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Volume Title: Foreign Trade Regimes and Economic Development: Egypt

Volume Author/Editor: Bent Hansen and Karim Nashashibi

Volume Publisher: NBER

Volume ISBN: 0-87014-504-5

Volume URL: http://www.nber.org/books/hans75-1

Publication Date: 1975

Chapter Title: Chapter 9: Efforts to Broaden the Industrial Structure: The New Industries

Chapter Author: Brent Hansen, Karim Nashashibi

Chapter URL: http://www.nber.org/chapters/c4058

Chapter pages in book: (p. 255 - 308)

Chapter 9

Efforts to Broaden the Industrial Structure: The New Industries

FERTILIZERS

In Chapter 6 we mentioned the change from basin to perennial irrigation that took place in the second half of the nineteenth century and the increased need for fertilizer inputs that accompanied it, further intensified in the 1960s by the Aswan High Dam. As early as 1911, Egypt imported 60,000 tons of fertilizers, and by 1960 her consumption of fertilizer per acre of cultivated land surpassed all developing countries except Taiwan and South Korea.[1] Thus, there is a very substantial domestic market for chemical fertilizers in Egypt. The demand is concentrated on phosphate and nitrogen fertilizers; potash is of secondary importance.

Since phosphate and nitrogen fertilizers are produced by two distinct industries in Egypt, they will be discussed separately.

The Phosphate Fertilizer Industry.

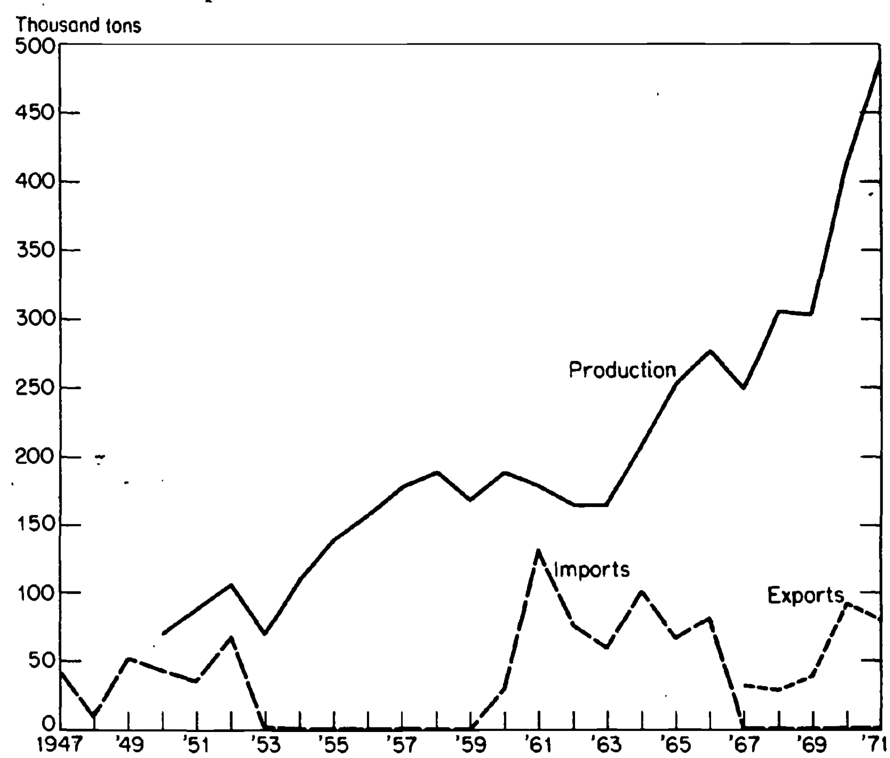
The phosphate fertilizer industry had a relatively early start in Egypt—the combined result of strong domestic demand and abundant domestic deposits of phosphate rock. The demand for phosphate fertilizers arose from the cultivation of beans and clover, in particular. Large deposits of relatively low-grade phosphate rock were discovered in the Red Sea area and near Esna, and earlier some of the rock seems to have been used directly in areas with sufficient soil acidity. In the beginning, most of the phosphate rock was exported to Japan. By 1936 total exports of phosphate rock had reached half a million tons. But it is obvious that Egypt had natural advantages in producing superphosphates herself.

The first superphosphate factory was established in 1937 at Kafr-El-Zayat in the Nile Delta, with a small annual capacity of 25,000 tons. It was followed by a second plant, with a capacity of 35,000 tons, at Abu Zaabal in 1948. Both got their phosphate rock by rail from the Esna deposits some 500 miles away. The location of the factories, combined with the seasonal nature of the demand, resulted in severe transportation problems. As capacity and scale of production were expanded, the single-track, narrow-gauge rail line responsible for part of the transportation became overburdened. Eventually this led to disruption of production in the years 1961–1964 (see Chart 9–1). Recently, a new plant with a 200,000-ton capacity was built at Assiout, much closer to the phosphate rock deposits.[2]

The sulphuric acid needed as a catalyst was originally derived from roasting pyrites imported from Cyprus. This technology is capital-intensive and was

CHART 9–1

Phosphate Fertilizers: Production and Trade, 1947–1971



probably less economical than the one based on elemental sulphur, but may have been justified at the time because of favorable special arrangements made with the suppliers regarding prices and quantities to be delivered. The Korean boom and the growth in Egypt's pyrite requirements led to the abrogation of these arrangements, and the import price of pyrites rose from $8 per ton in 1950 to $15.50 per ton in 1953 and remained at that level thereafter.

In the early 1950s Egyptian superphosphates emerged as a powerful import substitute, although the rate of protection against imported fertilizers did not exceed 10 to 15 percent of the c.i.f. price. By 1954, domestic production was sufficient to satisfy domestic demand, and a ban on imports was imposed. In 1960, however, when production fell short of demand, imports reappeared, partly because of the transportation problems mentioned above. They fell again drastically after 1964 and Egypt emerged as an exporter of superphosphates. From 1965 to 1968 exports amounted to about 30,000 tons annually, going mainly to Arab countries. In 1970 a level of 93,000 tons was reached.

Cost and Revenue Data

Cost data on superphosphates, derived from the operations of the same two factories, are available for 1954, 1957, and 1964–65.[3] While the comparability of the results is enhanced by the homogeneity of the output, a change in technology between 1957 and 1964–65 that substituted elemental sulphur for pyrites in the production of sulphuric acid[4] posed some problems in interpreting cost trends.[5]

In the calculations for 1954, an adjustment to 90 percent capacity utilization (the level of utilization actually prevailing in the other years studied here) was made. Domestic resource costs were calculated on the basis of import prices c.i.f. (see Table 9–1). For 1964–65, however, we have computed resource costs also on the basis of two alternative f.o.b. export prices: the export unit value actually realized in 1964–65 and the average export unit value realized in 1969 and 1970. Comparison makes it possible for us to assess the profitability of the industry, both as an import-substituting and as an exporting activity.

The Competitiveness of Egyptian Superphosphates

The industry initially looked like an inefficient attempt at import substitution: it was designed to operate at a low and uneconomical scale; it relied on low-grade phosphate deposits with unreliable and expensive transportation to the plant; and it resorted to the derivation of sulphuric acid via pyrites, normally a relatively expensive method, based on a short-lived favorable price arrangement. On the other hand, the industry benefited from cheap labor and engineering skills and was, as an import substitute, naturally "protected" by a

TABLE 9–1
Phosphate Fertilizer Industry: ERPs, DRCs, and Performance Indicators

	1954		1957	1964–65		
	At Actual Plant Utilization of 53%	At Full Capacity Utilization of 90%	At Actual Plant Utilization of 90%	At Actual Plant Utilization of 90%		
	(at import prices c.i.f.)	(at import prices c.i.f.)	at import prices c.i.f.)	(at import prices c.i.f.)	(at export prices f.o.b. of 1964–65)	(at export prices f.o.b. of 1969–70)
ERP (percent)	14.6	—	34.4	7.5	0.0	0.0
DRC at current internatl. prices (piasters per U.S. $) at rate of return of						
5 percent	31.3	23.4	35.6	27.0	30.1	40.9
10 percent	38.5	27.4	36.2	32.8	36.4	49.5
15 percent	45.8	31.4	42.2	38.6	42.8	58.1
DRC at constant internatl. prices (piasters per U.S. $) at rate of return of						
5 percent	29.7	22.2	27.7	24.3	—	—
10 percent	36.7	26.1	32.5	29.7	—	—
15 percent	43.5	29.8	37.3	35.1	—	—

Effective exchange rate (piasters per U.S. $)	37.0	37.0	38.5	43.5	43.5	43.5
Rate of return to capital (percent)						
at actual domestic prices	17.6	—	16.5	21.8	—	—
at internatl. prices	8.9	—	7.4	19.3	—	—
Performance indicators (1954=100)						
Physical labor productivity[a]	100	—	132	—	190	—
Physical capital productivity[b]	100	—	170	—	190	—
Hourly wages	100	—	130	—	214	—

SOURCE: B. Hansen and K. Nashashibi, NBER Working Paper No. 48, New York, 1975, Tables 23 and 25.

a. Tons per man-hour.

b. Tons per unit of equipment value.

large freight margin—15 to 20 percent of the import price of the final product and 40 to 50 percent of the import price of phosphate rock.

By 1954, the industry had seventeen years of experience, including a difficult period during World War II. With a domestic price 14 percent above the average import price c.i.f., the industry's rate of return on capital was 17.6 percent at a capacity utilization of 53 percent. Evaluated at import prices, the industry was competitive at a rate of return on capital of 8.9 percent, even at this low utilization of capacity. At a 10 percent rate of return, the resource costs were only slightly higher than the official exchange rate. Had the industry operated at full capacity, it would have been competitive in exports as well. Conditions were thus sufficiently favorable to offset the initial drawbacks and to make the industry profitable and competitive.

In 1964–65, the industry was efficient both as an import substitute and in exports. Its domestic resource cost, based on that year's export price and a 10 percent rate of return on capital, was 36.4 piasters, well below the official exchange rate of 43.5 piasters per U.S. dollar. At the much lower export price realized in the 1969–70 period, the resource cost per U.S. dollar earned in 1964–65 would have been 49.5 piasters, somewhat higher than the official exchange rate but substantially lower than the exchange rate of 61 piasters per U.S. dollar suggested by the IMF to the Egyptian government in 1966. The latter exchange rate would make the industry as profitable in exports (and a fortiori as an import substitute) in 1969–70 despite the international price decline.

In discussing the development of the industry's efficiency and profitability, our first focus is on the price developments in its output and input.

Over the last two decades, domestic prices for superphosphates, both at factory gate and delivered to the farmer, have remained relatively stable. Most of the time the ex-factory price has stood at about £E10.0 per ton, with the farmer paying about £E11.5 per ton.[6] During this twenty-year period, the import unit values, albeit less stable, have fluctuated around an average of £E10.0 per ton.[7] On the other hand, export unit values have been falling since 1964, possibly as a result of attempts to reach new markets and expand exports.

In contrast to the relative stability of the output prices, raw materials prices rose, particularly those of rock phosphate and packing material. Over the 1954–1957 period, however, this rise in cost was offset by a higher capacity utilization, which prevented the rate of return from falling. Profitability, measured at actual prices, was only slightly lower in 1957 than in 1954. In terms of international prices, it shows a similar development, falling from 8.9 percent in 1954 to 7.4 percent in 1957. The calculations at constant international prices and full capacity indicate that productive efficiency was higher in 1954 than in 1957. This decline in efficiency is also reflected in higher physical input coefficients.

Input prices continued to increase between 1957 and 1964–65. At the same time, wage increases exceeded the rate of productivity growth, the typical pattern for manufacturing industry (Chapter 4). However, while in the cement industry labor productivity fell, in the phosphate industry it increased substantially. An improvement in the quality of labor may have contributed to this development, but it is also a result of the "embodied" technical progress related to the expansion of capacity described above. Productivity of capital increased, although the value of the machinery and equipment installed doubled between 1957 and 1964–65. Evaluated at constant prices, domestic resource costs declined from 32.5 piasters to 29.7 piasters. On balance, the growth in labor productivity and a rise in the import price of phosphates more than offset the rise in wages and material input prices, resulting in an improvement in the competitive position of superphosphates in 1964–65 over 1957. Moreover, there is no firm evidence that production was physically less efficient in 1964–65 than a decade earlier. A hypothetical computation of resource costs at a 90 percent capacity utilization in 1954 yields a DRC of 26.1 against 29.7 in 1964–65 at a 10 percent rate of return and constant prices.

Once labor's share in value added has returned to the level prevailing before 1961, as it appears to have done by all indications in the early 1970s, the industry should be more efficient than it was in 1955 and should be highly profitable as an export activity. A comparison of its 1964–65 cost shares (relative to the international output price) to that of a Yugoslavian plant shows that Egypt derives some advantage from its labor costs, although these represent only a small share of the total. More important is the marked advantage it reaps from low raw materials costs.[8] The recent discovery of new deposits of phosphates should further strengthen the competitiveness of the industry.

The Nitrogen Fertilizer Industry.

Nitrogen fertilizer production began in 1951. The product was calcium nitrate (15.5 nitrogen) based on gases emerging as a by-product of the two petroleum refineries in Suez. Until 1961 calcium nitrate was the only nitrogenous fertilizer produced in Egypt. It was well suited to the high acidity of Egyptian soils but had a low nitrogen content and required large amounts of inert matter; transportation costs were therefore high and it was highly subject to leaching.

Imports of calcium ammonium nitrates increased rapidly during the fifties, and in 1954 it was decided to produce ammonium nitrates domestically. This type of nitrogen fertilizer is particularly appropriate for Egyptian soil: it allows for a much higher nitrogen concentration and is resistant to leaching. Moreover, the domestic demand for this type of fertilizer was sufficient to justify production on a scale large enough to attain productive efficiency. The location of the plant, however, posed certain problems. The Suez refineries supplied all their gases to the existing calcium nitrate plant and could not accommodate a greater capacity. Appreciable reserves of natural gas had not yet been discovered, and oil production satisfied only two-thirds of domestic demand. It was therefore decided to carry out an old plan elaborated after the second raising of the old Aswan Dam in 1934 for electrifying the dam and using an electrolytic process to obtain the required hydrogen.[9] The weaknesses of the original plan at the time were the relatively low economies of scale associated with the technology, the lack of demand for the oxygen by-product, and the high costs of transporting the fertilizer to the Delta, which consumes a large share of the output. The production cost of the fertilizers depended critically, of course, on the pricing of electricity. On the face of it, the price paid by the fertilizer plant for electricity seemed quite low (at 1.178 milliemes per kwh)—only one-sixth of the next lowest price paid by an industrial undertaking (cement). However, information on the costs of electrifying the dam indicate that the pricing of electricity to the fertilizer plant did assure a normal return (8 to 10 percent) on the electrification investment and hence did not conceal a subsidy for the fertilizer industry.[10] Given the large difference in the social costs of producing electricity at Aswan and in lower Egypt, the increasing demand for fertilizer in upper Egypt, with its conversion to perennial irrigation, and the rise in fuel and gas costs at the end of the 1960s, the decision to use an electrolytic process seems to have been correct. The Aswan plant, KIMA, the construction of which was well coordinated with the electrification of the dam, began production in 1961 and reached an annual output of 600,000 tons of ammonium nitrate fertilizers (20.5 percent N) by 1964.

In addition to the demand for ammonium nitrates, the government anticipated a strong increase in the demand for ammonium sulphates as a consequence of the construction of the Aswan High Dam. The two large consumers of this fertilizer are rice and sugar cane, which were to be the main beneficiaries of the increased water supply. The government decided, therefore, to build a 100,000-ton unit adjacent to the Suez plant, based on sulphur and gases from the expanded Suez refineries. This unit started production in 1963, and Suez was now developing into a petrochemical complex where all the by-products of oil refining were being gradually put to use.

The KIMA factory at Aswan suffered from the same kind of transportation difficulties that faced the phosphate industry on the long haul between Aswan and the Lower Egypt consuming areas—long shipping delays, accumulation of inventories, and spoilage of the fertilizer through moisture absorption.[11] It did not, on the other hand, depend upon long shipments of bulky raw materials. Thus, while the consumers felt the inconvenience of the transportation problems, the production process itself did not suffer from the serious interruptions that plagued the phosphate industry; this explains much of the difference between the growth performance of the two industries during the 1960–1963 period (Charts 9.1 and 9.2).

Moreover, transportation costs per unit of nutrient diminished through the output's increasing nitrogen content. In 1964 the production of the 20.5 percent nitrogen variety was abandoned in favor of a 26 percent variety, and in 1968 the latter was discontinued in favor of a 31 percent variety.[12] Apart from achieving economies in transportation costs, the higher nitrogen concentration also reduces the costs of other materials, such as limestone.

CHART 9–2

Nitrogenous Fertilizers: Production and Imports, 1950–1971

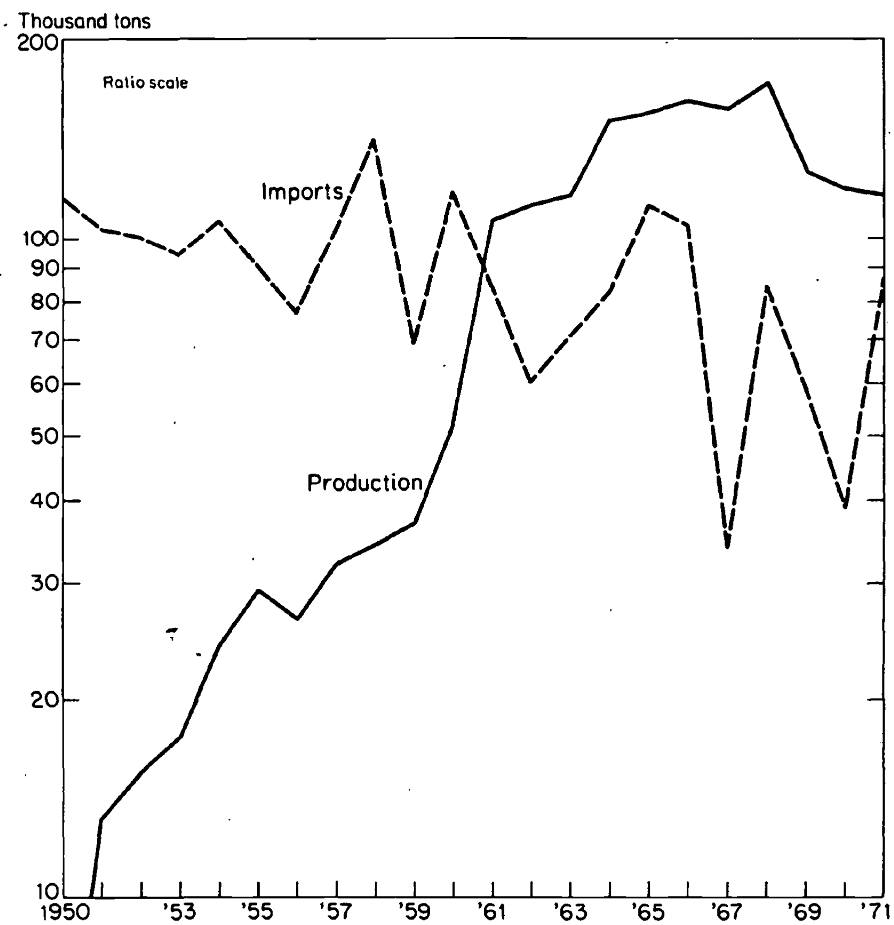


TABLE 9–2

Nitrogenous Fertilizer Prices, 1951–1968

(£E per ton of equivalent nutrient)

	1951	1953	1955	1957	1960	1963	1965	1966	1968
Calcium nitrate									
	31.0[a]	28.5[a]	26.8[a]	28.5[a]	25.0[a]	23.0[a]	22.6[a]	—	21.3[a]
	21.0[b]	—	20.0[b]	14.2[b]	19.1[b]	16.8[b]	19.7[b]	—	—
Ammonium sulphates									
	—	—	—	—	—	27.5[a]	27.5[a]	27.5[a]	26.2[a]
	—	—	—	—	—	20.2[b]	14.5[b]	19.9[b]	15.7[b]
Calcium ammonium nitrates 20.5	—	—	—	—	—	25.3[a]	25.2[a]	—	—
	—	—	—	—	—	—	18.6[c]	—	—
Calcium ammonium nitrates 26.0	—	—	—	—	—	—	31.3[a]	31.3[a]	31.3[a]
	—	—	—	—	—	—	—	22.8[c]	—

SOURCE: Federation of Industries, *Yearbook*, various issues.

a. Domestic price, ex-factory.

b. Import price, c.i.f.

c. Export price, f.o.b.

The high rate of investments in the industry together with the large domestic market explain the steepness of the production curve in the 1951–61 period (Chart 9.2). The potential demand for fertilizers in Egypt at low prices and the allocation of investment funds to the expansion of the industry could undoubtedly have maintained this rate of growth for a number of years. The 1967 War, however, resulted in the destruction of both the Suez petroleum refineries and the adjacent fertilizer plants. By 1970 the production of calcium nitrates and ammonium sulphates had completely ceased, reducing output of nitrogenous fertilizer by 30 percent.[13] Nevertheless, in spite of these setbacks, the industry should resume its growth with the inauguration in 1971 of a fertilizer plant in the Cairo area. It feeds upon the gases of the coking plant that serves the requirements of the Helwan steel mill, and its capacity is planned to reach 800,000 tons per year from the present total of 400,000 tons by 1975. The government has shown a strong and sustained commitment to both fertilizer industries to expand capacity well beyond projected consumption in the expectation of exploiting a growing export market.

Costs and Revenues

Cost data are available for 1954, 1957 and 1964–65. However, it should be clear from our historical introduction that the data are strictly comparable only for 1954 and 1957; in these two years they pertain to the same product and production unit. By 1964–65 the industry had expanded into additional products and production units, and the cost data include all plants. Nevertheless, the final output may be considered the same, namely, nitrogen nutrients. The changes in nutrient concentrations, the introduction of new techniques with different inputs and by-products may all be considered technological innovations that aim at improving the performance of the industry. What matters is the competitiveness of the output-mix produced in 1964–65 as compared with the output-mix (in our case a single product) produced in the years 1954 and 1957. It can be determined by estimating the resource cost of the domestic fertilizer-mix in terms of import prices of equivalent fertilizer varieties.

In Table 9–3 we have estimated effective rates of protection and domestic resource costs in both current and constant international prices. As the industry was operating at various levels of capacity in the three years, we have also calculated resource costs at 90 percent "full capacity" utilization.

The choice of international prices causes some problems in this industry. Although Egypt has both exported and imported fertilizers, it was decided to use c.i.f. import prices. Therefore, c.i.f. prices for fertilizers with equivalent concentrations had to be found. These were readily available for calcium nitrates and ammonium sulphates because concentrations here are standardized. However, ammonium nitrates were imported in mixed concentrations during the early 1960s and this precluded the derivation of import prices by

TABLE 9–3

Nitrogenous Fertilizer Industry: ERPs, DRCs, and Performance Indicators

	1954		1957		1964–65	
	Actual Plant Utilization (64%)	Full Capacity Utilization (90%)	Actual Plant Utilization (83%)	Full Capacity Utilization (90%)	Actual Plant Utilization (80%)	Full Capacity Utilization (90%)
ERP (percent)	24.7	—	48.3	—	12.4	—
DRC (piasters per U.S. dollar)						
At current international prices, c.i.f.						
5% rate of return	43.3	34.4	51.7	49.1	43.3	39.2
10% rate of return	52.4	40.4	61.1	57.6	52.3	47.1
15% rate of return	61.5	46.3	70.6	66.2	61.3	55.0
DRC, at constant international prices, c.i.f. (piasters per U.S. dollar)						
5% rate of return	40.7	34.8	38.0	36.3	32.3	30.5
10% rate of return	49.8	40.8	45.4	43.0	39.3	36.7
15% rate of return	58.5	46.7	52.8	49.7	46.4	42.8
Effective exchange rate	37.0	37.0	38.5	38.5	43.5	43.5
Rate of return to capital (percent)						
at actual domestic prices	9.4	—	14.6	—	13.5	—
at international prices	1.5	—	−2.0	—	5.5	—

			Performance Indicators (1954 = 100)			
Labor productivity per man-hour						
Output (in terms of pure nitrogen nutrient)	100	—	118	—	176	—
Value added at domestic prices	100	—	143	—	147	—
Value added at international prices	100	—	103	—	174	—
Physical capital productivity (in terms of pure nitrogen nutrient per unit value of machinery and equipment)	100	—	125	—	185	—
Hourly wages	100	—	132	—	193	—

SOURCE: B. Hansen and K. Nashashibi, NBER Working Paper No. 48, New York, 1975, Tables 24 and 25.

variety. Fortunately, both of the Egyptian varieties were exported, and through the addition of a freight margin, hypothetical import prices were calculated. Domestic and foreign prices are set out in Table 9–2.

The Competitiveness of the Nitrogen Fertilizer Industry, 1954 to 1964–65

In its first year of production (1951) the fertilizer industry priced its calcium nitrates at £E31 per ton. The equivalent import price was £E21.0. The price difference amounted to a nominal rate of protection of 48 percent. The domestic price was then gradually reduced, with temporary increases in 1957 and 1958, to £E21.3 in 1968. The import price also declined, albeit more moderately, with the result that the nominal rate of protection was reduced to 15 percent in 1965 and perhaps to less in 1968. The degree of protection of those nitrogen fertilizers that were introduced in the 1960s was substantially higher. With each weighted by its nitrogen content, the average degree of protection in 1964–65 amounted to 29 percent. Nevertheless, small quantities of ammonium nitrates were exported in 1965 and 1966, and the intention behind the additional investments, allocated to the industry, was to create a substantial export surplus and to transform the industry into a foreign exchange earner.

Of course, it is entirely possible for an industry to be both protected in the sense that the domestic price is higher than the c.i.f. import price and to be an efficient foreign exchange earner. The necessary conditions are a domestic monopoly (the condition is fulfilled when production as well as trade are nationalized) and costs of production falling short of the c.i.f. import price by a sufficient margin to absorb freight and yielding a marginal revenue on exports equal to or larger than marginal costs.[14] We shall investigate whether these conditions were fulfilled by the Egyptian nitrogenous fertilizer industry.

Let us first look at the data for 1954 and 1957 as given in Table 9–3. In terms of domestic prices, the rate of return increased from 9.4 percent in 1954 to 14.6 percent in 1957. The general price increase that occurred after 1956 (see Chapter 3) included fertilizers.[15] This price increase helped to secure higher profitability in terms of domestic prices despite a general increase in input prices, particularly for fuel oil and refinery gases. In terms of international prices, profitability declined, however, from 1.5 to −2.0 percent, because the c.i.f. price of calcium nitrates fell. As a result, resource costs (at 10 percent rate of return) increased from 52.4 piasters in 1954 to 61.1 piasters in 1957, in spite of higher capacity utilization. At hypothetical full capacity utilization, the competitive position of the industry in 1954 and 1957 was better, of course, but the decline of competitiveness was enhanced. The ERP increased from 24.7 percent to 48.3 percent. Thus, after several years of operation, in 1957 the nitrogen fertilizer industry was in greater need of protection than in its earlier years. Prices of fertilizers abroad fell, while the domestic industry, with the given scale and technique of production, was faced with rising input prices and costs.

In terms of *constant prices*, the industry shows a lower resource cost in 1957 than in 1954, but this is attributable to the higher capacity utilization. At hypothetical full capacity utilization, the resource costs are virtually at the same level, some 20 percent above the official exchange rate.

Wage developments are not of much direct importance for the industry; wages do not exceed 10 percent of the total cost of production (at international prices). The bulk of production costs consists of payments for three inputs: fuel, refinery gases, and packing. Any substantial improvement in the industry's competitiveness depends upon cost reduction for these inputs, or on major changes in production techniques. Substantial fuel cost reductions were, indeed, achieved (in terms of international prices) through the falling oil prices during the 1960s and the shift in Egypt's position from a net importer to a net exporter of oil, with the resulting change of opportunity cost of oil from a c.i.f. basis to an f.o.b. basis. The introduction of a new packing material promised cost savings. At the end of the 1960s the industry introduced the use of plastic bags—a by-product of the domestic petroleum industry—in lieu of paper or jute bags. In addition to the advantages of lower costs and a low import content, plastic bags also protect the fertilizer from moisture. Finally, refinery gases became relatively cheaper. In the late 1940s the gases—mainly butane and methane—were wasted. Eventually, butane was marketed on a large scale for household use. This may explain a sharp price increase between 1954 and 1957. Later, however, the expansion of refining capacity and the discovery of commercial quantities of natural gas exerted a downward pressure on the price.

These favorable developments in input prices during the sixties improved the competitiveness of the Suez plant, particularly after the ammonium sulphate unit was added to the basic facilities, resulting in lower capital charges per unit of output.[16] However, the major reductions in costs were related to new techniques of production and new output mixes. Moreover, since capital invested usually increases with capacity expansion by a factor of only 0.71,[17] the large scale of production at the KIMA plant and the increased scale at the Suez plant led to more economical levels of operations.

The beneficial effects of these changes are reflected in lower resource costs, even though the average import price of nitrogen nutrients fell by 20 percent between 1957 and 1964,[18] and the industry suffered from the inflationary developments afflicting all manufacturing industry (see Chapter 4). At current international prices and actual capacity utilization, resource costs fell from 61.1 piasters in 1957 to 52.3 piasters in 1964–65 at a 10 percent rate of return, while the official exchange rate increased from 35 piasters to 43.5 piasters. Had the industry in 1964–65 been operating at full capacity (90 percent), it would almost have been competitive as an import substitute at the official exchange rate and a 10 percent rate of return. With a freight margin of £E1.20 per ton to allow for exports, resource costs in production for export in 1964–65 would have been 56.9 piasters at actual capacity and 52.0 piasters at hypothetical full capacity utilization. This is somewhat above the official exchange rate but well below the rate of 61 piasters suggested by the IMF in 1966. At this latter rate the industry would seem to be competitive in exports to neighboring Middle Eastern and African markets, where Egypt has a freight advantage over alternative suppliers.

In 1964–65 the nitrogenous fertilizer industry had thus almost reached trade efficiency as an import-substitute industry at the existing official exchange rate and as an export industry at a "realistic" exchange rate of 61 piasters per U.S. dollar, provided only that it worked at full capacity. As mentioned earlier, however, the weighted average ex-factory price that year implied a nominal rate of protection of 29 percent. The industry was really no longer in need of this protection. Indeed, at the "realistic" exchange rate and at full capacity utilization, the rate of return to capital would have exceeded 20 percent. It is clear, therefore, that the current capacity expansion aiming at export markets is correct despite the somewhat lower prices that this would bring. Also, nitrogenous fertilizers are overpriced domestically, and it is noteworthy that even at the relatively high domestic prices, optimal requirements are believed to be much higher than actual consumption. At current prices, nitrogen requirements of agriculture have been estimated at 737,000 tons, while total consumption in 1966 reached only 262,000 tons.[19] Thus, both external and internal reasons would argue in favor of expanding the nitrogenous fertilizer industry.

Determinants of the Industry's Competitiveness

The transition from a heavily protected industry to an almost efficient import substitute and—at a "realistic" exchange rate—possibly even to a profitable export industry is the result of a number of factors. Of prime importance is the shift to a higher concentration of nitrogen and the exploitation of economies of scale.

Table 9–3 shows a strong increase in capital productivity. Between 1954 and 1957 it was essentially due to higher capacity utilization. In 1964–65 capacity utilization was at about the same level (80 percent) as in 1957, yet capital productivity increased by nearly 50 percent—the consequence of the adoption of more efficient production techniques. Physical labor productivity rose by almost the same percentage as capital productivity. And—for the first time among the industries reviewed so far—we find a growth in labor productivity (both physical and in terms of value added) that exceeds wage increases during the sixties.

The improvement in the industry's competitiveness was also related to the fact that it became relatively more labor-intensive (with a greater share of wages in total costs of production) and less capital-intensive. It should be emphasized that this technologically sophisticated industry could draw upon a large pool of domestic engineering skills, without which it could not have achieved the growth rate it did or succeeded in the adaptation and learning processes that transformed it into a viable undertaking.

Conclusions.

Both phosphate and nitrate fertilizer industries appear to have attained productive efficiency and were on their way to becoming profitable export ventures in 1964–65. The phosphate fertilizer industry was profitable from the outset because it could draw on a large natural resource base and needed only to operate at optimum capacity and to solve its transport problems. The nitrate fertilizer industry, by contrast, went through a trial period characterized by heavy protection and high costs of production. It finally succeeded in finding the choice of technique, product-mix, and scale of production best suited to its relative input costs. International cost comparisons for the two fertilizer industries reveal that Egypt derived a comparative advantage mostly because of the low cost of rock phosphate and electricity. Low labor costs and abundant availability of engineering skills also contributed to the competitiveness of the industry.[20]

The initial protection thus seems to have been justified by later developments, and here we have what looks like a case of a successful infant industry policy. Investment allocation to the industry's ancillary services, particularly in transportation, distribution, and storage should have been larger, but there is no indication that foreign exchange controls have directly hampered the industry. Finally, recent natural gas finds in Lower Egypt promise further development in even more competitive technologies.

THE RUBBER TIRE INDUSTRY

The development of the tire industry in Egypt originated in the early 1950s, when private entrepreneurial interests, encouraged by the government's commitment to industrialization, obtained guarantees that a domestic tire industry would be adequately protected from foreign competition. From the outset, the project appeared as a purely import-substituting venture without much prospect for developing a comparative advantage and expanding its activities into the export field.

Demand for tires and tubes amounted to 4,000 tons in 1951 and, while it declined because of the recession following the end of the Korean boom (see Chapter 2), demand projections were encouraging. The size of the existing stock of motor vehicles, its rate of increase, the extension of the road network, and plans pertaining to the establishment of an automobile industry were all cited in favor of the project. In 1953 the Transport and Engineering Company presented the Permanent Production Council with a proposal for the construction of a 5,000-ton tire plant to be expanded to a capacity of 10,000 tons within six years.[21] This is a small plant by world standards, but economies of scale in this industry are not very important over a broad range of output.[22]

On the supply side, the situation appeared less favorable. Unlike other industries considered in this chapter, the tire industry did not have any domestic raw material base that might have given it a cost advantage (equal to freight). It had to rely almost entirely on imported raw materials. A theoretical possibility of domestic substitution for some of the inputs does exist, such as synthetic rubber and nylon cord from petroleum feedstock, and steel beads and wires from the domestic iron and steel industry. The first is practically excluded, however, because of the large size of the minimum efficient plant (27,000 tons as compared with a domestic demand of 2,000 tons for synthetic rubber in 1963–64),[23] and the latter is still only a remote possibility. The cost data for 1963–64 reveal that, after eight years of operation, 92 percent of the total material inputs (including services) were still imported.

In approving the project, the Permanent Production Council subscribed to 25 percent of the original capital raised and recommended a number of protective measures:[24] (a) waiving of customs duties on imported raw materials and machinery and the imposition of adequate duties on imported tires, (b) assuring the firm of sufficient foreign exchange for imported raw materials, and (c) a government guarantee to purchase its tire requirements from the plant for five years at a price equal to production costs plus a 10 percent margin, provided the price would not exceed the price paid by the U.S. government for its tire requirements plus freight and insurance costs.

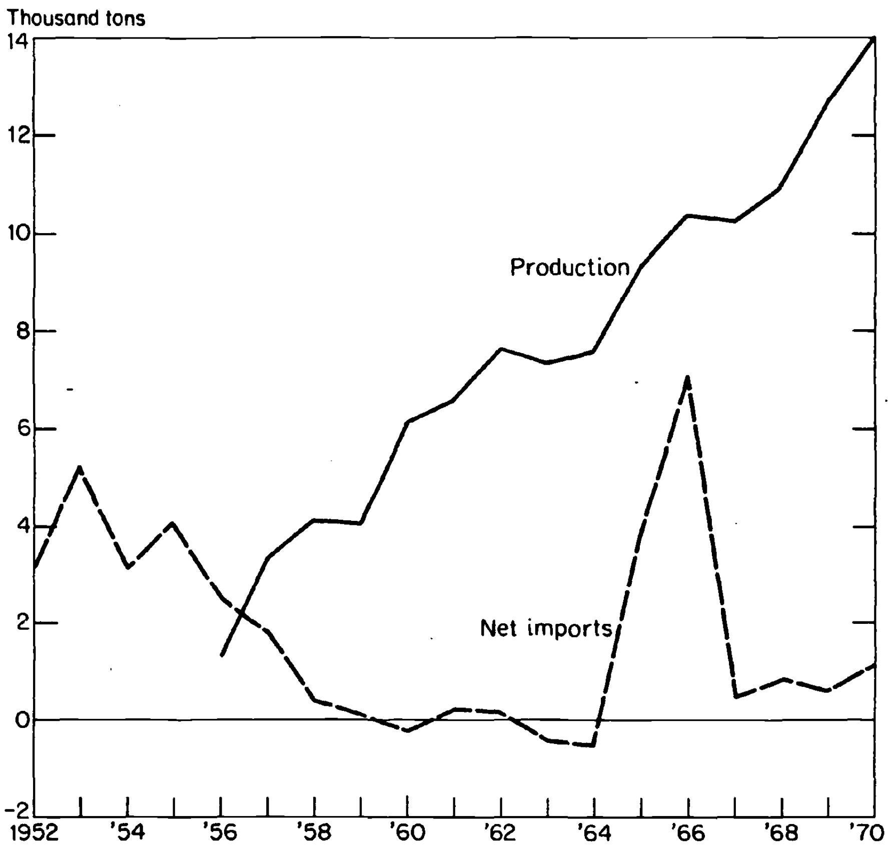
Production and Trade.

The tariff recommendations were adopted in May 1954. Information about their immediate impact on tire prices is not available, but tire prices went up by 21 percent from 1955 to 1957. The factory went into operation in 1956, and production expanded smoothly (by 12.5 percent a year) over the period from 1956 to 1970, hardly affected by raw material shortages except, for a brief period, as an aftermath of the 1967 War (Chart 9–3).

Imports declined steadily from 1957 to 1964, while exports increased rapidly from 1959 on and surpassed imports by 1961. The continued flow of

CHART 9–3

Rubber Tires: Production and Trade, 1956–1970



imports is partly due to the limited production program of the factory. In 1965 exports fell to almost nothing while imports soared from about 650 tons in 1964 to 7,000 tons in 1966, with a production of about 10,000 tons. In 1967 imports fell back to their earlier level, and in 1968 exports began to recover. In 1969 and 1970 the situation was quite similar to that of the years 1963 and 1964, with production, imports, and exports all running at somewhat higher levels. In the post-1967 period, net imports were restricted by a system of domestic rationing.[25]

We have no satisfactory explanation for the peculiar movements of trade between 1965 and 1967. Inventories increased from 1964 to 1965, but that can explain only a minor part of the apparent increase in consumption. Since there was a simultaneous rise in imports and drop in exports, with the rise in imports greatly exceeding the fall in exports, it would be natural to look for an explanation in the development of domestic demand. Domestic production problems can be ruled out as an explanation because production actually increased substantially alongside the increase in tire imports. Government demand is unknown, but it seems likely that an increased share of production was absorbed by the army (possibly to satisfy replacement demand after three years in Yemen). A rapid growth in the stock of registered private automobiles from 1961 to 1963 may also, with a lag, have led to a burst of replacement demand in 1965 and 1966. But erratic import licensing should not be ruled out, either.

Costs and Revenues, 1960–61 and 1963–64.

Cost and revenue data are available for the years 1960–61 and 1963–64. This is a short interval for studying the development of competitiveness and physical productivity, but it conveniently straddles the 1962 devaluation and the nationalization of the industry.

The output of this industry is rather heterogeneous. It includes both tires and tubes, of different sizes, and, in the case of tires, different number of plies and other characteristics. Thus, the choice of international prices to be used in the estimates of ERPs and DRCs gave rise to problems. C.i.f. prices for individual tires and tubes were not available (in any case, it would not have been feasible to work on a completely disaggregated basis). C.i.f. values per unit had to be derived from trade statistics, but Egyptian import statistics could not be used for this purpose because imports in 1960–61 had become complementary to domestic production and thus had a completely different composition. Hence, trade data for Lebanon and Syria were used. Both countries have roughly the same truck-automobile ratio as Egypt, and both import all their tires and tubes, with approximately the same cost, insurance, and freight as Egypt when importing from the major European and Japanese suppliers. Unit values were almost constant for both Lebanon and Syria during these years, with the average c.i.f. unit value equal to U.S. $1.04 per kilogram. We have applied this c.i.f. price to Egyptian production for both 1960–61 and 1963–64. In doing this, we ignore the fact that Egypt did not produce all of its consumption, but in 1960–61 imports amounted to only about 10 percent of total consumption (by weight). The remaining imports consisted partly of automobile tires for special purposes, but contained also motorcycle and bicycle tires. It is difficult to say, therefore, whether our choice of c.i.f. unit value exaggerates or underestimates the international value of Egyptian production. We also call the reader's attention to the possibility of quality differences between the imports of Lebanon and Syria and Egyptian output: most probably the Egyptian product's quality was lower than that of European tires. In regard to f.o.b.

prices, we had no choice but to use the unit value of Egyptian exports. It may be too high for our purposes because all Egyptian exports were made under bilateral agreements, and these may tend to inflate prices.

Competitiveness of the Industry, 1960–61 and 1963–64.

Table 9–4 summarizes the main results of our estimates. We note first that the profitability of the industry at actual domestic prices and costs was extraordinarily high. In 1960–61, the rate of net profit (before payment of

TABLE 9–4
Tire Industry: Rates of Return, ERPs, and DRCs

	1960–61	1963–64		
	(at c.i.f. prices)	(at constant 1960–61 c.i.f. prices and effective rates)	(at c.i.f. prices)	(at f.o.b. prices)
Rate of return (%)				
at actual domestic prices	71.5	69.9	59.8[a]	
at internatl. prices				
actual effective rates	8.1	6.3	2.5[a]	
official rates	−0.1			
ERP (%)				
at actual effective rates	239.9	235.9	261.9[a]	
at official rates	427.4			
DRC (piasters per U.S. $)				
at 5% rate of return	48.2	37.7	48.5	51.7
at 10% rate of return	58.5	46.5	58.5	62.2
at 15% rate of return	68.9	55.4	68.4	72.8

	1960–61	1963–64
Exchange rates (piasters per U.S. $)		
official	35.2	43.5
effective (including premiums)		
outputs	41.9	41.9
inputs	38.7	38.7

SOURCE: B. Hansen and K. Nashashibi, NBER Working Paper No. 48, New York, 1975, Table 26.

a. At official rate.

interests, rents, and taxes) on capital invested was 71.5 percent. In 1963–64, after the devaluation, nationalization, and wage increases, profitability was lower but remained as high as 59.8 percent (an attempt to calculate returns on capital at replacement costs might lower this figure to about 50 percent). The industry was given a virtual monopoly, and government price fixing did not prevent the emergence of huge monopoly profits.

The decline in the net rate of return during the period under review was partly the result of the shift from multiple to uniform exchange rates that accompanied the 1962 devaluation. In 1960–61 a multiple rate system had been in effect, with an exchange premium of 20 percent applied to imports of tires and tubes. For imported raw materials the premium was only 10 percent and for imported machinery and spare parts it was usually waived. The multiple rate system thus implied a subsidy to the industry. It disappeared with the devaluation, which, on balance, was unfavorable to the industry.

The implicit nominal tariff protection for tires (expressed by the difference between domestic output price and c.i.f. price at actually applied exchange rates) was 67 percent in both years under study. The ERP in 1960–61, however, was 239.9 percent at actual exchange rates (including premium) and 427.4 percent at the official exchange rate. These high ERPs are, of course, related to the high import content of production and the low tariffs on imported inputs.

At international prices, the monopolistic profit would, of course, disappear; but it is interesting that there would still be a profit left in 1960–61, close to "normal" (8.1 percent), at least at the actual multiple exchange rates. At the official rate and international prices, however, the rate of return would be about zero. The difference indicates the subsidy that the multiple exchange rate system implies for this industry.

The DRC in 1960–61, at 10 percent return to capital, was 58.5 piasters per U.S. dollar and was thus much higher than the official rate of 35.2, as well as considerably higher than the exchange rates actually applied to the industry—41.9 for outputs and 38.7 for inputs. The apparent contradiction—that the industry would be almost "normally" profitable with a rate of return of 8.1 percent at international prices and actual exchange rates but that, nonetheless, the resource costs at 10 percent return would be much higher than the level of the actual rates—is related to the fact that the actual exchange rate for output was higher than for inputs (see above).

In 1963–64 the official exchange rate applied to the industry was 43.5. The ERP was now 261.9 percent, somewhat higher than at the actual rates in 1960–61, but much lower than at the official rate that year. The DRC at 10 percent return to capital remained unchanged from 1960–61 at 58.5. Thus, the industry continued to be noncompetitive, but the situation was clearly much better than in 1960–61, and the industry would have been competitive at the rate of 61 suggested by the IMF in 1966. For 1963–64 we have also calculated the DRC on the basis of f.o.b. prices for output. At 10 percent return on capital, the DRC in export was 62.2, quite close to being competitive at the rate of 61 just mentioned.

Since wage costs increased very considerably during the three-year period, the unchanged DRC indicates that productive efficiency must have improved substantially. To illuminate this aspect of the problem, we have calculated the DRC for 1963–64 at constant 1960–61 prices and effective exchange rates. At 10 percent return to capital, the DRC thus calculated was 46.5, compared with 58.5 for 1960–61. Productivity of primary factors thus increased by about 20 percent over three years. This increase in productivity was partly due to a shift from natural rubber to cheaper synthetic rubber as the basic raw material. The major strength of the industry as revealed by a comparison of its costs with those of other countries lies in its low labor costs. This, combined with a relatively labor-intensive technology, allowed the industry to offset to a large extent the high cost of its imported raw materials. Despite nationalization, the industry thus fared quite well during these years, and to some extent began to prove itself a successful infant industry.

THE PULP AND PAPER INDUSTRY

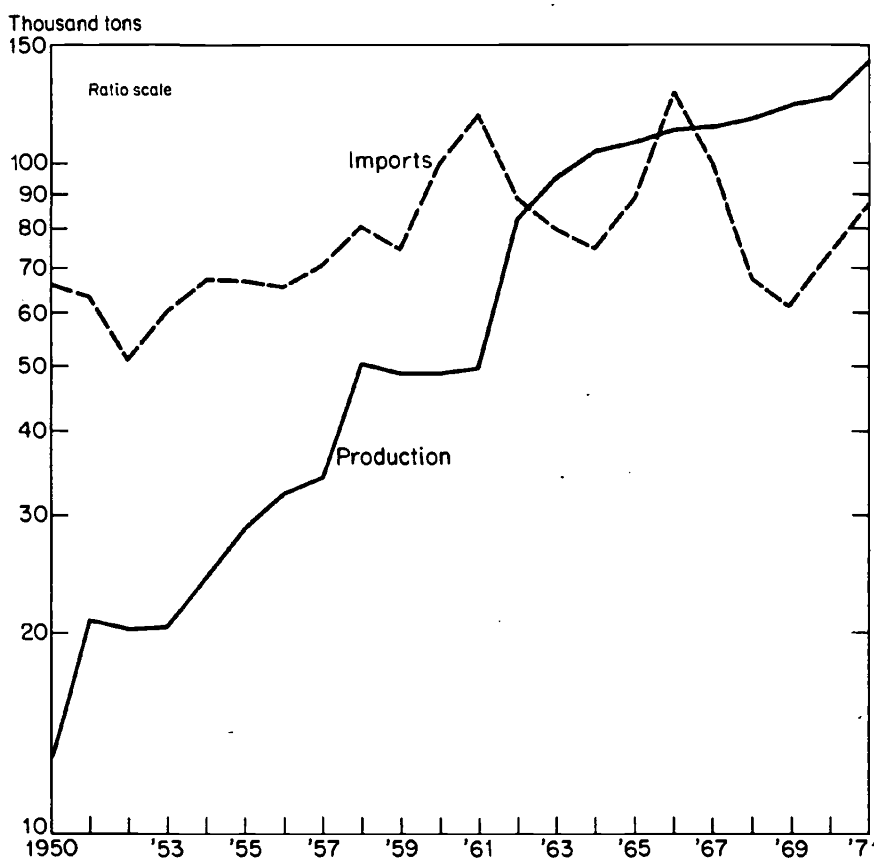
This industry started in the early 1930s as a direct, private response to the protective policy instituted by the tariff reform of 1930. The industry was operating on a very small scale, almost on a handicraft basis: in 1951, seven private firms were producing a total of about 20,000 tons of paper and cardboard, and their aggregate investment did not exceed £E1.5 million.[26] Their operations were limited to the most labor-intensive stages of production, such as cutting the raw material (mostly paper waste) and reducing it to pulp. More elaborate and technically demanding processes, such as bleaching and glazing, were not attempted. Consequently, only crude packing paper and crude varieties of cardboard were produced, while imports satisfied the demand for finer qualities, particularly printing and writing paper. Both production and imports increased rapidly during the 1950s as consumption expanded. The demand for finer quality paper, used for direct consumption and as an input in the printing industry, and for kraft packing paper, particularly by the cement and fertilizer industries, became sufficiently large to encourage the establishment of modern integrated paper mills (Chart 9–4).

Technical Characteristics of the Modern Establishments.

As was the case with tires and steel (see below), the Production Council also played a crucial role in the development of the modern paper industry. In 1953 the Council made a survey of agricultural waste in Egypt to ascertain

CHART 9–4

Paper: Production and Imports, 1950–1970



its possible use as the raw material basis for various varieties of paper pulp and sent missions abroad to solicit tenders for integrated paper plants in Egypt.[27] A pulp and paper mill was established in 1958 at Alexandria (RAKTA) with a capacity of 24,000 tons,[28] and in 1960 a kraft paper mill was established at Suez with a capacity of 20,000 tons. Production in the two mills began in 1961 and 1963, respectively.

These plants were located near sources of bulky raw material. The production of writing and printing paper in the Alexandria plant was based on rice straw from the northern part of the Delta. The kraft paper mill was divided into two units: one, producing pulp from bagasse, was located near the sugar factory at Edfu, while the other, the paper plant, was located at Suez next door to the fertilizer factories that were to receive a large part of its output.

The plants were quite satisfactory as regards linkage effects: they provided a market for the growing chemicals industry (using caustic soda and chlorine as inputs) and for by-products from sugar and rice production with a very low opportunity cost. By 1970 the importation of inputs was limited to some wood pulp and spare parts, whose share of total input value did not exceed 30 percent. On the other hand, the capital intensity of these plants exceeded that of any other manufacturing industry in Egypt.

Despite large investment outlays—£E17.1 million—the scale of operations seems to have been uneconomical. Paper production of acceptable quality is subject to large economies of scale with respect to fixed capital. For instance, a 500-ton-per-day paper mill would have required U.S. $120,000 in equipment per ton of daily output, while a 250-ton-per-day plant would require U.S. $180,000.[29] Doubling of plant size would thus reduce capital costs per unit of output by about one-third. The printing paper plant at Alexandria was designed to produce only 66 tons of paper per day: At full capacity, its capital per ton of output at the official exchange rate amounted to U.S. $740,260, with capital charges alone amounting to 24 percent of output value (at full employment and 10 percent interest). The kraft paper plant required similar capital investments. To be sure, additional lines of production can always be added in tandem with existing facilities as the market expands. This was done at the Alexandria plant in 1965, when a cardboard unit was added, and in 1968, when the printing paper capacity was expanded. But it is mainly administrative labor that is saved by this piecemeal approach. Capital requirements are by and large the same, and generally there is no large-scale advantage in regard to variable costs.

The planned small scale of production was not based on any accurate forecast of demand. Within a few years, as we shall see, excess demand was reflected in a general shortage of paper and rising imports.

Import Substitution.

Table 9–5 shows production, imports, and prices (domestic and international) of paper over nearly two decades (1953–1970). During this period domestic production increased at an annual average of 12 percent, reducing the share of imports in total consumption, which increased at an annual average of 4.7 percent (that is, roughly in line with GNP).

Reports from industries depending upon the output of the paper industry make it abundantly clear, however, that supply did not always meet demand, so that at times paper shortages emerged. Such shortages appeared for the first time in the aftermath of the 1956 Suez War, when imports were disrupted.[30] Together with the higher level of protection that the government deliberately afforded to industry at that time (higher tariffs and tighter import

TABLE 9–5

Paper Industry: Production, Imports, and Prices

Year	Domestic Production of Paper and Cardboard (000 tons)	Domestic Production of Printing and Writing Paper (000 tons)	Paper, Domestic Wholesale Price Index (1939 = 100)	Paper, Export Price f.o.b. (U.S.$ per ton)[a]	Imports of Paper and Cardboard (000 tons)	Imports of Printing and Writing Paper (000 tons)	Import Unit Value of Printing and Writing Paper (£E per ton)
1953	20.3	[b]	502	140	60.3	n.a.	n.a.
1954	24.2	[b]	465	144	67.0	25.0	75.7
1955	28.8	[b]	466	149	66.7	26.2	79.4
1956	32.3	2.1	496	156	65.5	25.0	82.5
1957	34.1	1.2	519	150	70.5	30.9	84.8
1958	50.5	3.4	555	145	80.3	21.9	85.3
1959	48.7	4.0	567	145	74.2	23.7	83.6
1960	48.6	6.8	514	145	99.7	34.1	84.0
1961	49.6	5.4	511	143	117.8	39.6	81.7
1962	82.9	23.2	508	138	87.7	16.3	87.7
1963	95.5	25.7	543	137	79.7	5.4	112.8
1964	104.1	29.5	534	141	74.4	1.4	125.5
1965	107.2	27.1	533	145	86.8	8.9	106.2
1966	111.7	25.2	533	152	127.4	28.8	108.2
1967	112.7	28.4	534	152	99.0	13.2	108.4
1968	116.0	32.7	534	146	67.3	4.8	94.5
1969	122.0	36.1	560	153	61.5	3.5	101.0
1970	124.8	43.2	n.a.	167	73.3	2.3	127.0

SOURCES: Federation of Industries, *Yearbook*, various issues; FAO, *Production Yearbook*, various issues.

a. Finland, kraft paper, export unit value.

b. Insignificant quantities.

controls, as explained in Chapter 2, the shortages contributed to a rise in prices which, in turn, induced an expansion of production. The average return on invested capital in the industry jumped from 7 percent in 1954 to 22.6 percent in 1957,[31] and one of the enterprises embarked upon production of printing and writing paper, albeit on a small scale (6,000 tons at full capacity). Imports were subsequently increased and demand satisfied. But the price rises that had taken place caused concern on the part of both the government and the printing industry (the latter being much more important than the small paper industry). In 1960, therefore, the government stepped in; it ordered price reductions by 15 percent on average for domestic paper and limited profit margins for imported paper.[32] The price cuts resulted in stagnation of domestic production, and the authorities had to permit a sharp increase in imports. Domestic costs of production—suffering from both a primitive technology and rising prices for produced inputs, domestic as well as imported—were rapidly moving out of line with the falling world market prices, and increased protection was required if private industry was to maintain, let alone increase, its share of domestic consumption.

The situation changed with the nationalizations of 1961, on the one hand, and production starting, on the other, in the Alexandria and Suez plants in 1961 and 1963, respectively. Production expanded and profitability was no longer a condition for increased domestic output. After four years of stagnation, production in 1962 was back on the growth path followed from 1950 to 1958. Imports were cut back somewhat but total supply had increased, and in the aggregate, equilibrium between demand and supply was probably established for the moment, although shortages could still occur for particular types of paper.

The 1962 devaluation did not lead to changes in the quoted prices for many varieties of paper, domestic as well as imported. This may be understandable in some cases where the import premiums, replaced by the devaluation, had exceeded the devaluation. Input prices, on the other hand, rose by about 10 percent as a result of the devaluation, and the general effect on profits was adverse:[33] in this regard the paper industry shared the general fate of manufacturing industry during these years (see Chapter 4). For the new production of printing and writing paper from the RAKTA mill, prices were brought into line with the prevailing domestic prices for imported paper, or some 50 percent above the c.i.f. prices, a level at which they remained until 1968. Considering the price cuts in 1960 and the price policies at the time of the 1962 devaluation, the overall degree of protection of domestic production may not have increased from 1954 to 1969 despite rising domestic production costs. Domestic wholesale prices for paper increased by 20 percent from 1954 to 1969, while world prices went up about 6 percent (Table 9–4) and the official devaluation in 1962 amounted to 24 percent.

In 1965 the RAKTA mill reached full capacity of production, but, with imports of paper varieties similar to those produced at RAKTA prohibited, shortages had again become serious and a black market emerged. The shortage of paper in the market was estimated to be about 37,000 tons that year, or some 20 percent of actual supply, and was attributed to the low foreign exchange quota allocated to the industry by the trade authorities.[34] In addition, repeated complaints were voiced that the distribution of imports by paper variety did not correspond to actual demand, and that domestic varieties more often than not failed to meet minimum specifications in regard to quality.[35] A sharp increase in imports in 1965 and 1966 alleviated these shortages, but supply was disrupted again by the 1967 War. In that year a new line of cardboard production with a capacity of 15,000 tons was opened at the RAKTA mill. This expansion was offset, however, by the partial destruction of the Suez kraft paper plant by Israeli attacks.[36] New paper shortages appeared in the immediate aftermath of the war as imports were disrupted. In the following year imports remained inadequate and black markets in certain types of paper prevailed, although prices were increased and productive capacity was further expanded in 1969 by the addition of a new printing paper line in the RAKTA mill.[37]

While paper imports were reduced to only one-third of domestic consumption, their absolute level remained virtually the same from 1950 to 1970; and although their product-mix changed toward finer qualities, import substitution was incomplete, particularly in the case of newsprint, which could not have been produced solely on the basis of bagasse pulp. To judge from the increase in demand, the Alexandria RAKTA plant could have been designed for a much larger capacity of production, possibly twice the actual capacity. However, there may have been some rational arguments for keeping the new industry at a low scale of production despite high fixed costs: lack of skilled workers, difficulties in mobilizing sufficient domestic raw materials, and, particularly, the necessity of gaining experience before even larger capital outlays were sunk in the industry.

Costs and Revenues: Competitiveness.

The large diversity of paper varieties produced in Egypt and the difficulty of obtaining the corresponding import price data precludes an analysis of the competitiveness of the industry as a whole. Fortunately, cost of production data were available for the operations of an important modern segment of the industry—the integrated paper and pulp RAKTA mill, which produces printing and writing paper only. The data cover the fiscal year 1962–63, immediately following the devaluation. Note that at that time there were still some starting-up expenses and capacity utilization was less than full; thus, we are studying an industry in its infant stage. Prices ex-factory were fixed at

£E151.5 and £E142.3 per ton for writing and printing paper, respectively, well above the corresponding c.i.f. prices of £E96.0 and £E90.0 per ton for allegedly equivalent varieties at the official exchange rate.[38] The price differential corresponds to a de facto nominal protection of 58 percent, but does not take into account the possibility that the quality of domestic paper may have been inferior to that of imported paper.

Costs of production at domestic and international prices are shown elsewhere.[39] As in the case of iron and steel (see below), at international prices, costs of traded inputs are close to the value of output, while total input costs (both traded and nontraded) even exceed output value. Thus, at international prices we have negative value added, defined in terms of return to primary factors of production. However, capacity utilization was only 78 percent, which, for a highly capital-intensive industry, is important. Since full capacity utilization was actually reached a few years later, we have computed DRCs for 1962–63 both at actual and at hypothetical full capacity utilization. The results are shown in Table 9–6 (see p. 284).

At a 10 percent rate of return, the DRC at actual capacity utilization exceeds 200 piasters per U.S. dollar, almost five times the official exchange rate; adjusted to full capacity utilization, it falls to 141 piasters but is still more than three times the official foreign exchange rate. The DRCs evaluated at a 5 percent rate of return are very much lower because of the high capital charges, but even at this low rate of return the industry would be far from competitive. Cost comparisons with Indian, Mexican, and European plants show an extremely low labor productivity in Egypt for this industry, and even though wage costs hardly exceed 15 percent of total costs in this industry, unskilled labor may have increased overall costs through wastage of raw materials and an output that failed to meet the required specifications.[40]

The development of world prices since 1962–63 may have helped to increase the competitiveness of the industry. Stable until 1969, they rose some 20 percent in 1970 and 1971, and another 14 percent in 1973.[41] On the domestic front, costs of production were relatively stable during the period from 1962 to 1967, but seem to have moved up from 1967 to 1971. Domestic prices were raised from £E146 per ton for printing paper in 1967 to £E164 in 1970.[42] Since the subsequent international price trends resulted in a substantial increase in the import price of paper relative to the rise in domestic costs, it is likely that resource costs were favorably affected.

THE IRON AND STEEL INDUSTRY

As one of the big battlefronts of World War II, Egypt became a burial ground for large quantities of military equipment, iron reinforcements, and shell frag-

TABLE 9–6

Paper Industry: Rates of Return, ERPs, and DRCs, 1962–63

(percent)	
Rate of return	
at domestic prices	4.9
at international prices, c.i.f.	−3.8
ERP	239.6
(piasters per U.S. dollar)	
DRC, 5% rate of return	
at actual capacity utilization	148.4
at full capacity utilization	101.9
DRC, 10% rate of return	
at actual capacity utilization	207.7
at full capacity utilization	140.7
DRC, 15% rate of return	
at actual capacity utilization	266.9
at full capacity utilization	179.5
Official exchange rate	43.5

NOTE: DRC at full capacity utilization evaluated on the assumption that no increase in labor employed would take place. Other produced inputs and services were extrapolated on a pro rata basis.

SOURCE: Hansen and Nashashibi, NBER Working Paper No. 48, 1975, Table 27.

ments. These added to the domestic supply of iron scrap which had been exported before the war at a rate of 4,000 tons a year. The increased supply prompted domestic entrepreneurs to push for the prohibition of scrap metal exports and the establishment of a domestic iron and steel industry. At that time the annual domestic steel consumption was only about 180,000 tons, mostly beams for reinforced concrete, but consumption was expected to rise rapidly with industrialization.[43]

With domestic scrap as their source of raw material, three steel plants were established by competing firms in 1948–1949.[44] They were small, and had electrical furnaces or open-hearth furnaces fired by fuel oil; the rolling mills had an annual capacity of production of 30,000 tons each. These plants seem to have been well-managed, and they benefited from low wage rates and a price of steel scrap in line with the United Kingdom f.o.b. price. Excess demand for steel in Europe during the first postwar years contributed to the enhancement of local competitiveness by inflating international steel prices. Moreover, the major technological innovations that later resulted in large spurts in productivity and output in Europe and Japan had not yet been generally adopted. Egyptian domestic prices were about the same as average import unit values from 1952 to 1954 (Table 9–7), and could have been even lower had the government abolished the tariffs on imported inputs (coke, ferromanganese, and ferrosilicon).[45]

The three steel mills were using up more scrap than the economy was currently generating, and the stock of scrap, estimated in 1953 at 200,000 tons, was being rapidly depleted. Thus, as early as 1951 the Industrial Chamber for the Iron and Steel Industry exerted pressure upon the government to provide the necessary protection and guarantees for the creation of a fully integrated, domestic steel plant on the basis of iron ore deposits discovered at Aswan.[46] The iron content of the ore was mediocre (29 to 44 percent) and the deposits would be depleted in thirty years, but they had the advantage of being close to river and rail transportation. The much larger and richer deposits (60 percent iron) known to exist in the Western Desert at the Bahariya Oasis were left out of consideration, for they were located more than 200 kilometers from the Nile Valley and thus required large investments in transport.[47]

In 1954 the Permanent Production Council approved the project of an integrated steel plant at Helwan (a Cairo suburb) as presented by a consortium of major Egyptian firms (the Misr Group) and the German firm Demag. The Egyptian Iron and Steel Co. was established with the government and its various agencies as a major contributor to the initial capital issued and the Misr Group as a minority participant. Demag limited its participation to 20 percent of the value of the machinery and equipment it supplied up to a limit of £E2 million. Subsequent increments of capital were offered to the public with a minimum return of 4 percent guaranteed by the government.[48]

The plant was to have an annual capacity of 300,000 tons of crude steel, produced by Thomas and electrical converters. Demag undertook to deliver and install the equipment and to operate the plant in association with Egyptian managers appointed by the shareholders.[49] Top management was composed mostly of engineers. Price estimates for various steel products, submitted by the company to the Production Council, were between 12 and 36 percent below import prices, conveying the impression to the government that the plant would be competitive and would have an export potential.[50] It appears that the Helwan Steel Plant was promoted by the small rolling mills, which saw their scrap supplies dwindling and did not want to depend on imported raw materials. An integrated iron and steel plant would guarantee them a constant supply of steel ingots and semifinished products.

TABLE 9–7

Domestic and Import Prices of Steel Products

	Merchant Bars					Heavy Plates				
Year	Domestic Prices (£E per ton) (1)	Actual Import Unit Values, c.i.f. (£E per ton) (2)	Hypothetical Import Prices, c.i.f. (£E per ton) (3)	Export Prices, f.o.b. Antwerp, 4-year Moving Average (U.S.$ per ton) (4)	Average Nominal Protection (%) (5)	Domestic Prices (£E per ton) (6)	Actual Import Unit Values, c.i.f. (£E per ton) (7)	Hypothetical Import Prices, c.i.f. (£E per ton) (8)	Actual Export Prices, f.o.b. Antwerp, 4-year Moving Average (U.S.$ per ton) (9)	Average Nominal Protection (%) (10)
1952	44.0	41.8	57.9	—	—	—	—	—	—	—
1953	42.0	43.2	43.6	—	—	—	—	56.7	—	—
1954	34.2	36.2	39.0	—	—	—	—	44.4	—	—
1955	47.0	39.9	46.3	110	−1	49.9	—	48.6	124	−0
1956	50.0	42.7	46.1	103	14	77.6	—	51.1	120	55
1957	54.0	—	46.1	105	22	81.5	—	53.8	116	65
1958	57.8	—	37.9	108	31	81.5	—	42.1	115	67
1959	57.9	—	41.7	101	35	81.5	—	40.9	110	74
1960	57.9	—	43.2	99	37	89.4	—	43.9	105	98
1961	58.0	—	42.4	97	38	89.4	—	41.6	99	113

1962	—	—	47.7	97	—	89.9	—	46.3	98	107
1963	—	—	39.7	93	—	89.4	—	42.3	96	105
1964	—	—	44.5	90	—	89.4	—	51.4	97	97
1965	64.3	—	43.6	88	47	89.4	—	44.5	96	94
1966	64.3	45.6	41.4	87	56	—	59.3	42.7	94	—
1967	64.3	44.0	39.2	87	57	—	59.2	42.7	94	—
1968	65.0	44.2	38.8	84	60	94.4	60.6	42.3	89	110
1969	66.2	44.5	51.1	87	55	94.4	61.4	66.7	101	94
1970	82.9	69.4	56.7	96	60	114.3	83.8	66.0	115	110
1971	87.5	62.2	50.0	103	78	114.3	69.9	61.5	125	93

NOTE: Cols. (1) and (6): 1952–1955, Federation of Industries, *Yearbook;* col. (1), 1955–1967 and col. (6), 1955–1959, Domestic Price Index; col. (6), 1960–1965, Egyptian Iron and Steel Company records; 1968–1969, *Industrial Statistics by Commodity,* 1968–1969 and October 1970; 1970–1971, *Semi-Annual Bulletin for Prices of Industrial Commodities,* January 1971.

Cols. (2) and (7): Unit values from Trade Statistics in Federation of Industries, *Yearbook*. For col. (7) more expensive sheets are combined with plates in the statistics, which raises the average price somewhat.

Cols. (3) and (8): European export prices from *The European Steel Market,* United Nations Economic Commission for Europe. U.S. dollar prices were converted at a rate of $2.60 per £E until 1962, and at a rate of $2.30 thereafter. To convert prices to c.i.f., a freight margin of $11.50 per ton was added on the basis of *AMELITE Freight Conference* of 1968.

Cols. (4) and (9): Four-year moving average of f.o.b. export prices from *European Steel Market,* United Nations Economic Commission for Europe.

Cols. (5) and (10): Difference between domestic price and four-year moving average of c.i.f. import price as percent of the latter.

By the time the plant went into operation in the middle of 1958, £E19 million had been invested in ore extraction and production of steel. It was the single largest investment in the 1950s, but it was not large enough: there were substantial diseconomies of scale at that level of production and its capacity fell far short of actual and projected demand by the time it went into full operation. Whether the investment should have been made at all is another question, which we shall attempt to answer in the following section.

Steel Production, Trade, and Prices, 1951–1970.

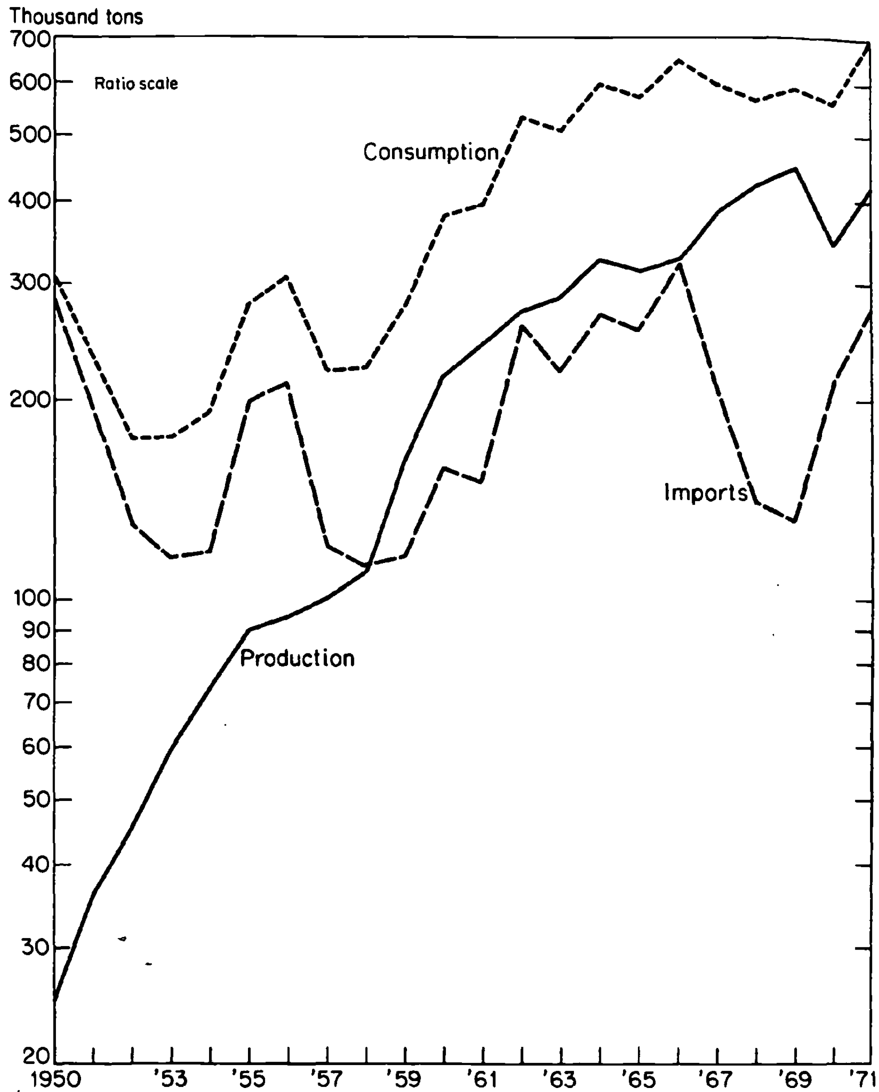
Chart 9–5 shows production of steel and imports of finished products, as well as apparent steel consumption, from 1952 to 1970. Exports are not shown; they remained below 10,000 tons.[51] Apparent consumption equals the sum of domestic production and imports; stock figures are not available. In addition, we have constructed domestic and import price series for merchant bars, produced mainly by the three small plants, and for heavy plates, produced by the Helwan plant (Table 9–7). Two import price series are shown: unit values (from Egyptian foreign trade statistics) and export prices obtained at Antwerp by European countries (as quoted by the European Steel and Coal Community) to which we have added a c.i.f. margin.[52] European export prices are given as a four-year moving average to smooth the sharp short-run fluctuations characteristic of steel products.

Up to 1956, the actual Egyptian c.i.f. unit value for merchant bars coincides roughly with the hypothetical c.i.f. series derived from the Antwerp f.o.b. export prices. For the period 1965–1970, the hypothetical c.i.f. prices are somewhat lower than the actual unit values (columns 3 and 2); the composition of imports became complementary to domestic production, and hence the import-mix became more expensive than the domestic output-mix. This was particularly evident for plates and sheets, where price differences according to quality and size are much broader than for merchant bars. Finally, we derived a series showing de facto protection defined as the difference between domestic and average import prices as a percentage of average import prices.

The recession from 1952 to 1954 was marked by a stagnation in the domestic demand for steel; investment in residential building fell, and industry was saddled with excess capacity. At that time merchant bars, used mainly in residential construction, accounted for 80 percent of total steel consumption. The increasing domestic production of merchant bars by the three small mills was rapidly replacing imports. Domestic prices were almost competitive with c.i.f. import prices, and the actual degree of protection did not exceed 5 percent. In spite of their uneconomical scale of operations, the small steel plants were able to compete with imports, while the integrated steel plant in Helwan eventually proved to be highly inefficient. While this was partly due

CHART 9–5

Iron and Steel Products: Production, Consumption, and Imports, 1950–1971



to more efficient management of the small plants, perhaps a more important reason is that the Helwan steel plant suffered much more from its relatively small scale of operation than did the smaller plants. Economies of scale are largest for blast furnaces producing the basic pig iron. The small plants dispensed with this stage of production altogether by using steel scrap and ingot.

Between 1954 and 1956 both production and imports rose in response to a recovery in economic activity (Chapter 1, Table 1–10). Imports of steel rose faster than production inputs, and the steel mills may have been close to full capacity utilization. This caused domestic prices to rise above c.i.f. prices, which remained steady; European f.o.b. prices were even declining slightly.

The 1956 Suez War disrupted steel importation and slowed down economic activity temporarily. It also marked the beginning of a period of investment growth that lasted until the mid-sixties. Demand from both residential and industrial construction rose sharply until 1962 and then more modestly until 1966, after which it turned down slightly. The production upturn in 1958 reflects the start of the Helwan plant's operation. Imports increased slightly until 1960. By that time, the Helwan plant was in full operation and the expansion in output decelerated. Domestic demand, meanwhile, propelled by the investments of the first Five-Year Plan and by the construction of the Aswan High Dam, caused a rapid rise in imports, which equaled domestic production in 1962. To be sure, growth in consumption slowed down somewhat with the demand curbs of 1965–66 and the aftermath of the 1967 War, but it resumed its tempo again in the early 1970s. At that time it became evident that the capacity of the new steelworks was far below demand. While import substitution in steel was only partial and failed to save much foreign exchange, it served to raise the prices of finished steel products substantially.

The degree of nominal protection of merchant bars rose from an average of 19 percent prior to the Suez War to 36 percent for the 1958–1961 period. This was a protective measure in favor of the three small producers, who were facing rising scrap prices. World export prices of steel, on the other hand, had been moving downward ever since the end of the Korean boom. Thus, domestic and world prices were now moving in opposite directions.

During the 1960s, the gap between domestic prices and import prices increased further, with the nominal level of protection reaching 50 percent for merchant bars and more than 100 percent for plates. Costs of imported materials rose after the 1962 devaluation, and prices were adjusted upwards. In 1970, unit values for imported steel increased sharply, and the Egyptian government raised domestic prices on merchant bars and other products by 25 percent; it increased the degree of protection when world prices eased off again in 1971. The protective position in that year vis-à-vis the hypothetical average import prices was 70 percent on merchant bars and 93 percent on plates. With respect to actual unit values, assuming the same quality and specifications for imported as for domestic products, the protection would have been 40 percent and 63 percent, respectively, for bars and plates. Significantly, the degree of protection was much smaller for merchant bars produced mainly by the small steel mills than for heavy plates produced exclusively by the Helwan plant. With respect to light sections (merchant and reinforced concrete bars), the Helwan plant had to follow the prices of the smaller plants. Protection for products not produced by the three steel mills was tailored to the high costs of the Helwan plant—hence a somewhat distorted structure of domestic prices.

The import substitution program for the steel industry brought Egypt into the company of various other small and medium-sized developing countries that attempted to create a national steel industry and ended up with high levels of protection (Peru, 106 percent; Columbia, 74 percent; Chile, 68 percent; Mexico, 46 percent; and Venezuela, 37 percent).[53] However, the result might have been more favorable had the Helwan Steel Plant been differently conceived, as we shall show in the following section.

Finally, as a supplier of inputs to other industries, including crude iron to the small steel mills, the Helwan plant must have been a source of severe disruption. Users of steel products (finished and semifinished) had difficulties in obtaining import licenses for them because foreign exchange authorities anticipated a greater domestic steel output. But the Helwan plant constantly failed to achieve its output targets, with production even falling in 1964–65 and in 1965–66.

Costs and Revenues of the Helwan Plant: Competitiveness.

Cost and revenue data obtained for the steel industry refer exclusively to the steelworks at Helwan for the year 1964–65. Unfortunately, no information is available for the three small, apparently much more efficient mills. Nonetheless, we have here the records of the "modern" and integrated sector of the industry that accounts for two-thirds of Egypt's output of steel products. 1964–65 was the sixth year of plant operations; it shows costs and productivity at a time when initial difficulties should have been overcome. Complete data are lacking for any earlier year, but data are available on output-mix and material inputs for 1959–60, so that a comparison of input coefficients would be possible. A record of profits and losses for the firm is available for the whole period.

Our ERP and DRC estimates, with some productivity indicators, are presented in Table 9–8. The Helwan plant was operating at two-thirds capacity in 1964–65. The data were not adjusted to full capacity utilization because the shortfall in production did not result from lack of demand but from difficulties in operating the plant, preventing the planned production and output-mix from being achieved.[54]

TABLE 9–8

Value Added, Profits, DRC, and ERP at the Helwan Steel Plant, 1964–65

(000 £E)	
Net domestic value added (incl. nontraded inputs)	
at domestic prices	5,103.8
at international prices	851.5
Net value added	
at domestic prices	2,459.0
at international prices	−2,091.0
Wages and salaries (incl. fringe benefits)	2,757.0
Net profits	
at domestic prices	−298.0
at international prices	−4,848.3
Total capital (historical costs)	40,000.0
(piasters per U.S. dollar)	
DRC	
5% rate of return	378.0
10% rate of return	480.0
15% rate of return	582.0
Official exchange rate	43.5
(percent)	
ERP	599.4

SOURCE: Hansen and Nashashibi, NBER Working Paper No. 48, New York, 1975, Table 28.

Table 9–8 reveals the industry subject to losses not only in terms of international prices but also in terms of domestic prices, even though the domestic, weighted average ex-factory price of its output-mix exceeded international prices by 66 percent. It is also striking that domestic value added, defined as the value of output minus the value of traded inputs, was positive at international prices (albeit with an ERP of almost 600 percent), but negative in terms of the conventional definition of value added (value of output minus value of all material inputs and services). The high costs of nontraded inputs (ore) are also reflected in the DRCs, which were about ten times the official exchange rate (at 10 percent rate of return).

From Table 9–9 it is evident, moreover, that productivity in the Helwan plant was very low compared with steel plants in other countries, be they underdeveloped or highly developed, and that productivity deteriorated with the passage of time, culminating in a particularly poor performance in 1964–65.

The first two years of operations were marked by losses (£E1.7 million), followed by a short-lived period of recovery. In 1961–1962 the firm even managed to break even. The devaluation of July 1962, however, raised the prices of coke, imported ore, ferrosilicone, and spare parts—without immediate domestic output-price compensation. Furthermore, there was a sharp increase in the coke coefficient (see Table 9–9). The result was a series of losses and worsening of productivity indices. Production reached a peak in 1963–64, with 144,032 tons of steel products, and fell thereafter to 137,970 tons in 1964–65 and 121,270 tons in 1965–66, as input coefficients rose abnormally, labor productivity declined, and a succession of breakdowns occurred. By 1964–65, investment in the industry (fixed and circulating capital) amounted to £E40 million, to which another £E10 million could be added in start-up expenses and accumulated losses over the 1959–1965 period. Between 1963 and 1965 the plant was absorbing more resources than it was generating; there were hardly any savings in foreign exchange, with net domestic value added at international prices at only £E851,000 in 1964–65, and if an international price had been attached to nontraded goods, there would have been rather large foreign exchange losses.

Causes of the Helwan Plant's Inefficiency.

One of the major reasons usually offered for the deteriorating performance is the declining quality of the iron ore. The Aswan ore deposits, estimated to be only about 25 million tons, are shallow, have a high silicone content, and are spread over a large area with a low iron content ranging between 29 and 44 percent. The richer ores were depleted first and a gradual lowering of the iron content occurred, necessitating higher coke inputs. The rate of coke consumption in 1959 was almost normal by international standards; it rose to more than 1,200 kg by 1963–64 and within one more year to 1,600 kg. No attempt was made to enrich the iron ore charge, which would have reduced transportation costs and coke inputs considerably while increasing the productivity of the blast furnace. Moreover, the blast furnace charges appeared to be quite heterogeneous, and eventually a sintering plant was installed to remedy the situation. Nevertheless, the performance did not improve significantly.

The low and changing quality of the iron ore is at most only a partial explanation. First, ore consumption per ton of steel did not increase much. Moreover, European plants have been using ores with iron contents not exceeding 40 percent for decades, yet they have not reached such high levels of coke consumption. Table 9–9 shows that inputs of both iron ore and coke were much lower in Western European countries than in Egypt.

A more general explanation might be the inexperience of Egyptian management and labor in the operation of an integrated steel plant demanding a high degree of coordination and skill. Unlike industries (such as cement or fertilizers) that have constant output specifications and produce in a continuous flow (hence with a minimum of coordinating operations), steel shapes have to be individually handled by labor, which ultimately bears a large share of the responsibility for its quality. Moreover, tight coordination between departments (blast furnace, converter, rolling mill) is essential for maintaining efficiency and depends largely on the ability of labor and the engineering staff to maintain consistent and uniform rates of production in each department.

In the light of these requirements, the labor skill structure in the plant was totally inadequate. A consulting firm, hired to diagnose the factory's ills ascribed much of the difficulties to the structure of the labor force.[55] It found that 35 percent of the workers were recruited from neighboring villages, had never before worked in a factory, and continued to pursue their rural occupations. A substantial 78 percent of the workers had no technical training in metal industries. Moreover, although substantial overstaffing was reported in 1963, employment continued to increase until February, 1965, yet output was falling—hence, the low labor productivity (see Table 9–9) and the high labor costs as compared with the United Kingdom and other Western European countries.

Low labor skills and faulty installation of some production units resulted in numerous breakdowns and work stoppages. The premature wearing-out of the linings in one of the blast furnaces and in the Thomas converters as well as numerous electrical power failures affecting the electrical converters may serve as examples.[56] Continual repairs explain the large expenses for spare parts, which amounted to £E4.5 million in 1963–1965, or 16 percent of production costs.

In addition to the poor quality of the raw material and inexperience of the labor force, serious criticism may be directed against the whole conception of the project. For one thing, the location of the ore deposits and that of the plant virtually nullified Egypt's initial advantage in having domestic ore deposits. Given the location of the deposits 900 kilometers south of Cairo, high transport costs would result whatever the location of the plant. Shipping

TABLE 9–9

Steel Industry: Costs and Performance Indicators in Egypt and Other Countries, Selected Years

	Cost Distribution (% output value at internatl. prices)		Performance Indicators				
	Raw Materials and Fuel	Labor	Coke Consumption (per ton of finished steel)	Ore Consumption (per ton of finished steel)	Labor Productivity (tons of finished steel per man-year)	Capacity Utilization (%)	Profits (000 £E)
Egypt (Helwan)							
1959–60	—	—	1.036	2.320	—	45	−852.9
1963–64	—	—	1.251	2.375	30	75	−1,837.7
1964–65	75.7	32.8	1.593	2.386	27	77	−1,472.2
Other Countries							
1955	34.0[a]	17.5[a]	(0.723[b]	(0.824[b]	(45[c]	—	—
			(0.881[c]	(1.633[c]	(90[a]	—	—
			(0.915[d]	(1.510[d]	(156[d]	—	—

SOURCES: Data for countries other than Egypt: *Long-Term Trends and Problems of the European Steel Industry*, United Nations Economic Commission for Europe, 1959, pp. 73, 80. Data for Egypt: for 1959, *Yearbook*, Federation of Industries, 1959–60; for 1963–64, *Annual Report*, Iron and Steel Company, as quoted in Mohamed Metwalli, *Factors Affecting the Establishment of the Iron and Steel Industry in the U.A.R.*, 1964–65; for 1964–65, F. A. El Bahaï, "The Economics of the Iron and Steel Industry: the Egyptian Iron and Steel Company," Institute of National Planning, Cairo, 1966–67.

a. UK, 1950.

b. Japan. Ore consumption includes sinter. Also, steel scrap may have been added directly to the blast furnaces.

c. India.

d. Average of nine western European countries. The ore figure includes an average of 772 kg. of sinter.

the ore by rail to the Cairo area was very expensive and exceeded the existent railroad capacity. Moreover, a new bridge across the Nile had to be built at Helwan. Shipping the ore by barge on the Nile would have meant heavy investments in ports, barges, and tow boats, and, for deep-going barges, navigability is not always safe. To locate the plant at Aswan would have entailed shipping the finished product to the Delta region and coke from Alexandria to Aswan, or from a Red Sea port. In the latter case, heavy investments in port and rail facilities would have been necessary. As a result of the high domestic transportation costs, the Helwan plant was paying the same price—and often more—(per unit of iron content) for the Aswan ore as for imported ore (c.i.f.). Hence it did not benefit from any natural advantages.

The plant also suffered from an inefficient scale of operations. It was designed to produce 300,000 tons of steel products per year, and its two blast furnaces (where economies of scale offer the greatest potential) had a capacity of 400 tons per day. For that reason alone, compared with the minimum efficient plant size at the various stages of production, costs per ton of steel would be 50 percent above those of an efficient European plant.[57] This is a general problem that tends to make steel production uneconomical in developing countries, where domestic demand is often well below the efficient scale of operations.[58]

Whether Egypt could possibly have planned for a larger capacity when the construction of the plant began back in 1956 is another question. In 1962, when the plant had operated for two years, the country's apparent total consumption was about 550,000 tons. The production of the three small plants (already existent in 1956) was about 90,000 tons. About 250,000 tons more were of a specification and quality that could not be produced in Egypt. Thus, the demand at that time for products from the Helwan plant was about 200,000 tons, in contrast to planned production of 300,000 tons at full capacity. When it reached its peak in 1966, apparent consumption was still less than 650,000 tons, implying a demand for products from the Helwan plant of less than 300,000 tons. Had developments been correctly foreseen up to 1970, there would have been no need for building a larger capacity than 300,000 tons, unless the country had planned for steel exports. It could, of course, be argued that, with more effective demand management and foreign exchange policies—and disregarding the 1967 War—investment and steel consumption could have continued their growth after 1966; in that case the capacity of the Helwan plant would certainly have been too small by 1970.

Could actual developments have been foreseen at all in 1956? To some extent, yes. A very substantial part of the investments undertaken during the years 1958 to 1962, together with the Aswan High Dam project, were in fact approved by the Production Council as early as 1954. To extrapolate a certain growth of investment beyond 1962 would not have required too much imagination. However, investing for future demand means increased unutilized capacity during the first years of operation; what is gained on the swings may thus be lost on the roundabouts. Moreover, the risk of loss from technical obsolescence would increase.

In fact, the Helwan plant did not benefit from various innovations introduced in some European plants during the 1950s. It did not use the LD oxygen converters, in particular, which would have resulted in a much higher quality of steel and a lower coke coefficient, nor did it adopt the continuous casting process that reduces the capital-output ratio in the forge as well as wage costs. And because of the low skill of labor, the use of automation to ensure quality control and coordination among the various shops might have enhanced productivity substantially despite the small scale of operations. To be sure, it is not clear whether any of these innovations could have been incorporated in the Egyptian steelworks in 1957–58. The most widely used innovation in Europe at that time was the oxygen converter, but not until 1960 was it applied in developing countries; continuous casting and computer-controlled rolling mills did not spread until the 1960s.[59] The Helwan plant was constructed at a time of technological transition, and by 1960, when it went into full operation, it was already obsolete. In this sense, it is a blessing that it was planned with a relatively small capacity.

Aside from the government's heavy responsibility in the failure of the project, one may also question the role of the German firm Demag. On the face of it, as a participant in the investment, the firm may have miscalculated the costs of production and subsequently incurred heavy losses. For instance, it may have substantially overestimated the capacity of Egyptian labor and management in running the plant. But conditions of raw material supply, quality, and location, as well as the size and technology of the plant, should have been sufficient grounds for turning down the project. As for the firm's participation in the financing, it could have easily been recouped through the deliveries of plant and equipment. Even assuming that the firm did invest up to the maximum agreed (see above), its financial commitment amounted to only a small part of the value of plant and equipment supplied.[60] A moderate overpricing of its deliveries would have sufficed to recoup the capital invested—a possibility which has suggested to some that this may be yet another instance of questionable behavior on the part of foreign enterprises in the industrialization of developing countries.

The new steel complex currently under construction with Soviet assistance attempts to remedy the ills that afflicted the old plant. It will incorporate both oxygen converters and continuous casting, and will resort to the richer and closer ore deposits of the Western Desert. Its major operations will be computerized, and it will be built at an efficient scale of operations (1.5 million tons) based on exports to the Soviet Union, partly as repayment of loans, partly in exchange for steel types that cannot be produced in Egypt. It remains to be seen whether the new plant will prove more economical.[61]

THE AUTOMOBILE INDUSTRY

After World War II, Egypt could not resist setting up an automobile industry. In doing so it followed the example of other relatively industrialized developing countries without avoiding the problems that characterize the industry in such countries: diseconomies related to small-scale production and a high foreign exchange content.[62] Other consumer durables industries (refrigerators, air-conditioning units, TV sets, et cetera) set up in Egypt after World War II seem to suffer from the same problems as the automobile industry.

It is difficult to see why the automobile industry should be given a high priority in Egypt. The relatively dense railroad system, particularly convenient in a flat country, the large possibilities for water transportation, and the low per capita income should tend to relegate road transportation to a secondary level of priority. The allegedly egalitarian ideals of the régime speak strongly against sacrificing resources for the higher income brackets' luxury goods. Moreover, the continuous diminution in the share of exports in GNP until the end of the 1960s would hardly warrant large expenditures in convertible currencies to set up an automobile industry and keep it going. Finally, the rudimentary steel and engineering industries could not sustain a rapid process of import substitution in automobile components or secure a dissemination of knowledge and skills to lower stages of production. The backward linkages simply were not there.

Imports and Production of Automobiles.

While imports of private automobiles were licensed and restricted through high customs duties (66 percent) during most of the 1950s, trucks and buses were imported relatively freely, with only a 10 percent duty on chassis without bodies. A case can be made for the domestic assembly of trucks and buses because freight costs are much higher when they are imported assembled than when they are imported in parts. It was on this basis that the Ford Motor Company (the British subsidiary) set up an assembly plant for trucks in Alexandria. It was a small enterprise with a capital of £E500,000 and 200 workers, based on importation of all parts. Output did not exceed 1,000 units per year. The production of trucks was discontinued after the Suez War, when the company was Egyptianized, but its predominant activity—the construction of bodies for trucks and buses—continued, although the latter was discouraged because the Cairo municipality insisted that bus line concessionaires import complete buses.[63]

In 1959 a new attempt was made to develop an automobile industry that would gradually increase its use of domestic components; in this connection agreements were reached between Egyptian firms and Deutz (Germany) concerning production of trucks, and Fiat (Italy) and NSU (Germany), concerning production of passenger cars. Deutz and Fiat were to deliver all tools and parts. The agreement with NSU was limited to the supply of small engines and some parts for the production of a "popular" car—the Ramses—which represented a genuine attempt to develop an indigenous, labor-intensive technology for the production of a cheap, Jeep-like automobile with an engine hardly exceeding the horsepower of a motorcycle.

All three firms received preferential customs treatment, which reduced imports of other automobiles substantially. Customs duties on fully manufactured cars were raised to 70 percent, while duties on parts were lowered to 25 percent.[64] Likewise, duties on assembled chassis of trucks and buses were raised to 30 and 50 percent, respectively, while duties on components were set at 15 percent.[65] The production capacity of these firms was small: 24,000 Fiat cars and 3,700 trucks and buses a year; the capacity of the Ramses plant is not known to us, but it was a very small enterprise.

Table 9–10 shows the growth of automobile production together with the total value of automobile imports, including all parts. Typically, the importation of finished cars and trucks drops when domestic assembly takes place; if imports of parts and tools were not included, the real foreign exchange outlays on motor vehicle consumption would be disguised.

From 1953 to 1955, the annual demand for new passenger cars amounted to about 5,000 units, and for trucks and buses, to about 1,000 to 1,200 units. After the Suez War, imports of automobiles were restricted through both quotas and high customs duties (the former being the effective limitation), while imports of trucks and buses were allowed to grow. These measures reduced foreign expenditures for private automobiles and parts and stabilized them for all vehicles and parts at around £E 10 million (roughly 5 percent of total imports) between 1955 and 1961.

1960 saw the start of production of both the Ramses and the Deutz trucks, and in 1962 the first Fiat ("Nasr") automobiles were produced. In 1962, over 2,500 vehicles were assembled, and the total import value of finished parts and vehicles immediately doubled to about £E20 million. Part of the increase can be ascribed to the devaluation, and some of it may have been due to replenishment of stocks of materials and spare parts that were in short supply during the 1956–1960 period. A much larger amount of foreign exchange, however, was clearly allocated to the importation of private cars and parts, which can only be interpreted as a liberalization of the private automobile policy as compared with the years from 1956 to 1960. This tendency was further strengthened in 1963 and 1964, when total import expenditure on motor vehicles and parts rose to £E30 million and the industry

TABLE 9–10

Automobile Industry: Production and Imports, 1954–1971

	Production					Imports (mill. £E)		
	Passenger Cars			Trucks and Buses		Finished and Unassembled Vehicles and Components	of Which Finished	
	Output (units)		Capacity Utilization (%)	Output (units)	Capacity Utilization (%)		Passenger Cars	Trucks and Buses
Year	Ramses	Fiat (Nasr)						
1954	—	—	—	544[a]	n.a.	5.0	1.6	0.9
1955	—	—	—	n.a.	n.a.	11.5	3.3	1.8
1956	—	—	—	n.a.	n.a.	10.5	2.0	1.1
1957	—	—	—	454[a]	n.a.	5.9	1.0	0.6
1958	—	—	—	913[a]	n.a.	10.3	0.9	1.5
1959	—	—	—	n.a.	n.a.	13.2	1.4	2.3
1960	240	—	n.a.	867	23.4	10.7	1.4	1.9
1961	211	—	n.a.	1077	29.1	10.1	1.9	1.3
1962	144	863	4.1	1549	41.8	19.8	0.9	2.3
1963	209	3806	16.8	1927	52.1	30.4	3.4	1.8
1964	449	4527	20.7	1045	44.4	31.5	2.1	3.3
1965	264	4004	17.8	1345	36.6	22.4	2.3	4.0
1966	192	1615	7.5	916[b]	24.7	26.4	7.0	2.8
1967	—	108	0.4	712[c]	19.2	13.8	0.9	1.3
1968	—	758	3.1	1232	33.3	15.0	1.3	1.7
1969	—	2325	9.7	1340	36.2	18.3	2.3	3.2
1970	—	3590	14.9	1533	41.4	20.8	6.9	5.3
1971	—	5750	23.9	1833	49.5	31.7	11.1	8.2

SOURCES: Output and capacity utilization: Federation of Industries, *Yearbook*, and CAGMS, *The Production of the Automobile Industry*, various issues.

Imports: United Nations, *Yearbook of International Trade Statistics*, various issues; Federation of Industries, *Yearbook*, 1970 and 1971.

a. Assembly only in Ford Plant.
b. 1966–67.
c. 1967–68.

reached the peak of its operations. Yet, capacity utilization did not exceed one-fifth for passenger cars and one-half for trucks and buses. By then, however, the government seems to have realized the implications for foreign exchange expenditures of pushing the domestic car industry to full capacity. Full capacity utilization of the three factories would have entailed foreign exchange expenditures of at least £E60 million, amounting to one-fifth of the total value of imports. In 1965, the foreign exchange crisis forced a cutback in the operation of all the plants, and in 1966 the capacity utilization of the automobile and truck plants fell to 8 and 25 percent, respectively. The cutbacks were more severe for passenger cars than for trucks and buses: like a number of other industries producing consumer durables with high import contents, the automobile industry became a buffer where cuts in foreign exchange appropriations could be made without much consequence for other producing sectors; also, employees were not laid off despite the fall in production.

In the absence of information about the decisions that led to the establishment of the domestic car and truck industry, one may speculate on the causes for this total breakdown of planned performance. It does not seem likely that the government would ever have planned to allocate £E60 million in foreign exchange to these enterprises under the illusion of export possibilities. It appears that it envisioned a rapid process of import substitution whereby domestic components would be substituted for imported ones. Thus, the Deutz Company submitted a time schedule according to which 27 percent of the truck components would be of domestic origin by the fifth year and 44 percent, by the eighth year.[66] The Five-Year Plan visualized an increase in domestic production of means of transportation from £E14.3 million to £E41.4 million, with an increase in imports from £E14.3 million to only £E17.2 million.[67] As it turned out, the local components used in the early 1960s included only upholstery, side windows, paint, brake lining, clutches, batteries, and tires. Nor was there any realistic prospect that additional simple components such as radiators and mufflers could be manufactured domestically, simply because no plants were planned for this purpose.

In a sense, the Ramses car came closest to being a domestic product, because it partly used domestically produced metal sheets. But the crudeness of the result, the many technical difficulties surrounding it, its unconventional design, and the emergence of the more glamorous Fiat project (making cars with status value) resulted in a gradual neglect of the enterprise.

The scarcity of foreign exchange in 1966 and the war of June 1967 virtually stopped production of passenger cars, while the production of trucks fell to about one-third the peak reached in 1963. Finally, in 1968–69 it became clear to the government that the agreement with the Italian Fiat Company could not be continued, considering the very large convertible currency expenditures involved. While alternatives were studied, cars were delivered only to private persons who could finance the purchase through convertible currency deposited to the account of the Egyptian company in Beirut. The solution finally reached was to resume production on the basis of Fiat components manufactured in Poland and delivered under barter arrangements against Egyptian exports. To relieve the domestic demand pressure, the government liberalized imports of finished cars purchased abroad by residents who could manage to earn convertible currencies, albeit with an increase in the customs duty to 100 percent.

The Competitiveness of the Automobile Industry.

Revenue and cost data of the industry for 1963–64 are published elsewhere.[68] In calculating the effective rate of protection, we have had to take into account the fact that ex-factory prices of finished products were far below domestic market prices. At the official ex-factory prices, the ERP is relatively modest—82.7 percent. However, private cars could be obtained only after long waiting periods, through favoritism, or from the black market. In the latter case, the prices are known to have been roughly twice the official quotations; they were probably somewhat below what the cars would have fetched at open auction. Note that black market profits accrued to purchasers who had obtained the cars at the official prices, not to the factory. Trucks were delivered to nationalized transport companies and industry at factory prices, and it is not known what their open market prices might have been. On the rough assumption that market prices of passenger cars were twice their official quotations, and using the official truck prices, the ERP amounts to 283 percent (Table 9–11).[69] The ERP would probably be higher if market equilibrium prices could be assigned to both trucks and passenger cars.

Fortunately, the domestic market price is immaterial in an evaluation of the DRCs, which are also shown in Table 9–11. At a 10 percent rate of return, the DRC is estimated at 113 piasters per U.S. dollar, and at the 5 percent rate of return level, at 83 piasters. Considering that the factories were operating at only 21 and 44 percent capacity for cars and trucks, respectively, that year, it is surprising that the production was not more inefficient. Indeed, the DRC falls well below that found for the steel industry, and is also below that for paper production.

Here is a possible explanation. Unlike the steel and paper industries, where large amounts of raw materials have to be shipped, handled, and transformed into final products, there are no "raw" materials in the automobile industry. With the exception of the few domestic inputs already mentioned, all of the produced inputs are imported components that fulfill required specifications and simply have to be assembled. This circumstance virtually ex-

TABLE 9–11

Automobile Industry: Rates of Return, ERPs, and DRCs, 1963–64

(percent)	
Rate of return	
At actual, official domestic prices	3.4
At international prices	−0.9
ERP	
At official prices	64.0
At black market prices for passenger cars	283.0
(piasters per U.S. dollar)	
DRC	
5% rate of return	82.7
10% rate of return	113.1
15% rate of return	144.3
Official exchange rate	43.5

SOURCE: Hansen and Nashashibi, NBER Working Paper No. 48, New York, 1975, Table 29.

cludes raw materials waste (not even the metal sheets were tooled domestically) and does not allow for the breakdown of expensive equipment. To be sure, serious inefficiency in workmanship was reported at the welding stages—reflecting Egyptian labor's lack of experience with mechanical industries—and slowdowns in production were also encountered due to erratic (domestic) supplies of tires and batteries.[70] But domestic resource input, including labor, is low, and small defects in workmanship and domestic parts are not reflected in prices or costs but are borne by the consumer. Interestingly enough, developing countries with more advanced automobile industries than Egypt (in the sense of a higher *domestic* value added content) suffer from far greater inefficiency, mainly because their domestic supply of components often fails to meet required specifications.[71] Another reason for the relatively low degree of inefficiency in Egypt appears to be the low prices charged by the Italian Fiat Company for the unassembled cars. The 1,000 cc model was quoted ex-factory in Egypt at £E700, or U.S. $1,510 at the official rate of exchange, and while the import price of unassembled cars is not available to us, it seems to have been around £E600.[72] This seems to be a low price by international standards, and may be explained by the "bulk" nature of the agreement and by the fact that it concerned automobile components for models that were being discontinued in Italy.

There is no doubt that the conception and the development of the automobile industry, particularly the passenger car division, constituted a serious misallocation of resources. It is a good example of bad "planning"; supply linkages seem to have been completely left out of the picture, and foreign exchange requirements were grossly underestimated. But the initial misallocation did not cumulate because the regime was unwilling to devote further resources to save the industry—something which could have been done only at the expense of other, economically sounder projects. Ironically, the very underdeveloped state of the industry helped minimize the social losses through the almost total reliance on foreign-made components. Given the capital investment already sunk into the project, the resource cost of current operations does not exceed 50 piasters per U.S. dollar. Thus, it is probably worthwhile to pursue production until the existent fixed capital is worn out, as, indeed, appears likely.[73]

NOTES

1. Food and Agriculture Organization of the United Nations, *Fertilizer: An Annual Review of World Production, Consumption, and Trade,* 1962, Table 17.
2. Federation of Industries, *Yearbook,* Cairo, 1968, p. 98.
3. *The Chemicals Industries: Phosphate Fertilizer,* Central Agency for General Mobilization and Statistics, Cairo, 1968. See B. Hansen and K. Nashashibi, "Protection and Competitiveness in Egyptian Agriculture and Industry," NBER Working Paper No. 48, New York, 1975, Tables 23 and 25.
4. *The Reduction of Sulphur Needs in Fertilizer Manufacture,* United Nations, New York, 1969, pp. 4–6, 20. Also *Fertilizer Manual,* United Nations, New York, 1967, pp. 117–136. This technology was introduced in the 1960s in sulphuric acid production from both sulphur and pyrites. The decline in fuel consumption side by side with the increased volume of electricity generated in line with the expansion of phosphate output may be due to a change in technology. The capacity expansion which occurred between 1957 and 1964–65 seems to have embodied processes capable of recovering the heat produced from roasting pyrites or sulphur, thus providing some of the power needed by the plant. It has resulted in a substantial increase in productive efficiency and partly explains the steady decline in the "real" world prices of superphosphates that has been taking place over the last two decades.
5. See Hansen and Nashashibi, op. cit.
6. The difference between the two prices reflects transport costs to the consumption stations as well as storage charges.
7. Wholesale prices in the main producing centers of the world (France, Italy, United Kingdom) were declining between 1954 and 1962, rising till 1968, and declining again without any perceivable overall trend. (See FAO, *Production Yearbook,* various issues.)
8. See Hansen and Nashashibi, op. cit.

9. In 1937, at the initiative of the government, the English Electric Company submitted a proposal for the electrification of the dam for £E6.9 million. The project, which only needed the approval of Parliament, was shelved, probably because of the outbreak of the war. See National Bank of Egypt, *Report for February 1937*, p. 11, and *Report for April 1937*, p. 16.

10. Conversely, if the cost of electrification is integrated in the fertilizer plant investment and the electricity sold to other users is treated as a joint product, the DRC of producing fertilizers at the 10 percent of return level would hardly change. On the other hand, the DRC at the 15 percent rate of return would be higher. These estimates are based on the cost of electrification (£E27.5 million, however, it is not clear whether this also includes the cost of transmission lines to the Aswan and Kena governorates); the electricity consumption by the plant (1.4 billion kwh out of 1.9 billion kwh generated); and the conservative assumption that the electricity distributed to other users in the Aswan area would bear the same price as that charged to the fertilizer plant. We have also assumed that other material and factor inputs in the production of electricity are small. See *Industry after the Revolution and the Five-Year Plan*, Ministry of Industry, Cairo, July 1957, pp. 11–12.

11. Jute bags were used. These do not protect the fertilizers against humidity.

12. This latter fertilizer is not a perfect substitute for the former ones. It seems to lack the lime content beneficial to Egyptian soil.

13. Substitute projects are now being constructed in Alexandria and Talkah.

14. This situation implies a high rate of return on domestic sales and distortion of domestic fertilizer consumption. The situation becomes less extreme with an overvalued currency. Under such circumstances the shadow import and export prices may even exceed the domestic price.

15. This price increase was later reversed and the ban on imports of calcium nitrates lifted.

16. Had the data on the Suez facility been available to us separately from the overall returns, some of these cost developments would have appeared as early as 1964–65.

17. Factor derived for a particular plant with natural gas feedstock on U.S. Gulf Coast. See Picciotto and Sweeney, "Ammonium Manufacture from Petroleum Feedstock," *Studies in Petrochemicals*, United Nations Industrial Development Organization, New York, 1966–1967, Vol. II, p. 373.

18. For trends in fertilizer prices, see also FAO, *Production Yearbook*, various issues.

19. *Profile of Manufacturing Establishments*, United Nations Industrial Development Organization, New York, 1968, Vol. II, pp. 524–525.

20. See Hansen and Nashashibi, op. cit.

21. The construction was to be performed with the assistance of the American firm Mansfield. See Economic Development Organization, *2d Annual Report*, Cairo, 1958–1959, p. 166.

22. See Joseph S. Bain, "Economies of Scale, Concentration and the Conditions of Entry in Twenty Manufacturing Industries," *American Economic Review*, 1954, pp. 23–25; and U.S. Department of Commerce, *Census of Manufactures*, 1947 and 1958, Vol. II.

23. "Synthetic Rubbers," *Studies in Petrochemicals*, op. cit., Vol. II, p. 640. Rayon fibers are produced in Egypt but on the basis of imported woodpulp; a nylon plant producing cord suitable for tires is presently under construction.

24. Federation of Industries, *Yearbook*, 1955–1956, pp. 182–186.

25. Thus, in the period 1969–73, valid license holders were allowed to purchase one set of tires per year for private car use, and taxis were allocated two sets per year. Official prices for small tires (for Fiat cars) were £E11 per tire.

26. See Federation of Industries, *Yearbook*, 1963, pp. 225–226. See also United Nations, *Pulp and Paper Development in Africa and the Near East*, 1965, pp. 428–429.

27. Permanent Production Council, *Major Production Projects*, Cairo, July 1954, pp. 57–58.

28. The RAKTA plant was built by a West German group led by the Krupp firm for £E 4.3 million. As in the case of other industries established in this period, the Economic Development Organization subscribed to a large share of the capital, ranging from 25 to 41 per cent of paid up capital. See Economic Development Organization, op. cit., pp. 160–163.

29. "Estimation of managerial and technical personnel requirements," ibid., p. 83.

30. Federation of Industries, *Yearbook*, 1956–1957, p. 210.

31. *The Paper Industry*, CAGMS, Cairo, 1960.

32. Federation of Industries, *Yearbook*, 1960, p. 205.

33. Rates of return fell after 1962 to about 5–10 percent. See A. Moneim Ali Soliman, *The RAKTA Paper Industry*, Institute of National Planning, Cairo, 1964.

34. Federation of Industries, *Yearbook*, 1966, p. 306.

35. Federation of Industries, *Yearbook*, 1969, p. 142; and 1971, p. 110.

36. Production of kraft paper fell from 24,000 tons in 1966 to 3,400 tons in 1967, reflecting a temporary shutdown of the Suez plant. Production partially recovered in 1968 to 13,900 tons, but fell again in 1969 to 5,800. The plant was destroyed in 1970.

37. Federation of Industries, *Yearbook*, 1971, p. 109.

38. Prices for medium-grade paper reported to one of the authors by the Nasr Trading Organization. They are in line with the unit values in Table 9–5, which rose from an average of £E83 in 1959–1961 to £E113 in 1963. The increase reflects both the rise in domestic prices of imported paper due to the devaluation and a shift of imports to higher qualities of paper not produced at the RAKTA plant.

39. Hansen and Nashashibi, op. cit.

40. Ibid.

41. See FAO, *Commodity Review and Outlook*, 1971–1972, various issues.

42. *Semi-Annual Report on Prices of Manufactured Products*, CAGMS, Cairo, April 1971.

43. By 1962 per capita consumption had more than doubled, to 19 kg. In comparison, India and China consumed in 1963 roughly 16 kg. per capita, and Latin American countries consumed on average 43 kg. per capita. See United Nations, *World Trade in Steel and Steel Demand in Developing Countries*, Economic Commission for Europe, 1965, p. 88.

44. The Egyptian Copper Works (1948), the Delta Steel Mills (1948), and the National Metal Industries (1949). See Federation of Industries, *Yearbook*, 1951 and 1952.

45. In 1951 tariffs were waived, but only for imported machinery and spare parts.

46. Federation of Industries, *Yearbook*, 1951–1952, p. 88.

47. The Permanent Production Council, *The Iron and Steel Industry*, Cairo, July 1954, pp. 18–19 (in Arabic).

48. The original distribution of the capital invested was: Government—£E 1 million; Permanent Production Council—£E1 million; Demag—20 percent of equipment up to a limit of £E2 million; Bank Misr—½ million; Industrial Bank—¼ million; Misr Insurance Co.—¼ million; Misr Spinning and Weaving Company—¼ million. In

addition, these firms subscribed to increase the capital with roughly the same shares as their initial participation. Permanent Production Council, ibid., pp. 43–45.

49. Demag was represented by two members on the Board of Directors. In addition, it provided the services of about 250 German engineers and technicians in association with 300 Egyptian engineers. Sixty Egyptian foremen were sent to Germany for training before the plant opened. See F. Harbison and I. A. Ibrahim, *Human Resources for Egyptian Enterprises*, New York, 1958, pp. 63–64.

50. Permanent Production Council, op. cit., p. 22.

51. The exception is 1969, when 45,100 tons were exported.

52. We may have underestimated the transport margin; the c.i.f. applied here covers only shipping charges between Mediterranean ports.

53. Excess of domestic prices in 1963 over world export prices of merchant bars. *The Iron and Steel Industry*, United Nations, New York, 1969, p. 25.

54. The planned level of production largely exceeded actual output, particularly for light sections and metal sheets:

	Planned Output	Output	Sales
Heavy sections	76,000	68,339	59,633
Light sections	65,000	23,022	21,674
Plates	28,000	31,198	23,688
Sheets	90,000	10,004	9,331
Total	259,000	122,563	114,326

55. Coopers International, as quoted in F. A. El Bahaï, *The Economics of the Iron and Steel Industry: The Egyptian Iron and Steel Company*, Institute of National Planning, Cairo, 1967, pp. 62–64.

56. Breakdowns or deficient performances are also reported for the limestone cracker, the raw material conveyor, the ventilator facilities, and the cooling unit of the blast furnaces. Ibid., pp. 34–60.

57. An efficient blast furnace should produce a minimum of 1,800 tons per day, and an efficient integrated plant producing flat products, 1.5 million tons per year. See UNIDO, *Iron and Steel Industry*, 1969, p. 24.

58. Ibid., p. 25.

59. The first LD installations in developing countries were in Argentina, Brazil, and India, all in 1960–61. See United Nations Economic Commission for Europe, *Long-Term Trends and Problems of the European Steel Industry*, 1959, p. 96, and *Principal Factors Affecting Labor Productivity Trends in the Iron and Steel Industry*, 1954, p. 15.

60. The value of the plant and equipment in 1963–1964 was put at £E15 million. See F. A. El Bahaï, op. cit.

61. The project is expected to realize a profit of 5.8 percent on invested capital. It is not specified how this figure was arrived at, nor is the domestic price structure known on which it is based. But if the forecast proves accurate and domestic prices remain at their present levels, it will certainly imply losses at international prices. See Federation of Industries, *Yearbook*, 1972, p. 31.

62. See L. Johnson, "A Case Study in Import Substitution: The Automobile Industry in Chile," *Economic Development and Cultural Change*, January 1967.

63. Otherwise, they had to pay the municipality the difference between domestic and foreign cost. Federation of Industries, *Yearbook*, 1955–1956, p. 113. The rationale of this arrangement is not clear to the authors; it amounted in effect to a production tax levied by the Cairo Municipality.

64. Federation of Industries, *Yearbook*, 1959.

65. GATT document, L1816; and Federation of Industries, *Yearbook*, 1960.

66. Federation of Industries, *Yearbook*, 1959–1960, p. 104.

67. *General Frame of the Five-Year Plan, July 1960–June 1965*, Ministry of Planning, Cairo, 1960, pp. 63 and 76.

68. See Hansen and Nashashibi, op. cit., Table 29.

69. In the 1970–1973 period a small Fiat 124 could be obtained in the black market for £E 2,000.

70. CAGMS, *The Manufacturing of Automobiles and Their Components*, June 1965, pp. 49–51.

71. Johnson, op. cit.

72. The official retail price of the car in Egypt was £E795 up to 1965 and £E1,140 thereafter.

73. *Middle East Economic Digest*, London, March 23 and March 30, 1973.