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THE UTILIZATION OF PRODUCTION CAPACITY IN ARGENTINE INDUSTRY 1/

by

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1/ The views and opinions expressed in this paper are those of the consultant and do not necessarily reflect the views of the secretariat of UNIDO.

CONTENTS

I. INTRODUCTION

The external demand for agricultural products and the international movement of capital and labour constituted the dynamic factors in Argentine industrial development until the world crisis of [illegible]. Thereafter, industrialization based on the substitution of imports of consumer goods became the main factor in growth. Around the beginning of [illegible], the light branches of industry had exhausted the possibilities of import substitution. The growth [illegible] then depended upon the [illegible] the raw materials and capital goods [illegible] to expand the economy [illegible] expanding exports of agricultural products and the products of light industry and importing intermediate inputs and capital goods with the exchange thus earned, or [illegible] the domestic production of basic intermediate goods and capital goods. After a certain amount of vacillation, which partly explains the stagnation in industrial production in [illegible], the alternative of expanding heavy industry was chosen.1/

The stage of industrialization based on the substitution of imports of basic intermediate goods and capital goods has been characterized by the formation of oligopolistic enterprises, with substantial participation by foreign capital, producing goods at higher costs than in the developed countries.2/

Bearing in mind these phases of industrialization and the present characteristics of the industrial structure, we are [illegible] to see at what rate Argentina will be able to grow if the present policy of producing mainly industrial goods for the domestic market and agricultural products for the external market is continued.

1/ Throughout this [illegible] we have used the expressions "light industry" and "heavy industry". [illegible] consumer goods [illegible] durable goods [illegible] light industries [illegible] capital [illegible]

2/ See the [illegible] the stage [illegible] J. Katz, [illegible] Manufacturing [illegible] International [illegible]

In the study by Jorge Sabato,[1] the conclusion is reached that, if this policy of economic development is maintained, it will be impossible for the overall growth rate to exceed 4 per cent annually owing to restrictions in the external sector. This result is obtained on the basis of the following growth hypotheses: (i) the total percentage of imports in relation to Gross National Product remains constant; (ii) agricultural exports increase by 4 per cent annually. This means raising the present level of exports from 1,900 million dollars to 2,250 million dollars in 1980.

The development strategy reflected in the projections is similar to that followed towards the end of the 1950's. The policy of substituting imports of basic intermediate goods and capital goods is emphasized and agricultural exports are neglected. The result of this approach is stagnation.

Thus, instead of a 4 per cent annual growth rate, Argentina tries to attain a higher growth rate which, maintaining the earlier policy, the trade deficit will be increased by 1,000 million dollars a year by 1980 and will continue to increase thereafter. These deficits, which are not considered in the projections, would have to be financed in that manner.

Consequently, industrial development based on the production of manufactures destined for the domestic market will end in stagnation. Not only will living standards be lowered as a result of the high costs involved in producing for a small market like the Argentine domestic market, but also domestic demand will be insufficient, in the end, to stimulate accelerated industrial development. In the elaboration of the future strategy for the industrialization of Argentina, therefore, special attention must be given to the need to "open up" the economy and encourage exports of manufactures.

Starting out from this basic frame of reference provided by the various approaches to industrialization which have been followed in Argentina and the need to promote new future strategy within the context of industrial exports, the present paper will attempt to analyse the degree of under-utilization of production capacity

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[1] United Nations, ECLA, El sector externo y el proceso de industrialización argentina, mimeo.

in industry, and ascertain how far such under-utilisation is the result of special features which have characterised the most recent phase of industrialisation and whether its elimination can be achieved by producing exclusively for the domestic market, or whether it is necessary to stimulate exports of manufactures. We shall therefore begin by considering the degree of under-utilization of capacity in each sector of industry. We shall then go on to an analysis of its causes and of the possibilities of ensuring a greater utilization of productive resources.

II. EXCESS CAPACITY AND CYCLICAL VARIATIONS IN THE LEVEL OF ECONOMIC ACTIVITY

In analysing the causes of excess capacity, we may group them in two major categories. The first category comprises effects of cyclical variations in aggregate demand on the degree of utilization of productive resources, and the second category comprises causes which might be described as structural since they are due to factors requiring a more long-term solution, such as limitations in the supply of certain intermediate inputs which hinder the full utilization of resources in the industry requiring these inputs, and the indivisibility of the investments, a factor which, in some branches of industry, leads to capacities exceeding the existing level of demand.

The intention in this paper is to pay special attention to the structural causes which impede the full utilization of industrial capacity. In view of the fact that much of the statistical information available on production capacity begins with 1960, the basic problem in such a study is to find a way of separating one cause from another empirically, considering that since the above date economic activity has been characterized by continual cyclical upward and downward movements in its level. One possible approach to the problem would be to analyse the degree of utilization of capacity in the years regarded as peak years - that is to say, in the years in which it is assumed that the economy came closest to the point of full employment. In these years, excess capacity in industrial activities can largely be imputed to structural causes. Accordingly, we shall confine ourselves in this

section to studying the degree of under-utilization of productive resources for the economy as a whole resulting from the insufficiency of total demand, in order firstly to provide a frame of reference for the same analysis applied to the industrial sector and, secondly, to determine the years closest to full employment in order to allow an assessment of structural excess capacity in those years.

The Argentine economy has shown continual cyclical fluctuations during the last four years: in 1959, the Gross National Product per head of population fell by 7.1 per cent; in 1960-1961 it increased by 11.5 per cent; in 1962-1963 it fell by 3.4 per cent; in 1964-1965 it increased by 11.4 per cent; in 1966-1967 it fell by 1.4 per cent.

The degree of under-utilization of capacity for the economy as a whole is given by the relationship between the production which the country could have achieved if its resources had been fully utilized and the production actually attained. In order to calculate the potential gross product, two methods of estimation have been used; their results can be regarded only as an approximation.

1. Exponential adjustment for peak years: For this exponential adjustment, the annual series of the gross product was taken at 1960 prices for the period 1935-1967.1/ The years chosen as peak years were those preceding a fall in the gross product, whenever the new peak was higher than the preceding peak. In general, the years selected coincided with our prior expectations based on various economic sources.2/

The exponential function obtained by adjusting the values of the gross national product (GNP) at 1960 prices and factor cost is as follows:

$$GNP = 402.400\ (1.022)^{t}\ ; \quad r^2 = 0.9[illegible]$$

Once the required equation was obtained, the analysis was limited to the period 1950-1967, since the peaks prior to 1950, particularly 1948, were influenced by the particular conditions which prevailed during the Second World War and the immediate post-war period.

1/ Source of information for 1935-1965: Origen del producto y composición del gasto nacional, Central Bank of the Argentine Republic, Supplement to the Boletín Estadístico No. 6, June 1966. For the years 1966-1967 the Quarterly Report of the Ministry of National Economic Affairs, second quarter of 1968, was used.

2/ The years selected were 1937, 1942, 1944, 1948, 1951, 1958 and 1961.

Since, during the period 1950-1967, the year 1950 came out higher than the adjusted exponential equation, the function was moved upwards in order to cover 1950. Consequently, the calculation of the potential gross product involves the assumption that, during the year 1950-1967, the only year of full employment was 1950.

B. Linear adjustment between peak years: This consisted of taking 1950 as the base year and adjusting the period 1950-67 linearly. The method of adjustment consisted in relating the peaks of time, in which full capacity was assumed.[1]

A straight line between peaks indicates the potential gross product for this period. In the years following the peak the straight line is maintained at the same gradient until the production of a given year intersects the line. In this event, a new straight line is drawn joining the last peak to the new peak, represented by the most recent level of production.[2] For the period 1950-67 the peak years selected were 1950 and 1957.

Table 1 summarizes the results obtained by both methods. The coefficient of rank correlation between the two methods of estimation (r = 0.92), which indicates that the annual ranking of the degree of utilization of capacity by either of the methods is very similar. In Table 1, we can see that the average capacity is greater during the 1960's than in the earlier period, corresponding with more continuous and marked cyclical variations in the levels of economic activity. As the majority of the statistics on which the analysis of excess capacity in particular industries is based relate to the years beginning in 1963, it is clear that an analysis of the structural causes of excess industrial capacity must be concentrated on the years 1961 and 1965, which came closest to full employment.

1/ K. Krishnamurty, Industrial utilization of capacity, Proceedings of the Business and Economic Statistics Section, American Statistical Association, 1961.

2/ For a critical analysis of this method see Almarin Phillips, An appraisal of measures of capacity, American Economic Review, Vol. LIII, No. 2, May 1963, pp. 275-292.

Table 1

INDICATORS OF THE DEGREE OF UTILIZATION OF POTENTIAL CAPACITY FOR THE ECONOMY AS A WHOLE, 1950-1967

(in percentages)

Year	Exponential adjustment method	Linear adjustment method
1950	97.1	100.0
1951	95.0	99.8
1952	90.4	90.5
1953	92.0	92.6
1954	93.5	93.9
1955	97.1	97.4
1956	96.4	96.4
1957	98.2	98.2
1958	100.0	100.0
1959	92.4	92.6
1960	95.3	95.6
1961	97.1	98.5
1962	90.1	91.1
1963	85.2	86.5
1964	89.6	[illegible]
1965	93.6	96.1
1966	90.9	94.0
1967	89.6	93.3

III. INDICATORS OF THE DEGREE OF UTILIZATION OF CAPACITY IN THE INDUSTRIAL SECTOR

The statistical information on the utilization of capacity in industrial enterprises is scanty and imprecise, and suffers from grave shortcomings in the definition of the variables and in the measurement techniques used. Consequently, even in the few cases where information exists, we must use it with extreme care and its interpretation cannot be more than a frame of reference and an indication of trends regarding the magnitude of excess capacity in industry.

The measurement of production capacity in each sector of industry can be approached in two different ways. In the first case we utilize the results of surveys in which industrial enterprises are asked for information regarding the maximum output attainable if equipment and machinery are used under normal conditions. In the second, we use annual statistical series which enable information on production capacity to be obtained through the estimation of potential output.1/

A. Estimates based on surveys

The tasks of the Oficina de Coordinación y Planificación (CORDIPLAN) included, until recently, that of drawing up annual forecasts in order to collate them with the targets of the longer-term plan. These annual forecasts were based on econometric estimates and direct estimates through enquiries with enterprises of certain strategic economic variables. For this purpose, CORDIPLAN conducted a survey in August-September 1964 on "Output and investment expectations of industrial enterprises"; these surveys were subsequently repeated twice yearly, the first in April-May and the second in September-October, during 1965 and 1966.2/

1/ See the [illegible] study [illegible], op. cit., which [illegible] and criticizes [illegible] different [illegible] the United States. [illegible] Statistics [illegible]

2/ See [illegible] enterprises [illegible]. In 1967, [illegible] surveys [illegible] have not been published.

The object of these surveys was to obtain information on the plans of the enterprises regarding: output; total investments and investments broken down by origin (domestic or foreign); level of utilization of installed production capacity; the actual level of and variations in installed capacity; building up of stocks; labour force; main obstacles, in the view of the enterprises, to the expansion of production. The survey covers private undertakings with their registered offices in the Greater Buenos Aires, and consequently includes enterprises whose production takes place in the interior of Argentina but which have head offices in the metropolitan area of Buenos Aires.[1] The number of enterprises interviewed increased from 150 in the first survey, in 1964, to 192 in the 1966 survey. The surveys covered enterprises described as "large".[2] In cases where an enterprise included several completely distinct lines of production, each line was treated as an independent "establishment". On the basis of the survey conducted in April-May 1966, it was estimated that the enterprises represent, on the average, about 50 per cent of total manufacturing output for 1965. In each industrial branch, the degree of representativeness in the surveys carried out up to 1964 was as follows:[3]

1/ This is the case with industries processing agricultural products, such as those concerned with wine, sugar, cotton ginning, etc.

2/ In some years partial surveys were conducted with the aim of including medium-sized enterprises, but the results have not been published in the same detail as the surveys of large enterprises.

3/ CONADE, Cuarta encuesta sobre [illegible] producción e inversión de las empresas industriales, September 1966.

Industrial branch	Percentage of production covered
Food and beverages	31.0
Tobacco	90.9
Textiles	34.7
Ready-made clothing	20.1
Wood	9.1
Paper and cardboard	74.8
Printing and publishing	22.8
Chemical products	57.4
Petroleum products	26.1
Rubber	58.0
Leather	23.3
Stones, glass, ceramics	54.9
Metals, excluding machinery	46.9
Vehicles and machinery, other than electric	47.3
Electrical machinery and apparatus	31.8
Total manufacturing industry	39.8

In the survey, the degree of utilization of installed capacity is defined as the relationship between actual output and maximum output. "Actual output" is taken to mean the output achieved during the year with the equipment available, and "maximum output" to mean the output that could have been obtained during the year if the equipment available during that period had been working at full capacity. The enterprise itself determined what was to be understood by producing "at full capacity".

Actual and maximum production figures for each branch were obtained by weighting the results of the survey on the basis of the enterprise's share in the value of output of the branch concerned. In moving from the level of the branch to manufacturing industry as a whole, each branch was weighted on the basis of its value added.

B. Estimates based on linear adjustments

For estimates of excess production capacity in manufacturing as a whole and in each industrial sector, the same procedure was followed as for the economy as a whole, based on the "Wharton School" index. The period 1948-1965 was taken and, in each sector of production, the peak values, where capacity was regarded as fully utilized, were selected. A straight line drawn between the peaks indicates potential capacity between the peaks. For the years following the peaks, the straight line is continued with the same gradient until the output for a given year intersects the line. In this case, a new straight line is drawn joining the last peak to the new peak, represented by the most recent output level.

The degree of utilization of production capacity was defined as the relationship between recorded and potential production. To calculate the latter value, the Gross National Product series was utilized, at 1960 prices and factor cost for each industrial sector.1/

C. Results obtained

Table 2 shows the degree of utilization of capacity according to the results obtained through the surveys conducted by CONADE. Table 3 shows the results obtained by means of the linear adjustment of historical Gross National Product series in each manufacturing sector.

Both methods of estimation suffer from a number of limitations which are more evident in the case of numerical values. We have therefore sought to ascertain whether the annual ranking of production sectors is similar in the two methods of estimation, on the basis of the rank correlation coefficient for the years in which the necessary information was available for both measurement techniques. In 1963 and 1964, excluding the leather industry, which represents an extreme case under both methods, the rank correlation coefficient is 0.54 and 0.43 respectively. In 1965, ignoring leather and vehicles and non-electrical machinery, the coefficient is 0.54.

1/ Central Bank of the Argentine Republic, Orígen del producto y composición del gasto nacional, Supplement to the Boletín Estadístico No. 6, June 1966, pp. 26-27.

Table 2, in which the influence of large industrial undertakings is felt, shows the appreciable margin of excess capacity with which industry operated in the period 1963-1965. As Argentina recovered from the sharp recession of 1962-1963, the degree of utilization of capacity was increased, rising from 56.3 per cent in 1963 to 70 per cent in 1965. It is clear that even in 1965, regarded in our preliminary analysis as one of the years closest to full employment, appreciable under-utilization margins remain. Of a total of fifteen production sectors, seven have a degree of utilization of capacity above the average for industry as a whole. Conspicuous in this regard, in 1965, were the industries utilizing petroleum derivatives (91.8 per cent) and rubber (83.6 per cent). On the other hand, the food and beverages, ready-made clothing and machinery and vehicles industries operate with excess capacity margins of over 35 per cent.

Table 2

ESTIMATES BY THE SURVEY METHOD OF THE DEGREE OF UTILIZATION OF CAPACITY IN MANUFACTURING 1963-1965

in percentages

Production sectors	1963	1964	1965
Food and beverages	60.2	61.2	61.5
Tobacco	83.5	88.5	77.5
Textiles	68.1	70.1	77.6
Ready-made clothing	50.6	57.3	60.6
Wood	53.8	58.7	67.3
Paper and cardboard	64.6	71.5	74.5
Printing and publishing	57.6	64.6	66.6
Chemical products	56.8	64.3	69.7
Petroleum products	63.7	87.2	91.8
Rubber	54.6	66.9	83.6
Leather	73.6	79.8	79.6
Stones, glass and ceramics	54.7	59.7	69.1
Metals	49.3	66.6	74.2
Vehicles and mach. other than elec.	41.2	50.1	61.7
Electrical mach. and app.	45.4	52.5	63.9
All industry	56.3	64.6	70.0

Source: CONADE, Encuestas de expectativas de producción e inversión industrial.

Table 1

ESTIMATES BY LINEAR ADJUSTMENT OF THE DEGREE OF UTILIZATION OF CAPACITY IN MANUFACTURING, 1950-1965

in percentages

Production sectors	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Food and beverages	82.3	76.8	76.3	[illegible]	75.8	84.7	91.7	91.3	100.0	[illegible]
Tobacco	95.0	84.5	90.2	90.3	86.8	91.3	91.2	91.8	100.0	91.6
Textiles	93.4	94.1	92.1	87.2	89.[illegible]	94.5	100.0	94.5	97.8	[illegible]
Ready-made clothing	76.2	75.9	70.1	73.2	72.2	77.1	79.4	80.2	79.5	[illegible]
Wood	86.8	83.7	83.3	95.5	100.0	94.4	100.0	99.3	91.3	98.[illegible]
Paper and cardboard	100.0	95.9	90.6	66.4	77.6	100.0	98.4	95.4	100.0	81.[illegible]
Printing and publishing	91.2	100.0	56.8	54.8	61.5	57.3	61.4	81.6	100.0	[illegible]
Chemical products	89.1	89.4	86.4	88.4	92.3	100.0	91.7	98.4	100.0	[illegible]
Petroleum products	100.0	96.6	91.2	89.6	94.7	84.7	96.2	97.[illegible]	100.0	[illegible]
Rubber	74.1	92.1	91.8	83.6	84.7	100.0	93.9	89.[illegible]	95.5	[illegible]
Leather	83.5	98.3	[illegible]	100.0	93.1	[illegible]	94.[illegible]	[illegible]	100.0	[illegible]
Stones, glass and ceramics	98.3	100.0	91.8	95.7	100.0	94.2	96.6	98.1	100.0	96.4
Metals, excl. mach.	98.8	100.0	77.0	74.3	90.3	100.0	89.7	93.5	100.0	[illegible]
Vehicles and mach. excl. elec.	40.6	39.0	38.3	37.7	40.1	46.4	50.1	54.8	61.3	56.4
Electrical mach. and app.	88.5	85.1	92.3	88.4	92.2	100.0	72.0	88.6	91.3	87.4
All industry	84.0	83.2	79.0	77.0	80.0	86.6	88.6	93.3	100.0	88.9

Table 3

ESTIMATES BY LINEAR ADJUSTMENT OF THE DEGREE OF UTILIZATION OF CAPACITY IN MANUFACTURING, 1950-1965 (continued)

in percentages

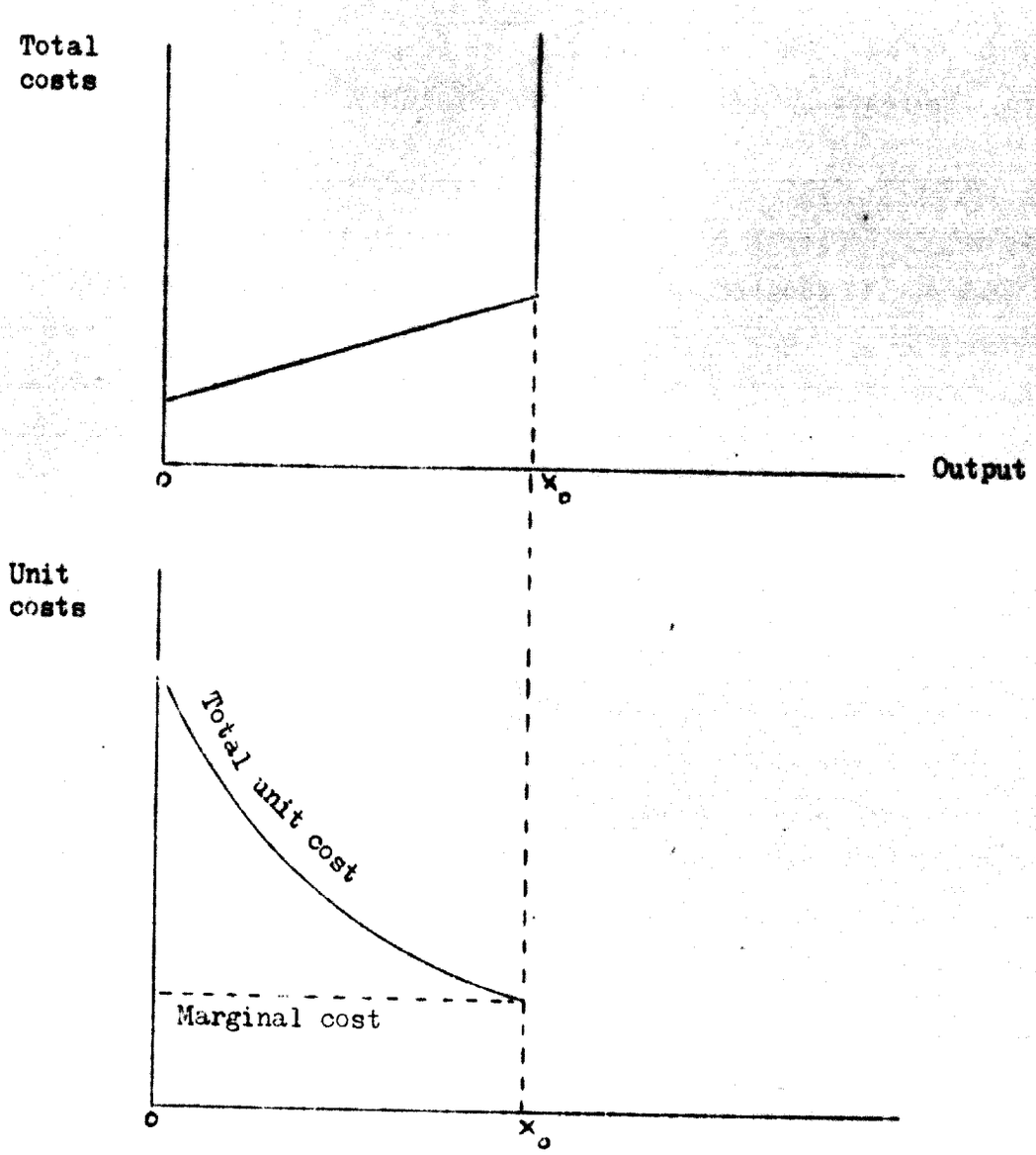
Branch sectors	1960	1961	1962	1963	1964	1965
[illegible] average	87.2	91.2	97.2	99.4	93.0	97.8
	85.1	93.1	95.0	91.6	98.5	98.7
	82.4	94.0	76.1	70.8	88.0	99.9
[illegible] clothing	76.7	78.5	66.7	61.3	74.1	81.6
	70.3	77.5	69.4	59.3	68.2	73.4
[illegible] cardboard	63.2	75.0	69.0	63.0	70.3	76.2
[illegible] and publishing	87.0	97.5	82.4	79.2	79.8	88.7
[illegible] products	93.2	90.8	81.1	79.4	93.3	100.0
[illegible] products	89.1	91.5	100.0	93.7	93.3	100.0
	83.6	100.0	89.7	64.9	78.5	89.7
	54.2	67.2	52.2	49.5	53.6	53.3
[illegible] and ceramics	82.5	92.5	87.0	73.9	79.5	88.6
[illegible], nec.	79.8	83.0	71.8	68.7	89.7	94.4
[illegible] mach. excl. elec.	84.8	100.0	91.1	73.4	92.0	100.0
[illegible] and app.	96.1	100.0	75.7	57.3	64.7	70.8
[illegible]	94.2	100.0	91.6	83.9	93.0	100.0

IV. ANALYSIS OF THE CAUSES OF EXCESS INDUSTRIAL CAPACITY

Before attempting to analyse the causes of under-utilization of capacity, we feel that it would be useful to examine the concept of "capacity". There are two approaches that can be adopted in defining this concept: the "engineering" approach and the "economic" approach. The former bases full capacity on the maximum output which can be achieved with the equipment and plant working under normal conditions. This interpretation of full capacity ignores the relationship between production and cost level. The economic approach defines full capacity as the output which is associated with the minimum point on the short-term unit total cost curve.1/

The statistical data, particularly those derived from surveys, reflect the engineering approach, or the concept of maximum output attainable with the plant and equipment working under normal conditions. This approach is compatible with the economic approach based on the minimum point on the unit total cost curve is a straight line with a positive intersection on the axis of the ordinates (equal to the fixed costs). This hypothesis has been utilized in determining cost functions for the tractor industry, which will be analysed later. Thus in this particular case the unit total cost curves and the marginal cost curve will have the following form in the short term:

1/ L. R. Klein "Some theoretical issues in the measurement of capacity", Econométrica, vol. 28, (2), April 1960.



The maximum output possible with existing plant is X_o, and, in view of the particular shape assumed for the total cost curve, the output level X_o coincides with the lowest point on the unit total cost curve. Consequently, under the two definitions of full capacity, outputs below OX_o will lead to under-utilization of the optimum capacity.

Excess capacity may be due to the inadequacy of aggregate demand, relative changes in demand, prices and costs, alterations in the make-up of an enterprise's output, technological changes, etc. This paper, in view of the absence of adequate

statistical information, concentrates on analysing some of those causes. We will devote special attention to excess capacity resulting from the relationship between the indivisibility of capital investments and the size of the domestic market, and also that arising from restrictions on the supply of inputs.[1/]

A. Indivisibility of investments, size of the domestic market and excess capacity

The process of industrialization since the 1929 world crisis has been determined largely by the need to replace imports, owing to the limitations on potential capacity for industrial growth imposed by stagnation in exports. In this import substitution phase we can distinguish two sub-periods. The first of these coincides essentially with the 1940's, and substitution took place mainly in relation to consumer goods. The second sub-period, when domestic production of basic intermediate goods and capital goods was stressed, begins around the middle of 1950.

Table 4 gives a picture of the contribution of each sector of industry to the process of import substitution.[2/] While light industries contributed 60 per cent up to 1950, heavy industry contributed 15 per cent. During the following period the roles are reversed as far as the contribution of these industries to total import substitution is concerned. Light industry contributes 40 per cent while industries producing basic intermediate goods and capital goods contribute 85 per cent. In the first sub-period, the textile industry stands out, in that it alone contributes 40 per cent to the process of import substitution, while the metallurgical industry,

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1/ In relation to long-term competitive equilibrium, any long-term solution based on oligopolies also leads to excess capacity. In view of the statistical difficulties involved in the empirical quantification of this situation, it could not be analysed. For a more detailed study of the causes of excess capacity, see UNIDO, "Industrial excess capacity and its utilization for export", 31 October 1967, mimeographed.

2/ Net import substitution has been defined as follows: $(m'_1 - m'_2)(m_2 + f_2)$, where the sub-indices 1 and 2 represent different time periods, m' the imported components in the total supply of goods (domestically produced and imported), m the value of imports and f the value of domestic production by industrial branch. See Carlos Díaz Alejandro, op. cit., pp. 44-46.

vehicles and machinery constitute the dynamic factor in the second sub-period, contributing 70 per cent to the process. In view of the indivisibility of investments characterizing heavy industry, and the fact that a possibly excessive number of firms in relation to the domestic market have been set up, the process of replacing imports of capital goods and certain basic intermediate goods has given rise to structural excess capacity in those industries. This is the case with the tractor industry, which will be analysed in detail below and in which, even with the projected 1975 demand, there will be excess capacity in relation to the potential number of tractors which could be produced with the plant installed.

Another example is the automotive industry. According to the information provided by five enterprises representing 70 per cent of total production, the degree of utilization of capacity in the year when production was highest (1965) was 62.3 per cent.[1/] (Table 5). Moreover, the two enterprises which work three shifts are capable of meeting the whole of domestic demand for motor vehicles, with a certain margin.[2/] To be specific, the maximum capacity of the two enterprises working three shifts was 150,100 units of passenger cars and lorries, while total demand in 1965 (peak year in the output of the automotive industry) was 135,200 units. Yet thirteen enterprises were actually operating in 1965, four of them accounting for 73 per cent of total production.

Another industry in which the situation is similar is the petrochemical industry. Table 6 shows, firstly, that the rate of utilization of capacity is low and, secondly, that the plants operating in Argentina have capacities below those normal in industrialized countries. A significant case is the production of ethylene. Three enterprise manufacture this product. Leaving on one side PASA, which was still in the process of being installed in 1964, the two other plants had a combined capacity of 23,000 tonnes annually, representing together 36.2 per cent

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1/ Jack Baranson, "Automotive industries in developing economies", International Bank for Reconstruction and Development, 1967, mimeographed.

2/ Not all automotive enterprises in Argentina are equipped to work three shifts.

Table 4

RATE OF IMPORT SUBSTITUTION IN MANUFACTURING BRANCHES EXPRESSED AS PERCENTAGES OF THE TOTAL IMPORTS REPLACED BY MANUFACTURING INDUSTRY

	1937-1939 1948-1950 (a)	1948-1950 1959-1961 (a)	Returns with scale of production
Industries producing consumer goods mainly	60.9	15.1	
Food and beverages	3.6	0.9	1.50
Tobacco	1.2	0.9	-
Textiles	40.4	9.9	-
Ready-made clothing	-0.1	1.5	0.81
Wood products	6.1	1.5	0.82
Printing and publishing	0.3	-0.1	0.77
Leather products	0.9	0.0	-
Other manufactures	2.6	0.5	-
Industries producing intermediate and capital goods mainly	40.0	84.9	
Paper and cardboard	3.1	3.0	1.12
Chemicals	13.7	2.3	1.18
Petroleum refining	-2.2	8.2	-
Rubber	0.2	-1.7	-
Stones, glass and ceramics	2.8	2.8	1.25
Metals	10.2	18.7	1.60
Vehicles and machinery	9.4	31.8	-
Electrical machinery and appliances	2.9	19.8	1.45

(a) Source: Carlos Díaz Alejandro, op. cit., p. 47.

(b) Source: Jorge Katz, op. cit., p. 77.

Table 5

AUTOMOTIVE INDUSTRY: UTILIZATION OF CAPACITY, 1965

Firm	Capacity	Annual output (passenger cars and carries)	Percentage utilisation
A	3 shifts - 92,800	56,600	61.0
B	1 shift - 40,300	30,400	75.4
C	2 shifts - 7,200	3,100	43.1
D	3 shifts - 57,600	28,900	50.2
E	1 shift - 19,000	16,200	85.3
Total	216,900	135,200	62.3

Source: Jack Baranson, "Automotive industries in developing countries", International Bank for Reconstruction and Development, 1967, mimeographed.

Table 6

PETROCHEMICAL INDUSTRY, INSTALLED CAPACITY FOR CERTAIN PRODUCTS, 1964

Product by enterprise	Installed capacity, 1965 (tonnes/year)	Optimum capacity per plant[1/] (tonnes/year)	Output 1964
Ethylene	33,500	61,500	11,700
Ipako S.A.	11,000		
Duperial S.A.	15,000		
PASA	7,500		
Methanol	26,500	40,000	6,000
Atanor	10,000		
Cía. Casco S.A.	16,500		
Lampblack	11,000	25,000	11,300
Cabot Argentina	11,000		

1/ The reference is to a plant [illegible] adequate capacity for economic production, comparable with the [illegible] of plants existing in industrial countries such as the United States and [illegible] United Nations, La industria química en América Latina, [illegible].

Source: United Nations, [illegible] La industria petroquímica en América Latina, E/CN.12/744, [illegible] Estructura [illegible] industriales en ALALC, working paper [illegible].

of what is normal capacity in advanced countries. Even in these small plants, only 45 per cent of capacity was utilized in 1964. It seems reasonable in principle to have several independent plants competing with each other, but it is clear that production costs would be closer to those in the United States and Europe if instead of three very small plants a single plant had been set up to supply the domestic market.

Thus the industrialization phase which began at the end of 1950, based on the development of heavy industry, was associated with greater technological progress, greater industrial concentration and a greater inflow of foreign capital than in the period of development of light industry.[1/] The examples given earlier lead to the conclusion that, although the development of heavy industry brought about an intensification of the oligopolistic market structure in that it was based on a small number of enterprises, even this number is excessive in view of the size of the existing domestic market. The latter fact is closely linked itself with the circumstance that the industries which were set up, being associated with foreign firms, confined themselves to adopting production methods developed for the economies of countries with larger markets than Argentina and differently endowed with factors of production. Excess capacity in heavy industry thus results not only from greater indivisibility of investments in comparison with light industry but also from what seems to be an excessive number of plants in relation to the domestic market. For several of the branches included in the heavy industry group, the domestic market is undoubtedly capable of absorbing only one plant or enterprise. However, the desire to avoid the creation of a monopolistic markets has given rise to an oligopolistic structure with a degree of excess capacity, and consequently higher production costs. We must state that we are not considering here the limitations of monopolistic enterprise from the point of view both of industrial efficiency and of income distribution. We feel that it would be highly desirable to carry out studies on the advantages and disadvantages of greater industrial concentration, appropriate mechanisms for encouraging a monopolistic enterprise to be efficient and competitive, and the participation and role of government in a monopolistic structure.

1/ Jorge Katz, op. cit.

One way of reducing excess capacity in heavy industry would be to eliminate plants with lower capacities so that those remaining can operate at full capacity producing for the domestic market. Another possibility would be for each of the plants to expand its market with the help of exports. The difficulty of the latter approach lies in the impossibility of competing on the international market when operating with plants of much smaller size than those normally existing in developed countries, unless the exports are subsidized. A third possibility emerges from Table 4, which shows that the majority of "heavy industries" show increasing returns as scale of production increases whereas light industries show constant or diminishing returns.1/

Thus, for industries showing increasing returns with scale, the possibility of concentrating production in one or very few plants, while also expanding capacity in order to take advantage of the economies of scale characterizing these industries, would reduce production costs and bring them closer to international costs, which would in turn increase the possibilities of exporting the products of these industries, particularly if it can be done in the context of a regional market in Latin America. Naturally this approach cannot be applied to the whole of heavy industry simultaneously, since it would be necessary to see in which particular light or heavy industries Argentina has sufficient relative advantages to compete internationally. Unfortunately, the statistics available do not allow us to be more specific on this point. We think it essential for Argentina that research should be undertaken in this direction in order to decide the role of heavy industry in future phases of industrialization.

4. The case of the tractor industry

A more detailed analysis of the excess capacity associated with the development of heavy industry and possibilities for reducing such excess capacity can be made in the case of the tractor industry, as a result of the excellent material provided in

1/ The high increasing returns in food and beverages are essentially due to the influence of the refrigerating industry.

the study by Dagnino Pastore.[1] The tractor industry developed very rapidly in Argentina after 1959.[2] Whereas Argentina imported 20,406 units of tractors in 1956-1959, the figure fell to 2,916 units in 1959-1964 while domestic production rose to 83,785 tractors. The total number of tractors in use in Argentina rose from 49,759 in 1952 to 104,184 in 1960. The tractor industry can therefore be regarded as representative of those which arose during the second sub-period of import substitution - that is to say, capital-intensive industries composed of affiliates of firms registered abroad, using imported technological processes which require plants with large production capacities, whose increasing returns with scale the domestic market does not generally allow to be fully utilized.

This industry comprises five undertakings, all of them affiliates of foreign firms. Table 7 provides data on four undertakings which accounted for 88 per cent of the output of tractors in 1963.

As indicated in Table 7, the output of the parent firms was eight times the output of the Argentine affiliates. The Argentine enterprises, moreover, utilized only part of their production capacity.[3] The lower utilization of capacity in 1963 is partly due to the fact that the economy was in a cyclical recession phase.

In the study by Dagnino Pastore mentioned above, unit total costs are calculated for each of the enterprises. For this purpose, tractors of different horsepower and models were reduced to a standard 50 HP and then the unit total cost curve for the whole of industry was obtained, combining the unit costs of each enterprise when they are working at 100 per cent capacity. This unit cost curve for the industry can be

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1/ José M. Dagnino Pastore, La industria del tractor en la Argentina, Centro de Investigaciones Económicas, ITDT, internal study No. 21, 3 volumes, June 1966.

2/ In the period 1955-1958, the tractor industry confined itself to assembling imported parts in Argentina.

3/ In this analysis of the tractor industry, production capacity was defined as the maximum output that it is possible to obtain with the plant working under normal conditions. The figures were obtained from the survey covering each of the enterprises.

The number of shifts worked varied in different enterprises. One of them reported working one shift, another two shifts and the remainder three shifts.

visualized more or less as a long-term curve joining the points of greatest efficiency in the short term for each enterprise. This unit total cost curve for the industry makes it possible to determine economies of scale for different levels of production. Since the adjustment for calculating this curve is linear, the unit total cost curve does not have the traditional U-shape but falls steadily, forming an asymptote with a line of unit fixed costs (see diagram 1).[1/] The analysis, in the tractor industry, of maximum production capacities and unit total cost curves for the industry and for each of the five enterprises leads to the conclusion that:

(a) The domestic market in Argentina is capable of absorbing only one enterprise, taking into account the fact that the average annual demand for tractors in the period 1956-1963 was 12,700 units (each with a belt horsepower of 50 HP) and that capacity in the largest enterprise is 12,000 units.

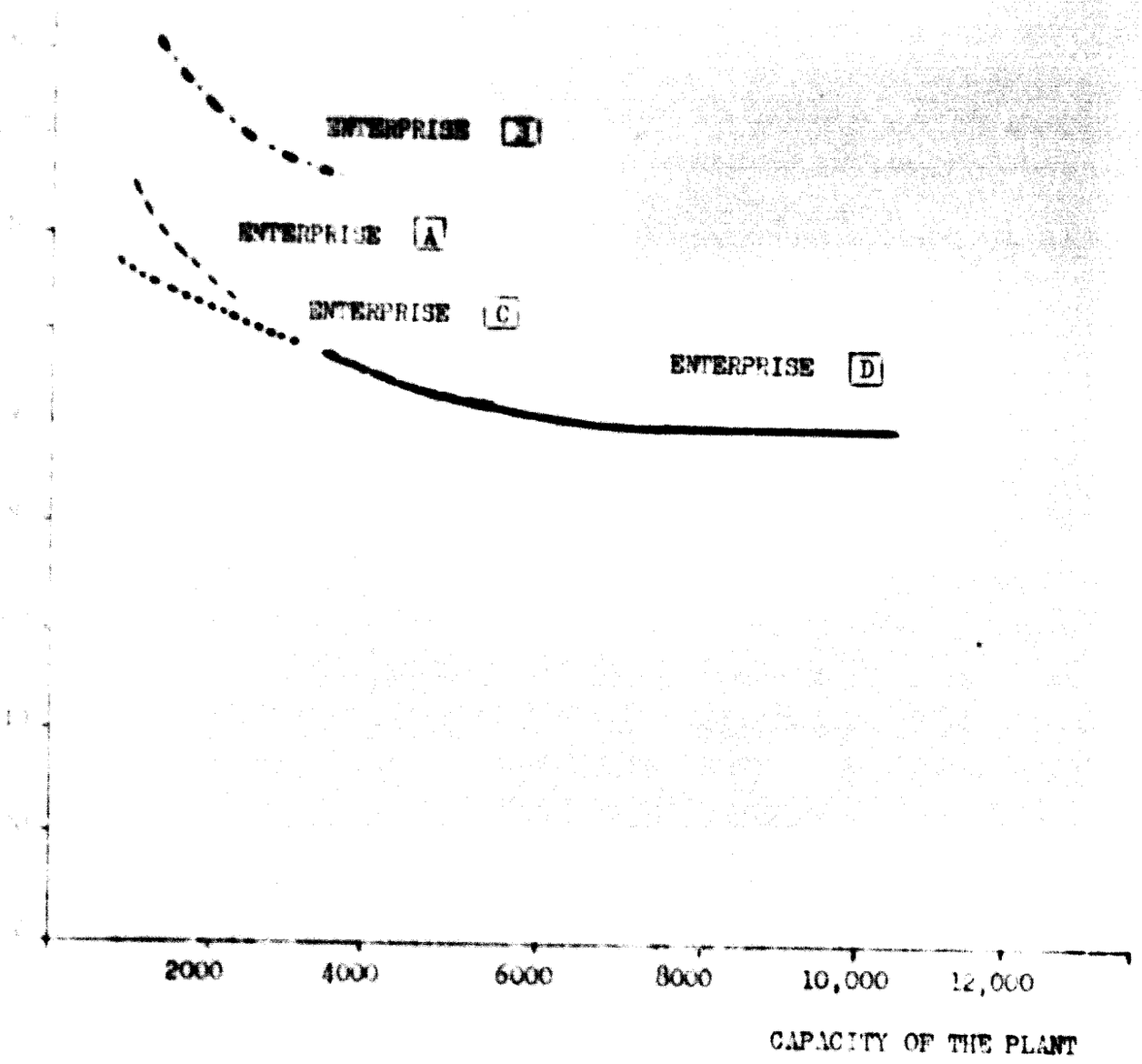
(b) It is an industry in which unit total costs decrease as the scale of production increases.

It may be helpful, in order to give a better understanding of the possibilities open to the tractor industry, which in its turn is representative of a number of industries that developed during the 1960's, to redefine the graph in diagram 1 in terms of normal total cost curves. Accordingly, diagram 2 gives short-term unit total cost curves for the four enterprises referred to in diagram 1, in the hypothetical case of their having a traditional U-shape.

1/ See the analysis of different definitions of capacity, above.

Diagram 1

UNIT TOTAL COST CURVES FOR A TRACTOR WITH A RATED HORSEPOWER OF 50 HP AT 12 DOLLARS 1963 PRICES FOR EACH ENTERPRISE[1]



[1] Unit total cost for a production of 12,300 tractors in enterprise (D).

Note: The letters designating the enterprises refer to Table 7.

Source: J. M. Dagnino Pastore, op. cit., p. 436, vol. I.

Table 7

THE TRACTOR INDUSTRY IN ARGENTINA[1/]

Enterprise	Quantity of tractors produced in Argentina, 1963	Quantity of tractors produced by the parent firm in its own country, 1960	Installed capacity		
			1964 in units	Utilization of capacity (percentages)	
				1961	1963
A	913	14,500	3,500	85	45
B	1,798	28,000	3,000	82	60
C	2,720	26,000	4,800	90	57
D	4,617	11,500	12,000	50	38
Total	10,053	80,000	23,300		

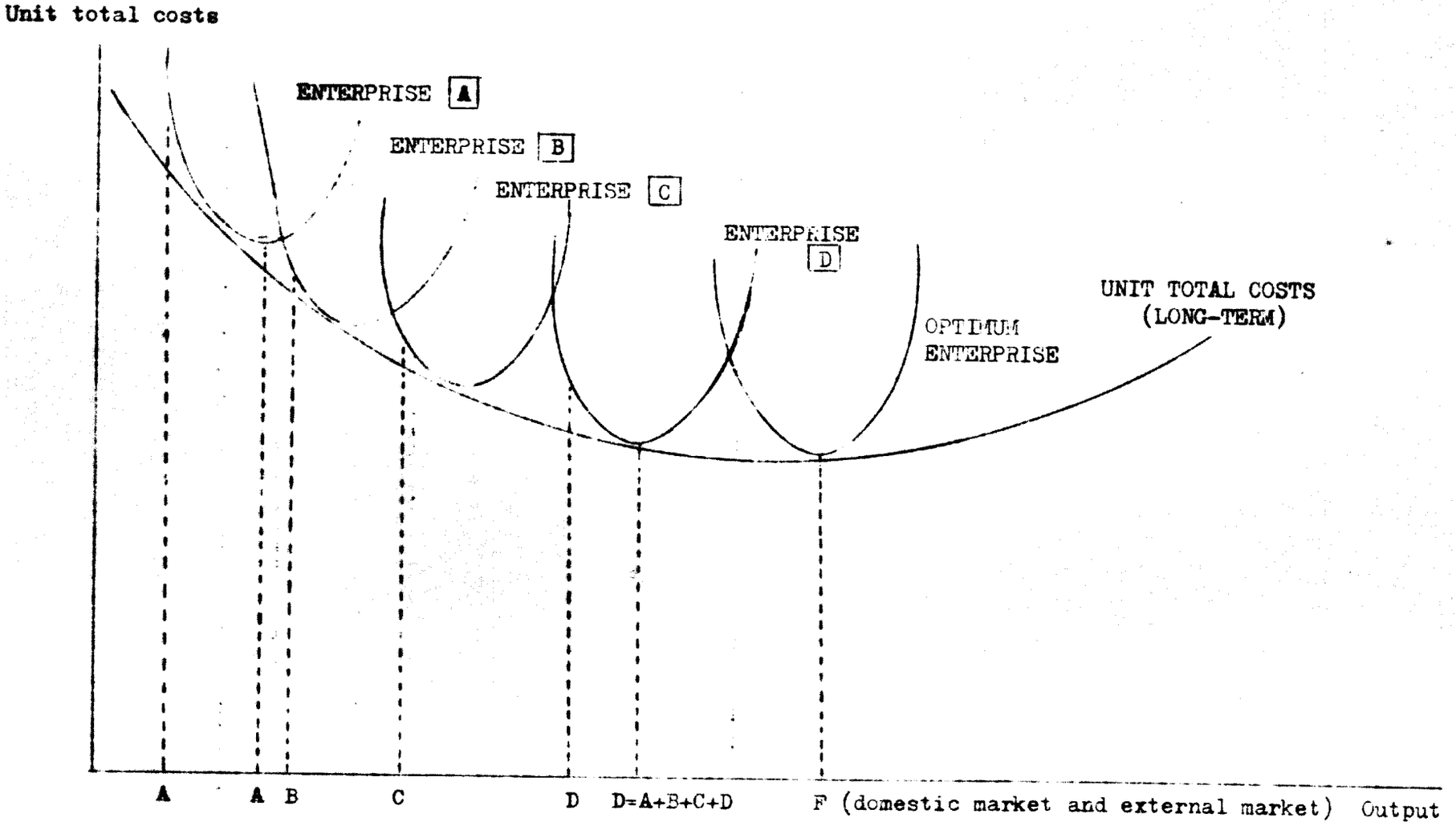
1/ From the source of information utilized, it is not possible to identify the enterprises. Each enterprise is therefore indicated by a letter of the alphabet.

Source: J. Dagnino Pastore, op. cit., chapter 7.

Diagram 2

SHORT-TERM AND LONG-TERM UNIT TOTAL COST CURVES
FOR THE TRACTOR INDUSTRY

(hypothetical situation in Argentina)



It can be seen from this diagram that all four enterprises have levels of production below the level corresponding to the minimum point on the short-term unit total cost curve. For example, enterprise A produces OA when the output corresponding to the minimum unit cost would be OA'; there is thus an unutilized capacity of AA'. A similar situation exists in the cases of enterprises B, C and D. In the tractor industry, the domestic demand for tractors coincides with the point of greatest efficiency in the enterprise with the largest installed capacity - that is to say, an output OD' in enterprise D. The fact that enterprise D does not squeeze the other three out of the market is due to the existence of governmental regulations fixing production quotas for individual enterprises. Thus it is clear from the present situation in the tractor industry that unless the number of enterprises is reduced there will always be excess capacity in relation to the domestic demand for tractors. However, even if one accepts the argument that a single firm can supply the Argentine domestic market, operating at the minimum point on the short-term unit cost curve, one must still ask whether this is an optimum solution in the long-term. To discover this, we must find out whether the minimum point on the short-term curve is tangential with the minimum point on the long-term unit cost curve.

The present demand for tractors fluctuates around 12,000 units, which is in line with the installed capacity of enterprise D, and the projected demand for 1975 is 16,000 tractors. Moreover, several of the enterprises operating with affiliates in Argentina have a capacity above 20,000 units. If we assume that these enterprises are efficient, we can conclude that output levels below 20,000 are at the stage in which there are increasing returns with scale. This, returning to diagram 2, indicates that the output OD' in enterprise D is not sufficient to take full advantage of increasing returns. The optimum enterprise in the long term would therefore have to produce OF, this being the minimum point on the long-term unit cost curve. Any output below OF would mean unit costs above international costs.

In Latin America, Argentina and Brazil are the only two countries which manufacture tractors and do not simply assemble them. In one study which has been carried out,[1] the optimum location of this industry within the Latin American Free Trade Association is studied, for the year 1975. The model used is a linear model which minimizes the production and distribution costs necessary to meet the demand of each of the countries making up this region in 1975. In this study, production costs for 1975 in Argentina and Brazil were projected, the demand in each country was estimated and provision was made for domestic transport costs from the place of import or production to the place of consumption and for transport costs between countries. The model allows for the alternative of importing from the United States if its sale price is less than that of the most efficient producers in Argentina and/or Brazil. The final result indicates that, if we take the official exchange rate for 1963, the year when the study was carried out, Argentina is in a position to supply the whole Latin American market, replacing imports from the United States.[2]

In short, an analysis of the tractor industry, taken as an example, representing the development of heavy industry since the end of the 1950's, leads to the conclusion that excess capacity in these industries is largely due to the indivisibility of investments characterizing heavy industry and to the existence of more enterprises than the domestic market is able to absorb. Moreover, even if a monopolistic solution is accepted, the size of the domestic market does not permit full utilization of the economies of scale attainable in this branch. An optimum long-term solution can therefore be found only in considering the possibilities for expanding the market by means of exports. This course must be considered within the context

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1/ ECIEL, The location of industries in the LAFTA area, mimeographed. The model used is that of Victorisz and Manne, which allows consideration of economies of scale and differs from the linear programming model which assumes constant returns. See: T. Victorisz and A. Manne, "Chemical process, plant location and economies of scale", in Studies in Process Analysis, edited by A. Manne and H. Markowitz, John Wiley, 1963.

2/ We must make it clear that the relationship of the peso to the dollar on the official 1963 market was 27 per cent lower than the unofficial rate (135 pesos to the dollar as against an unofficial rate of 155). Naturally, a rate of 155 pesos to the dollar only strengthens the argument. The study does not take into account the possibility of importing tractors from Europe, where the price is lower than the United States price. See ECIEL, op. cit.

of a regional market for Latin America and the feasibility of such exports in the light of possibilities of supplying the regional market by imports from more developed countries, with endowments of productive resources differing from those of Latin America.

C. Other factors which may lead to excess industrial capacity

So far, our analysis of the causes of excess capacity has been centred on the indivisibility of investments and the oligopolistic market structure which makes it possible to contain, at the cost of excess capacity, a larger number of enterprises than the domestic market is able to absorb.

Another factor which may have played a part in excess capacity is the inadequate supply of certain inputs, impeding the full utilization of capacity in industries depending on these inputs. Clearly, for enterprises which depend heavily on imported inputs, full utilization of capacity is limited by restrictions on the capacity to import. For example, the regulations governing the automobile industry were amended in 1965, and instead of maximum production quotas being fixed for individual enterprises import quotas were fixed for enterprises, and this indirectly determined the output level which could be reached.

Another example of the incidence of this factor was the results of the severe restrictions on the supply of electricity during the early 1950's. The absence of State investment in this branch led to drastic rationing in the use of electricity. In order to remedy the shortage, industrial enterprises installed their own generating stations in spite of the implications of this in terms of higher costs and investment requirements.[1/]

In the surveys carried out by CONADE on "output and investment expectations of industrial enterprises", information was requested on the obstacles which, in the view of the enterprises surveyed, impeded the expansion of production during the

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1/ The production of electricity by the user plant itself consumes 10 to 15 per cent more calories per kilowatt hour than production by central power stations and may, in some cases, need twice as much capital per kilowatt installed as that required per kilowatt in central power stations. United Nations, ECLA, El desarrollo económico de la Argentina, 1958.

period 1963-1965. This information was published only in the case of the survey of August-September 1964, in which 350 enterprises located in Greater Buenos Aires were surveyed. The information provided by the survey on 1963 consists of historical data for the enterprise, that referring to 1964 consists of one part - up to the date on which the surveys were conducted - made up of historical data and the other of estimates made by the enterprise, and the 1965 information is based on estimates. Thus the survey was not carried out at a time of full employment. In 1964, Argentina was beginning its period of recovery after the acute recession of 1962-1963. In spite of the fact that 1965 is the year nearest to full employment after the recession, we think it appropriate, on the basis of the data obtained in 1964, to study the influence of restrictions in the supply of inputs on the utilization of capacity, in view of the fact that the estimates made by the enterprises for 1965 on the basis of production plans are included.

As is shown by Table 8, the insufficiency of actual demand was the major obstacle to the expansion of the production of the enterprises. This result is to be expected in view of the sharp fall in economic activity in the two years prior to that of the survey. The factor in question loses significance as economic revival proceeds. In 1964, the weighted percentage was 33.7 per cent, and it fell to 20.7 per cent in 1965. The same situation is found in the case of monetary and credit restrictions; the policy was more liberal in 1965 than in the preceding years, but the restrictions continued to affect the production and investment plans of the enterprises.

Another factor of importance, connected with our preliminary analysis of the influence of an oligopolistic market on excess capacity in certain industries, is the fact that enterprises are afraid to increase their output in the face of competition from similar domestic products. It is clear that, in order to expand their markets, the enterprises must replace other competitors, and the fear of a competitive "war" leads to a tacit or imposed oligopolistic agreement, which regulates the market for each enterprise and thus results in excess capacity for each of them.

Table 8

FACTORS HINDERING THE EXPANSION OF PRODUCTION

(All manufacturing industry)

Obstacles	Relative importance of each factor (Weighted percentages)[1]		
	1963	1964	1965
1. Insufficiency of demand	33.7	26.1	20.7
2. Competition from similar domestic products	13.3	13.5	13.9
3. Monetary and credit restrictions	20.7	22.7	18.7
4. Restrictions resulting from an inappropriate taxation and tariff policy	7.0	10.7	11.0
5. Restrictions on transport	0.9	1.0	1.1
6. Competition of similar imported products	2.6	2.6	2.0
7. Restrictions on the supply of intermediate inputs and capital goods	2.4	11.4	11.6
(i) Provision of domestic raw materials	5.3	6.3	5.9
(ii) Provision of imported raw materials	0.7	0.9	0.5
(iii) Lack of domestic equipment and machinery	0.3	0.2	0.3
(iv) Lack of imported equipment and machinery	1.6	2.1	2.5
(v) Shortage of electricity and fuel	0.8	0.7	0.9
(vi) Lack of skilled workers	0.6	0.9	1.1
(vii) Lack of unskilled workers	0.1	0.3	0.4
8. Other factors	3.7	2.2	5.0
9. Did not reply	8.7	9.3	16.0
	100.0	100.0	100.0

Table 8 (cont'd)

In the survey, the enterprises were asked to state, in order of priority, the three obstacles which, in their view, most impeded the expansion of production each year. The replies were weighted by assigning the values 3, 2 and 1 to the factors named in first, second and third place.

Source: CONADE, Resultados de la encuesta sobre expectativas de producción e inversión de las empresas industriales, March 1965.

The entry which concerns us is "restrictions on the supply of intermediate inputs and capital goods". Table 8 reveals the small influence of this factor on the expansion and production plans of the majority of enterprises, even though its importance grows as we approach full employment (9.4 per cent in 1963 and 11.6 per cent in 1965). The factor which increases in importance most rapidly is the lack of imported equipment and machinery, due to a restrictive economic policy in this field in the form of limitations on the capacity to import (1.6 per cent in 1963 and 2.5 per cent in 1965).

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