

(b) The presence of supporting institutions such as efficient parts suppliers and co-operative labour unions;

(c) Government protection and promotion policies for the motor vehicle industry;

(d) External factors, such as United States military procurement during the hostilities in Korea, the two oil shocks and technology transfer.

The first two factors led to increased demand for Japanese motor vehicles and the third improved the technological level of Japanese producers. All interacted and worked in favour of the Japanese motor vehicle industry. Had any one of them been missing, the growth of the industry would have been much slower.

The maturity stage, which began near the end of the 1970s, came about mainly as a result of protectionist policies adopted abroad to stem Japanese imports. Because there appears to have been room for further export growth at that time, the beginning of the maturity stage probably resulted more from protectionism than from changes in cost and demand structures; in that sense, it was an artificial (or policy-induced) development.

The development pattern of the Japanese motor vehicle industry followed the CPC pattern regarding production, consumption and

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*See Ozaki [33]. The analysis would be better if the repercussions from the United States in terms of increased output were incorporated.

**Direct foreign investment in the parts industry has mainly been increasing in response to such investment by motor vehicle manufacturers.

foreign trade.* As the Japanese economy became capital-abundant as a result of rapid capital accumulation, its comparative advantage shifted from labour-intensive to capital-intensive goods.** However, the recent pattern of direct foreign investment is not consistent with the CPC hypothesis. According to the CPC hypothesis extended by Kojima [4], such investment should be made in developing, not developed, countries. Nevertheless, as a result of import protection policies, direct foreign investment became necessary in developed countries in order to secure markets.

The divergence between actual developments and the predictions of the CPC hypothesis can be explained by various factors. First, the hypothesis assumes a smooth transition as an industry moves from exporting to importing, but in reality the transition creates friction because it involves unemployment of resources. The transition is especially difficult if the economy is growing slowly, since that would limit employment opportunities. A number of countries facing such difficulties during the transition resorted to trade restrictions, which prompted inflows of direct foreign investment. Secondly, the CPC hypothesis assumes that production technology remains the same throughout the CPC cycle. However, the technology is constantly changing. A labour-intensive method could be replaced by a capital-intensive method involving, for example, the use of robots, and leading to an ambiguous ordering of sectoral comparative advantage. Finally, the hypothesis ignores the production of and trade in intermediate goods. The presence of intermediate goods, and especially trade in intermediate goods, further complicates the ordering of comparative advantage. The problem of intermediate goods is made worse by frequent changes in foreign exchange rates, which are mainly related to macro-economic factors. Since all those elements have become increasingly important, not only in the motor vehicle industry, but also in other industries, the development pattern of industries in the future may be quite different from that predicted by the CPC hypothesis. For example, the textile industry, once considered a maturing, declining industry in developed countries, may again become an exporting industry because of technological change. That observation leads to the next topic, the future of the motor vehicle industry in various country groupings.

Assuming that protectionist policies continue to be applied in most developed and developing countries because of trade imbalances or efforts to protect infant industries, several development patterns will probably be observed in the motor vehicle industry

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*Wells [34] analyses the development pattern of the automobile industry in the United States and finds that it followed the pattern suggested by the product-cycle hypothesis. His findings suggest that regulation did not significantly contribute to the decline of the United States automobile industry, contrary to the claim frequently made.

**Urata [35] examines the changes in trade structure and factor endowments in Japan.

world-wide. First, production will take place in the country of consumption. Secondly, international co-operation will intensify, not only to facilitate market access, but also to improve access to better technology. Thirdly, product differentiation is likely to increase in the motor vehicle market, especially the automobile market. With those patterns in mind, possible developments may best be considered by dividing the world into three regions, namely Japan, other developed countries and developing countries.

In the case of the Japanese motor vehicle industry, exports are likely to be replaced by overseas production because of protectionist policies abroad and the appreciation of the yen.* If an increase in overseas production occurs, it will lead to excess capacity in Japan, resulting in unemployment of resources. Unemployment will be worse if the appreciation of the yen leads to increased imports. All those factors are likely to produce greater competition, unless either some type of government intervention takes place in order to rationalize capacity, or import restrictions are imposed to protect domestic producers. However, such intervention tends to result in misallocation of resources, especially if it is maintained for a long period. In the United States and Europe, production capacity is likely to increase, mainly because of increasing direct foreign investment, but demand tends to grow slowly and excess capacity may result. In the absence of government intervention, excess capacity would increase competition among domestic and foreign firms. It seems more likely, however, that excess supply would lead to government intervention through import restrictions, thereby reducing foreign competition. Despite reduced competition from imports, an increase in foreign participation in the home market, combined with the excess capacity of domestic firms, would probably generate competitive pressure within the market, thereby increasing efficiency. That has apparently already taken place, since United States manufacturers are reported to have adopted a number of systems acquired from their collaboration with Japanese producers; the pressure to compete against Japanese investments in the United States has also spurred efficiency. For example, United States manufacturers have adopted the just-in-time inventory system and the Japanese type of quality circle system. Lack of competition from imports, however, may lead to inefficiency if local firms, whether their ownership is domestic or foreign, practice some type of collusion. In order to avoid such an undesirable situation, direct foreign investment should not be discouraged.

In developing countries, it appears unlikely that the development pattern of the Japanese motor vehicle industry can be repeated.

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*According to the Motor Vehicle Manufacturers Association of the United States, in 1985 the share of overseas production in the total production of Honda, which has the highest share among the Japanese motor vehicle producers, amounted to 11.5 per cent, much lower than that of United States or European transnational corporations such as Ford (47.7 per cent), General Motors (28.8 per cent) and Volkswagen (23.9 per cent).

repeated. The major obstacle is the emergence and persistence of protectionism overseas, which precludes developing countries from attaining scale economies, their domestic markets alone being too small to sustain such economies. The inability to exploit scale economies leads to inefficiency in production. Moreover, changes in production technology, such as the use of robots in place of labour, may deny comparative advantage to developing countries. There are several ways that developing countries could advance their motor vehicle production. One is to increase foreign collaboration, which would provide technology as well as an export market. A second way is to focus on the production of certain motor vehicle parts that require a level of technology consistent with that existing in the country concerned. Through such measures, a developing country may acquire the skill and experience needed to build stronger and more competitive industries.

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ECONOMIES OF SCALE IN PROTECTED MANUFACTURING INDUSTRIES IN DEVELOPING COUNTRIES - THE CASE OF THE BRAZILIAN PASSENGER CAR INDUSTRY

Matthias Lücke*

Introduction

Manufacturing industries in developing countries often enjoy very high rates of protection from foreign competition in their domestic markets. The resulting cost in terms of higher prices to be paid by investors (in the case of capital goods) or consumers is usually supposed by the proponents of protection to be more than offset by social benefits such as human capital formation, for which firms would receive no reward in a free-market situation (the external-economies argument). Moreover, it is presumed that rates of protection will be reduced as the industry becomes more efficient than its foreign competitors (the infant-industry argument).**

The theoretical reasoning underlying both arguments has been the subject of an intense debate (see Myint [1], pp. 131-136, for a summary of the opposing positions). A recurrent feature of infant industry protection in many developing countries is the continuing protection of manufacturing industries that have existed for several decades and therefore can no longer be regarded as "infants". Such long-term protection runs counter to the stated intentions of the proponents of the infant-industry argument, and suggests that protection as a means of establishing an internationally competitive industry has been less effective than expected. The cost of protection is therefore likely to have been rather greater than originally foreseen.

The present article deals with one particular source of inefficiency that may result from protection in manufacturing industries. Economies of scale, which may be broadly defined as a decline in per-unit costs as a result of an increase in output, imply that per-unit costs can only be reduced to an internationally competitive level if the volume of production is large enough to allow the available cost savings to be realized. At the same time,

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**The obvious alternative of providing a direct subsidy to domestic firms equivalent to the external economies created is often rejected as impractical due to limitations on government finance in many developing countries.

the size of the protected market, which in developing countries is likely to be relatively small, places an upper limit on the scale of production of an industry operating at above-normal cost.* Inefficiency due to the small scale of operation may be compounded by the fact that most manufacturing industries make a range of products. A protected industry attempting to serve the whole range of consumer preferences therefore tends to produce a wider variety of the same basic goods than an industry of the same size that is integrated into the world market and specializes in a more limited number of variants.

The Brazilian passenger car industry provides an appropriate example for a case-study on the impact of protection on scale efficiency. The domestic car market was effectively closed to imports in the mid-1950s.** Its relatively large size (at least compared with other developing countries) appeared to make import-substituting industrialization supported by protectionist measures a viable proposition, even from the point of view of economies of scale. Since then the output of domestically produced cars has increased steadily to make Brazil the largest car producer among developing countries. Nevertheless, high rates of protection persist, although the industry can no longer be considered an infant industry three decades after its inception. This article first assesses the scale efficiency of the Brazilian passenger car

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*Even some proponents of import-substituting industrialization with tariff protection have therefore argued that industries where economies of scale are very important should not be considered prime candidates for introduction in developing countries (Prebisch [2], p. 71; Sutcliffe [3], pp. 226-227). However, their caveats do not appear to have received the attention they deserve. See Pratten [4] for an often cited (though somewhat outdated) survey of the extent of economies of scale in a variety of industries. It is assumed here that the country in question does not enjoy a large enough advantage in other types of costs to render scale efficiency irrelevant. Given the great importance of economies of scale in many manufacturing industries, that seems a plausible assumption.

**The closure of the domestic market was part of a programme undertaken in 1956 by the Brazilian Government to create a national automobile industry. Imports of cars and components were severely curtailed through very high tariffs and outright prohibitions in line with the "law of similars", while firms were obliged to comply with local content requirements of up to 95 per cent for all domestically produced cars by the end of 1960. In return, investment by firms that participated in the programme was subsidized at the rate of 89 cents for every dollar invested through a variety of measures, including duty-free imports of equipment and privileged access to foreign exchange for loan repayment (World Bank [5], p. 117; Bergsman [6], pp. 125-127; Mericle [7], p. 6). Both high legal tariffs and import licensing have persisted since then and continue to shield the domestic market from potential competition from imports (UNIDO [8], p. 33).

industry, and then examines the validity of the hypothesis that protection is one important cause of the disadvantage found to exist in scale efficiency as compared with that of the major producer countries. If valid, it would imply that a less protectionist trade policy could help to promote scale efficiency through appropriate specialization.* The concept of economies of scale and the methodology of assessing scale efficiency are dealt with in section A; the extent to which the Brazilian passenger car industry may be considered scale-efficient, as compared with its international competitors, is analysed in section B; strategies designed to improve scale efficiency and their implications for trade policy are discussed in section C; and conclusions are presented in section D.

A. Economies of scale in passenger car production

1. The concept of economies of scale and its application to the passenger car industry

Economies of scale may be defined as reductions in per-unit costs achieved by expanding the scale of production, which is represented by installed productive capacity (as opposed to capacity utilization). In micro-economic theory the concept is commonly expressed through a downward-sloping, long-run average cost curve relating per-unit costs (with full utilization of productive capacity) to changes in capacity. The long-run curve may be thought of as the envelope of an infinite number of short-run, U-shaped average cost curves that relate per-unit costs to changes in capacity utilization (Rhys [10], pp. 266-268). It is usually assumed that the declines in per-unit costs decrease as capacity is expanded by constant amounts (that is, the second derivative of the long-run cost function declines towards 0 as capacity increases). At some point, termed minimum efficient scale or minimum economic size,** cost savings due to further extensions of capacity are assumed to become insignificant.

Such a wide definition of economies of scale, which is commonly used in the empirical analysis of industrial market structures, contrasts with the more stringent notion of increasing returns to scale in the theory of production. Increasing returns are usually associated in the literature with a homogeneous production function of degree $r > 1$, where a proportionate increase in the

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*This analysis is restricted to the passenger car branch of the Brazilian motor vehicle industry because the available information on commercial vehicle production is too vague to allow any but the most general conclusions to be drawn (see Lücke [9] for a summary of evidence).

**The concepts of size and scale are used in the literature on industrial organization with a variety of meanings (see Gold [11] for a thorough discussion). In this article only the term scale will be used in relation to the capacity of a firm (or country) to produce a particular number of passenger cars.

quantities of all inputs yields a more than proportionate increase in output (see, for example, Henderson and Quandt [12], p. 79). However, the strict assumptions employed in the definition of increasing returns (such as homogeneous factors of production, identical technology, and constant factor prices over the full range of scales analysed) are usually relaxed for the purpose of empirical studies. The corresponding concept of economies of scale assumes only that essentially similar products are made with essentially similar inputs, while allowing for changes in production technology (such as a higher degree of mechanization) and, consequently, variations in factor intensity.* Although such a definition of economies of scale lacks theoretical rigour, it has nevertheless become a standard tool in the empirical analysis of industrial market structures, particularly in relation to the motor vehicle industry (as will be seen from the literature cited below in section 2). That is the justification for the use of the concept in this article.

Economies of scale may arise from a variety of sources in the areas of technology, procurement, marketing and finance. A further distinction is between economies at the firm, plant or product level. As concerns technology, significant economies of scale may be achieved in passenger car production in accordance with the law of mass production (Kern [13], pp. 58-59), which states that average total per-unit costs tend to fall with an increasing division of labour and specialization of the manufacturing process. A firm that produces a certain commodity on a large scale, using specialized machinery and flow techniques of production (such as an assembly line), can thus expect to enjoy lower per-unit costs than another firm making a smaller quantity of the same product with general-purpose machinery, shop assembly and little division of labour. That may be true even if the small firm produces efficiently in the sense of not wasting any resources and achieving the same degree of capacity utilization as a large firm.

Apart from technology, significant economies of scale in passenger car production can be achieved by manufacturing firms in the areas of procurement, marketing (through the effects of indivisibilities in advertising, the setting-up of a dealer network etc.) and finance (involving, inter alia, the ability to undertake costly research and development efforts, with the associated risk of failure, and to fund large-scale investment projects). Economies in finance and marketing cannot be analysed in a Brazilian context only, because nearly all Brazilian passenger car production is accounted for by the subsidiaries of large transnational corporations (Fiat, Ford, General Motors, Volkswagen). In addition to their own resources, those firms rely on the facilities of their parent companies for research and development of both models and production technology, as well as for support in the marketing of

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*For an extended discussion of the two concepts and the underlying assumptions, see Gold [11]. Sutcliffe ([3], chapter 6) discusses thoroughly the significance of economies of scale in the process of industrial development.

exports. Economies of scale in marketing or finance will therefore not be further discussed in this article. Economies in procurement may result either from cost savings by suppliers as a result of larger orders, or from increased market power of the vehicle manufacturers. However, conditions of production in the component industry as well as the relationships between suppliers of components and vehicle manufacturers in Brazil are too diverse to be covered here in sufficient detail.* The resulting limitations in the validity of the findings of this paper are discussed below in section 2.

2. Estimates of the minimum efficient scale and long-run average cost function

An analysis of scale efficiency should ideally be based on manufacturers' data on their cost structures. Since that information is not available, data on production by manufacturer and model are compared with estimates of the minimum efficient scale of production and of the long-run average cost function in the passenger car industry. Such estimates are surveyed in this section; all studies relate to conditions of production in developed countries. More recent estimates, and data for developing countries, are apparently unavailable.**

Table 1 presents estimates of the minimum efficient scale in each stage of production, as well as overall figures for one car model and a complete model range. In some categories (especially casting, machining and stamping) the estimates vary widely. To sum up the results, it seems reasonable to assume that engine block castings may be efficiently produced in quantities of about 1 million units per year, while the minimum efficient scale for other castings, which are often supplied by independent foundries, is lower. Cost savings can be realized in engine and power-train

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*The limited evidence available suggests that the overall efficiency of the automobile parts industry in Brazil is not lower than in competing producer countries (Stevens [14]).

**A recent publication by the Organisation for Economic Co-operation and Development relies on many of the same studies as this paper (Organisation for Economic Co-operation and Development [15], table 29, p. 76). Some studies have been undertaken on the feasibility of establishing a motor vehicle industry in a typical developing country (for example, El Darwish [16]); a brief survey is provided by Maxcy ([17], p. 214). While these studies provide rough estimates of the minimum level of annual production needed for overall efficiency, the data are not specific enough to serve as a basis for an assessment of the scale efficiency of the motor vehicle industry in a particular country. The following authors all discuss various aspects of economies of scale in car manufacturing; their findings generally confirm the conclusions reached in this paper: Central Policy Review Staff [18], Prud'homme [19], Rhys [20], United Nations Centre on Transnational Corporations ([21], p. 73), White ([22], pp. 283-284).

Table 1. Estimates of the minimum efficient scale in passenger car production
(Thousands of units per year)

Item	Estimates and sources				
	Pratten [4] a/	White [23] b/	Rhys [10] c/	Rhys [24] d/	Bristol University Motor Industry Research Group (reported by Bhaskar [25] e/)
Stage of Production					
Casting	1 000	"Efficient operation over most otherwise feasible scales of production seems likely"	Varies according to product; production of up to 200 000 cars involves "no cost disadvantage"	1 000 (engine blocks) 100-750 (other parts)	1 000-2 000
Machining	250 (engines) 400 (transmission units)	260-280 (with use of automatic transfer devices)	1 000 (engines); 300-1 000 (transmission units, depending on technology)	600 (power train) 500 (axle)	400-1 000
Stamping	500	400 (identical component; press capacity is approximately 2,500)	2 000	1 000-2 000	>500
Assembly	300	200-250	200	250 (painting and final assembly)	200-400
One model	500	400	-	-	>400
One firm (complete model range)	1 000 (3 basic models)	800 f/ (2 models)	2 000; less in case of out-buying of components	-	>1 000 with small economies thereafter

a/ pp. 138-149; based on conditions in the United Kingdom of Great Britain and Northern Ireland.

b/ pp. 20-29, 39, 44-50; based largely on conditions in the United States of America.

c/ pp. 280-299.

d/ p. 183.

e/ p. 55.

machining through production volumes of up to half a million units per year, with further economies at higher volumes. In stamping, the minimum efficient scale seems closer to 2 million units per year, which need not be identical, but have to be stamped on the same set of presses. However, the ensuing batch production with time-consuming changes of dies carries a cost penalty, as compared with continuous production of identical panels; the excess cost increases along with the number of different types of panels produced.

The studies agree broadly that the minimum efficient annual rate of final assembly is approximately 200,000 vehicles per year on a five-day-week, two-shift basis. The recent increase in the degree of automation and robotization of assembly operations in developed countries is likely to have two separate effects on the minimum efficient scale. On the one hand, assembly lines can be operated at higher speeds, increasing the minimum efficient rate of assembly per line. On the other hand, while traditional assembly technology makes it difficult to produce more than one basic model on one line without expensive changes in the set-up of the machinery, the greater flexibility of recently installed equipment allows several similar models to be assembled on the same line.* The minimum efficient rate of assembly per model may therefore be reduced.

The minimum efficient scale of assembly operations may also be assumed to represent the minimum efficient scale of production for one basic passenger car model (of which several versions may be made with a high proportion of interchangeable components), if both the engine and the transmission (each with a minimum efficient scale of about half a million units per year) are also used in other models. Otherwise, the model minimum rises accordingly. Similarly, the minimum efficient scale of production for a firm making a range of three to four models, to cover the "mini", small, medium and large segments of the market, can be assumed to lie between 1 and 2 million units per year, depending on the number of basic engines and types of power train used. Some economies at the plant level may be achieved at volumes of up to 2 million units per year, in line with the capacity of the large presses used for stamping body panels.

The above conclusions are broadly in agreement with the estimates presented in table 2 of the long-run average cost function in motor vehicle manufacturing. The data from Pratten [4], White [23], Rhys [27] and Doz [28] all indicate that per-unit costs fall considerably as annual production per model increases from 100,000 units to about a quarter of a million units, but decreases rather more slowly as production rises further to half a million

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*The Volkswagen manufacturing system at its plant at Wolfsburg, Federal Republic of Germany, for the Golf II model is capable, for example, of producing not only several body styles of the Golf but also the three-box Jetta, without changing tools or interrupting production (Altshuler and others [26], pp. 135-136).

Table 2 Estimates of the long-run average cost function in passenger car production

Annual production (thousands of units)	Pratten [4] a/		White [23] d/	Rhys [27] e/		Doz [28] h/
	1 model b/	Range of models c/	1 model b/	1 model (annual production) f/	1 model (model life volume) g/	1 model
	(Index of per-unit costs: 100 000 units = 100)		(Index of per-unit costs: 400 000 units = 100)	(Index of per-unit costs: 100 000 units = 100)	(Index of per-unit costs: 300 000 units = 100)	(Index of car variable, per-unit manufacturing costs: 200 000 units = 100)
50			120			
100	100	100	110-115	100		
200			103-105			100
250	89	83				
300				85	100	
400			100			
500	84	74		73	93	92
800			>99 (production of 800 000 or above)			
1 000	81	70			89	
2 000		66			86	

a/ pp. 141-142; based on United Kingdom prices in 1968. Apart from technological economies of scale, the estimates also include economies in the purchase of materials and components.

b/ Assuming a production run of four years.

c/ Three basic models with variants, five basic engines. Pratten's estimate does not take into account the effects of certain scale economies at the firm level, such as greater opportunities for introducing new plant of the optimum size and fully utilizing it quickly, or a greater incentive to incur expenditure on innovation as the costs of research and development can be spread over a larger volume of production.

d/ p. 39; production economies only.

e/ p. 314.

f/ Data supplied by one United Kingdom firm, based on 1974 budgeted costs.

g/ Based on data from one United Kingdom firm.

h/ Exhibit 1; average per-unit cost decrease generated by a doubling of annual production in the range of from 200,000 to

vehicles. Similarly, at the firm level, reductions in per-unit costs (see Pratten [4]) become small beyond a production volume of 1 million vehicles per year. However, even a decrease in per-unit costs as small as 4 per cent due to a doubling of firm production from 1 to 2 million units per year (as suggested by Pratten [4]) may affect the profitability of a firm, and therefore its competitiveness in an industry where profits are often less than 5 per cent of turnover (Rhys [24], p. 184).

3. Methodolcgical limitations and data problems

Two separate problems arise in using the estimates presented above in section 2 for an assessment of the scale efficiency of the Brazilian passenger car industry. First, it needs to be investigated whether current conditions of production in Brazil are sufficiently similar to those of developed countries in the late 1960s and the 1970s on which the estimates are based. Secondly, some data problems need to be considered.

In all countries the passenger car industry is highly capital-intensive; the available evidence indicates that the technologies used in Brazil do not differ substantially from those used in developed countries in spite of differences in relative factor prices. Labour-intensity in Brazil tends to be somewhat higher; robotization, which has only occurred to a limited extent, has resulted from quality control considerations rather than high labour costs (Stevens [14], p. 36). Thus the estimates of the minimum efficient scale based on conditions in developed countries in the late 1960s and the 1970s can be expected to reflect reasonably well the current position of the Brazilian motor vehicle industry.

For international comparisons, more severe problems may arise concerning the adequacy of the data used in the present study. The analysis is based on production data for each firm and each basic model. A basic model is defined to include all different versions of each model, irrespective of engine, body style etc. When that concept is applied in a cross-country analysis, the diversity of statistical sources for a variety of firms and countries makes it difficult consistently to group individual models (for which production data are often available) according to the basic model criterion. The resulting margin of error however is unlikely to invalidate the use of the concept for an assessment of the scale efficiency of car manufacturing as long as international differences, upon which judgements are based, are considerable.*

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*An alternative approach could consist of using data on production per model family, which is commonly defined to include several models that share a high proportion of components, including major ones, and are sometimes even produced on the same assembly line. Unfortunately, available data have not been sufficient to allow the grouping of all relevant models into families.

Firm-specific data on car production can only reflect scale efficiency in the areas of casting, machining and stamping (which play an important role in determining overall efficiency) if the degree of vertical integration does not differ between firms. Within the Brazilian passenger car industry, such variations are apparently limited (Stevens [14], p. 29). However, differences are likely to be more pronounced in an international comparison, which tends to widen the margin of error of the findings. In addition, little information is available on the extent to which components are shared between models or even firms, particularly outside Brazil. Gains in scale efficiency resulting from joint use of components thus cannot be captured by the available production data.

B. The scale efficiency of passenger car production in Brazil: an international comparison

In this section, after a brief description of the firm structure of the Brazilian passenger car industry, the scale efficiency of the industry is assessed in relation to the estimates of the minimum efficient scale and long-run average cost function surveyed above in section 2, and scale efficiency in Brazil is compared with that in other selected producer countries.

The current firm structure of the Brazilian passenger car industry is summarized in table 3. Among the four firms, Volkswagen holds a prominent position with two fifths of total production, which should be even strengthened by its recent agreement on close co-operation with Ford (Autolatina). Fiat's high share of exports as a percentage of production may indicate that its Brazilian operations are more closely integrated into its global production network than is the case of the other firms.*

Table 3. Firm structure of the Brazilian passenger car industry, 1985

Firms	Production (thousands of units)	Production (percentage of total)	Number of basic models produced	Exports (percentage of production)
Fiat	114	15.1	5	34.3
Ford	146	19.3	4	16.3
General Motors	191	25.1	5	15.0
Volkswagen	307	40.5	7	22.4
Total	759	100.0	21	21.1

Source: ANFAVEA [29]; Mercedes Benz do Brasil [30].

*See UNIDO ([8], pp. 133-137) for an overview of the history of the Brazilian passenger car industry.

In table 4 the development of the scale of production in the Brazilian passenger car industry since the early 1960s is surveyed. The data on average production for each firm and each basic model only relate to those models of which the annual rate of production exceeds 5,000 units, because the inclusion of specialist models with even smaller runs (in the production of which scale efficiency does not play an important role) would bias the findings by leading to an underestimation of overall scale efficiency. To give a rough approximation of installed capacity in the passenger car sector, data on the overall degree of capacity utilization in the motor vehicle industry are combined with the figures on actual production in the passenger car sector. Even such a rough measure of installed capacity should provide a more reliable basis for an assessment of scale efficiency than actual production, which was subject to considerable short-term fluctuations.

The reference case corresponding to scale-efficient production may be defined, on the basis of the estimates presented in tables 1 and 2, to involve installed capacity of one million units per year for a firm producing a range of from 3 to 4 basic models. Similarly, minimum efficient installed capacity for each basic model may be assumed to be 200,000 units per year. By comparing those figures with the corresponding data from table 4 and using the estimates of the long-run average cost function in motor vehicle manufacturing from table 2, an estimate can be obtained of the excess cost per unit produced that results from a lack of scale efficiency.*

Concerning the scale of production per firm, table 4 reveals that average installed capacity per firm amounted to roughly a quarter of a million units annually throughout the 1980s. Using Pratten's estimate of the long-run average cost function, that involves extra per-unit costs of about 20 per cent compared with scale-efficient production.** With respect to the development over time, it becomes apparent that until the mid-1970s the scale of production per firm (measured by average production in the absence of data on capacity utilization before 1975) grew more slowly than total passenger car production as a result of the emergence of new

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*The question arises whether an analysis of firm-specific data could not yield a more reliable estimate of the scale efficiency of each manufacturer, and therefore of overall efficiency. However, many of the conceptual and data problems discussed above (grouping of models into families and degree of vertical integration of production and of capacity utilization) are likely to have less of a distorting effect on an estimate of the extra cost due to low scale efficiency if the estimate refers to the whole passenger car branch (where distorting effects can average out to some extent) rather than to an individual firm. A firm-specific analysis of scale efficiency is therefore not attempted in this study.

**This estimate could be on the low side as the individual firms produced between 4 and 7 basic models each, rather than a maximum of four as assumed in the reference case (see table 2).

Table 4. Production a/ of passenger cars and light multiple-usage vehicles in Brazil, 1960-1985

Year	Total passenger car production (thousands of units)	Number of mass-producing firms	Number of mass-produced basic models b/	Volume of mass-production (thousands of units)	Average number of basic models per firm	Average production per firm (thousands of units)	Average installed capacity per firm c/ (thousands of units)	Average production per basic model (thousands of units)	Average installed capacity per basic model c/ (thousands of units)	Unutilized capacity in the motor vehicle industry (percentage)
1960	46	2	4	39	2.0	20	..	10	..	..
1965	118	3	7	109	2.3	36	..	16	..	..
1970	305	3	7	290	2.3	96	..	41	..	..
1975	706	3	12	690	4.0	230	244	58	61	5.7
1976	747	3	12	731	4.0	244	260	61	65	6.2
1977	719	4	13	711	3.3	178	214	55	66	17.0
1978	858	4	11	839	2.8	210	221	76	80	5.2
1979	900	4	12	891	3.0	223	235	74	78	5.2
1980	927	4	14	918	3.5	229	254	66	73	9.7
1981	585	4	15	581	3.8	145	227	39	61	36.0
1982	673	4	17	668	4.3	167	287	39	67	41.7
1983	749	4	19	743	4.8	186	284	39	60	34.7
1984	679	4	21	674	5.3	169	268	32	51	37.0
1985	759	4	21	752	5.3	188	266	36	51	29.2

Sources: Unpublished data of the Associeçao Nacional dos Fabricantes de Veiculos Automotores; Macchione ([31], table 26); and calculations by the author.

a/ Includes only basic models with an annual production of more than 5,000 vehicles.

b/ A basic model is defined here to include all different versions of one model, irrespective of the number of doors, type of engine etc.

c/ Data on capacity utilization for the whole industry have been used in the calculation of this column.

mass-producing firms. Thus the increase in the volume of total production was only partly translated into improved scale efficiency at the firm level.

A similar picture emerges from an analysis of the development of the scale of production for each basic model. Average installed capacity per basic model reached a maximum of 80,000 units per year in 1978 and has since fallen to 51,000 units annually (see table 4). On the basis of White's estimate of the long-run average cost function (see table 2), the latter figure is found to imply an extra cost per unit produced of between 13 and 14 per cent, compared with scale-efficient production of 200,000 units annually. The continuous increase over time in the number of basic models has meant that the scale efficiency of production at the basic model level actually deteriorated.

The findings thus far show that there remains considerable scope for improvements in the scale efficiency of Brazilian passenger car production, in terms of both production per firm (relating to economies of scale in the production of major com- ponents such as engines and transmissions) and production per basic model.

In order to assess the impact of scale efficiency on the competitive position of the Brazilian car industry in the international market, the scale of production in Brazil will now be compared with that of its competitors (rather than with the hypothetical optimum value). In table 5 the scales of production in Brazil and seven other important producer countries, both developed and newly industrializing,* are compared. Since comparable information on capacity utilization is not available, the cross-country analysis has to be based on actual production data.

Among newly industrializing countries, Brazil clearly has more scale-efficient production than India and Mexico, its performance being comparable to that of Spain. The Republic of Korea, however, by concentrating its much smaller volume of total production on a very limited number of models, has managed to achieve a slightly higher degree of scale efficiency at the basic model level than Brazil. In fact, the Republic of Korea may show a distinct advantage in this respect in the near future, since the 1984 data in table 4 do not fully reflect the recent success of the Hyundai firm in introducing its Pony 2 model in the North American markets. Economies at the firm level (relating mostly to the production of components common to several basic models), where Brazil is in a better position than the Republic of Korea, may somewhat compensate for the relatively small scale of Brazilian production per basic model.**

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*The term "newly industrializing country" is used extensively to describe developing economies, be they countries, provinces or areas, where industrialization has been particularly rapid.

**The scale inefficiency resulting from model proliferation becomes even more obvious in the Mexican case. Possible firm strategies to overcome inefficiency due to model proliferation are discussed in the next section.

A comparison of data on Brazil and the developed countries listed in table 5 shows that the volume of production per basic model in Germany, Federal Republic of, Japan and the United States was about four times as large as in Brazil. On the basis of White's estimates of the relationship between per-unit costs and the scale of production (see table 1), that can be assumed to imply a difference in per-unit costs of about 10 per cent.* In relation to the United States that estimate is likely to be on the low side, given that the three large firms in the United States often produce very similar or almost identical models in their separate divisions.** Economies of scale resulting from the interchangeability of components in such cases are not reflected by the data on production per basic model, because sufficient information on construction similarities between models is not available.

In conclusion, the Brazilian passenger car industry has greatly improved its scale efficiency over the years and now enjoys a clear advantage compared with other newly industrializing countries except the Republic of Korea, which is rapidly improving its position, especially at the basic model level. At the same time, Brazil continues to find itself at a disadvantage relative to the major developed countries, with an excess cost per car of approximately 10 per cent as a result of its smaller scale of production.***

C. Strategies to improve scale efficiency and the role of trade policy

The continuing difficulties facing the country as well as the fact that scale efficiency in the Brazilian automobile industry has deteriorated in recent years, especially at the basic model level, demonstrate the need to consider measures aimed at improving scale efficiency. The following conceivable firm strategies (which are not mutually exclusive) and their implications for trade policy are discussed in this section: reducing the number of basic models; lengthening model runs; inter-firm co-operation, including mergers; and increasing exports.

A reduction in the number of basic models would increase the scale of production per basic model, provided that production per firm can be maintained at its previous level. With three of the

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*A decrease in the scale of production from 100,000 to 50,000 is reported by White to carry a cost penalty of between 4 and 9 per cent.

**For example, the General Motors "J Car" is sold in the United States in the following five different versions, corresponding to the General Motors car divisions: Cadillac Cimarron, Pontiac J 2000, Buick Skylark, Oldsmobile Firenca, Chevrolet Cavalier (Waymark [33], pp. 138-139).

***This conclusion assumes that the distortions that result from the limitations of the methodology applied in this analysis tend to average out rather than lead to a clear-cut bias in the findings.

Table 5. Production of passenger cars and light multiple-usage vehicles in Brazil and selected countries, 1984

Country	Total passenger car production (thousands of units)	Mass-produced cars a/			Average number of basic models per firm	Average volume of production per firm (thousands of units)	Average volume of production per basic model (thousands of units)
		Number of firms	Number of mass-produced basic models	Volume of mass production (thousands of units)			
Brazil	679	4	21	676	5.3	169	32
Mexico	232	6	17	216	2.8	36	13
Republic of Korea	159	2	4	156	2.0	78	39
India b/	86	4	4	85	1.0	21	21
United States of America c/	7 952	4 d/	64	7 742	16.0	1 935	121
Japan e/	7 771 f/	5 f/	..	7 071 f/, g/	18 h/	1 414 f/	134 h/, i/
Germany, Federal Republic of	3 754 j/	4	24	2 819 j/	6.0	705	117
Spain	1 225	6	..	1 254 k/	..	209 k/	..

Source: Compiled from [32].

a/ Including only basic models with an annual production of more than 5,000 vehicles.

b/ Including jeeps.

c/ Retail sales of domestically produced cars. No data are available relating to individual models of Volkswagen or Honda.

d/ American Motors, Chrysler, Ford and General Motors.

e/ Production figures for individual models are only available for Toyota.

f/ Involving total production by Honda, Mazda, Mitsubishi, Nissan and Toyota.

g/ Including knocked-down sets.

h/ Toyota only.

i/ Excluding completely-knocked-down kits, for which no data are available at the model level.

j/ B.M.W., Mercedes Benz and Porsche have not been included since those firms cater for particular market segments with only limited relevance to Brazilian conditions.

k/ Production figures are not available for individual models. Figures relate to the total production of the firms.

four Brazilian car makers mass-producing only four or five basic models each, such an approach would probably force some firms to stop serving particular segments of the market. Such specialization could, however, turn out to be counter-productive in the current situation. The nature of oligopolistic competition in the protected domestic market makes it important for each car manufacturer to cater for first-time buyers of automobiles as well as for customers who are moving up-market, in order not to lose market shares and, consequently, scale efficiency in production. The alternative of importing certain models from abroad instead of inefficiently producing them domestically does not exist in Brazil because of the effective closure of the domestic market to imports. The protection of domestic car manufacturing is thus found to have contributed to the recent deterioration of scale efficiency by encouraging model proliferation.

The marketing strategies currently pursued by firms in the Brazilian domestic market tend to emphasize style and appearence rather than, for example, practical usefulness or ease of maintenance (Macchione [31], p. 42). That approach apparently plays an important role in preventing a lengthening of model runs, which could otherwise reduce per-unit costs through the spreading of certain model-specific fixed costs over larger model life volumes (see table 2 for an estimate by Rhys [27] of the relationship between per-unit costs and model life volume). The traditional notion that model runs are distinctly longer in newly industrializing countries than in developed countries cannot be upheld (despite examples to the contrary), as a comparison between the average period of production of 1984-produced basic models in Brazil and the Federal Republic of Germany demonstrates (Lücke, [9], table 8). That may be a result precisely of the need to limit the number of basic models to the minimum required to cover the main segments of the market. With changes in consumer preferences demanding a frequent introduction of new models, the production of older models has to be terminated (even if there is still significant demand for them) once their replacements are introduced. By contrast, the larger markets in developed countries apparently allow each firm to have a somewhat greater number of models in production simultaneously, and still take advantage of economies of scale.* The implication for trade policy is that if liberalized trade régimes prevailed in several countries with a similar structure of demand

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*Some examples of the early withdrawal of still popular models in Brazil are the replacement of the Volkswagen Brasilia and Beetle models with the BX family (Gol, Voyage, Parati), the substitution of the General Motors Monza for the Opala, and the replacement of the Ford Corcel II with the Escort (Crissiuma [34], pp. 85-86). The introduction of new models in Brazil tends to follow with a lag of several months the appearance of the equivalent model in the home markets of the parent companies. Thus the experience of the parent company may be relied upon in the setting-up of production in Brazil to avoid certain starting-up (that is, model-specific, fixed) costs. That cost saving may be set against any unit cost disadvantage resulting from relatively short model runs.

(for example, developing countries in Latin America), production of slightly dated models would still be feasible if exports could be counted on to supplement domestic sales in order to achieve a sufficiently large scale of production. In a Latin American context this could be realized, for example, through increased specialization and international trade between the local subsidiaries of each of the major transnational car producers.

Economies of scale in the manufacture of parts can also be achieved through increasing the degree of interchangeability of components among models. This is already being done to a great extent,* and within individual firms the process may in fact be approaching its limits, given that cars of different sizes (to cover different market segments) each require their own body parts, engines, and, possibly, transmissions. There remains, however, ample scope for increasing scale efficiency through inter-firm as well as international co-operation in the production of components. That seems to be the main thrust of the recent collaboration agreement covering the operations of Volkswagen and Ford in Brazil and Argentina ("Autolatina"; see Stevens [14], p. 60). Such co-operation presupposes a liberal trade régime for automobile parts.

Finally, the possibility of increasing exports must be considered. The example of the Republic of Korea demonstrates that even with much smaller total production, concentration on a few models together with determined efforts to expand exports may considerably improve scale efficiency. In the case of Brazil several obstacles to such an approach appear to exist. First, in the past the pressure to export is likely to have been smaller than in the Republic of Korea, given the much larger size of the protected domestic market. Secondly, being subsidiaries of transnational corporations, the Brazilian carmakers are not entirely free to choose their export markets if their decisions conflict with the interests of other parts of the corporation. That appears to be one reason why exports to the North American and Western European markets have remained limited, although those markets would seem to be the most natural targets for an export expansion strategy aimed at increasing the scale of Brazilian production. However, deliveries of Brazilian-made cars by Fiat to Western Europe and by Ford to Scandinavia demonstrate the feasibility in principle of such exports, because in both regions they compete with cars produced in the European factories of the two companies.** Thirdly, legally binding local content requirements which apply to all cars produced in Brazil (Prud'homme [19]) appear to represent an obstacle to a fuller integration of the Brazilian subsidiaries into the global

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*The Volkswagen BX model family, for example, accounted for 47 per cent of 1985 passenger car output (Stevens [14], p. 45).

**The current export drive of Volkswagen in the United States, if successful, may alter the picture somewhat.

production networks of the parent companies,* although the rules are relaxed somewhat for cars destined for export under special agreements between car manufacturers and the Government (see Stevens [14], p. 31 and Prud'homme [19]). There is some evidence (Nunnenkamp [36], pp. 128-135) that during the early 1980s the combined effects of export incentives and protection was a net subsidization of exports. However, the recently introduced restrictions on imports of electronic components, which are of particular importance for cars exported to the markets of developed countries, are likely to alter the picture in as far as they represent an obstacle to those exports. Local content requirements and similar restrictions such as the new law on information technology also necessitate costly design changes in parent company models in the course of their adaptation for production in Brazil, changes that may impair the suitability of the Brazilian versions for sale in the markets of developed countries, thus restricting the scale of Brazilian production (Stevens [14], pp. 33 and 42).** Liberalized imports of technologically sophisticated components that cannot be efficiently produced domestically can therefore be expected to help to improve export performance in the markets of developed countries.

D. Conclusions

It has been found that the remaining disadvantage of the Brazilian automobile industry in terms of scale efficiency, as compared with its major international competitors, is to a considerable extent a consequence of the protection of the industry. Various sources of inefficiency have been identified (model proliferation, relatively short model runs, limited international co-operation in the production of components and limited success in exporting to the markets of developed countries) which could be reduced through greater specialization in the context of a less protectionist approach to imports of cars or technologically sophisticated components.

Such findings may be expected to apply even more strongly to the automobile industries in many other developing countries, especially in Latin America, where the size of the protected domestic market is much smaller and the number of firms even greater than in Brazil (see the example of Mexico, table 5; UNIDO [8], pp. 122 and 125). It seems likely, provided that across-the-board liberalization of automotive imports cannot be implemented, that regional co-operation and specialization (for example in the context of a Latin American free trade association) could constitute a second-best strategy for improving scale efficiency.

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*For a discussion of the "world car" strategy, involving ideally a global integration of production, see Black [35]. Stevens ([13], p. 33-34) describes the problems encountered in applying that strategy in Brazil.

**For example, in transforming the Parati/Voyage into the Fox for the United States market Volkswagen had to make alterations to 30 per cent of the components.

The applicability of the findings to other protected manufacturing industries depends on the impact of economies of scale on the costs of production, as well as on the size of the domestic market relative to the minimum efficient scale of production in the industry. While in the automobile industry economies of scale are more important and technology is more standardized internationally than in some other manufacturing branches, inefficiency as a result of small scale is likely to be a widely relevant problem for protected industries in developing countries. That applies especially to countries whose domestic markets are much smaller than that of Brazil. In any case, the appropriate response by an industry with a small domestic market to the presence of significant economies of scale will be specialization, rather than protectionism, with a view to exporting a considerable proportion of output and importing those product varieties that cannot be efficiently produced domestically.

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INDUSTRIAL RESTRUCTURING OF THE PUBLIC STEEL INDUSTRY: THE MEXICAN CASE

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Introduction

Industrial restructuring is a world-wide phenomenon that has arisen, in the context of the third industrial and technological revolution, independently of the type of economic or political system involved or the stage of economic development. The process of industrial restructuring is part of a wider process of reshaping international trade relations and integrating different countries into a new international division of labour. Countries that fail to adapt to the new situation will be cut off from technological and scientific progress, and the prospects for improving the social and economic conditions of their people will be seriously undermined.

In 1986 Mexico began to restructure its public industry within the framework of a global strategy for structural change initiated in 1983. Structural change in the public steel industry is intended to achieve the restructuring of a mature industrial branch.

The Mexican steel industry comprises four huge integrated corporations, 23 semi-integrated enterprises and 44 re-roller plants. It has an installed capacity of 9 million tonnes of steel goods, 58 per cent of which is accounted for by the public steel sector. In 1986, the Mexican steel industry produced 7.1 million tonnes of steel goods, with a contribution of 86 per cent by the four integrated plants. The apparent domestic consumption of steel was 6.8 million tonnes. The industry has a work-force of 70,000, with the public sector contributing 70 per cent of that total.

Reshaping the public steel sector involved shutting down, merging, transferring or selling enterprises, the number of which was reduced from 3 integrated plants to 2, and from 87 associated enterprises to 35. In 1986, industrial restructuring was initiated in the public steel sector with the following five well-defined aims: technical and productive modernization; commercial modernization; managerial modernization; financial soundness; and programming of investment flows and growth.

Technical and productive modernization involved shutting down the integrated corporation Fundidora de Monterrey S.A. (FUMOSA), the modernization of Altos Hornos de México S.A. (AHMSA), the rehabilitation and implementation of automatic systems in

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SICARTSA I, the reactivation of the project SICARTSA II and the possible reutilizat'on of the flat-steel producing line of FUNOSA. Such action, in addition to improving product quality and competitiveness, will increase productive capacity by an additional 1.5 million tonnes of final steel goods.

The decision to shut down FUNOSA in May 1986 was one of the most far-reaching steps in the restructuring process, since that corporation had an installed productive capacity of 1.5 million tonnes of liquid steel and a labour force of 12,500 employees who were supported by the Mexican social security system. No supply problems arose, however, because the corporation was closed during one of the sharpest recessions in steel demand. At the same time, a decision was made to go ahead with the SICARTSA II project, which will have a productive capacity similar to that of FUNOSA. That project will contribute substantially to the restructuring of the steel industry by making available modern equipment and making possible the production of flat-steel goods (plate). It will also help to bring about a diversification of domestic supply, a substantial increase in import substitution and the establishment of indirect and permanent exports of manufactured goods.

Modernization of AHMSA will lead to a substantial increase in the use of installed capacity by 1 million tonnes of liquid steel. The SICARTSA II project will contribute with an installed capacity of 1.5 million tonnes. In net terms, therefore, the various above-mentioned changes will add 1 million tonnes to capacity, and by 1992 increases in efficiency are expected to produce an additional 0.5 million tonnes. That amounts to a capacity increase of 15 per cent.

Restructuring the Mexican steel industry has also involved personnel measures to impove productivity from 130 to 200 tonnes per worker per year by 1990.

With regard to commercialization, restructuring involves a price policy that reflects the level of efficiency of the enterprise, its awareness of real costs and market competition. At the same time, protectionist regulations must be rationalized. That was accomplished when Mexico lifted controls on 52 per cent of tariff items in 1984 and introduced their total liberalization in October 1987, with an average tariff of from 14 to 17 per cent.

Managerial restructuring of enterprises in the steel industry has also been a part of the strategy. It has been initiated by concentrating some functions in a holding unit, SIDERMEX, and by allowing autonomy to enterprises in programming production and in plant management, under the general policy guidelines to be defined by the holding.

With respect to finance, a decision was made to rescue the enterprises with the support of the federal Government, which is to absorb $883 million of a total debt of $2,104 million, thereby leaving each enterprise in a position of self-reliance to meet its obligation to repay both interest and principal.

Finally, the primary requirement for the success of the restructuring process is an investment and growth strategy. A programme covering the period up to the year 2000 has been elaborated for the steel industry. It will allow enough resources to undertake modernization in each of the productive plants, with the incorporation of new technologies, the rehabilitation of equipment and the updating of managerial systems, culminating in the permanent and dynamic development of the industry.

A. The Mexican steel industry in the international framework

International restructuring of industrial plants has arisen as a government response to the problem of maintaining industries competitive with those of other regions and countries. The restructuring process is a recent world-wide phenomenon that is under way in both market and centrally planned economies. Measures designed to improve competitiveness have been undertaken in certain strategic industries, in particular the more mature and traditional ones.

One of the main consequences of restructuring efforts has been the initiation of a process of disinvestment. In industries such as shipbuilding, steel, automobiles, textiles and fertilizers, disinvestment has occurred as a result of the scrapping of installed capacity. At the same time, a number of the affected industries throughout the world have had to update their productive and managerial equipment and procedures. It has therefore been necessary to retool some firms while taking steps to reduce installed capacity and to implement programmes designed to improve productive efficiency.

The main factors leading to the loss of competitiveness in the more mature and traditional industries are rapid technological change, globalization of production, factor changes that stress capital-intensity and low raw-material content (steel in the present case) by production unit and the creation of idle capacity world-wide through product substitution or obsolescence.

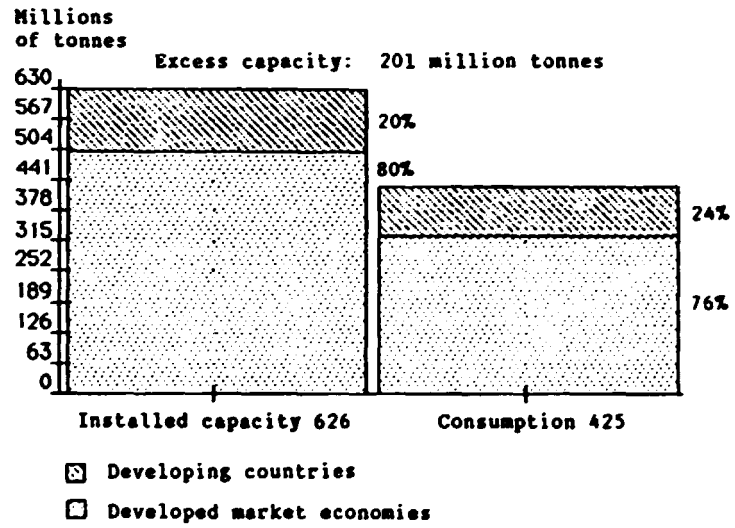
The international process of industrial restructuring has affected in particular the steel industry. The decline of that industry was the result of stagnation of demand and of excess capacity built up until the mid-1970s. Since then, rationalization has brought about factory closures. The countries of the European Economic Community (EEC) have reduced their steel productive capacity by about 20 million tonnes and another 10 to 15 million tonnes are to be scrapped in the coming years. In the United States of America approximately 15 million tonnes, amounting to almost 10 per cent of productive capacity, were eliminated within a four-year period, and another 15 million tonnes are expected to be scrapped.

As part of a world-wide restructuring process, the steel industry has undergone continual changes in production methods in order to improve scale economies and encourage product differentiation. Industries throughout the world now rely on state-of-the-art technologies that make less use of steel. The steel industry has

responded in two ways: first, by upgrading production using special steels and alloys; and second, by modernizing traditional production to supply industries such as shipbuilding, oil and construction, which are expected to remain steel consumers in both the short and the medium term.

In 1986 world steel output reached 714 million tonnes, almost 450 million tonnes of which were accounted for by developed market economies (see figures I and II). In that year, total steel consumption in those economies amounted to 425 million tonnes. The main consumers were Germany, Federal Republic of, Japan and the United States, which together represented a half of world consumption. Trade in steel has occurred in a markedly protectionist atmosphere. The World Development Report 1987 of the World Bank has noted that in the last ten years the European Economic Community and the United States have adopted measures to protect their steel products from cheaper imports, while they seek to restructure their domestic industries. Protectionism continues to be practised, causing trade distortions that sometimes lead to unfair competition.

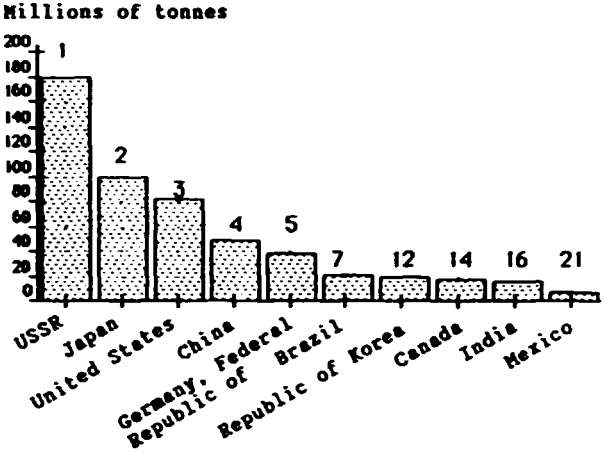
Figure I. Installed steel capacity and consumption in developed market economies and developing countries, 1986



Source: I.L.A.F.A.

Production has generally followed consumption trends in developed countries, but on the whole, productive capacity has continued to be greater than demand, despite the important restructuring measures undertaken. Those measures have contributed to a profound transformation in the industrial structure, the main features of which have been the displacement of labour and the rationalization of capital.

Figure II. Steel output of selected countries, 1986



Total world output: 714 million tonnes

Source: CANACERO.

Note: Numbers at top of bars indicate world ranking of producers.

On the other hand, production and consumption have been more dynamic in developing countries, and the use of installed capacity greatly exceeds the registered levels in OECD countries. However, changing international markets and the world-wide restructuring process have made it unnecessary to pursue individual projects to expand capacity, or at least necessary to re-evaluate them.

In Latin America, market conditions changed from growth to recession as the steel industry expanded, leaving unconcluded projects and a heavy financial burden. There seems to be considerable potential for expanding productive capacity, but such expansion will depend on whether real opportunities exist for achieving internationally competitive standards of production. Investment to improve efficiency, as well as to modernize, retool and rationalize steel plant, has the fist priority.

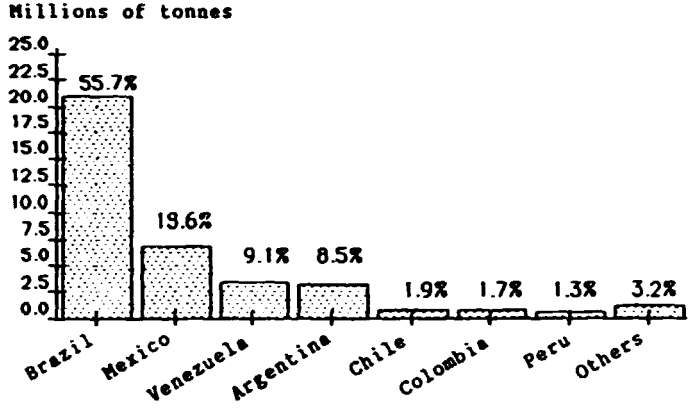
Annual steel output in Latin America exceeds 37 million tonnes (see figure III). In 1986, Mexico was the twenty-first largest producer in the world with an output of 7 million tonnes, which amounted to approximately 1 per cent of world production in that year. In Latin America it is the second largest producer after Brazil, which, with an annual output of 21 million tonnes, three times that of Mexico, ranks seventh among world producers.

B. The Mexican steel industry in the national economy

The steel industry occupies an important place in the industrial structure of Mexico. Its strategic importance arises from

the need to provide other industries with a reliable supply of good-quality steel goods comparable in price to those on the international market. It can thereby establish links with downstream consumer industries and exploit its comparative advantage by selective participation in world markets.

Figure III. Steel output in Latin America, 1986



Total output in Latin America: 37.7 million tonnes

Source: I.L.A.F.A.

In 1986 the Mexican steel industry had a share of 1.2 per cent of Mexican gross domestic product (GDP) and 5 per cent of manufacturing GDP. It comprises four huge integrated companies* that together produce 86 per cent of national steel output. Two of them are public enterprises: Altos Hornos de México S.A. (AHMSA) and Siderúrgica Lazaro Cardenas-Las Truchas (SICARTSA). The other two are private: Hojalata y Lámina S.A. (HYLSA) and Tubos de Acero de México S.A. (TAMSA) (see figure IV). There are also 23 semi-integrated companies and approximately 40 re-rollers. The industry employs 70,000 workers, 70 per cent of them in the public sector.

Installed capacity in the Mexican steel industry amounts to 9 million tonnes per year, with 58 per cent in the public sector. In 1986 national output reached 7.17 million tonnes of steel, of which 4.3 million tonnes was accounted for by SIDERMEX.

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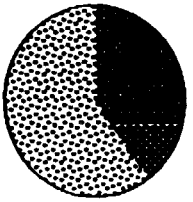
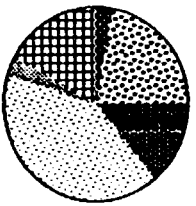
*Integrated companies carry out the whole range of mining and steel-making operations, including exploration, exploitation, concentration and pelletizing of minerals, reduction, steel-making, rolling and manufacture of the final steel product. Semi-integrated producers carry out steel-making and rolling operations, and re-rollers only the latter.

Figure IV. Mexican steel production: share of different economic agents



Share by sector

Private sector	40%
SIDERMEX	60%



Share by enterprise

TAMSA	3.0%
HYLSA	22.0%
Non-integrated firms	14.0%
AHMSA	41.0%
FUMOSA	3.0%
SICARTSA	17.0%

Source: CANACERO.

Mexican apparent demand for steel grew from 0.8 million tonnes in 1950 to 12.4 million tonnes in 1981, which means an annual average weighted growth of almost 8 per cent. However, the sharp recession in the Mexican economy caused a drop in steel consumption between 1981 and 1983. In 1983, consumption amounted to 6.5 million tonnes, but it recovered to 8.1 million tonnes in 1985. In 1986, economic difficulties, particularly sharp drops in oil prices, high interest rates and the external debt burden, contributed to a decline in demand to the level of 6.8 million tonnes. Some downstream consumer industries that reduced demand were the construction, capital goods and automobile industries.

C. Conditions in the Mexican steel industry before the industrial restructuring programme

Up to 1985 the Mexican steel industry had developed several structural problems, and a further deepening of the economic crisis worsened conditions in the industry, particularly those of the SIDERMEX group, as described below.

1. Corporative size

By 1985 the public steel industry comprised 91 companies, a holding (SIDERMEX S.A.) and three integrated steel plants (Fundidora de Monterrey S.A. (FUMOSA), AHMSA and SICARTSA). There were 87 other companies involved in such activities as commercialization, real estate, transport, mining and the manufacture of refractories, capital goods, pipes, cans and automobile parts. There were clearly too many enterprises with the most varied activities and excessive functional dispersion, including enterprises which in some cases were far removed from steel production.

2. Technical and productive conditions

In 1985 SIDERMEX production centred on the three integrated companies described below.

Fundidora de Monterrey S.A. was the pioneer of steel-making in Mexico, its origins going back to 1903. It had major problems of technical obsolescence and maintenance, which led to high production costs and finally to its closure in May 1986.

At the time of closure it had an installed capacity of 1.5 million tonnes of steel and a work-force of close to 12,500 employees. In 1985 FUMOSA produced 943 thousand tonnes using only 63 per cent of installed capacity, with an average productivity of 75 tonnes per worker. It had a high coke consumption (657 kilograms per tonne), far more than that of AHMSA and SICARTSA (560 and 525 kilograms per tonne, respectively). At the same time, the plant suffered from the effects of frequent bottlenecks in the supply of inputs as well as high pollution in the central area of Monterrey, an important city of Northern Mexico, with a population of over 3 million.

Persistent low productivity made it impossible to cover operational costs, hindered compliance with financial obligations and led to the decision to shut down. Its continued operation in such conditions for five more years would have meant accumulating losses of up to more than 500 billion pesos, which would have represented federal government transfers of nearly $1 billion at the exchange rate prevailing in May 1986.

In 1985 Altos Hornos de México S.A. had in operation five blast furnaces with their associated steel-making plant. The company was formed by merging two units or plants operating with equipment of unequal quality. As table 1 shows, total installed capacity amounted to 4 million tonnes. Average costs were $319 per tonne of output and the work-force numbered 32,600.

The main technical and production problems of AHMSA arose from the fact that two of the five blast furnaces (in plant 1) were old and the profitability of using them in steel-making was low. The furnaces in operation were obsolete open-hearth Siemens Martin furnaces of nineteenth-century design. Continuous casting was not practised, and the front ingot-pouring system used was inefficient and expensive. Bottlenecks were also caused by the use of rolling-mills of less than the required capacity and in poor operating condition. The result was high double-processing and inferior final products that were marketed although they failed to meet quality standards.

The above-mentioned problems caused excessively high operating and maintenance costs, for which it was difficult to compensate in the modern parts of the company (plant 2). The latter were equipped for continuous casting and automatic operation, but were hampered by various difficulties such as input supply bottlenecks and inefficient maintenance programmes.

Table 1. Capacity and output of the Mexican steel industry
(Millions of tonnes) a/

Enteprise	Installed capacity (1) 1984	Installed capacity (1) 1986	Output (2) 1984	Output (2) 1986	Idle (?) b/ 1984	Idle (?) b/ 1986
AHMSA	3.95 (37.5)	3.95 (44)	2.468 (32.7)	2.87 (40)	0.375	0.273
SICARTSA	1.3 (12.3)	1.3 (14)	1.028 (13.6)	1.192 (16.5)	0.209	0.083
FUMOSA	1.5 (14.2)	--	0.858 (11.3)	0.254 c/ (3.5)	0.428	--
SIDERMEX total	6.75 (64)	5.25 (58)	4.354 (57.6)	4.316 (60)	0.355	0.178
HYLSA	1.7 (16.1)	1.7 (19)	1.637 (21.7)	1.582 (20)	0.037	0.069
TAMSA	0.465 (4.5)	0.465 (5)	0.343 (4.5)	0.233 (3.2)	0.262	0.437
Semi-integrated enterprises	1.633 (15.5)	1.633 (18)	1.226 (16.2)	1.039 (15)	0.249	0.364
National total	10.548	9.048	7.56	7.17	0.283	0.208

Source: Ministry of Energy, Mining and Quasi-Governmental Industry.

a/ Percentage of total indicated in parentheses.

b/ (3) = ((1) - (2))/(1).

c/ Production until May 1986, when it was shut down.

Notes: National apparent consumption of steel was 7.725 million tonnes in 1984 and decreased to 6.792 million tonnes in 1986. SIDERMEX steel exports amounted to 0.5395 million tonnes (12.39 per cent of output) in 1984 and reached 0.812 million tonnes (20 per cent of output) in 1986.

The steel company Lazaro Cardenas-Las Truchas S.A. (SICARTSA I) has only one blast furnace with a capacity of 1.3 million tonnes and two oxygen converters, providing an annual output of 1.2 million tonnes of steel goods in the form of non-flat steel (bars and rods). Having started operations in 1976, it does not yet face any serious problems of obsolescence, but other problems affect its efficiency and therefore have an impact on direct production costs. In particular, energy use in continuous casting and rolling is inefficient and costly. Moreover, in spite of being a modern plant, it lacks quality control equipment and an automatic system of production control.

3. Commercial conditions

(a) Pricing policy

With regard to pricing, the steel industry has felt the negative effects of a rigid official price-control policy that did not take into account cost changes. With accelerating inflation the price-cost gap widened, serious harm was caused to the financial structure of enterprises, and increased federal government fiscal subsidies had to be granted to the industry.

Between 1974 and 1980 steel prices did not increase by more than 20 per cent. During the 1981-1985 period, prices increased by from 37 to 100 per cent annually, but that was not enough to compensate for increased costs, since inflation was always higher than price adjustments. The financial condition of the steel industry continued to deteriorate because of rapid inflation, high leverage and losses due to the devaluation of exchange rates and the involvement of foreign credit.

(b) Marketing policy

On the other hand, up to 1985 there was an excessive centralization of the SIDERMEX complex in matters of distribution and marketing. The problem was more acute with regard to the domestic market because the latter is typically composed of clients ordering small quantities of steel goods with specific characteristics.

(c) Rationalization of protectionist regulations

Another structural problem was related to a policy of protectionism. The steel industry, as well as other industries in the Mexican economy, was highly protected for many years. Import licences were required for almost 70 per cent of tariff items. Such a protectionist policy made structural problems worse and was one of the causes of deteriorating quality standards, distorted cost patterns and delays in the upgrading of equipment.

4. Managerial and labour conditions

With regard to the managerial aspects of SIDERMEX, the three integrated corporations faced similar problems, in particular the following:

(a) Centralization of purchases in Mexico City, which hindered the establishment of a dynamic buying agency in the natural supply area of the enterprise;

(b) Inadequate planning systems and, in some cases, a lack of planning;

(c) Lack of adequate costing and accounting procedures for each enterprise, which frequently prevented correct decision-making.

The most significant problem in personnel administration has been an excessive payroll, with 40,140 employees producing 4,158 million tonnes of steel in 1985. That represented a productivity ratio of 103.6 tonnes per worker per year, far below international standards and the productivity ratios of the United States, Japan and the Republic of Korea, respectively 270, 459 and 667 tonnes per worker per year. Other problems have been poor training and few programmes designed to train managerial and operating personnel.

Moreover, the Mexican steel industry in general and the public sector industry in particular have had difficult labour relations. During the past ten years the relationship between firms and unions (mining and metallurgical) has been marked by several strikes and disputes that have been difficult to resolve. In addition, when they were first established, some plants, such as SICARTSA I, experienced a high labour turnover, and there were low personnel expectations of long-term employment, a problem which, to a certain extent, continues to exist.

5. Financial conditions

In early 1986, the SIDERMEX complex had an equivalent of $2,104.6 million in total liabilities (without FUMOSA). Such a huge debt, with its high servicing requirements, and a financial structure undermined by rigid price controls, were the main financial problems facing the corporation. The debt levels of the individual firms were $559 million for FUMOSA, $967 million for AHMSA, $188 million for SICARTSA I and $955 million for SICARTSA II. Those liabilities involved a high foreign currency component ($1,576 million), more than half of it accounted for by the SICARTSA II project. The debt burden was worsened by adverse international conditions, with the collapse in oil prices, high interest rates, international monetary problems and the failure to obtain timely capital contributions seriously threatening the survival of the SIDERMEX complex. The financial costs of the debt could not therefore be compared with those of steel companies in more developed countries, where traditionally 15 per cent of income is used to pay interest on loans, whereas in Mexico such payments were over 50 per cent of income.

The financial structure of the enterprises was in a critical state by 1985. Net losses of the complex amounted to 102 billion pesos ($229 million at current exchange rates), 54 per cent of it accounted for by FUMOSA. In May 1986 it was decided to close that corporation because it did not cover its operating costs and would

have represented additional losses of approximately 100 billion pesos (about $225 million) in that year.

As reflected in table 2, by late 1985 the three integrated corporations were clearly unable to solve their grave financial problems or to meet their domestic and foreign debt obligations from sales revenue; in fact, the debt-equity ratio showed them to be technically in bankruptcy. However, there seemed to be sufficient grounds, on the basis of their operating costs, to rescue two of the enterprises (AHMSA and SICARTSA I). In the case of FUMOSA, its problems had reached such a stage that a declaration of bankruptcy was considered the wisest decision for both the country and the steel industry.

Table 2. SIDERMEX integrated steel plants: main financial items (Billions of pesos)

Enterpise	Assets	Sales	Liabilities	Capital
AHMSA	919	206	446	472
SICARTSA I	1 057	65	445	613
FUMOSA	276	44	210	65
Total	2 252	315	1 101	1 150

Source: SIDERMEX, INFORME DE LABORES 1985-1986 (Mexico City, 1986).

The SICARTSA II project was a special case, since it involved a $245 million debt contracted with several foreign banks, and there was not yet any operating income.

6. Programming of investment flows and growth

As previously mentioned, since the mid-1970s the world steel industry has been subject to drastic adjustments in capacity, in response to the slower pace of growth of demand in international markets.

In Mexico, the stagnation of demand, the worsening state of the public finances and the economic crisis from which the country has suffered since 1982 forced the cancellation or postponement of several investment projects, including two projects of importance to the national steel industry. The first was SICARTSA II, a flat-steel plant producing slab and high-quality plate, with an annual capacity of 1.2 million tonnes of finished goods. The other was the enlargement of the private firm Hojalata y Lamina S.A., also designed to produce flat steel, mainly plate of low width,

with an annual capacity of 600,000 tonnes. Both were based on expectations of continued growth for the Mexican economy, which had reached an annual average growth rate of 8 per cent during the period from 1970 to 1981, and were intended to replace frequent imports and to bridge the gap opened in 1984 between domestic demand for and output of mainly flat-steel products.

In order to adapt the public steel industry to the new market conditions, to improve productivity, quality and price and to become competitive in international markets, the restructuring process was set in motion in 1986. The federal Government took steps to achieve a comprehensive solution to the problems. It started by reshaping the public sector, in the context of the industrial restructuring policy. Additional financial support was granted to ordinary programmes to compensate for financial losses and equipment deterioration. The emergency measures taken led to the restructuring programme for SIDERMEX and finally to the long-term development strategy for the complex up to the year 2000.

D. The SIDERMEX restructuring programme

Since the public sector in Mexico is one of the basic instruments of structural change, there is an urgent need to rationalize, consolidate and make solvent the public enterprises. The main objectives of structural change which the public sector seeks to achieve include the following:

(a) Concentrating efforts in strategic and high-priority industries and dissolving companies that do not fall within that category;

(b) Concentrating scarce resources in order to consolidate the mixed economy under State supervision;

(c) Modernizing the traditional industrial branches at the technological, production and managerial levels in order to improve efficiency and competitiveness in international markets, to save and generate foreign exchange and to promote productive, permanent and well-paid employment.

1. Development strategies and objectives

There is a recognition of the imperative need to strenghten and sustain the existing public steel plant, thereby avoiding the risk of further losses of capital, in the context of an explicit public-enterprise policy. Under such a policy, responsibilities are distributed on the basis of a well-defined scheme to facilitate enterprise development in accordance with national strategies. The five basic objectives are defined as follows:

(a) Guaranteeing the supply of steel goods to national downstream industries at competitive conditions in terms of quality and price and at minimal cost of production;

(b) Rational exploitation of national mineral resources, iron and coal, by maximizing value added in their processing;

(c) Generating financial resources and gradually recovering investment by means of increased productivity and higher returns;

(d) Improving the operating efficiency of steel plants and making them more competitive both nationally and internationally;

(e) Making the industry an engine of domestic growth by increasing its contribution to the strengthening of linkages between the metallurgical and capital goods industries.

2. Restructuring strategies and action

The mid- and long-term strategy for the public steel industry has two principal elements:

(a) Reducing the size of the public sector by the closure, merger, transfer or sale of enterprises;

(b) Plant restructuring in already mature and traditional branches by action along the following lines: technical, productive, commercial and managerial modernization; labour retraining; and the achievement of financial soundness and the programming of investment flows and growth.

Accordingly, companies have been subject to action of the following kind by the Ministry of Public Industry:

(a) Closure of enterprises that have already fulfilled their original purpose, that lack economic viability, or whose activities could be more efficiently performed by other public enterprises;

(b) Merger with other enterprises to improve the use of resources by integrating the productive, marketing and managerial processes;

(c) Transfer to state governments of certain enterprises of local importance or relevance to regional development programmes;

(d) Sale of enterprises in activities that are neither strategic nor of high priority, but whose economic viability makes them acceptable for purchase by the private sector or under schemes involving the participation of labour.

The SIDERMEX group was reorganized by setting apart associated companies that have no activities related to steel-making or raw material supply. The original structure comprised 91 enterprises, a holding unit, SIDERMEX S.A., three integrated plants, FUMOSA, AHMSA, SICARTSA and 87 associated companies in diverse activities.

By closing FUMOSA in May 1986 the integrated steel producers in the complex were reduced to only two and the associated companies from 87 to 35 (see figures V, VI and VII). Of the 52 dissolved or reorganized enterprises, 10 remained in the public sector (other than steel) because of the relevance and viability of their activities. Forty-two enterprises were removed from the public sector by the following means: 18 were sold, 11 shut down, 10 reorganized through mergers and 13 dissolved.

Figure V. Installed steel capacity and output of Mexico, 1984-1986

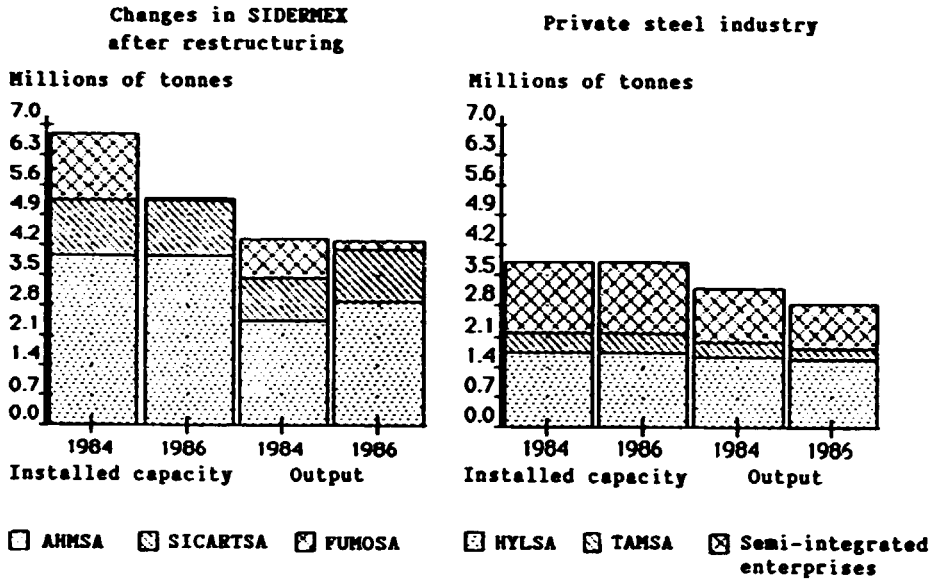
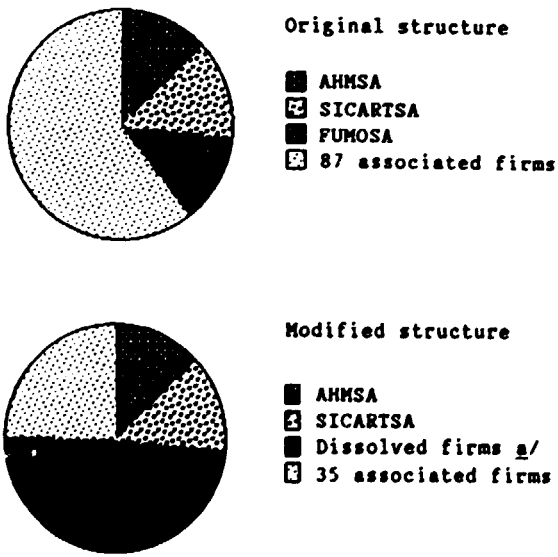


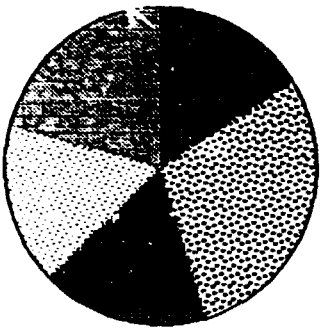
Figure VI. Restructuring of the SIDERMEX group



a/ FUMOSA and 52 associated firms.

Source: SEMIP.

Figure VII. Dissolved or restructured SIDERMEX firms



62 dissolved or restructured firms

10 remained in the public sector	16.1%
18 were sold	29.0%
11 were shut down	17.7%
10 merged	16.1%
13 were dissolved	21.0%

Source: SEMIP.

The 35 enterprises that remained in the complex were raw material producers (iron, coal, refractories and ferroalloys) and marketing or real estate agencies. It was expected that by late 1987 SIDERMEX would comprise only 28 enterprises.

(a) Technical and productive modernization

The aims of technical and productive modernization in the public steel industry of Mexico are as follows:

(a) Adjustment of plant sizes to obtain competitive scales of production, by such means as broadening the scale of the plant, shutting down obsolete plant or merging to reach optimal sizes;

(b) Promotion of technological development by incorporating new technologies;

(c) Adapting the size of the labour force to the scale of the plant and to its requirements for efficient and competitive operation.

(i) Adjustments in plant size and personnel

Technical and productive modernization started in SIDERMEX with the cancellation of obsolete and anti-economic operations, as in the case of FUMOSA. Once such operations have been cancelled, the modernization process is continued from a mid-term and a long-term perspective. In each case, two types of project and action are defined in institutional programmes, on the basis of market balance and of current and future productive capacities of firms belonging to the SIDERMEX complex.

In the mid-term perspective, from 1986 to 1990, which has been called phase I, the projects included were designed to improve returns, to increase labour productivity, to upgrade product quality standards, to complete the process of restructuring, to promote technological renovation, to start a new plant producing flat-steel goods with an installed capacity of 1.5 million tonnes -

SICARTSA II - and eventually, if necessary, to restart the FUMOSA rolling mill, since it can be operated at a profit.

In the long-term perspective, from 1990 to 2000, phase II, three steps are envisaged, namely the expansion of SICARTSA (consolidating projects and balancing production lines) and, within AHMSA, the modernization of module 1 and the balancing of module 2.

(ii) Advances in restructuring of firms

The progress of technical and productive modernization in phase I is summarized below.

The modernization of AHMSA will allow an increase in productive capacity from 3 million to 4 million tonnes of liquid steel per year. Action will be taken to replace equipment, to renovate obsolete plant and to channel investments towards overcoming bottlenecks in the production process. Such steps will make it possible to expand the use of installed capacity from 75 to 90 per cent, to improve labour productivity from 118 to 200 tonnes of steel per worker per year, to make a 12 per cent reduction in energy consumption per tonne and to attain better exploitation of raw materials.

SICARTSA I is a producer of non-flat-steel goods (rods and bars) with a relatively new plant - it started operations in 1976 - that does not require large investments to modernize equipment. It is necessary only to rehabilitate and make optimum use of installed capacity, to develop automation and to put into operation quality control systems designed to sustain international competition in non-flat steel. Improving operating conditions in SICARTSA I will make it possible to increase capacity use from 90 to 94 per cent and labour productivity from 157 to 172 tonnes per year, and to achieve a 24 per cent reduction in energy consumption per tonne produced, starting in 1988.

SICARTSA II is the largest steel project in progress in Mexico. It has been designed to produce 1.2 million tonnes of flat-steel goods (plate and slab). To date, 54 per cent of the project has been completed. An investment of $1,725 million has been financed with $779 million in fiscal contributions and $946 million in credits. Completion of the project will require an additional $1,556 million.

A feasible method of completing the SICARTSA II project involves dividing it into stages, so as to reduce the need for fiscal contributions in future and to generate an adequate resource flow. It has therefore been planned in three stages, the first of which is the intermediate production stage, in which slabs will be produced from pellets. As part of the strategy to conclude the first stage, and in order to reduce federal government transfers, $260 million credit was obtained from the Eximbank of Japan. That credit is vital for the completion of the project.

The direct-reduction electric steel mills and continuous casting plants, as well as the services required for their opera-

tion, were to be completed during the period 1987-1988. Completion of the pelletizing plant, the rolling-mill and the corresponding services was deferred to 1990. Steps must be taken to ensure the timely delivery of necessary plant inputs, in particular iron and coal, at reasonable prices; to upgrade the quality of raw materials and to forecast their longer-term development in order to optimize investment flows.

The project will permit the creation of 4,000 permanent jobs and another 3,700 during the building process, and enable the country to produce the plate necessary to supply the oil, shipbuilding, transport, petrochemicals, mining and capital goods and related industries.

(iii) Promotion of technological development

The Instituto Mexicano de Investigaciones Siderúrgicas (IMIS) is making an important contribution to the technical and productive modernization of the Mexican steel industry. Technologies developed by IMIS are to be incorporated in new processes to improve the competitiveness of the integrated plants. The use of national technologies in restructuring the industry would be a major development.

IMIS has made a major contribution to the modernization of the national steel industry by improving the "combined-blast" process. In steel-making, the oxygen converter in which the process is carried out is normally fed with oxygen from the top, while inert gas is simultaneously injected into the bottom of it, in order to agitate the pig-iron that is being converted into steel. IMIS has modified the process in two ways. First, a ceramics element that is permeable to gas has been developed and is to be placed in the bottom part of the steel pot, thereby eliminating the old injection tuyère device that has to be periodically replaced. Secondly, it has developed new ways of injecting natural gas instead of inert gas. Those two innovations, besides improving both control of the production process and the quality of the final product, reduce the costs of material devices (for adding inert gas) and raw materials, since natural gas is cheaper than inert gas. Given current plant conditions in SIDERMEX, consistent savings can be made by adopting such innovations.

IMIS has developed an innovative steel-making process. Two competing processes are currently in use. One is the blast-furnace process, in which iron ore and coal are fed to the blast-furnace to obtain pig-iron, which in turn is fed to the steel furnace for conversion into steel by oxygen injection, with the furnace reaching very high temperatures through the burning of coal, pig-iron and the injected oxygen. The other is the direct-reduction process, in which a reactor is fed with iron ore which, by heating in a reducing gas derived from natural gas (methanol), is made into sponge iron. The latter is then fed to an electric furnace where it is converted into steel.

IMIS has developed new technologies that permit the elimination of both blast-furnaces and electric furnaces by the following

process. Sponge iron is fed into a fusion furnace similar to the steel converter normally used in plants that have a blast-furnace. Natural gas and reduction gas are injected into the bottom of the furnace to obtain very clean high-quality steel, while reduction gases are generated for use in a parallel process carried out in a reactor tower, where pelletized iron ore is melted by circulating in the reduction gases to generate sponge iron. The process is beginning to be known as the IMIS process.

In the best operating conditions, the lowest cost of obtaining one tonne of steel by means of blast-furnaces is $192 in Mexico. The direct-reduction process costs $158 per tonne, and the estimated cost of the new process described above is $138 per tonne. In addition to that cost advantage, the optimum plant scale has been found to be 300,000 tonnes per year, which offers a new growth alternative that is both internationally profitable and competitive for the steel industry, thanks to increased flexibility, which permits further growth, and to better opportunities to forecast investment flows as a function of demand.

(b) Commercial modernization

Industrial restructuring from the supply side involves technical and productive modernization. From the demand side and with respect to market structures, it involves modernization of the marketing organization to meet the challenges posed by greater openness to international competition. A twofold strategy must be developed: first, a defensive one to cope with the effects of internal rationalization of protectionism; and secondly, an offensive one to conquer external markets. Hence there is a need to develop new systems with more efficient marketing channels, within the framework of a sound price policy and of a new policy to rationalize protectionism. As part of that strategy, commercialization activities were returned to plant control to enable management to develop self-reliance in search of productive specialization and to seize the opportunities related to the advantages of each plant.

(i) Marketing policy

The decentralization and reorganization programme for the marketing system in SIDERMEX is intended to make the commercialization process an integral part of the activities of each enterprise. The policy is to be implemented by means of private concessions. That implies a gradual elimination of direct marketing by public enterprises.

Exports (see figure VIII) will be handled by SIDERMEX International, an associated enterprise that is strengthening its organization in order to secure the participation of the complex in international markets on a competitive basis.

(ii) Rationalization of protectionist regulations

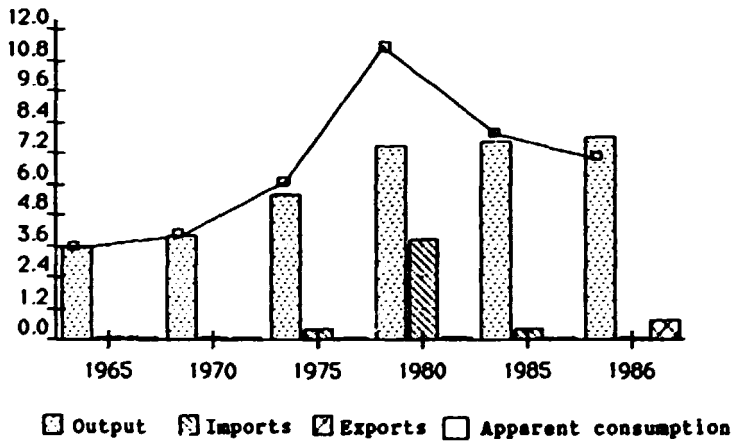
A programme designed to rationalize protectionist regulations has been undertaken to help improve the competitiveness of the industry. It has consisted mainly in substituting tariffs for the

prior import licence requirement, while at the same time the schedule of general import tariff items is being revised. The intention is to cancel some items, to incorporate new ones and to designate some products that fulfil similar objectives. The results thus far achieved are as follows:

(a) In 1984 the items that included raw materials and primary, intermediate and final goods were 157; by November 1987 the items corresponding to the four groups were 154;

(b) In 1984, 52 per cent of tariff items in the steel industry were subject to controls, the average tariff being 11 per cent. Since October 1987, all steel goods are free from quantitative restrictions, which were replaced by tariffs. The latter vary from 0 to 32 per cent, with an average of 17.2 per cent.

Figure VIII. Mexican steel exports and imports



Source: CANACERO.

The strategy followed in order to achieve a rationalization of protectionist regulations is in accordance with domestic price policy and takes into account the productive chain, since the highest tariff level, amounting to 32 per cent, applies to final products. By contrast, with regard to raw materials and intermediate goods, the tariff level is only 5 per cent for primary goods such as slab, ingot and bloom. For primary mill products the average tariff is 13.3 per cent.

This policy of rationalizing protectionist regulations and replacing import licence requirements with tariffs was initiated in 1985 and its first stage concluded in November 1987, with the elimination of official prices on imports (see tables 3 and 4). Tariffs thus remain as the only instrument of protection.

Table 3. Mexican steel industry: structure of protection in 1984

Items covered	Raw materials	Primary products	Intermediate goods	Finished goods	Total a/
Total number	15	13	2	127	157 (100)
Items under control	3	2	2	74	81 (52)
Liberalized items	12	11	--	53	76 (48)
Items subject to automatic licence	12	11	--	53	76 (48)
Tariff-exempt items	9	1	2	1	13 (0.08)

a/ Numbers in parentheses indicate percentage of total.

Table 4. Mexican steel industry: structure of protectionism in 1987

Items covered	Raw materials	Primary products	Intermediate goods	Finished goods	Total a/
Total number	15	13	2	124	154 (100)
Items under control	--	--	--	--	--
Liberalized items	15	13	2	124	154 (100)
Items subject to automatic licence	15	13	2	124	154 (100)
Tariff-exempt items	10	2	1	1	14 (0.09)

a/ Numbers in parentheses indicate percentage of total.

During the first stage of restructuring in 1986, the public steel industry undertook a successful export programme that to a great extent helped compensate for the fall in domestic demand. The public steel complex sold more than 800,000 tonnes of steel goods overseas, which represented an increase of 280 per cent over the export volume of the previous year. That involved AHMSA and SICARTSA exports amounting to, respectively, 21 and 35 per cent of total sales in that year, with foreign earnings of about $180 million dollars.

(iii) New price policy

A new price policy aimed at eliminating price controls has also been introduced and is to be carried out in two phases. Criteria were established to allow an adjustment of 95 per cent of cost increases during the first phase, to be applied bimonthly according to the consumer price index. During the second phase, starting in the first half of 1988, a more flexible price policy was to be carried out, a policy that allowed companies to adjust prices as a function of market conditions, cost changes and efficiency improvements. Any sudden price distortions would have to be dealt with by the appropriate authorities. Such measures were designed to eliminate artificial advantages, and their success will help to demonstrate the soundness of the new price policy.

(c) Managerial modernization

Technical and productive modernization will only be successful if it is accompanied by improved labour productivity at the level of both management and workers. Productivity increases involve working, not necessarily harder, but better. It requires better training and organization, modern technologies and efficient scales of production. At the managerial level, strategic planning must be developed, as well as systems of evaluation and control. At the administrative and plant levels, training programmes to increase productivity must be accompanied by direct incentives.

As part of its restructuring process, SIDERMEX reduced its number of employees from 1,021 in December 1985 to less than 800 in 1987. It also streamlined its organizational and functional structure from 11 to 6 corporate managerial units and one internal auditing unit. In a similar manner, the new managerial functions were adjusted to the changes in structure. The number of employees in the various organizational units was made more balanced, and the small units were combined to form bigger and more efficient ones. At the same time, the different companies were reorganized into groups and divisions (see figures IX and X).

The activities of the SIDERMEX holding are concentrated on planning, co-ordination, organization, control, definition of global commercialization strategies and setting economic and financial policies for the enterprises in the complex. Since the holding obtains its resources by selling its services to those enterprises, it needs to change its status to that of a financially autonomous control and services entity.

Figure IX. Organizational structure of SIDERMEX, December 1985

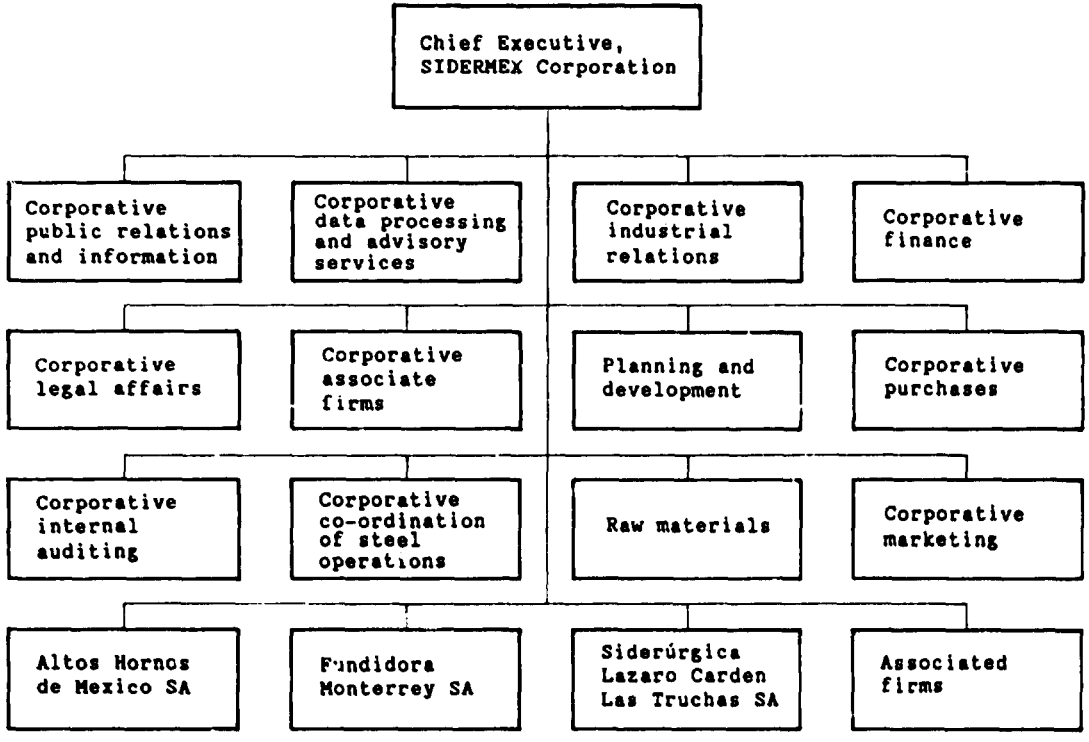
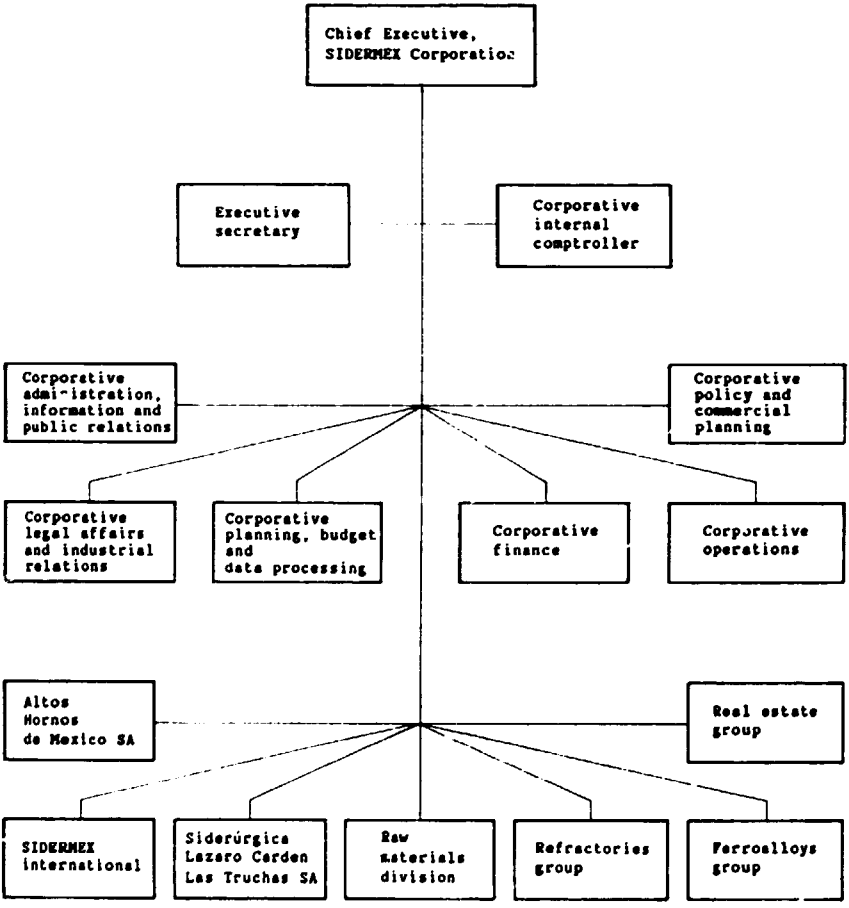


Figure X. Organizational structure of SIDERMEX, October 1987



Within the new scheme of operations, the holding has assumed the important financial function of treasury control and debt management. Autonomy, including control of finances, has been granted to the steel companies in order to balance self-management with financial and operational responsibilities. Standard methods are nevertheless employed to follow up and control their operations, which are evaluated through the administrative boards and technical committees.

Since the SIDERMEX complex is formed by a number of firms with diverse activities related to steel production, it has been necessary to establish a corporate organizational structure with the following functions:

(a) To define, supervise, evaluate and control the application of rules and policies designed to improve the global performance of the complex;

(b) To maintain an optimum level of operations and staff performance;

(c) To supervise compliance with programmes and targets and to support the external operations of the enterprises (exports, technology transfer, credit and international trade negotiations).

A system of strategic planning has been introduced to strengthen medium-level management in the holding and the firms. The system has helped to improve the analysis of external and internal problems and the decision-making process. A programme for organizational development and the automation and standardization of operations has also been introduced. It covers planning systems, production forecasts, administration and maintenance, and has led to significant improvements in organization and management.

Restructuring has involved decentralizing marketing activities by creating sales management departments in each plant, while some of the distribution functions have been allotted to private agencies. Information and automatic control systems have been installed to guarantee consistency in productive operations and to ensure the systematic planning and control of production and maintenance. To promote the fullest use and further development of new steel technologies and managerial know-how, it has also been necessary to design and organize a systematic retraining programme that allows the active participation of human resources in the restructuring process.

(d) Financial soundness and debt absorption

The excessive debt burden on the economy of Mexico has hindered the technical, productive and commercial modernization of public enterprises, and made necessary the inclusion of financial rescue measures in the restructuring process. A financial rehabilitation agreement to help restructure the public steel industry was concluded by the federal Government and the SIDERMEX complex and signed in September 1986. Under the agreement, debt absorption amounted to 270.2 billion pesos (at February 1986 prices) for

AHMSA, 29.6 billion pesos for SICARTSA I and $283.6 million for SICARTSA II, or a total of approximately $883 million (at the May 1986 exchange rate of 500 pesos to the dollar) (see table 5). Before debt absorption, the financial structure of the enterprises was seriously impaired. In the case of AHMSA, debt represented 52 per cent of assets, but was reduced to 28.1 per cent after absorption. In the case of SICARTSA I, it was reduced from 27 to 20 per cent of assets.

Table 5. Federal Government absorption of debt of the SIDERMEX complex (Millions of 1986 dollars) a/

Enterprise	Debt	Amount absorbed	Balance
AHMSA b/	962	540	422
SICARTSA I b/	187.6	59.2	128.4
SICARTSA II	955	283.6 c/	671.4
Total	2 104.6	882.8	1 221.8

a/ An exchange rate of 500 pesos to the dollar was used.

b/ The FUMOSA debt amounted to $560 million.

c/ The SICARTSA II debt was denominated in dollars.

By the end of 1986 the effects of the financial rescue measures began to emerge, with dramatic changes in the results of business operations as compared with 1985, in particular an improvement from losses of 102 million pesos to profits of 26 million pesos. Lower financial costs allowed resources to be released for plant operations and investment. The ratio of financial costs to revenue was drastically reduced from 75 and 59.4 per cent for AHMSA and SICARTSA I in 1985, and to 23.4 and 20.2 per cent, respectively, in 1986.

(e) Programming of investment flows and growth

To achieve technical and productive modernization and sustained and dynamic growth in the public sector, priority must be given to strengthening investment programmes and to obtaining adequate internal and external resource flows for that purpose. In carrying out an industrial restructuring process such as the one analysed in this paper, success will depend on the investment effort and technological progress.

Plans for the development of the public steel industry provide for meeting the investment needs of each enterprise in two phases, from a mid- and a long-term perspective (see figures XI and XII). Mid-term (phase I) investment has already been approved by the federal Government in a financial rehabilitation agreement adopted in 1986. To support the restructuring process a credit of $300 million to be used in phase I is under negotiation with the World Bank. The analyses and studies carried out jointly by the World Bank and SIDERMEX, including feasibility and cost-benefit analyses for each enterprise in the complex, have resulted in wider support for the five-year investment programme (1986-1990).

Figure XI. SIDERMEX investment programmes, 1986-2000

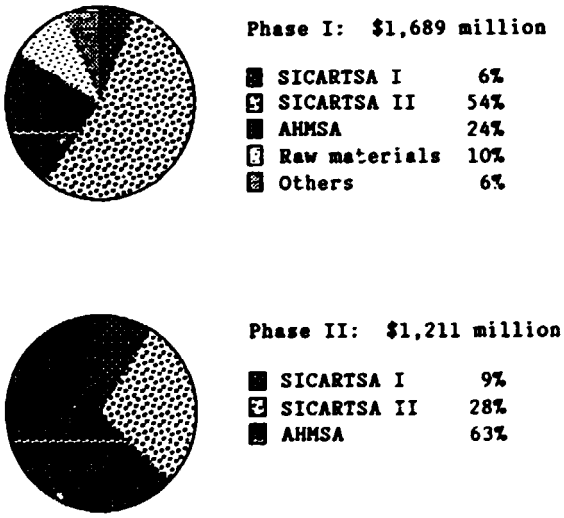
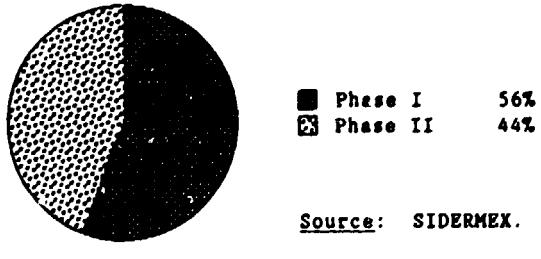


Figure XII. Total investment requirements of the public steel industry



Source: SIDERMEX.

Long-term (phase II) requirements are the deepening of structural changes in productive installations and accelerated modernization and technological renovation. To meet the objectives of the steel industry, total requirements in both phases I and II amount to $2,780 million for the year 2000, as shown in table 6. Phase II requirements consist mostly in starting the plate rolling-mill and related services in SICARTSA II and in the modernization and rationalization of the installed plant for flat goods in AHMSA.

Table 6. Estimated SIDERMEX investment requirements, 1986-2000

Enterprise	Phase I (1986-1990)	Phase II (1990-2000)	Total
AHMSA	371.8	924.4	1 296.2
SICARTSA operation	99.0	413.6	512.6
SICARTSA II	865.5	118.0	983.5
Raw materials	155.6	--	155.6
Refractories	6.1	--	6.1
Ferroalloys	51.0 a/	--	51.0
Plate mill products	20.3	--	20.3
Subtotal	1 569.3	1 456.0	3 025.3
Deduction because of reuse of FUMOSA equipment	--	245.0	245.0
Total	1 569.3	1 211.0	2 780.3

a/ Financial costs are not included.

The progress of the industry until the year 2000 will depend on the success of the investment programme, which should bring improvements in the efficiency of production and in product quality, while at the same time promoting technological development. Investment will allow diversification and increased supplies, mainly of flat products, while making possible a wide range of steel products for export as well as a sufficient and reliable supply of steel pipe and other metallic goods for indirect export, an activity in which the national plant has demonstrated its competitiveness. Such results will place the steel industry on stable commercial foundations and enable it to respond efficiently and competitively to sustained economic growth, thereby making the domestic economy more integrated and independent.

E. Conclusions

The progress of the third industrial revolution is becoming increasingly evident around the world. As always, the most developed economies have taken the lead in a dynamic process of change that is sweeping across both developed and developing countries.

Despite the diversity of political and ideological systems, the central importance of industrial modernization has gained acceptance in developed market economies. In recent years, technological change has accelerated and market competitiveness increased as a result of improved productivity.

The international process of industrial restructuring has had a particular impact on the steel industry because of the slow growth of demand and excess installed capacity that became evident by the mid-1970s. The industry responded world-wide by drastically readjusting its production programmes to achieve reduced costs and steel products of improved quality, which have been progressively designed for such industries as shipbuilding, oil and construction. On the other hand, painful but necessary decisions had to be made concerning enterprises that were clearly unprofitable, some of which had to be closed down.

In such an international context, Mexico suffered its 1982 economic crisis, when economic growth ground to a halt, inflation accelerated and the public deficit increased sharply. In addition, the country was burdened by an enormous external debt, which increased from 20 to 80 billion dollars during the period 1976-1980. At the same time, the public finances were threatened by the first big oil price drop and by a rise in interest rates that pushed up the cost of debt servicing to $10 billion per year.

The situation was made worse by a breakdown in the industrialization process, with poor integration in productive plants, intra-industry disruption and reduced international competitiveness, all of which caused profound imbalances in the growth and development of Mexican industry.

The objective of industrial restructuring in Mexico is therefore to integrate the steel industry with other industries and with external markets, to promote growth and development and to create industries based on state-of-the-art technologies.

The steel industry occupies a central place in the industrial structure of Mexico because of its importance as a producer of strategic inputs, its contribution to the integration of the industrial sector and the substantial comparative advantages it creates for the country by providing adequate inputs and technologies.

The initial stages of restructuring the steel industry in Mexico were undertaken in 1986. The following action has been taken in response to new demand requirements and to the problems raised by inefficient productive and financial structures:

(a) In 1986 the federal Government underwrote a $883 million debt as part of a financial rehabilitation programme designed to enable public enterprises to overcome their severe financial problems;

(b) The SIDERMEX holding was restructured, with the number of integrated corporations being reduced from three to two, and that of associated firms from 87 to 35;

(c) The labour force for the whole SIDERMEX complex was reduced from 50,589 in 1985 to 42,299 in 1986, mainly as a result of the closure of FUMOSA;

(d) Agreements setting standards of efficiency and productivity were made with the labour unions, one of the main results of which was an increase in global production from 103 tonnes per worker per year in 1985 to 129 tonnes per worker per year in 1986;

(e) The SICARTSA II project was restarted. It will have an installed capacity of 1.5 million tonnes of quality steel plate per year, and will be resumed in stages to ensure self-financing investment;

(f) Modernization of the steel furnaces has been initiated, with the incorporation of technological innovations by IMIS. Those innovations will mean national savings of about $100,000 per plant per year in operating costs, as a result of both improved productive efficiency and import substitution.

The commercial operations of the holding unit have been cancelled and full marketing autonomy has been granted to the steel plants to enable them to forge their own links with the domestic market.

A new price policy has been established to ensure financial soundness in the companies. The policy was to be implemented in two stages. During the first stage, lasting until December 1987, provision was made for the automatic adjustment of up to 95 per cent of cost increases, according to the consumer price index. That cancelled the rigid price policy in operation until May 1986. During the second stage, which was to start in 1988, provision was made for a flexible price policy, since the enterprises themselves would be left to adjust the cost increases.

The policy of rationalizing protectionist regulations has led to the substitution of tariffs for licence requirements and the liberalization of 52 per cent of tariff items, with average tariffs ranging from 11 to 20 per cent. In 1986, as a result of improved productivity and the contraction of the domestic market, the SIDERMEX complex shifted its excess supply to foreign markets, exporting 800,000 tonnes of steel that brought in foreign currency earnings of about $200 million. The bulk of the exports were non-flat steel (bars and rods).

Finally, an investment programme involving two phases has been undertaken. The first phase has a five-year perspective (1986-1990)

and is designed to bring to completion the projects currently in progress and to break bottlenecks. The second phase will be devoted to continuing the process of thoroughly restructuring and modernizing existing plants. Total programmed investments amount to $2,780 million until the year 2000.

INDUSTRIAL POLICY AND DEVELOPMENT OF RURAL INDUSTRIES IN BANGLADESH: A REVIEW OF SOME ISSUES

Dilip Kumar Roy*

Introduction

A strategy of rural industrialization is being carried out in Bangladesh to generate productive employment opportunities for the rural poor, to reduce poverty and to promote rural development in general. The scope for expanding employment in the agricultural sector is limited, however, by the unfavourable population density, the gradual displacement of labour through the introduction of modern technology (e.g. in post-harvest operations and in the tilling of land) and the growing concentration of land ownership. An increase in landlessness and declining employment opportunities are causing a rapid transfer of labour from the agricultural sector to non-farm sectors and its migration from rural to urban areas. It is, accordingly, as a means of creating new employment opportunities and stemming this migration that rural industrialization is becoming more and more important.

Rural industries based on labour-intensive technology make use of a comparatively abundant resource, labour. By increasing demand for labour, these industries stimulate economic growth. Because the small scale of rural industries encourages the broad-based participation of small, rural entrepreneurs throughout the country, this strategy promises to lead to more balanced regional growth.

The objective of this study is to highlight some of the policy issues that arise in connection with the development of rural industries in Bangladesh. The study will, it is hoped, provide policy-makers with insights into the links between industrial policy and the development of rural industries.

The paper is organized as follows. Section A reports on the structure of rural industries in Bangladesh. Section B discusses some of the policy issues related to rural industries. Section C deals with institutional involvement. As usual, concluding remarks are given in section D.

A. The structure of rural industries

This study considers two types of rural enterprise: small firms, both traditional and modern, and household manufacturing units, usually referred to as cottage industries.

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The industrial sector as a whole plays a relatively small role in Bangladesh, having contributed 10.0 per cent of the GDP in 1984/85 at constant 1972/73 prices, but the share of small industry in it is significant (table 1), although not as significant as it was three decades ago, when the overall industrial base was even smaller. The contribution of rural industry would even be higher if these particular official statistics included cottage industries. It is estimated that about 7 per cent of the total labour force is directly employed in rural industries [1].

Table 1. Share of small industries in industrial GDP (Percentage)

Fiscal year	Small industries	Large industries
1949/50	79.7	20.3
1959/60	52.1	47.9
1969/70	53.1	46.8
1979/80	43.4	56.6
1984/85	44.2	55.8

Sources: [2], [3] and [4].

When industrial production is broken down by region (table 2), the Dhaka and Chittagong regions together account for 54 per cent of the country's small industry output, followed by Comilla region (11 per cent). The per cent share of small industry in the total industrial production of the individual regions is as follows: Comilla, 84 per cent; Faridpur, 71: Mymensingh, 64; Tangail, 89; Barisal, 97; Patuakhali, 99; Dinajpur, 77; Rangpur, 70; Dhaka, 40; and Chittagong, 34. Not only do the last two regions account for a majority of the country's small industrial production, but they also account for an even larger share (72 per cent) of the total production of large industries.

For cottage industries, there were 321,743 manufacturing units and 160 categories of enterprise in 1980; for small industries, there were 24,005 manufacturing units and 128 categories of enterprise in 1978-1979 ([5], [6]). Cottage and small industries are classified into sectors in tables 3 and 4, respectively. Three sectors - food and allied products, textiles and wood (including bamboo) products - together account for 75 per cent of manufacturing units and employment in the cottage industry sector. In the small industry sector, food and allied products alone account for more than 70 per cent of employment and about an equal proportion of manufacturing units. Handloom is the single most common cottage industry, having accounted for 45 and 42 per cent of total employment in 1962 and 1978, respectively.

The average number of persons engaged in a manufacturing unit is small, although it is 4-5 times larger in small industry than in cottage industry. It varies significantly among different sectors

Table 2. Shares of large and small industry by region and regional shares of industrial output by small and large industry at current prices, 1983/84

Region	Regional industrial output (Tk crore) a/	Distribution of industrial output within regions (%)		Regional shares of national industrial output (%)		
		Large industry	Small industry	All industry	Small industry	Large industry
Chittagong	9 352	65.8	34.2	30.2	23.4	35.7
Ctg. H.T.	756	51.5	48.5	2.4	2.7	2.3
Comilla	1 759	15.8	84.2	5.7	10.8	1.6
Noakhali	639	15.2	84.8	2.1	4.0	0.6
Sylhet	1 439	52.1	47.9	4.7	5.0	4.3
Dhaka	10 400	59.8	40.2	33.6	30.5	36.1
Faridpur	308	29.2	70.8	1.0	1.6	0.5
Jamalpur	117	70.9	29.1	0.4	0.3	0.5
Mymensingh	463	36.1	63.9	1.5	2.2	1.0
Tangail	301	11.0	89.0	1.0	2.0	0.2
Barisal	205	3.4	96.6	0.7	1.5	0.04
Jessore	575	59.0	41.0	1.9	1.7	2.0
Khulna	1 704	81.5	18.5	5.5	2.3	8.1
Khushtia	479	63.9	36.1	1.6	1.3	1.8
Patuakhali	72	1.4	98.6	0.2	0.5	0.01
Bogra	180	68.9	31.1	0.6	0.4	0.7
Dinajpur	507	23.1	76.9	1.6	2.9	0.7
Pabna	632	50.0	50.0	2.0	2.3	1.8
Rajshahi	438	49.1	50.9	1.4	1.6	1.3
Rangpur	619	29.6	70.4	2.0	3.2	1.1
Total						
Tk crore	30 945	17 250	13 695			
Per cent	100	55.7	44.3	100	100	100

Source: [2].

Note: Column 2 + column 3 = 100.

a/ Crore = million monetary units.

Table 3. Cottage industries: key statistics by sector, 1980

Sector	Types of industry	Number of manufacturing units	Number of persons engaged a/	Raw materials consumed per employee (Tk)	Sales value per employee (Tk)	Investment per employee (Tk)	Average number of workers per unit	Investment/ output (sales value) ratio
Food, beverages and tobacco products	32	84 749 (26.34)	232 414 (25.35)	7 791	14 934	7 202	2.7	.48
Textiles, wearing apparel and leather products	28	87 905 (27.32)	229 404 (25.02)	4 119	8 464	2 359	2.6	.28
Wood, wood products and furniture	14	70 787 (22.00)	215 449 (23.50)	4 973	9 102	2 122	3.0	.23
Paper, paper products, printing and publishing	9	1 742 (0.54)	7 585 (0.83)	15 541	28 631	19 565	4.4	.68
Chemicals, petrochemicals, coal, rubber and plastic products	28	1 363 (0.42)	5 075 (0.55)	5 904	25 910	33 434	3.7	1.29
Manufacturing of non-metallic mineral products except petroleum and coal	11	18 546 (5.76)	83 145 (9.07)	2 069	6 170	1 839	4.5	.30
Fabricated metal products, machinery and equipment	26	23 191 (7.21)	60 148 (6.56)	8 111	15 466	5 357	2.6	.35
Other manufacturing industries and handicrafts	12	33 460 (10.40)	83 586 (9.12)	4 584	9 073	2 887	2.5	.32
Total	160	321 743	916 806					

Source: [5].

Note: Figures in brackets in columns 2 and 3 are percentages of respective column total.

a/ Number of persons engaged included both hired and family workers.

Table 4. Small industries: key statistics by sector, 1978/79

Sector	Types of industry	Number of manufacturing units	Number of persons employed a/	Average employees per unit	Average wage b/ (Tk)	Production per employee (Tk)	Spare parts, raw materials, fuel and electricity per employee c/ (Tk)	Average investment g/ per unit (Tk)	Investment g/ per employee (Tk)	Share of machinery in total investment (%)	Investment/ output ratio
Food and allied products	17	17 358 (72.31)	223 465 (89.37)	12.9	1 969	10 008	9 162	68 139	5 282	51.1	.53
Textiles, wearing apparel and leather products	24	1 391 (5.79)	18 901 (5.87)	13.6	4 272	24 400	20 123	104 893	7 720	55.5	.32
Wood, wood products and furniture	8	886 (3.69)	12 203 (3.79)	13.8	3 961	11 142	8 563	95 887	6 963	50.6	.62
Paper, paper products, printing and publishing	8	1 092 (4.55)	10 960 (3.40)	10	2 937	17 893	11 109	13 528	13 478	71.0	.75
Chemicals, petrochemicals, coal, rubber and plastic products	19	527 (2.20)	6 740 (2.09)	12.8	4 051	40 119	31 700	130 184	10 179	46.8	.25
Non-metallic mineral products except petroleum and coal	10	51 (0.27)	1 105 (0.34)	21.7	3 961	41 677	34 425	150 850	6 962	69.1	.17
Bricks and tiles	1	167 (0.70)	7 171 (2.23)	42.9	2 504	9 355	5 781	96 453	2 246	24.9	.24
Basic metal industries	12	1 743 (7.26)	31 374 (9.74)	18	3 867	7 210	5 939	33 421	5 044	71.5	.70
Fabricated metal products, machinery and equipment	27	646 (2.69)	8 271 (2.57)	12 8	2 637	20 482	17 563	78 656	6 145	65.8	.30

continued

Table 4 (continued)

Sector	Types of industry	Number of manufacturing units	Number of persons employed a/	Average employees per unit	Average wage b/ (Tk)	Production per employee (Tk)	Spare parts, raw materials, fuel and electricity per employee c/ (Tk)	Average investment d/ per unit (Tk)	Investment d/ per employee (Tk)	Share of machinery in total investment (%)	Investment/ output ratio
Other manufacturing industries	3	144 (0.60)	1 745 (0.54)	12.1	4 021	2 637	2 382	31 874	2 630	52.2	1.00
Total	129	24 005	321 935								

Source: (5).

Notes: Figures in parentheses in columns 1 and 3 are the percentage of the total.

a/ The term "employees" denotes all persons engaged other than working proprietors and unpaid family workers. This includes all persons who work in the establishment and receive pay under the head establishment.

b/ This includes all payments, whether in cash or in kind, made by the employer during the enquiry period in connection with work done, to all employees. It also includes wages paid during vacation and sick leave.

c/ The actual product sold or service charge during the period were taken into consideration.

d/ Raw materials and spares includes all materials, components and so on that are physically incorporated into the products of the establishment. All auxiliary materials (lubricants, water, packing materials, small tools, parts, materials for repair and maintenance and so on) and office supplies are also included, as are the actual direct charges paid or payable in connection with the acquisition of the raw materials that were consumed or processed (example: freight charges). Raw materials collected from others (traders, businessmen, consumers etc.) and processed for them on a service charge basis are not included.

e/ Land, building, machinery, tools and equipment and similar items have been included under investment, as has furniture having life of more than one year. The values reported here are the estimated present values.

and among different product types. About 71 per cent of employees in rural industries overall are family workers and the rest are hired labourers, whilst in cottage industry alone, 78 per cent of the persons engaged are family workers. About 39 per cent of households engaged in rural industry activity are landless [7]. Of these households owning 0.5 acre of land or less, about 90 per cent have non-farm activities as their primary occupation. These facts suggest that rural industries help to alleviate poverty by generating employment and income for the rural poor.

Average investment per worker in rural industries is rather low, and it varies quite widely amongst product types. For 60 per cent of the enterprises, machinery accounted for about half or less of the total investment cost. Capital-output ratios are also in general low. It may be noted that because rural industries largely operate with primitive technology, the labour force engaged in these operations has a low level of productivity and earns only subsistence income.

Many of the activities of rural industry are seasonal. The low level of rural income and competition from substitutes pose another threat to the self-sustaining character of the rural industrialization process. There are also supply-side problems, mainly relating to the availability of raw materials, technology, capital (fixed or working), marketing and entrepreneurial issues [8].

B. Policy issues

It is assumed for the purposes of this discussion that inefficient industries should give way to efficient ones by the interplay of market forces and that the same treatment should be afforded to small, rural industries as is afforded to large industries.

1. Raw material availability

Most rural industries involve food processing, traditional textiles, wood, cane and bamboo products and other agro-based products and are based on locally produced raw materials. A substantial increase in the marketable surplus of agricultural commodities will therefore stimulate investment in rural industries, especially so in the case of the food processing industries. The large number of surplus farmers in China (Taiwan Province), Thailand and the Philippines are partly responsible for the growth of rural industries in those countries.

In Bangladesh, there is an increasing concentration of land in the hands of fewer owners [9]. While it can be argued that breaking up large farm holdings would reduce the marketable surplus as well as investment in land, and that this would adversely affect productivity, it can equally well be argued that rural industries receive their greatest stimulus from the growing incomes of small and medium-size landowners. Empirical studies show that the returns to scale in actual production (yield per unit area) are constant whether the holdings are large or small, and they also show that small farms achieve a better utilization of land (with

quality held constant) than large farms. Appropriate land reform policies in Bangladesh may thus be able to increase the production of agricultural commodities, some of which can then be used as raw materials for rural industries. They would not, however, normally fall within the domain of industrial policy.

2. Technology

The level of technology is a factor in three aspects of rural industrialization: complementarity/competitiveness in rural labour use; transformation of household manufacturing units into larger, more modern units; and capital intensity vs. labour intensity

(a) Complementarity/competitiveness in rural labour use

The extent to which the farm and non-farm (particularly rural industry) sectors complement or compete with one another in the use of rural labour may influence the level of technology used in rural industries. Complementarity reinforces the use of primitive techniques by rural manufacturing units, while competitiveness compels these units to become more productive and to use more modern techniques. If rural industries and agriculture are in competition for labour, the manufacturing units must at least maintain the wage rate that prevails in the rural labour market. When there is complementarity in the use of rural labour between the two sectors, family workers often continue to manufacture goods in their homes no matter how poor the economic return, in order to subsist. These subsistence manufacturing units cannot sustain production, however, if they produce inferior goods at higher unit costs, and support services should be withdrawn from sub-standard enterprises to ensure that the industrial base created in the country is a self-sustaining one.

Competition in the use of rural labour is illustrated by the data in table 5. Rural industrial production begins to rise in September and peaks in December. The periods of maximum agricultural activity are as follows:

March-April	Harvest of boro and pre-sowing/sowing of aus
July-August	Aus harvest and aman transplanting period
November-December	Harvest of aman

The busiest time is during and after the harvest of aman. Some manufacturing activities based on agricultural raw materials are obviously determined by the timing and level of harvests, and post-harvest processing generates considerable employment. It seems, however, that the crucial determinant of rural industrial activity is demand rather than a lack of employment in agriculture.

Table 5. Value of monthly output per enterprise, February 1979-January 1980

Month	Value of output per enterprise (Tk)
February	3 617
March	3 606
April	3 219
May	2 998
June	4 479
July	4 658
August	4 413
September	4 860
October	5 810
November	5 096
December	6 116
January	5 667

Source: [7].

Evidence of complementarity in labour use between rural industry and agriculture is mixed. There are both negative and positive correlations between agriculture and non-agriculture labour use, and non-agricultural activities are more variable with respect to their profitability per unit labour than agricultural activities [10]. When returns to labour from cottage industry activities are lower than agricultural wage rates, as happens during busy agricultural seasons, male labourers are apt to choose agricultural work.

That positive correlations also exist can perhaps be explained by the fact that certain non-agricultural activities are dependent on agricultural operations.

(b) Transformation of household manufacturing units into larger, more modern units

As long as the economy remains primarily agricultural, the infrastructure will be rudimentary, the rural market will remain small and isolated and industrial production will largely take the form of non-factory or small-factory production. As the economy develops, trade within the rural sector and between the rural and urban sectors is likely to grow, permitting a greater degree of specialization within the rural sector. Increased commercialization and specialization are likely to change the status of rural industry, turning it into a primary rather than a secondary occupation. Many of the household manufacturing units will undergo elementary modernization as diesel engines are introduced and rural areas are electrified.

In China (Taiwan Province), the Government's policy of decentralized industrial growth has apparently made it possible to transfer labour services from agricultural to non-agricultural activity without moving labourers from rural to urban areas. The difficulty of obtaining raw materials and the high cost of transport in Bangladesh may also explain why small plants are the rule in remote areas of that country. As transport costs decline because of development and the locational advantages of urban areas diminish, rural industrial employment will shift from small factories to medium and large factories, although the rate of this shift will differ greatly from sector to sector. In any event, it is important to set up small as well as large establishments.

A variation on this pattern of decentralized industrial growth is the pattern that is commonly observed in developing countries, including Bangladesh, where rural industrialization is being pursued not only through the modernization of household manufacturing units but also through the establishment of industrial estates. Twenty industrial estates had been established by 1980 in Bangladesh, and nine more will have been set up by 1990 under the Third Five-Year Plan. Once rural industrialization is under way, the two types of manufacturing units, household and estate, may begin to complement one another as sub-contracting relationships are set up.

(c) Capital intensity vs. labour intensity

At the firm level, technology is generally thought of as alternative sets of techniques for making a product, using various combinations of labour and capital as well as various methods of production. Usually, the capital intensity reflects the level of technology: the more advanced the technology, the higher the capital intensity and the lower the labour intensity, with some industries having the possibility of technologies that are intermediate in capital-intensity between "high" and "low" ([8], [11]). Capital intensity increased from 1962 to 1980 in all nine cottage industry sectors, and it increased especially rapidly in three sectors, namely, agriculture and food products; leather, rubber and plastic products; and paper and paper products.

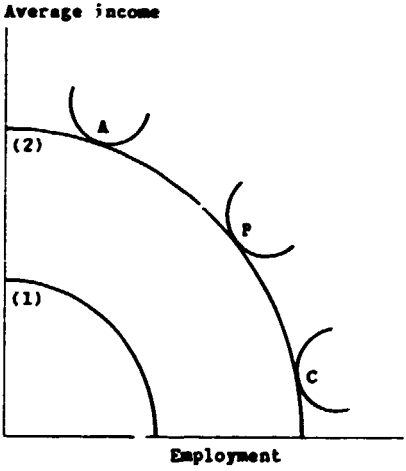
The choice of technology is a critical factor in the expansion of rural industries as well as in the creation of employment opportunities. If the employed rural poor are less productive, they earn less and are less able to buy the products of rural industry. From the point of view of supply, it is the productivity of the capital input that is the most important factor, for capital is in scarce supply. The limited capital resources available to a developing country like Bangladesh should be utilized in such a manner as to maximize the output from a given investment.

In the above context, rural industries often face twin problems - one is the problem of generating employment and the other is the problem of raising the standard of living. Is there a trade-off between the two objectives? The argument for the existence of a trade-off comes from the concept of production functions, whereby the use of factors of production is determined by their relative

prices. By this reasoning, higher wages (that is, a higher price for labour) would encourage the use of capital-intensive techniques and discourage the use of labour. The argument for complementarity comes from the labour-centred concept of development, which says it is possible to enhance both income and employment levels. By this reasoning, the two objectives may be achieved simultaneously, because higher incomes tend to increase the demand for labour-intensive goods, which in turn creates more jobs.

Both objectives - more employment and higher incomes - are desirable, but there is a trade-off between the two, and the policy-maker must choose an optimal combination. As seen from the figure, the indifference curve B, which represents an intermediate technology, is the most desirable to the policy-maker when employment and average income are given equal significance.

Transformation curves 1 and 2 and alternative indifference curves A, B and C, showing the trade-off between employment and average income



Source: Taken from [12].

Rural industries in Bangladesh are usually labour-intensive (tables 3, 4 and 6). The average productivity (value-added) per taka of capital investment has been estimated at Tk 2.03 in the rural industry sector, a very high average rate of return on capital. The products that have higher value-added per taka of capital invested are, in general, those of lower capital intensity. Usually, labour productivity is directly proportional to capital intensity (table 6). On average, labour productivity per hour is 57 per cent higher than the agricultural wage rate, and the marginal productivity of labour is about 90 per cent of the wage rate in an industrial activity. However, in some industries, such as paddy-husking, mat-making, bamboo products, fishing nets, rope-making and pottery, labour productivity is lower than the agricultural wage rate. In these industries, technological or product transformation is urgently needed. Profit rates are highest for products that are

intermediate in rank with respect to capital intensity, as are marginal savings and reinvestment rates.

Table 6. Product types by labour productivity, capital productivity and capital intensity
(Taka)

Product types	Value-added per labour hour	Value-added per Tk of capital	Capital per worker
Low labour productivity (≤ Tk 1.32/hr)			
Fishing equipment	0.53	38.93	29
Lime-making	0.57	66.76	20
Jute rope	0.69	14.79	58
Coir rope	0.71	11.31	44
Paper-bag-making	0.73	9.56	181
Basketry	0.74	60.75	13
Fishing nets	0.77	17.17	33
Pottery	0.80	1.55	789
Reeling yarn	0.81	15.62	47
Cane and bamboo furniture	0.85	51.58	33
Bamboo handicrafts	0.90	8.32	70
Mat-making	1.02	19.15	33
Footwear repair	1.03	3.51	355
Shital pati	1.10	43.55	23
Juice gur	1.13	5.46	110
Dhenki products	1.14	8.48	133
Bamboo chatai	1.25	49.55	16
Higher labour productivity			
Job printing	2.51	0.27	31 254
Bakery products	3.49	1.04	8 440
Soap and tooth powder	4.39	0.88	12 903
Plastic products	5.54	0.88	11 848
Grain milling	5.83	1.18	12 698
Hosiery	5.98	0.12	33 235
Sawmilling	6.77	0.97	14 474
Leather processing	7.73	0.45	22 974
Jute baling	11.65	0.30	49 909

Source: [7].

Note: Tk 1.32 is the average wage per hour for all types of workers in all enterprises. The average wage per hour for rural enterprises is Tk 1.28. The daily wage for rural enterprises is Tk 9.47, which is just a bit higher than the daily wage for unskilled agricultural workers (Tk 9.35).

If rural labour-intensive industries are efficient users of capital - that is, if they have low capital/output or capital/value-added ratios - and if they can keep their labour productivity at least above the prevailing agricultural wage rate, there is no doubt that they will simultaneously bring about employment expansion and industrial development. Because the rate of return on capital investment at the margin (67 per cent) is much higher than the interest on bank loans (10 per cent since 1987), capital invested in this sector will improve allocative efficiency.

3. Credit

When credit policies are being designed for the rural industry sector, construction costs should be excluded from the fixed capital cost. The investment cost of both machinery and buildings is normally higher for urban-based activities than for rural-based activities, presumably because the former use electricity. Despite the fact that the average working capital requirements of rural enterprises are very low, credit is needed by more than 80 per cent of the entrepreneurs, irrespective of location and industry type.

The main barriers to formal sources of credit, from both the borrowers' and the lenders' points of view, are as follows [7]:

(a) The excessive documentation requirements when the borrower cannot produce collateral;

(b) Collateral in the form of land, buildings and other assets amounts to three times the value of the loan;

(c) In addition to interest, there are other costs associated with institutional loans; these official fees, unofficial payments and miscellaneous expenses together amount to 3.5 per cent of the sum borrowed;

(d) Long waiting times, with 12 working days being lost on average;

(e) Ignorance on the part of borrowers about the availability of institutional loans;

(f) Past loans by lending agencies to unsuccessful projects;

(g) Lack of comprehensive credit programmes that include the necessary support services and extension facilities.

Until now, there has been no study of the credit requirements of the different rural industries. The amount of credit received per enterprise is estimated to be Tk 1,285, which is small in relation to their working capital needs [13]. There is, however, an indication ([8], p. 41) that a household can start up a non-crop enterprise if it is able to borrow Tk 2,000 on average. In addition to special credit programmes for the promotion of small industry, 5 per cent of the total and 5 per cent of demand deposits at nationalized banks, local banks and foreign banks has been targeted for disbursement to small-scale industries. The credit programme

should be designed to make it easy for rural people to participate in industrial activities. Bangladesh Small and Cottage Industries Corporation estimated that Tk 1,310 crore of credit would be required during the Second Five-Year Plan (1980-1985), and Tk 415 crore was actually lined up. In 1984/85, foreign credit funds were exhausted.

One question that arises is whether the generous industrial incentives already offered to large industries should also be offered to rural industries. This incentive system includes tax allowances, interest subsidies, export tax rebates, duty-free importation, protective tariffs, quantitative restrictions, the retention of export earnings and preferential access to foreign exchange and credit. These incentives, combined with the rapid expansion in domestic demand, have made the domestic market more profitable than the export market, creating a heavy bias against employment and exports. The reversal of policies favouring large industries, to the extent of providing similar incentives to small industries, may help rural industries.

To provide better support for small entrepreneurs, the debt-equity ratio was raised in 1986 to 80:20 from 70:30 and the interest rate on small industry loans was reduced from 16 per cent to 10 per cent. Because of the somewhat greater risk of defaults on loans, interest rates for small borrowers should be moderately higher than those for large borrowers, although they would still be much lower than the rates charged by non-institutional sources. The recovery rate of better than 90 per cent for rural industrial activity is quite encouraging and should dispel fears that excessive risk may be involved [14].

4. Marketing

Marketing problems can arise not only with the supply of raw materials and other inputs but also with the sale of rural industry products. The availability of raw materials depends on domestic production and imports as well as on the network of traders and Government-sponsored organizations, while sales of the products depend on domestic demand, export markets etc. Overall, marketing channels are underdeveloped due to the poor infrastructure.

As mentioned earlier, most of the rural industries (especially the food processing industries) procure their raw materials locally. More than 56 per cent of rural industry enterprises get their raw materials from retailers and wholesalers [6], although a significant proportion (25.4 per cent) buy their raw materials directly from the producers. Imports are important: textile fibres, metals and chemicals are all imported into Bangladesh. The use of imported intermediates varies widely, from as low as 10 per cent to more than 75 per cent.

Although 67 per cent of the proprietors say raw materials supply is one of their main problems, the role of Government agencies or co-operatives in this supply is negligible. Since processed inputs are mainly marketed through traders, they are available only at very high prices in remote areas. Channels for the distribution

of rural industry output are also not developed. Usually the output is brought to the local market by the producers. Forty-six per cent of enterprises report that local consumers are the main buyers of their products and 12 per cent report that retailers are their main buyers. Thirty per cent say that middlemen and wholesalers, who purchase the output to sell to distant markets, are their main customers.

The chief items of export are tanned and semi-tanned leather, handicrafts (made of jute, cane and bamboo, clay, ceramics and leather), dried fish, oil cake, coir and coir products, silk products, agarbati and atar. Merchant traders are generally involved in the process of exporting rural industry products. There are no producer exporters. The poor export performance of the rural industrial sector may be ascribed to a lack of standardization and quality control.

The market structure is competitive in the sense that the products face competition not only from similar products made by the same process but also from products made by alternative processes, imports of similar products and substitutes made by the large industries. To keep the prices of their products in line with the prices of competing products, rural industries will have to accept a lower return of labour. However, this type of competition may not act as a serious constraint on the expansion of rural industries. Only 9 per cent of the enterprises me ion large enterprises as their main source of competition, while 2.5 per cent mention imported goods as the main source. This situation may change when the country reaches a higher level of industrial development. A product like pottery may be considered inferior to a competing product (in this case, a utensil made of metal). Imports of soyabean oil marketed at lower prices than mustard oil constrain the expansion of the latter industry.

5. Domestic demand

The determinants of demand for the products of rural industries are household demand in both rural and urban areas, backward and forward production linkages and the prevailing distribution of income. Household income, which influences household demand, is the most important factor affecting the consumption of rural industrial products, particularly in rural areas, and the correlation is a strong, positive one, with demand for these products being highly elastic. In general, however, the market for rural industrial products in Bangladesh is limited by the rural poverty there.

It is commonly held that people tend to substitute more sophisticated goods for rural industry goods when their incomes rise, because they consider the rural goods to be inferior. Dhenki rice and certain pottery items are examples of goods that are usually replaced. One study [7] found, however, that absolute per capita expenditure for the products of rural industries increased as the income of the people rose. The findings of another study [15] bear repeating here: "Rural industry products have an edge over substitute products in terms of either elasticity or marginal budget share or both. Demand for rural industry products is at present severely limited by the current low levels of income".

Forward and backward linkages also generate demand for some rural industrial products. Handloom products, for instance, have backward linkages to large-scale spinning mills. The cost of cotton yarn has been found to constitute about 53 per cent of the value of the product for lungi and sari, about 70 per cent for shaloo and markin, and about 63 per cent for gamcha and napkin. Forward production linkages - the sale of rural industrial products to other rural industries and large-scale industries - also create demand. Blacksmiths make metal implements for farming and other purposes; wood-workers manufacture carts, boats and miscellaneous agricultural tools; and light engineering workshops produce machines and spare parts for large-scale industries. When there is complementarity of production, based on comparative advantage, between rural industries and large-scale industries, sub-contracting relationships may come into play. The careful co-ordination of such activities is expected to lead to economic growth.

Sub-contracting generally entails the supply of finished or semi-finished parts (e.g. nuts, bolts and screws) and components (e.g. mirrors and electric bulbs for automobiles) by the sub-contractor to the parent enterprise, but it can also take the form of a simple piece of commissioned work on raw materials or components supplied by the principal.

Bangladesh Textile Mills Corporation, for example, once purchased many items from abroad that could have been produced locally. Now, the official policy of the company is to purchase, where possible, products manufactured locally, if necessary extending technical assistance to local manufacturers to bring their products up to the required standards. As another example, the Bangladesh Machine Tools Factory is capable of producing almost all the spare parts, accessories and looms required by the jute and textile mills of the Bangladesh Jute Mills Corporation if it can get help from the latter. With such help, manufacturers can learn how their products are expected to function and they will be able to improve quality and reduce import requirements.

Sub-contracting arrangements between small and large firms should be co-ordinated. In the engineering industry, for example, these arrangements could include foundry work, forging, heat treatments, plating and metal finishing, and the production of tools and precision parts.

G. Entrepreneurship

In assessing the potential pool of entrepreneurs, it is a question not so much of number but of quality, which is related to financial ability, initiative, managerial ability and innovative ideas. These qualities are most important in those rural industrial activities where the rates of return are low.

Given the present system of social values in Bangladesh, the landless labourer will find it more prestigious to work in rural industry than in agriculture. Capital and technical training will become the dominant issue for innovative entrepreneurs. Households

that dc both farming and household manufacturing should be encouraged to increase their manufacturing output.

C. Institutional involvement in the promotion of rural industries

A number of government and semi-government bodies, as well as private voluntary organizations, both domestic and foreign, are involved in the promotion of rural industries. The most important public bodies are the Ministry of Industries, the Department of Industries, the Bangladesh Small and Cottage Industries Corporation (BSCIC), the Bangladesh Handloom Board, the Bangladesh Sericulture Board and the Bangladesh Rural Development Board. Two banks, the Small Industries Bank and the Islami Ummah Bank will soon be launched to support the development of small and cottage industries.

There is neither a separate ministry nor a separate division within any ministry that is concerned solely with rural industries. Policy on matters such as industrial incentives, investment outlays, the debt-equity ratio etc. of rural industries is formulated by the Ministry of Industries, which is responsible for both the rural sector and the large industry sector. The new industrial policy that took effect in 1986 did not mention rural industries except to increase the investment ceiling for small industries to Tk 15 million. Only the 13 per cent of rural industry enterprises that are classified as small-scale industries are affected by the new industrial policy; the remaining 87 per cent, classified as cottage industries, are unaffected [7].

The allocation in the Second Five-Year Plan for the small and cottage industry sector was only about 4.3 per cent of the total industries allocation in the public sector. Of the total industries allocation in the private sector, small and cottage industries accounted for 23.1 per cent.

Because information on local resource endowments is scarce, the Third Five-Year Plan aims to set up employment and resource centres in the upazilas to promote non-farm employment based on local demand resources. The Plan also expects to improve rural technology by using the Institute of Appropriate Technology at Buet, the upazila resource centres, the Bangladesh Small and Cottage Industries Corporation (BSCIC), the Handloom Board and the Sericulture Board as its extension agents.

The Government has decided to provide the following special incentives and facilities exclusively to small and cottage industries:

(a) Import duty on machinery and equipment of 15 per cent ad valorem (no sales tax) in developed areas, 2.5 per cent (no sales tax) in less developed areas, and 2.5 per cent (no sales tax) at BSCIC industrial estates in developed areas;

(b) Two banks are to be set up to finance small and cottage industries. The interest rate on loans to small and cottage industries has been lowered to 10 per cent;

(c) The debt-equity ratio for small and cottage industries will be 80:20. Industries of this kind located in less developed and least developed areas will be entitled to income tax rebates linked to production.

It may be noted that some of the benefits and facilities are yet to be implemented. Moreoever, the debt-equity ratio should be even lower for cottage industries, and the interest rate on institutional credit for rural industries should at least be as low as the rate on credit for the large industry sector.

1. Bangladesh Small and Cottage Industries Corporation (BSCIC)

The Bangladesh Small and Cottage Industries Corporation (BSCIC) is the main public body dealing with the promotion and development of rural industries. It has its headquarters at Dhaka, as well as offices in the four regions, at the district level (old) and in some of the upazilas, staffed by professional and technical personnel who provide promotional and extension services.

As stated earlier, BSCIC had already established 20 industrial estates by 1985. Nine more industrial estates are going to be established by 1990. It is expected that these new industrial estates will negotiate sub-contracting and product clustering arrangements. They will have infrastructural facilities like electricity, water supply etc.; common facility centres like engineering workshops; and a centre for product design, process technology and marketing. The enterprises at the estates will enjoy a tax holiday for 7-9 years and will have access to pre-investment counselling and post-investment extension services, and it is expected that the land price can be recouped within 20 years.

The Bangladesh Handicrafts Marketing Corporation (BHMC) has been set up within BSCIC to help the enterprises at the estates market their products. Fashion, durability and attractiveness of design will all be given special attention in its programmes. To expose consumers to rural industry products, BSCIC has established two emporiums and sales and display centres at Dhaka, Rangpur, Bogra and Cox's Bazaar, and it periodically organizes fairs and exhibitions. During the Third Five-Year Plan (1985-1990), BSCIC is investing Tk 1,000 crore, 85 per cent of which is allocated for the small-industry sector and only 15 per cent of which is for the cottage industry sector; this division of resources would seem to neglect the need for transforming household manufacturing units into larger, more productive units.

Arranging for credit and distributing it to borrowers is one of the important services to be rendered by BSCIC. The BSCIC officers in charge of the District Industries Centre receive loan applications, appraise them jointly with the lead bank representative, and convene at least one meeting of the District Committee every month. The District Committee processes the loan applications and takes the final decisions on loans in each district. The Committee is made up of the following members: Deputy Commissioner, Chairman of the Committee; District Manager, BSCIC, Member-Secretary; District Manager of the lead bank, Member; representa-

tives of the Chamber of Commerce, the Department of Industries and the Power Development Board.

The relationship between BSCIC and the bank and the other agencies is sometimes less than satisfactory, and it is then that delays can arise: the District Committees may meet less regularly and take much longer for their initial appraisals of loan applications. The banks, for their part, want to be sure of the credit-worthiness of borrowers, while the BSCIC, as an extension agent, is anxious to get the funds in order to set up the industries. As a result, a considerable number of loan applications remain pending [7].

In spite of continuing BSCIC efforts to promote small and cottage industries, there is still a long way to go to before rural industrialization becomes a self-sustaining process.

2. Bangladesh Sericulture Board

The Bangladesh Sericulture Board (BSB) started functioning as a government extension agent in February 1978. Its purpose was to undertake research, provide extension services and promote the country's silk industry. Silk fabrics are produced in four stages: (a) cultivation of the mulberry, (b) rearing of cocoons, (c) reeling/spinning of silk yarn and (d) weaving of silk cloth, all of which are highly labour-intensive. The Board provides support for all four stages of the industry.

At present, about 3,600 acres of land are planted in mulberry, 95 per cent of them under private ownership. Bush plantations are more labour-intensive than tree plantations, which account for about 59 per cent of the total cultivated area. Production of both silk yarn and silk fabrics fell far short of the target set in the Second Five-Year Plan.

Table 7 reports that, relative to 1980/81 and 1981/82, more labour was being used in 1982/83 and 1983/84 to produce fewer cocoons and less silk yarn and silk fabrics. This shows that labour productivity is, on average, decreasing in the sericulture industry.

The decrease in productivity points to the need for technological development. The Second Five-Year Plan contained a favourable prognosis for the sericulture sector in terms of its export potential and the outlook for shortening the gestation period and setting up auxiliary industries such as jam and jelly from mulberry fruit and by-products of host plants. Exports of silk fabrics increased from Tk 7 lakh in 1980/81 to Tk 20 lakh in 1985/86 (lakh = 100,000 monetary units), but they are still far below the target set by the Second Five-Year Plan. It is important to bring mulberry planters, cocoon rearers and rural silk weavers into the BSB assistance scheme to increase labour productivity, with the larger aim of sustaining rural industrialization through this activity.

Table 7. Indices of production and employment in the sericulture sector, 1982-1986

Year	Mulberry cultivation	Rearing of cocoons	Silk yarn	Silk fabrics	Employment generation a/ Direct	Total
1980/81-1981/82	100	100	100	100	100	100
1982/83-1983/84	128	124	126	123	146	127
1984/85-1985/86	101	136	98	72	147	159

Source: Calculated from tables 8.6.3 through 8.6.7 of [16].

Note: The figures used for the indices are averages for the two-year periods.

a/ Direct employment includes employment in cultivation, rearing the cocoons, reeling and weaving. Total employment is the sum of direct and indirect employment. Indirect employment includes employment in the preparation of rearing appliances and related trades.

3. Bangladesh Rural Development Board

The Bangladesh Rural Development Board (BRDB) has undertaken an extensive programme to create off-farm employment opportunities by forming societies of the landless in about 300 out of 460 upazilas in the country. BRDB also has special projects for the manufacture of agricultural tools and implements in rural areas.

4. Bangladesh Handloom Board

The Bangladesh Handloom Board (BHB) has been established under the Ministry of Textiles to provide promotional and extension services to handloom weavers. As stated earlier, handloom is the single most important cottage industry, having accounted for about 45 per cent of total employment in 1961. The census of handloom workers undertaken by BHB shows that 850,000 persons are engaged in this sector. There are about 200,000 handloom units, of which about 60 per cent are operative.

Seven textile facility centres, established in 1962 under the auspices of BSCIC, are now operating under the control and management of the Bangladesh Handloom Board. These centres concentrate mainly on training people in powerloom weaving. They also provide common facilities for sizing, beaming, dyeing etc. to the handloom weavers but do not give them any post-training support. BHB also maintains two handloom service centres at Rajshahi and Shahjadpur that provide pre weaving services such as yarn dyeing and starching and a centre for handloom product and equipment development at Narsingdi that promotes skills on the handloom. BHB has also

undertaken a programme to train weavers in improved technology, whereby pitlooms are replaced by semi-automatic looms, and it hopes to soon establish a cloth-processing centre at Madabdi to upgrade handloom products.

BHB is also responsible for the smooth supply of yarns and credit to the handloom weavers. It started a yarn distribution programme to make yarn directly available to the weavers at a fair price, through primary weavers co-operative societies at the village level and industrial unions in urban areas. The programme, which was supported by a credit scheme, received allotments of yarn from the Bangladesh Textile Mills Corporation for distribution to weavers through these organizations. It is no longer operative, because it failed to meet its objectives. It may be noted that the majority of handloom workers (about 64 per cent) have remained outside the operational reach of BHB.

The BHB programme for technological improvement, skills development, product development and marketing of handloom products should be re-activated if the handloom industry is to be promoted and developed.

D. Final remarks

The question naturally arises whether the generous system of incentives set up for large industry should be extended to rural industries. The system comprises tax allowances, interest subsidies, export tax rebates, duty-free importation, tariffs, quantitative restrictions, export earning retention and foreign exchange and credit priorities. Since the heavy bias it creates in favour of large industry may hold back employment and exports, the system must be carefully evaluated and perhaps changed to ensure growth and stability in the industrialization process.

Another important question is whether to continue to offer supply facilities to entrepreneurs whose productivity of capital is lower than productivity in the agricultural sector. It is essential to implement policies that can transform unproductive household manufacturing units into productive rural industrial units, taking into consideration both domestic demand and foreign markets. It is also necessary to conduct more research studies to learn whether the use of labour in the agricultural sector is complementary or competitive to its use in the rural industry sector and to identify which activities are which. The investment schedules of BSCIC for small and cottage industries should distinguish between rural and urban categories.

There sometimes seem to be difficulties with co-operation and co-ordination among different ministries and departments on national issues, among them, industrialization. As a result, any would-be entrepreneur faces many difficulties in obtaining bank loans, import licences for machines and raw materials, custom clearance etc. These difficulties will have a negative impact on the self-sustaining industrialization process, and they reflect the policies and the institutions involved therein.

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SOMMAIRE

Restructuration du secteur public de la sidérurgie : le cas du Mexique

René Villareal

En présence d'un fléchissement général de l'activité et d'une capacité excédentaire dans la sidérurgie mondiale, des difficultés éprouvées par l'économie mexicaine dans son ensemble et des rendements insuffisants de l'industrie sidérurgique mexicaine, le gouvernement a entrepris, en 1946, une campagne de restructuration du secteur public de l'acier, lequel domine la sidérurgie du pays. Le processus est décrit dans le mémoire. Dans le cadre de cette réforme, des entreprises ont été fermées, fusionnées, transférées ou vendues, le nombre des établissements intégrés passant de 3 à 2 et celui des entreprises associées de 87 à 35. La restructuration comporte cinq volets : modernisation des techniques et de la production; modernisation de la commercialisation; modernisation de la gestion; assainissement financier; programmation de l'investissement et de la croissance. Une meilleure exploitation des capacités et de moindres coûts de production sont au nombre des avantages obtenus grâce à cette réforme, qui devrait faire de la sidérurgie mexicaine un concurrent sérieux sur les marchés internationaux.

Politique industrielle et développement des industries rurales au Bangladesh : quelques aspects du problème

Dilip Kumar Roy

L'auteur étudie la structure des industries rurales du Bangladesh, examine les questions de politique relatives à ce secteur et décrit les institutions qui s'occupent de la promotion de l'industrie rurale. Il constate que la plupart des industries familiales (artisanales) sont peu productives et doivent être rénovées. La politique suivie favorise la grande industrie (d'implantation surtout urbaine); elle devrait être plus impartiale. Il faudrait aussi renforcer la coopération et la coordination des institutions chargées de la promotion de l'industrie rurale.

EXTRACTO

Desarrollo de la industria automotriz en el Japón después de la Segunda Guerra Mundial

Shujiro Urata

En la monografía se examinan los factores que condujeron a la rápida expansión de la industria automotriz japonesa después de la Segunda Guerra Mundial, dividiendo ese período, de acuerdo con la hipótesis del ciclo de nivelación del producto, en la etapa de sustitución de importaciones, la etapa de expansión de las exportaciones y la etapa de madurez. Se llega a la conclusión de que en la etapa de madurez, a partir de los últimos años del decenio de 1970, los cambios efectivamente ocurridos en la industria no encajan exactamente en la hipótesis por las siguientes razones: la protección creciente (principalmente en forma de restricciones voluntarias de la exportación) en los principales países importadores de la Organización de Cooperación y Desarrollo Económicos dio origen a inversiones extranjeras directas del Japón en esos países; los adelantos tecnológicos se tradujeron en desplazamientos de la ventaja comparativa; y gran parte del comercio ha tenido lugar a nivel de productos intermedios. Entre las tendencias futuras se mencionan el aumento de la producción en los principales países consumidores (sustituyendo las exportaciones japonesas por producción en el extranjero), la intensificación de la colaboración internacional y la mayor diferenciación de productos. Parece poco probable que los países en desarrollo puedan repetir la experiencia japonesa; las industrias de esos países posiblemente necesiten recurrir cada vez más a la colaboración extranjera y a la especialización en la producción de determinados componentes para automotores.

Economías de escala en industrias manufactureras protegidas de los países en desarrollo: el caso dela industria brasileña de automóviles

Matthias Lücke

Basándose en un estudio monográfico de la industria automovilística del Brasil, en el artículo se analiza la validez de la hipótesis de que la protección de las industrias manufactureras en los países en desarrollo contribuye al bajo nivel de rendimientos de escala. Se observa que la escala de producción de automóviles en el Brasil es en la actualidad más alta que en cualquiera de los demás países en desarrollo productores, con la posible excepción de la República de Corea. Sin embargo, persiste una considerable desventaja con respecto a los países desarrollados, como resultado

principalmente de la proliferación de modelos y de otros factores relacionados con la protección de la industria. El artículo concluye con la observación de que la liberación de las importaciones de automóviles y determinados componentes tecnológicamente complejos conduciría a la especialización apropiada y el incremento de las exportaciones, con lo cual mejorarían los rendimientos de escala.

Reestructuración industrial de la industria siderúrgica estatal: el caso de México

René Villarreal

Enfrentado a la contracción general y el exceso de capacidad en la industria siderúrgica mundial, a las dificultades de la economía mexicana en conjunto y a la ineficiencia de la industria siderúrgica del país, el Gobierno de México inició en 1986 la reestructuración del sector siderúrgico estatal, que domina la producción siderúrgica nacional. En el artículo se describe el proceso correspondiente. Como parte de la reestructuración del sector siderúrgico estatal, se cerraron, fusionaron, transfirieron o vendieron empresas, con lo cual el número de plantas integradas se redujo de 3 a 2 y el de empresas afines de 87 a 35. La reestructuración tuvo lugar en cinco áreas: modernización técnica y de la producción; modernización de las operaciones comerciales; modernización de las estructuras de gestión; solidez financiera; y programación de corrientes de inversión y crecimiento. El aumento de la utilización de capacidad y la baja de los costos de producción figuran entre los beneficios de ese proceso, del que cabe esperar que la industria siderúrgica mexicana habrá de surgir como competidor eficiente en los mercados internacionales.

Política industrial y desarrollo de industrias rurales en Bangladesh: examen de algunos aspectos

Dilip Kumar Roy

En el artículo se examina la estructura de las industrias rurales de Bangladesh, se discuten cuestiones de políticas pertinentes al sector y se describen las instituciones que participan en la promoción de la industria rural. Se observa que gran parte de las industrias domésticas son improductivas y es indispensable su reorganización. El régimen de políticas otorga una preferencia desmedida a la industria en gran escala (principalmente urbana) y es necesario darle una orientación más imparcial. Es preciso igualmente intensificar la cooperación y la coordinación entre las instituciones que se ocupan de promover la industria rural.

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