# CAPACITY UTILIZATION AND ECONOMIC DEVELOPMENT WITH SPECIAL REFERENCE TO THE PARASTATAL SECTOR IN SRI-LANKA

G. EDIRISOORIYA B. Com (Ceylon), Dip.Econ.Stud. (Lancaster), Post-Grad. Dip. Econometrics (Southampton).

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TO THE MEMORY OF MY LATE FATHER

WHO PASSED AWAY SOME THOUSANDS OF

MILES AWAY IN SRI-LANKA, WHILE I

WAS IN GLASGOW, ENGAGED IN THIS

PIECE OF RESEARCH

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Explanatory Note: The exchange rate of Sri-Lanka Rupee for sterling is Rs. 1 = 08p
(= Rs: 12.77 = £1.00)

## SUMMARY

In the absence of a well developed capital goods sector, an indigenous process of capital accumulation and technical progress has not taken place in the Sri-Lanka economy. This economy is faced with unfavourable terms of trade, balance of payment difficulties and the problem of increasing external debt. There has been considerable importation of foreign capital and technology mostly on project loans, commodity loans and aid over the last two decades or so, with a view to achieving higher rates of economic growth. This has led to the importation of "inappropriate technology" and has created a number of problems which can be seen in relation to under-utilization of capacity in the parastatal sector in Sri-Lanka. Hence it would seem that a mere injection of foreign technology and capital alone will not bring about the expected rate of growth for developing countries like Sri-Lanka.

In an attempt to throw light upon this hypothesis, we have adopted the following procedure. The Harrod-Domar growth model has been examined in relation to capacity utilization which in turn has implications for economic growth. A theoretical discussion on the concept of "capacity" has been carried out along with a comprehensive survey on available utilization measures of capital, land and capacity. Finally, we have carried out an empirical investigation on the problem of capacity under-utilization in eleven public sector corporations in Sri-Lanka, using the trend-through-peaks method. Results suggest that the problem of under-utilization of capacity in the parastatal sector in Sri-Lanka is rather critical.

# CHAPTER 1

## Introduction

It is believed that there exists a high rate of capacity under-utilization in the economy of Sri-Lanka. If this phenomenon exists it would undoubtedly create numerous problems (economic inefficiency, unemployment and foreign exchange difficulties) which would inhibit economic growth. Unfortunately attempts have not been made so far to examine the causes and the extent of under-utilization of capacity in Sri-Lanka, and this is reported in the U.N.D.P. Special Fund Report as follows:

> "The concepts of "capacity" and rate of capacity utilization have received much prominence in economic literature. The importance of these descriptive concepts has been underlined by the attention given by many countries to their measurements. Although it was claimed that the slow rate of growth in the industrial output in Ceylon during the past years has been largely due to the existence of under utilized capacity, no attempt was made to measure the extent of this excess capacity". (1)

Therefore, a study related to capacity utilization would be an important exercise and would be useful too. Such a study would provide a better understanding of the problem as it may explain the causes, the extent and the consequences of under utilization of capacity and identify measures to overcome the problem.

This problem does not seem to be something peculiar to

Sri-Lanka, as the I.L.O. asserts that this is a common problem that most of the developing countries are faced with and stresses the need to divert research interest into it. According to them:

> "Fuller utilization of existing industrial capacity could create more employment and produce more output with little or no additional capital outlay. Inquiry into the extent and causes of under-utilization of capacity in individual industries and measures to encourage capacity utilization should form an important part of industrial planning."(2)

The scheme of our study is as follows:

We set out our study with a discussion on the Harrod-Domar Growth Model. We do this for two reasons. One is that the Harrod-Domar Growth Model is the starting point for much theorising about capital accumulation and the other is that it refers to capacity utilization specifically. Domar explains that an economy's inability to grow at the required rate causes excess capacity in this economy, and suggests measures to overcome the problem (that is, reduction of marginal propensity to save and speeding up of technical progress). We will examine Domar's solution in general. Then we will examine the nature of capital accumulation and technical progress in the case of the Sri-Lanka economy and we will see that both capital accumulation and technical progress (which are major determinants of economic growth) are being introduced from outside. Sri-Lanka has been importing capital goods (embodied with technical progress) mainly on foreign aids and loans, because of the country's

foreign exchange difficulties. Then we will discuss the problems associated with importation of capital goods and see how these problems contribute to under-utilization of capacity in Sri-Lanka. In general, this is the area covered in the next (second) chapter.

The third chapter is concerned with analysing 'capacity' and capacity utilization, and this chapter is divided into two parts. The first part is devoted to a theoretical discussion of 'capacity' and capacity utilization. There we will discuss various definitions and interpretations attached to the notion of capacity by various researchers in their studies, and we will emphasise the need for the clarification of various terms connected with capacity (such as optimal capacity, plant capacity, sub-optimal capacity and normal capacity) in relation to an acceptable definition of capacity.

The second part of the third chapter is devoted to a survey of available capacity measures. We will make an attempt to analyse these measures in a suitably general framework. First we will be examining capital utilization measures, then labour utilization measures and finally capacity utilization measures. In our discussion of the available measures we will try to give a general idea of what each measure is and to examine relative advantages and disadvantages in as much detail as possible.

The fourth chapter contains a discussion on the results of our empirical study on capacity utilization in eleven public corporations in Sri-Lanka. First we will explain the estimation method we adapted (Wharton School method) for our study. We

shall also make an attempt to explain the problems encountered in application and the ways in which we managed to sort these out. Then we will discuss the results of our investigation into capacity utilization, taking corporation by corporation. Per capita-capital, profitability, import content of the total raw materials used, will be used as a guideline for our discussion, and in the process we will make comparisons between the Wharton School estimation method and the engineering estimation in each corporation. We will try to explain any disparities. Apart from the above guidelines we will be using other available information (prior information) in analysing the causes of under-utilization of capacity in each case. Then we will examine those causes of under-utilization of capacity in general and see whether there is any similarity between them and the problems arising from the exogenous nature of capital accumulation and technical progress which are being introduced into the economy. This will be followed by a general discussion on the consequences of under utilization of capacity, especially in the context of economic growth.

The final chapter contains the conclusions to the study. There we will take the causes of capacity under-utilization one by one and discuss the suitable measures to be taken in order to overcome the problem, and further we will be examining the possibilities for implementing such measures, the appropriate steps to be taken and the possible problems which may be encountered.

In the end we will emphasise the importance of setting up an independent planning authority (hitherto non-existent) for the

purpose of drawing up perspective plans with a view to long run growth. Such a planning authority could decide the objectives, priorities, strategies, policies, the time path and the shape of the economy for the foreseeable future. In addition to this, where such an authority exists, it will be able to examine carefully and to scrutinise all the government's short-term plans, thereby maintaining the objectives of the perspective plan. Above all, such an authority will be able to check whether commodity loans, project aid etc. are suitable and acceptable within the perspective plan. Hence, it will provide an opportunity to minimise the number of problems which would arise due to the exogenous nature of capital accumulation in Sri-Lanka.

## References

(1) U.N.D.P. Special Fund - Report - A.R. Abdul Meguid and L.R. Jayawardena. "Economic Planning and Programming Projects" Vol. VI, page 2.

(2) "Employment and Economic Growth", I.L.O. Geneva, N.S. 1967, page 146.

# CHAPTER 2

## CAPITAL ACCUMULATION, TECHNICAL PROGRESS AND CAPACITY UTILIZATION

### Part 1. Harrod-Domar Growth Model in Relation to Capacity Utilization

#### 2.1 A. Introduction

While one set of theories on economic growth predominently advocates capital accumulation as the engine of economic growth, another set of theories emphasizes the need for speeding up of technical progress. Apart from these two determinents, there is a number of other pre-conditions (i.e. sufficient demand, availability of other factor inputs etc.) which are crucial factors in economic growth. But most of the growth theories have assumed that these factors do perform due part in the process of economic growth. This may be a valid assumption in the case of developed countries, but the converse would be true in the case of developing countries. In that case, capital accumulation and technical progress alone will not bring about an expected rate of growth for developing countries. Non functioning or the non-existence of those pre-conditions coupled with inherent problems (peculiar to developing countries) in capital accumulation and technical progress, certainly creates numerous obstacles to economic growth. One such obstacle to economic growth in developing countries will be the under-utilization of capacity which is our main interest in this study.

In this chapter, it is hoped firstly to examine the Harrod-Domar growth model in relation to capacity utilization and secondly, to examine the nature of capital accumulation and technical progress which is taking place in Sri-Lanka and its relation to utilization of capacity.

There are quite a number of good reasons for examining the Harrod-Domar growth model in this discussion, namely: (a) it has laid the foundation for the development of capital accumulation growth theories, (b) it explains how and why under-utilization of capacity emerges in the process of economic growth, (c) within the context of the model, suggestions to overcome under-utilization of capacity have been given, (d) though the model demonstrates economic growth through capital accumulation it recommends the need for speeding up of technical progress in order to achieve a faster rate of growth.

2.1 B. The Harrod-Domar Coefficient of Capacity Utilization:

For both Harrod and Domar, economic growth depends mainly on capital accumulation, at which rate has capital to be accumulated in order to attain a steady state equilibrium in an economy? In general the Harrod-Domar answer to that question is that the rate of capital accumulation should be equal to the average savings ratio times the output/capital ratio. In symbolic terms:

$$\frac{dK}{K} = \alpha\sigma \qquad (1)$$

where K = capital stock at a given time

dK = change in capital stock

$\alpha$ = average propensity to save

$\sigma$ = output - capital ratio.

This solution is commonly regarded as being unstable.(1) In other words if the rate of capital accumulation does not equal the right hand side of the equation (1) then growth of the economy does not

converge towards a steady-state. Domar has defined this required rate of growth of the economy as "the warranted rate of growth" which is realised if expected.

Let $\gamma = \alpha\sigma$ (2)

where $\gamma$ = warranted rate of growth.

Then assuming away the instability problem, a coefficient of utilization is defined as follows:

$$\theta = \frac{\gamma}{\alpha\sigma} \quad (3)$$

Coefficient of utilization, $\theta$, might take values ranging from zero to unity ($0 < \theta \leq 1$). (But it is better to keep in mind that $\theta$ might take values greater than unity). The warranted rate of growth can be achieved only if accumulation of capital takes place at the rate of $\alpha\sigma$. In other words the realization of the warranted rate of growth means that the value of $\theta$ is equal to one, which implies that the capacity is fully utilized. If the value of $\theta$ is less than one then there exists under utilization of capacity. In other words

$$\gamma < \alpha\sigma \Rightarrow \theta < 1$$

Under utilization of capacity exists when $\hat{\gamma}$ is less than $\alpha\sigma$; which means the growth rate of the economy $\hat{\gamma}$ is below the required rate of $\alpha\sigma$. This provides an explanation of under utilization of capacity in an economy. In Domar's words:

> "When the economy grows at the equilibrium rate, so that $\gamma = \alpha\sigma$, $\theta$ = 100 per cent and production capacity is fully utilized. But as $\hat{\gamma}$ falls below $\alpha\sigma$, a fraction of capacity $(1 - \theta)$ is gradually left unused. Thus the failure of the economy to grow at the required rate creates unused capacity and unemployment."(2)

(It is important here to note that Domar has asserted the relation between unemployment of labour and the unused capacity in the economy).

In the case of Sri-Lanka, Table 2. I shows that the annual rate of growth in real income is around 3 to 4 per cent during the last decade, and the per capita real G.N.P. has increased only at a rate of 2 per cent per annum during the same period. This can be seen from Table 2 II.

TABLE 2 I

Gross National Product at 1959 factor cost prices.

Rs. millions.

| | Total | Annual Percentage Change |
|---|---|---|
| 1962 | 6710 | |
| 1963 | 6900 | 2.83 |
| 1964 | 7363 | 6.71 |
| 1965 | 7551 | 2.55 |
| 1966 | 7818 | 3.54 |
| 1967 | 8210 | 5.01 |
| 1968 | 8901 | 8.42 |
| 1969 | 9301 | 4.49 |
| 1970 | 9686 | 4.14 |
| 1971 | 9725 | 0.40 |
| 1972 | 10030 | 3.17 |
| 1973 | 10383 | 3.52 |
| 1974 | 10731 | 3.35 |
| 1975 | 11115 | 3.58 |

Source: Annual Review of the Economy, Central Bank of Ceylon, 1975, Table (1)

## TABLE 2 II

Per Capita G.N.P. at 1959 Prices

Rs.

| | Total | Annual Percentage Change |
|---|---|---|
| 1962 | 643 | |
| 1963 | 648 | 0.77 |
| 1964 | 675 | 4.16 |
| 1965 | 676 | 0.15 |
| 1966 | 683 | 1.03 |
| 1967 | 702 | 3.10 |
| 1968 | 742 | 5.70 |
| 1969 | 759 | 2.29 |
| 1970 | 774 | 1.98 |
| 1971 | 766 | -1.03 |
| 1972 | 770 | 0.52 |
| 1973 | 784 | 1.82 |
| 1974 | 801 | 2.17 |
| 1975 | 817 | 2.00 |

Source: Annual Review of the Economy, Central Bank of Ceylon, 1975, Table (1)

Obviously, the country's rate of economic growth is very low. In addition to this, t ough the gross domestic capital formation (at market prices) has increased considerably during the period (1962-75) except for few years (as shown in Table 2 III) the per capita real G.N.I. increases were at a very low level. According to Domar, this

TABLE 2 III

Gross Domestic Capital Formation

| Year | Rs: million | Percentage change |
|---|---|---|
| 1962 | 1080 | |
| 1963 | 1160 | 7.41 |
| 1964 | 1193 | 2.84 |
| 1965 | 1063 | -2.51 |
| 1966 | 1195 | 12.42 |
| 1967 | 1377 | 15.23 |
| 1968 | 1699 | 23.38 |
| 1969 | 2253 | 32.61 |
| 1970 | 2535 | 13.40 |
| 1971 | 2249 | -11.98 |
| 1972 | 2118 | -5.82 |
| 1973 | 2630 | 24.17 |
| 1974 | 3140 | 19.39 |
| 1975 | 3907 | 24.43 |

Source: Annual Review of the Economy, Central Bank of Ceylon, 1962-1975, Table 7.

slow rate of growth of the real G.N.P. (i.e. the failure of the economy to grow at the required rate) certainly suggests unused capacity and unemployment of factor input.

2.1 C Domar's Solution to the Problem of Under-Utilization of Capacity:

Now let us examine Domar's suggestions for overcoming this problem of excess capacity. In his own words:

"My own guess is that we shall be more concerned with the disparity between $\alpha s$ and $\gamma$, that is with the failure of income to grow at the required rate.

If, however, the difference between $s$ and $S$ becomes serious and inhibits investment or if the junking process proceeds at a faster rate than is deemed socially desirable, the society will have at its disposal two not mutually exclusive methods.

(1) the reduction of the propensity to save or

(2) the speeding up of technical progress.

I hope that the main emphasis will be placed on the latter".(3)

(Here, $S$ refers to the highest value of $s$ that can be achieved).

2.1 D Implications of Reducing Marginal Propensity to Save

Now let us see the implications of reducing marginal propensity to save. Excess capacity in the economy means that the effective demand is less than the potential output in the economy. To cure this, it will be necessary to increase the demand for goods and services and reducing the marginal propensity to save is one obvious solution. This may be achieved; but there is a problem, that is the linkage between savings and investment and the feedback to the economy through investment.

Let us assume that the reduction of marginal propensity to save takes place in time period t. According to the Harrod-Domar assumptions, as planned savings equal actual investment, the amount saved and

available for investment is less than the required amount in time period t. So in time period t + 1, the actual investment will be less than the required amount of investment. If this situation continues the amount of savings available for investment will not be sufficient to keep up with the required rate of increase in capacity creation. In other words, if for example the available savings for investment would only be sufficient for depreciation and wear and tear, then in the time period t + 1 and in subsequent periods the economy would stagnate. Since according to the Harrod-Domar assumptions the population increases at a rate 'n' and if the net investment in the economy is zero, and also if the utilization of excess capacity is not sufficient to employ the increasing population then there is bound to be unemployment in the economy. Even if the net investment is positive, that rate of investment plus the use of excess capacity together would not be sufficient to employ the increase in population unless investment increases for other reasons and forces its own financing. In this case the marginal propensity to save has to be further reduced in order to feed the unemployed in the economy. If this situation arises then the economy is in serious trouble without savings.

As we have seen above, utilization of excess capacity in an economy, by reducing the marginal propensity to save and hence increasing the demand for goods and services, depends upon the following conditions:

(a) The magnitude of the increased reduction in propensity to save

(b) The magnitude of the increased demand for goods and services taken economy as a whole

(c) The magnitude of the excess potential capacity in the economy

(d) The extent to which there are other factors in the economy operating to increase investment

2.1 E Implications of speeding up of Technical Progress:

We mentioned earlier that technical progress is one of the deterministic variables of economic growth. As we have seen above, Domar has suggested speeding up of technical progress as a measure to do away with excess capacity in an economy. Here we have to look at the feasibility of speeding up of technical progress in the presence of excess capacity.

The crucial point to examine here is the cost element involved in speeding up of technical progress. If cost element is zero, which is the extreme case, then technical progress will bring about an increase in production. This increase in production may wipe out excess capacity in the economy. If on the other hand cost element is involved in bringing technical progress up, then there are two factors to be considered. One is the financing of cost involvement in technical progress and the other is as a result of this cost whether the general price level will go up or not.

Financing the extra cost element may not be a problem if either internal funds are readily available within enterprises or credit facilities are available to enterprises. Here again, apart from the availability of funds, entreprenuers themselves and the creditors who supply credit to them, should be convinced of the result of new expenditure. In other words, entrepreneurs and the credit suppliers be sure of the fact that either sufficient demand prevails in the economy or demand will increase sufficiently in order to utilize prevailing

excess capacity in the economy. Perhaps some form of incentives may need to be introduced by the government in order to persuade entrepreneurs to embark upon projects which would speed up technical progress in the economy.

At a theoretical level, it is most unlikely that the price level would go up as a result of speeding up of technical progress, even if it involves extra cost. The reason is that excess capacity implies that the economy is operating below optimum level of production. That means, by producing more through utilizing excess capacity the economy could lower the average unit cost of production. The only possibility of an increase in the price level as a result of cost involvement in speeding up of technical progress, is in the case where the magnitude of cost involvement in speeding up of technical progress would be greater than the reduction in cost, resultant from the increase in production. If the general price level increases significantly then it may have an adverse effect on demand; if that happens the whole purpose of the exercise would be lost. In other words what this simply says is that if we were to speed up technical progress with a view to utilizing excess capacity in the economy, the magnitude of the cost element involved in the process should be maintained at a level below the aggregate cost reduction resultant from the increase in production.

Even though Domar suggested the speeding up of technical progress as a cure to excess capacity (He put more weight on that measure) he himself recognises the fact that in the presence of excess capacity new investment would be hard to come. As he puts it:

"The idea that smooth functioning of a capitalist society requires continuous growth is of course not new. All of these writers have stated more or less explicitly that the failure of income to grow at some required rate (defined in one way or other) will result in an excessive accumulation of capital and most probably in a subsequent fall in investment. Looking over our past performances they saw the obvious fact that income did not grow for more than a few years if at all at this rate. And from this they concluded that the required rate of growth of income simply could not be achieved."(4)

Part 2. (2.2)

2.2 A The nature of Capital Accumulation and Technical Progress in Sri-Lanka

Having examined the Harrod-Domar explanation to excess capacity problem we will make an attempt to examine the nature of capital accumulation and technical progress in the Sri-Lanka economy and examine whether this nature could lead to problems which can be seen in relation to under-utilization of capacity.

If there exists a well established (developed) capital goods sector and there is indigenous (within the economy) technical progress in an economy, that economy may find things easier. It would be more or less the same if an economy can afford to buy them from abroad. But unfortunately this is not the case with most of the developing countries.

For instance if we take the economy of Sri-Lanka, there is no such well developed capital goods sector. Table 2 IV shows that the manufacturing sector in the economy accounts for only about 11 to 13 per cent of the gross national income between the period from 1962 - 1975.

TABLE 2 IV

Sectoral composition of Real G.N.P.

| Sectors | (Rs. Millions) Total | | Percentage | |
|---|---|---|---|---|
| | 1962 | 1975 | 1962 | 1975 |
| 1 | 2704 | 3602 | 40.3 | 32.4 |
| 2 | 20 | 248 | 0.3 | 2.2 |
| 3 | 752 | 1462 | 11.2 | 13.2 |
| 4 | 288 | 503 | 4.3 | 4.5 |
| 5 | 13 | 33 | 0.2 | 0.3 |
| 6 | 678 | 1100 | 10.1 | 9.9 |
| 7 | 879 | 1501 | 13.1 | 13.5 |
| 8 | 67 | 184 | 1.0 | 1.7 |
| 9 | 208 | 350 | 3.1 | 3.1 |
| 10 | 322 | 646 | 4.8 | 5.8 |
| 11 | 812 | 1513 | 12.1 | 13.6 |
| 12 | 6743 | 11142 | - | - |
| 13 | - 33 | - 27 | -0.5 | -0.2 |
| G.N.P. | 6710 | 11115 | 100.0 | 100.0 |

Sectors from (1) to (13) are as follows:

1. Agriculture, Forestry, Hunting and Fishing
2. Mining and Quarrying
3. Manufacturing
4. Construction
5. Electricity, Gas, Water and Sanitary Services
6. Transport, Storage and Communications
7. Wholesale and Retail Trade
8. Banking, Insurance and Real Estate
9. Ownership of Dwellings
10. Public Administration and Defence
11. Services
12. Gross Domestic Product
13. Net Factor Income from Abroad

Source: Annual Review of the Economy, Central Bank of Ceylon, 1962 and 1975, Tables 11(A) I.

The manufacturing sector in this classification does not represent a capital goods sector by any means; actually, the manufacturing sector provides mainly consumption goods. Taking industrial production as a whole, investment goods account for only about 13-19 per cent between the same period. This is shown in the Table 2 V. Accordingly the investment goods sector accounts for only 2.42 per cent* of the gross national product of the economy of Sri-Lanka.

* Compared to developed countries, this meagre proportion of investment goods production shows the lack of well developed capital goods sector in Sri-Lanka.

TABLE 2 V

Value of Industrial Production at 1970 price.

| | Rs. millions | | Percentages | |
|---|---|---|---|---|
| | 1962 | 1975 | 1962 | 1975 |
| Consumer goods | 454.2 | 1367.9 | 55.42 | 54.41 |
| Intermediate goods | 255.5 | 713.6 | 31.18 | 28.38 |
| Investment goods | 109;8 | 432.7 | 13.40 | 17.21 |
| | 819.5 | 2514.2 | 100.00 | 100.00 |

Source: Annual Review of the economy, Central Bank of Ceylon, 1975
Table II B (3)

Even this small percentage of investment goods production out of gross national product represents only either tool production or small-scale machinery production; the composition of these investment goods can be seen from Table 2 VI.

TABLE 2 VI

Investment goods production (at 1970 prices)

| Category* | Rs. millions | | Percentages | |
|---|---|---|---|---|
| | 1962 | 1975 | 1962 | 1975 |
| (1) | 32.8 | 105.6 | 4.0 | 4.2 |
| (2) | 5.7 | 12.6 | 0.7 | 0.5 |
| (3) | 45.9 | 163.4 | 5.6 | 6.5 |
| (4) | 16.4 | 100.5 | 2.0 | 4.0 |
| (5) | 9.0 | 20.1 | 1.1 | 0.8 |
| (6) | - | 30.5 | - | 1.2 |
| | 109.8 | 432.7 | 13.4 | 17.2 |

*Categories from (1) to (6) are as follows:

(1) Fabricated metal products other than the machinery and equipment

(2) Rubber products

(3) Cement, cement products and asbestos products

(4) Machinery except electrical and transport equipment

(5) Bricks and Tiles

(6) Iron and steel basic industry

Source: Annual review of the economy, Central Bank of Ceylon, 1975, Table II B (3)

Since the Sri-Lanka economy does not possess a well developed capital goods sector, she will have to buy capital (goods) from outside. This depends mainly on the purchasing power of her currency in international markets, which in turn depends on its position in international trade and finance. Experience during the last two decades shows that the country's trade balance has always been in deficit. For the year 1975 it stood at the level of Rs. - 1421 millions. The total current account balance also has a similar trend. The deficit of the total current account for the year 1975 is Rs. - 772 millions. These figures are given in table 2 VII.

Apart from this, the terms of trade have also taken an unfavourable turn. Measured from 1967 = 100, export-import price index, the terms of trade for the year 1975 is 46. As we see from table 2 VIII, the Sri-Lanka economy has been faced with the problem of unfavourable terms of trade for quite some time. Apart from this, the level of external assets of the country stands at a very low level. For instance, the amount of external assets for the year 1975 stands at Rs. 833.9 millions and this is given in Table 2 IX.

TABLE 2 VII

| | Export (Fob) | Imports (Cif) | Trade balance | Total C/A Balance |
|---|---|---|---|---|
| | Rs. millions | | | |
| 1962 | 1763 | 1906 | -143 | -140 |
| 1963 | 1708 | 1869 | -161 | -168 |
| 1964 | 1767 | 1960 | -193 | -160 |
| 1965 | 1909 | 1922 | - 13 | 59 |
| 1966 | 1674 | 2018 | -344 | -290 |
| 1967 | 1650 | 1985 | -335 | -288 |
| 1968 | 1976 | 2356 | -380 | -355 |
| 1969 | 1909 | 2655 | -746 | -797 |
| 1970 | 2016 | 2332 | -316 | -350 |
| 1971 | 1931 | 2218 | -287 | -216 |
| 1972 | 1898 | 2153 | -255 | -196 |
| 1973 | 2346 | 2644 | -298 | -161 |
| 1974 | 3400 | 4663 | -1263 | -907 |
| 1975 | 3913 | 5334 | -1421 | -772 |

Source: Annual Review of the Economy, Central Bank of Ceyloh, Table 47.

TABLE 2 VIII

| | All export prices | All import prices | Terms of Trade |
|---|---|---|---|
| 1962 | 109 | 77 | 142 |
| 1963 | 109 | 85 | 129 |
| 1964 | 111 | 105 | 105 |
| 1965 | 113 | 100 | 112 |
| 1966 | 107 | 98 | 109 |
| 1967 | 100 | 100 | 100 |
| 1968 | 117 | 126 | 93 |
| 1969 | 117 | 134 | 88 |
| 1970 | 118 | 140 | 84 |
| 1971 | 117 | 150 | 78 |
| 1972 | 118 | 158 | 75 |
| 1973 | 137 | 209 | 65 |
| 1974 | 213 | 370 | 58 |
| 1975 | 199 | 433 | 46 |

Source: Annual Review of the Economy, Central Bank of Ceylon, 1975, Table 49.

TABLE 2 IX

Total External Assets

| | Rs. millions |
|---|---|
| 1962 | 406.7 |
| 1963 | 358.8 |
| 1964 | 304.7 |
| 1965 | 407.6 |
| 1966 | 281.9 |
| 1967 | 407.0 |
| 1968 | 417.4 |
| 1969 | 327.5 |
| 1970 | 366.6 |
| 1971 | 456.0 |
| 1972 | 680.1 |
| 1973 | 801.2 |
| 1974 | 835.3 |
| 1975 | 833.9 |

Source: Annual Review of the Economy, Central Bank of Ceylon, 1975, Table 48.

It is clear that the level of external assets would just be sufficient to balance off the deficit of the current account in the balance of payments for 1975.

Given the following conditions (1) there is no established capital goodssector and investment goods production is insignificant in the economy (2) the Sri-Lanka economy is not in a position to buy capital goods from abroad because of deficit balances (continuously) in its external current account, unfavourable terms of trade and a low level of external assets etc. an economy like Sri-Lanka will find it difficult to increase capital accumulation and to speed up technical progress in order to achieve a faster rate of economic growth. Even if domestic savings are available, in the case where there is no developed investment goods sector, those savings would only be relevant to the existing local investment goods market.

Under these circumstances, the Sri-Lanka economy will have to borrow capital (goods) from outside mostly in the form of aid and loans. This is what Sri-Lanka has been doing for the last two decades. What happens in this process is that since most of the capital loans (or aid) are project loans (or aid), they involve the import of capital goods which embody foreign technology.

As we will see under the section 4 C most of the large scale industrial projects (e.g. steel, textiles, leather products and cement) have been set up with project loans. The net balance on project and commodities loan account for the Sri-Lanka government has so far amounted to Rs. 3704.9 millions at the end of 1975 as shown in table 2 X.

TABLE 2 X*

Rs. millions

| | Project loans. | Commodity loans | Total | Annual Change |
|---|---|---|---|---|
| 1962 | 157.5 | 19.8 | 177.3 | |
| 1963 | 219.4 | 19.6 | 239.2 | 61.9 |
| 1964 | 281.9 | 22.3 | 304.2 | 65.0 |
| 1965 | 358.0 | 23.4 | 381.4 | 77.2 |
| 1966 | 390.3 | 75.2 | 465.5 | 84.1 |
| 1967 | 380.8 | 275.2 | 656.0 | 190.5 |
| 1968 | 453.4 | 531.6 | 985.0 | 329.0 |
| 1969 | 501.7 | 784.7 | 1285.4 | 300.4 |
| 1970 | 521.5 | 985.5 | 1507.0 | 221.6 |
| 1971 | 609.9 | 1118.8 | 1728.7 | 221.7 |
| 1972 | 705.5 | 1609.0 | 2314.5 | 585.8 |
| 1973 | 856.0 | 1861.3 | 2717.3 | 402.8 |
| 1974 | 848.6 | 2009.3 | 2857.9 | 140.6 |
| 1975 | 1150.7 | 2554.2 | 3704.9 | 847.0 |

* figures are the amounts outstanding at the year end.

Source: Annual Review of the Economy, Central Bank of Ceylon, 1975, Table 38.

## 2.2 B Dependence on Foreign Technology

We have seen that there is no well developed capital goods sector in Sri-Lanka, and this implies a lack of basic capacity for indigenous technical progress. Furthermore, Clark(5) has asserted that the prospects for viable indigenous technical progress in developing countries are remote, and it would be quite appropriate here to quote him.

"And, of course, the process of innovation is very much more complex (and risky) than the mere development of a laboratory prototype. Under such conditions the prospects for a viable indigenous technological alternative become remote. Skilled personnel leave for highly paid overseas jobs or they join locally-based foreign firms or they develop interests in pursuits remote from developmental relevance. In the face of manufacturers' apathy for their services, laboratories and technical institutes turn more towards "pure" science and see the focus of their efforts as lying within the ambit of the international scientific community, its philosophy and its standards. In short, the local science system is increasingly unlikely to act as a springboard for indigenous technological alternatives. Science has become an intellectual consumption item enjoyed by an educated elite. The education system itself becomes similarly affected."(6)

In actual fact, with regard to these peculiar conditions, Sri-Lanka is no exception. The Sri-Lanka economy is heavily dependent upon imported capital goods and technology, and this has created a number of problems(7) which will lead to under-utilization of capacity in Sri-Lanka.

2.2 C <u>Problems connected with and arising from Foreign Capital and Technology in relation to capacity utilization.</u>

(i) Planning problems

(a) Planning with no proper information

(b) Planning with no long-term perspectives.

(ii) Lack of bargaining power

(iii) Scale and indivisibility of investment projects.

(iv) Adjustment problems

(a) Finding necessary technical and management skill

(b) Climatic and weather conditions

(v) Finding raw materials

(vi) Emergence of a parastatal sector.

Let us examine these in detail.

2.2 C (i) (a) Planning with no proper information

When large scale and heavy industrial projects are being installed on loan and aid from abroad, these projects must be properly evaluated, and this is the responsibility of planning authorities. Unfortunately, the process of planning itself is subjected to lack of sufficient information.

Where planning takes place without sufficient information it can lead to unrealistic expectations about the behaviour of certain economic variables in the economic system. Though the country has been accustomed to national economic planning for more than two decades now, there has not been a single comprehensive econometric study for the economy; only the Central Bank of Sri-Lanka has been able to carry out some isolated studies on consumer expenditure and on rural indebtedness. In such a situation, where there is not sufficient information about the behaviour of economic variables the process of planning tends to follow the planners' subjective judgments.

2.2 C (i) (b) Planning with no long-term perspectives:

The other deficiency in economic planning is the lack of perspective plans for the economy. Since most of the plans are short-term plans, carried out by the Ministry of Planning, there is a tendency for political interference to intrude into planning and

plan implementation. Planners and plan implementators tend to follow politicians' instructions rather than objective criteria. So political interference may lead to the setting up of unsound projects. Interference of this kind may not be directly linked with the problem of under-utilization of capacity, but it may be linked indirectly.

2.2 C (ii) Lack of bargaining power

In a country which relies heavily on importation of foreign capital and technology, bargaining power in the transaction tends to rest with the donor country.(8) Even if the conditions are unfavourable the recipient country will have to accept it because there is little choice.(9) For instance, it is believed in the case of the Ceylon Steel industry which was set up with aid from the U.S.S.R that Sri-Lanka had to agree to import all equipments and machinery from the U.S.S.R at a price which was substantially higher (at that time) than the price of machinery (of same sort) in any other country. And also Sri-Lanka had to agree to import raw iron ingot from the U.S.S.R only.

This indicates how the recipient country may have to accept unfavourable conditions(10) at times, which in turn may lead to the import of inappropriate capital goods(11). At the same time if the technical details of capital goods are not available to the recipient country then the recipient country will be in a disadvantageous position. Even if such details are available, if the recipient country is not familiar with the technology, or not in a position to understand them, the situation will be the same. In Clark's terminology,

"The shortage of this, essentially management, skill in most underdeveloped countries leads to a situation where the local entrepreneur instead of "shopping around" for each technological element and thereby buying technology at a low "real" price, will tend to rely completely upon a foreign company (frequently a large multinational corporation which itself often subcontracts stages in the technical and production process) to provide the complete technology package. This factor is a very important source of "control" for the supplying company whose bargaining position in the 'Sale' of technology is thereby strengthened."(12)

One aspect of this problem is that the country by itself is not in a position to check whether the technology to be imported would be suitable for the country (e.g. in terms of scale, climate, factor intensity etc.) Thus, if the donor country's assessment of the suitability of technology for the recipient country goes wrong, it may jeopardise objectives and may lead amongst other things to emergence of excess capacity.

2.2 C (iii) Scale and Indivisibility of investment projects.

An important area requiring discussion in this context concerns economies of scale and indivisibility of investment projects.(13) Machines, especially those designed for heavy industries are often made for large scales of production and cannot be readily adopted to smaller scales.

As we know, the general tendency in business is to set up large scale plants with a view to expansion of markets in the future. On the other hand, since large scale is conducive to economies of scale,

business firms may prefer to instal the best possible large scale plants, but if the market does not expand as expected; then the firms will not be able to gain economies of scale as planned; instead there will tend to be a heavy rate of capacity under-utilization. And at the same time, the firms' average cost per unit of output will be to that extent higher as a result of high overhead costs.

However, Sri-Lanka seems to be in favour of the best possible large scale plants (e.g. in steel, sugar and textiles) and things may be similar in most of the developing countries. There is one special reason for this; that is that under the circumstances(14) a country may feel that it cannot afford to keep installing higher cost medium scale plants. And so, it may instal the largest possible plant, taking advantage of the opportunity of an offer of a project by a donor country in the hope that markets will expand. Of course, if these expectations are not realised, the result would be the emergence of excess capacity. For expansion of markets, developing countries will have to depend mainly on local markets and less on international markets because of stiff competition(15) in the latter. In this situation, setting up of plants with excessively large scales may not be justified.

2.2 C (iv) (a) Finding the necessary technical and managerial skills

Needless to say imported capital goods (embodying technical progress) is often superior to local technology, and this will create a number of problems. One is the finding of proper technical skill to "man" sophisticated machines and managerial skill to run the enterprise efficiently(16). If skilled labour and management are

not available (or not sufficiently available) then it may take some time to provide the necessary manpower. The time lag involved here is an important factor to be considered, as it may lead to capacity under-utilization. One way of solving this problem is to train labour in the donor country in advance. However, the cost involvement here will have to be considered again. Therefore the most suitable way of training those skills may be to train suitable personnel locally under local conditions, although there will still be a time lag.

2.2 C (iv) (b) Climatic and Weather Conditions

Furthermore, the imported pieces of machinery may be vulnerable to local climatic and weather conditions; and as a result machines may break down more frequently. If this happens production will be affected. On the other hand, it may be possible to provide the appropriate environment for imported plants but here again at a cost.

2.2 C (v) Finding Raw Materials

The source of raw materials is another important factor which we will have to consider when industries are set up on project loans from abroad. When there is acute shortage of foreign exchange, one of the criteria for setting up new industries should be the availability of local raw materials in sufficient quantities for new industries. If the industry is heavily dependent on imported raw materials, then under the circumstances the country may find it difficult to import raw materials in sufficient quantities. Such an industry may perhaps find things easier at the beginning, but if the price of raw materials in the world market goes up gradually, then the industry may run into

difficulty. This situation can lead in the end to under-utilization of capacity. A temporary remedy in such a situation is to import raw materials also on credit. As a matter of fact, this is what Sri-Lanka has been doing, utilizing supplier's credit and commodities loans to import raw materials and other essential inputs. The Central Bank of Ceylon has revealed this as follows:

> "Suppliers credits were utilized to finance certain essential inputs."(17)

Undoubtedly, this is a serious situation, as a short-term measure, it may help to keep production going but because of foreign exchange difficulties it cannot be followed indefinitely. However, such a strategy could be justified and the gravity of the situation could be eased if an export market can be found for the products concerned.

2.2 C (vi) Emergence of a Parastatal Sector

The organisation of industry also has to be taken into consideration as it determines the degree of capacity utilization to a certain extent. In Sri-Lanka, industries which have been set up on project loans and aid are either monopolies or have an oligopolistic position in their markets. The reason for this is that most of the "imported projects" tend to be either heavy or large scale industries. If the organisation of industry takes these forms (i.e. either monopoly or oligopoly) then the industry will tend to produce "less" than it would under competitive conditions and at a higher price. In other words the nature of industrial organisation itself may lead to under-utilization of capacity. The relationship between project loans and the emergency of public and semi-public monopolies in developing countries, and the problems created by this phenomenon has been extensively studied by Meehav(18)

Evidently, the injection of capital goods (embodied with technical progress) will create monopolies in developing countries, and as explained this may result in a heavy rate of capacity under-utilization. Unless governments in developing countries take stern measures to check and control these public monopolies it is likely that under-utilization will become widespread. Even in this case, an economy like Sri-Lanka is faced with such problems as described by Clark.

> "Governments usually do not have the skilled resources and information necessary for monitoring and control - except possibly in the case of very large projects. This weakness is liable to be greater the more complex the technology and the smaller the country in question, and suggests the need for adequate information systems and skilled techno-economic personnel."(19)

2.2. D Inappropriateness of Foreign Technology:

All in all, these factors seem to support the proposition that "foreign technology is inappropriate to developing countries" like Sri-Lanka. Clark (one of the prominent advocates of this school of thought) has asserted this proposition as follows:

> "Hence we see that while technologies developed for use in the rich countries have always been 'inappropriate' to the socio-economic conditions of most underdeveloped countries, contemporary patterns of technological change in the West show every sign of enhancing considerably the degree of this inappropriateness."(20)

Summary:

We have explained the importance of capital accumulation and technical progress in economic growth and then examined the Harrod-Domar growth model in the context of capacity utilization. There we found that the cause of under-utilization of capacity is the failure of the economy to grow at the required rate, and we discussed the problems likely to be encountered in the application of Domar's solutions to overcome under-utilization of capacity.

In the second part, we explained that a well established domestic capital goods sector is non existent in Sri-Lanka, nor is there much endogenous technical progress. We explained the nature of Sri-Lanka's balance of payment difficulties, concluding that the only option available is to import capital goods from abroad mainly on loan and aid account. Finally, we have examined the problems arising from this process of capital accumulation and technical progress, paying particular attention to how these problems can lead to under-utilization of capacity.

In the next chapter we will make an attempt to conduct a theoretical discussion on capacity and capacity utilization and the problems of measuring it.

## Notes and References

(1) - See for example pages 12, 13 and 14 in the introductory chapter in "Growth Economics" Selected Readings - edited by A.K. Sen, Hamondsworth: Penguin Books 1970.

(2) - E.D. Domar "Essays in the theory of Economic Growth" - New York, Oxford University Press, 1957, page 77.

(3) - ibid - page 81.

(4) - ibid - page 121.

(5) - Norman Clark - "The Multinational Corporation: The Transfer of Technology and Development" in Development and Change, Vol. 6, Number 1, 1975, pages 5-21. Though the author pays particular attention into multinational Corporations, the analysis provides some concrete guidelines for our discussion.

(6) - ibid - page 19.

(7) - For discussion on foreign technology and local employment and problems thereof, see "Employment in Developing Nations", edited by Edwards, Edgar, O. Report on a Ford Foundation Study, New York, London, Colombia University Press 1974, especially the article by J. Pickett, D.J.C. Forsyth and N.S. McBain "The Choice of Technology, Economic Efficiency and Employment in developing countries".
For studies on this aspect with special reference to Sri-Lanka, see "Matching Employment Opportunities and Expectations: A programme of Action for Ceylon (Report and Technical Papers) I.L.O. Geneva, Nov. 1971 and P.J. Richards - "Employment and Unemployment in Ceylon" - Development Studies Centre Development Studies, No. 3, Chapter 9 Part V.

(8) - Clark - op cit - page 14 (reference No. 12) and also see "Rich and Poor Countries" by Hans Singer and Javed Ansari, George Allan and Unwin, 1977, especially Chapters 1, 7 and 8.

(9) - Clark - op cit - page 17

(10) - ibid - page 15
He points out that -

> "In some cases recipients will often pay large sums of money ostensibly for the technology package as a whole, but in reality for the right to use a particular brand name which has a high "selling value" on the local market."

(11) - See for example, Charles Cooper and Francisco Sercovitch "The channels and mechanism for the Transfer of Technology from developed to developing countries" UNCTAD, TD/B/AC/11/5, 14 June 1971, especially part 3, paragraph 153 and 155.

(12) - Clark - op cit - page 14

(13) - See for further details, F. Stewart, "Choice of Technique in Developing Countries"in "Science, Technology and Development" edited by Charles Cooper, London, Frank Cass - 1973.

(14) - See our discussion under 2.2 A

(15) - Clark - op cit - page 12 and see our discussion under 4 C XI.

(16) - Clark - op cit - page 17 and see our discussion under 4.C VII.

(17) - Central Bank of Ceylon, Annual Report 1974, Colombo, Page 181.

(18) - Meir Merhav - "Technological Dependance, Monopoly and Growth" Oxford, Pergaman Publications, 1969.

(19) - Clark - op cit - page 17 and also see page 15 and 16.

(20) - ibid - page 13

And Pickett, Forsyth and McBain - op cit - have shown in their study of Ghananaian and Ethiopian Sugar and Footwear Industries that firms tend to choose capital-intensive methods although alternative technologies were available. This could equally be applied in the case of direct aid where the recipient country has no bargaining power as we discussed under 2.2 C II

And also see Charles Cooper "Science, Technology and Development" - op cit - especially Chapter one.

# CHAPTER THREE

## PART 1

### 3.1 Capacity-Utilization - A Theoretical Discussion

In recent years the concept of capacity has been widely used in economic analysis, namely: in the areas of; economic development[1] investment planning[2] trade cycle theory[3] and large scale econometric model building[4]. All the measures of capacity available show major discrepancies and are liable to criticism. A review of the meaning of capacity and a survey of available capacity measurements are the main objectives of this chapter.

### 3.1 I The concept of capacity

The word 'capacity' is not a well defined term. In the literature, the capacity concept has been used in numerous ways which make it rather more complicated to understand what capacity really means. To cite a few examples:

> 'The output rate at which short-run average costs are a minimum' [5]
>
> 'The output of minimum long-run average costs'[6]
>
> 'The tangency point between intermediate cost curves and long-run (average) cost curves'[7]
>
> 'Full capacity would be defined as the out-put level associated with full competitive equilibrium. For the individual firm this point would occur at the minimum of the average cost-curve'.[8]
>
> 'The level of output that corresponds to the minimum level of short-run total cost is often called optimal capacity, plant capacity or more simply just the capacity'

of the firm: at a given time. Capacity in this sense is not an upper limit on what can be produced'(9)

'By full capacity output I mean the output that the existing stock of equipment is intended to produce under normal working conditions with respect to hours of work, number of shifts and so forth. It corresponds to the notion of full capacity used in the steel and other industries'.(10)

The above examples show two things clearly. One is that there is no agreed definition of capacity and the other is that the authors have consciously tried to define capacity in relation to the theory of the firm. One talks about the output at which short-run costs are at a minimum while another one talks about the output of minimum long-run average costs. One associates the notion of full capacity with full competitive equilibrium, while another one associates it with the usage in the steel industry in the U.S.A. which operates under oligopolistic rather than competitive conditions. Apart from those contrasting views, many have used the notion of capacity, 'full' capacity, 'optimal' capacity, 'plant' capacity, 'maximum' capacity, in such a way that they are synonymous. Needless to say, this has made the study of capacity a rather complicated one.

Some authors have used the term capacity as a self-defining term and they have taken it for granted that there is agreement about its meaning. For example:

'Whenever price competition fails to function ..... the result is not merely higher prices, but also excess capacity as a permanent and normal characteristic of the equilibrium adjustment'.(11)

We have seen that, at the theoretical level, the concept of capacity is not well defined. The explanations of the meaning of capacity given by most of the empirical investigations which have been undertaken into the problem of capacity utilization vary considerably. This is simply due to the fact that each and every investigation has been carried out on the basis of their own individual basic hypothesis which of course depends on the nature and the purpose of each investigation. We quote two definitions of capacity from empirical investigations to substantiate the above view.

The Wharton school measurement of capacity utilization based on the trend-through-peak method, defines capacity as follows:

> 'The capacity of an industry at a particular time is the maximum sustainable level of output the industry can attain within a very short-time if the demand for its product were not a constraining factor, when the industry is operating its existing stock of capital at its customary level of industry'(12)

The words "can attain" as well as "customary level" leave room for considerable variation. A.M. Okun's method of measuring capacity utilization is to construct an index which measures the divergence between the potential and actual G.N.P. which is essentially a highly aggregative macro exercise. His definition of capacity would be seen from the following:

> 'Potential differs from actual only because the potential concept depends on the assumption ——— normally contrary to fact ——— that aggregate demand is exactly at the level that yields a rate of unemployment equal to four percent of

the civilian labour force. If in fact aggregate demand is lower, part of potential G.N.P. is not produced; there is unrealised potential or a "gap" between actual and potential output'.(13)

This definition of capacity even though it may be acceptable at a 'macro' level, certainly is not suitable for industry. It is a limited and specific definition of capacity.

3.1 II Definition of Capacity

We have seen that people have defined capacity in numerous ways; and that in order to find some way of clearing up the confusion thereof, it is very necessary to try to establish such a definition.

First and foremost it is important to point out that the terms capacity utilization, capital utilization and labour utilization etc. are not synonymous terms. To begin with we define the term capacity as follows:

'The flow of output associated with all the fully utilized (i.e./in economic sense) inputs such as labour, capital, land, managerial skill and any other factors of production'.

Defining capacity in this way, can be treated as a definition at an aggregate level. However this definition could very well be related to a disaggregate level in the following manner:

'The flow of output associated with one factor input in combination with other factor inputs, provided other factor inputs are available with no restriction'.

These definitions at both levels of activities need some subjective qualifications. Firstly, these definitions do away with

the problem of choice of technique presuming that the best technique available has been employed. In the case of defining the capacity of a new investment, the choice of technique does not arise since it is presumed that the best suitable one will be selected. Secondly, both the aggregate definition as well as disaggregate definition can be applied to any level of business organisation (i.e. at firm level, or at industry level, or taking the economy as a whole). In other words using the aggregate definition we can measure a firm's capacity utilization, or an industry's capacity utilization or economy's capacity utilization and using the disaggregate definition, any relevant measure (i.e. capital utilization, land utilization or labour utilization etc.) can be built up at firm level, at industry level or by taking the economy as a whole.

Thirdly, it must be made clear that in no way do these two definitions (aggregate and disaggregate) of capacity relate to the long run and the short run respectively. At a theoretical level these definitions may relate to the long run since both definitions are concerned with changes in all factor inputs which is normally defined as long-run.

Fourthly, on application of these definitions, the aggregate measure can be treated as a linear or non-linear (as the case may be) combination of various disaggregate measures.

In other words the capacity utilization measure is the aggregate measure while the labour utilization measure, capital utilization measure, land utilization measure etc. are disaggregate measures. Out of these disaggregate measures an aggregate measure (i.e. capacity utilisation measure) can be built up. The weights to be attached to

each disaggregate measure in combining them linearly or otherwise into the aggregate one should be decided upon suitable and appropriate grounds. For instance, if we take the Cobb-Douglas[14] production function, we may treat the coefficients of independent variables as suitable weights if we are to aggregate labour utilization measure and capital utilization measure into one single aggregate measure.

Finally, it is quite important to note here that the notion of capacity is an output concept and not an input concept. Capacity refers to the flow of output and not to the stock of input.

A number of writers have recognised this distinction between the aggregate definition and the disaggregate definition in some way. For example:

> 'Neither capacity and capital stock nor capacity utilization and capital utilization are synonymous.'[15]

> 'It might of course be questioned whether research activity would not be better directed towards improving measures of capacity utilization. That such a question can be posed reflects the confusion that has arisen around the terms 'capacity' and 'capital stock' and 'capacity utilization' and 'capital utilization'. If capacity utilization could be measured perfectly, would anyone seriously question the need for separate (labour) unemployment statistics?'[16]

> 'The capacity concept relates to output. It is, therefore, different from concepts referring to a single factor of production, such as the rate of unemployment of labour or the degree of utilization of fixed capital plant and equipment.'[17]

'We make the distinction (not made by many writers) - between capital, labour and capacity utilization ..... and use these measures to assess the usefulness of the capital and capacity utilization measures we employ'.(18)

However very few have given this operational significance. Klein is one of them.

'Capacity output is thus the production flow associated with the input of fully utilized manpower, capital and other relevant factors of production ..... capacity is not purely a proxy for the capital stock. It is, in a sense, an index combination of all fully utilised factors, including others as well as the capital stock'.(19)

By using a Cobb-Douglas type production function approach, Klein and Preston(20) have made this clear in their study of capacity utilization. By considering only two factors of production they define the capacity output as follows:

$$X_{ct} = Ae^{\hat{r}t} L_t^{\hat{\alpha}} K_t^{\hat{\beta}} ,$$

where $X_{ct}$ = full capacity real output at time t

$L_t$ = available man hours at time t

$K_t$ = fully utilized real capital at time t

$e^{rt}$ = a proxy for technical change.

Measuring capacity by using a Cobb-Douglas type production function tends to ignore the importance of other utilization indices such as land utilization and managerial man-power utilization etc. Nevertheless this sort of measure makes the distinction between the aggregate concept of capacity and the disaggregate concept of capacity.

3.1 III A technical concept

Capacity concept can be viewed purely as a technical concept. As we have defined the aggregate concept of capacity, it has a technical meaning. For example in the case of development planning the normal practice is to estimate the attainable output from a certain project over a certain period of time. This estimation is done before any evaluation is considered and therefore it is purely a technical estimation of capacity of a certain project or industry.

The disaggregated definition of capacity too has a technical meaning. For example, an engineer's estimate of capacity of a particular machine is a technical estimate which essentially considers the productive power of the machine only (i.e. capacity at a disaggregate level). However an engineer's estimate of capacity of a particular machine is in practise influenced by some economic considerations* too as pointed out by Salter(21). For instance the engineer's estimate of the maximum attainable output of a particular machine often allows for 'normal' downtimes, holidays, and other operating conditions. Since those considerations, however, amount to "norms" the technical nature of the engineer's estimate still remains.

Furthermore, there are definitions of capacity given by some economists which are essentially technical. A.M. Okum's definition of 'Potential G.N.P. is a technical definition of capacity at an aggregate level. There the potential G.N.P. is measured with no reference to cost either directly or indirectly. Although the concept of capacity is wrongly used, Reginald C. Noyes refers to the technical meaning of the capacity at disaggregate level as follows:

* And also see for example, Frank de Leeuw - op cit - page 833, where he states that ... "An engineering judgement as to maximum attainable output often allows for normal down time, holidays, and other operating conditions".

'The absolute limit of capacity is reached when all of the strategic factors (plant and machinery) are operated at maximum speed and none is strictly idle for any of the 168 hours in a week'.(22)

The technical meaning to capacity is an estimationally motivated one with no reference to cost.

3.1 IV An economic concept

The concept of capacity can be viewed as an economic concept (i.e. economists' viewpoint of capacity).

Obviously an economist's view of capacity is influenced by various factors such as:

A. Productivity Theory.

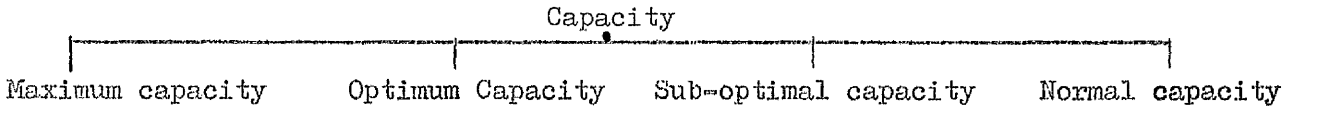
B. Prices of factor inputs.

C. Demand for the output concerned.

D. Profit/welfare maximization etc.

For instance a technical concept of capacity may be a mere consideration of what the attainable output is. But an economist would view capacity as economically feasible capacity which is subjected to various considerations such as those outlined above. This view seems more operative than technical and seems that there are various usages of capacity. Let us arrange these terms of capacity in an orderly manner as follows:

3.1 V. Capacity Specifications




= full capacity
= rated capacity
= designed capacity
= technical capacity
= physical capacity

= working capacity
= operational capacity

Maximum capacity is in general a technical measure. Optimum capacity is related to an optimization criterion which could relate either to profit or to production. The economic concept of sub-optimal capacity is linked with welfare theory. Normal capacity is related to day-to-day working capacity.

Normal capacity would become sub-optimal, or optimum, or maximum basically depending on a number of conditions such as: industrial organisation and concentration, the degree of freedom of entry, and product differentiation. In order to make it clear that these are not ad-hoc specifications of capacity we can show that some of these specifications can be linked with economic theory.

For instance the theory of "diminishing marginal productivity" can be used to illustrate the maximum and optimum capacity points. Thus, the capacity point where marginal productivity is maximum can be treated as optimal capacity while the point where marginal productivity reaches zero can be treated as maximum capacity.

Any capacity point below optimum capacity can be treated sub-optimal. Explaining sub-optimal capacity in this way is done with least cost considerations in mind. But in a way sub-optimality is determined by demand, prices and social welfare considerations etc. In this context, sub-optimal capacity implies under-utilization of capacity.

In simple terms 'normal capacity' is the capacity under which a firm or an industry is working under normal conditions for a reasonable period of time. Frank de Leeuw has viewed normal capacity as follows:

> 'Normal i.e. average over the past few years - operating conditions of each firm or industry as a standard. If two-shift operation with an average of 5 per cent machine down time has been customary practice in industry X during the last few years, (normal) capacity for industry X is defined in those terms.'(23)

Normal capacity to a firm is the average capacity sustained during a reasonable period of time. In one industry normal capacity may vary from firm to firm. Similarly normal capacity for one industry may be different from normal capacity for another industry.(24) Basically the level of normal capacity depends on the level of demand and over time, the level of normal capacity may change if the demand conditions are changed.(25) Stock adjustment is also a prominent variable in the determination of normal capacity. Still, if there is steady pattern of stock adjustment (or if it follows a similar system) it will have no significant effect on the pattern of normal capacity.

3.1 VI Capacity of a firm:

The capacity for one firm is not the same as that for another firm operating in the same industry, simply because of the differences in productivity in different compound sets of factor inputs. To make this clear, suppose there are two firms, each producing the same product with the same number of factor inputs. If we assume that the absolute productivity of each factor input in one firm is different from that of the other firm (although both firms are operating on the same scale) due to differences in efficiency, the relevant productivity curves are bound to be different from one another. Market imperfections too can make capacity specifications for one firm different from that for another firm.

3.1 VII. Capacity of an industry:

At the industry level, capacity specifications can be visualized easily if the market is either perfectly competitive or a pure monopoly. For instance if the market is perfectly competitive normal or working capacity of the industry can be counted upon simply by adding all normal capacity together, assuming implicitly that there is no difference between firm's specifications of capacity.(26) And also there are no difficulties in analysing capacity specifications of the industry if it is a pure monopoly, as the monopolistic firm represents the industry.(27) Capacity measurements such as those adopted by (a) Wharton School (b) Taylor and Pearce (c) Briscoe and Smith and (d) Hilton are based on industry level analysis.

3.1 VIII. Capacity of an Economy as a whole:

Again it is possible to define the capacity of an economy as a whole at a theoretical level. However, in practice, the maximum capacity of an economy may be estimated through normal capacity with an appropriate index. A.M. Okun's measurement of "potential G.N.P." provides an example of this kind of procedure which we will discuss later on under 3.2, 3 b (1). From development viewpoint the conceptualization and measurement of an economy's capacity will no doubt be an important exercise.

3.1 IX. Capacity in Relation to Time Period Analysis:

It is very necessary here to analyse the concept of capacity in relation to time period analysis. Earlier we stated that our definitions of capacity (aggregate and disaggregate) do not relate to long-run and short-run respectively. Definition of capacity can be conceptualized in short-run as well as in the long-run. For instance, the output associated with one factor input can be visualized for a very short period of time as well as for quite a long period of time. Hence, unemployment figures compiled from cross section studies constitute a proxy for the under-utilisation of labour force for a short period of time, while unemployment figures compiled from time series studies constitute a proxy for the under-utilization of labour force for a longer period of time. This could be applied to any other factor input equally. The aggregate concept of capacity can also be applied in the same manner, (i.e. cross section studies constitute short-run analysis while time

series analysis constitute long-run analysis). As far as the long-run potential capacity of a firm or an industry or the economy as a whole is concerned, its conceptualization would be very complicated. The only possible way of doing it is to look at potential capacity through normal capacity/trend with the use of an appropriate index.

3.1 X Capacity in Relation to Cost Curves:

On a discussion of capacity, we cannot avoid a discussion on the relevance of the shape of the cost curve. That is so simply because of the relationship between the capacity specification and the shape of the cost curves. According to the conventional theory of the firm the short-run average cost curve takes a 'u' shape while the long run average cost curve takes a 'u' shape with smaller curvature. If we take the short-run average cost curve the capacity specifications can be illustrated as follows:

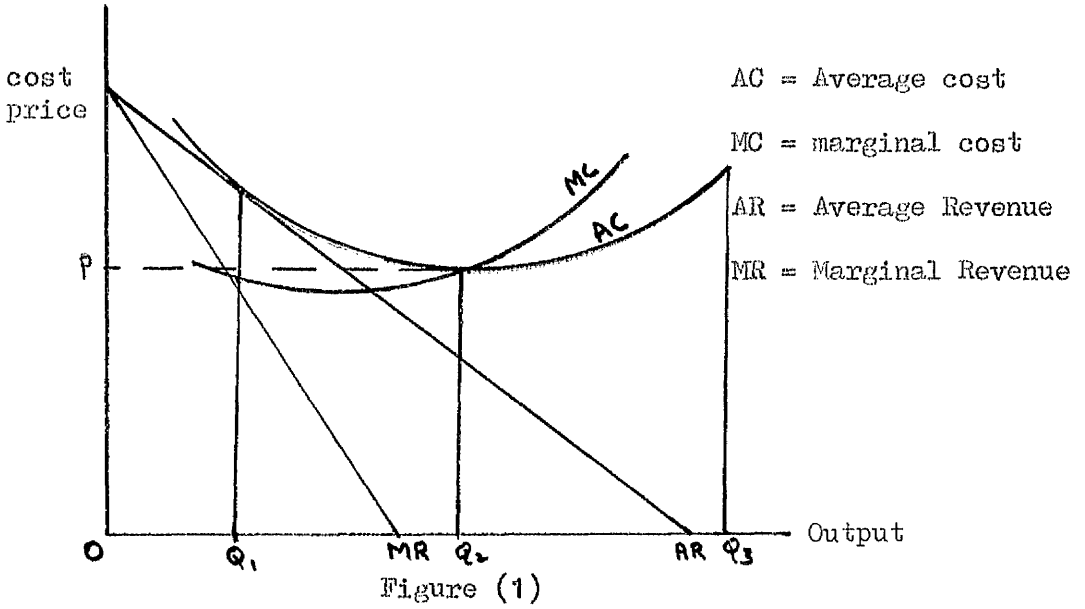



Figure (1)

According to the figure (1) above, capacity specifications are as follows:

Maximum capacity = $oq_3$

Optimum capacity = $oq_2$

Sub optimal capacity = $oq_1$.

Under non-perfect competitive conditions the normal capacity would be $oq_1$ which is sub-optimal and in turn it implies under-utilization of capacity. Under perfect competitive conditions if the demand conditions are such that the amount demanded and the prevailing price are $oq_2$ and op respectively; the normal capacity then would be $oq_2$ which is the optimum capacity.

Empirical studies[28] on cost analysis have shown that the average cost curve (short-run and long-run) takes an 'L' shape rather than a 'u' shape. Accordingly we have:

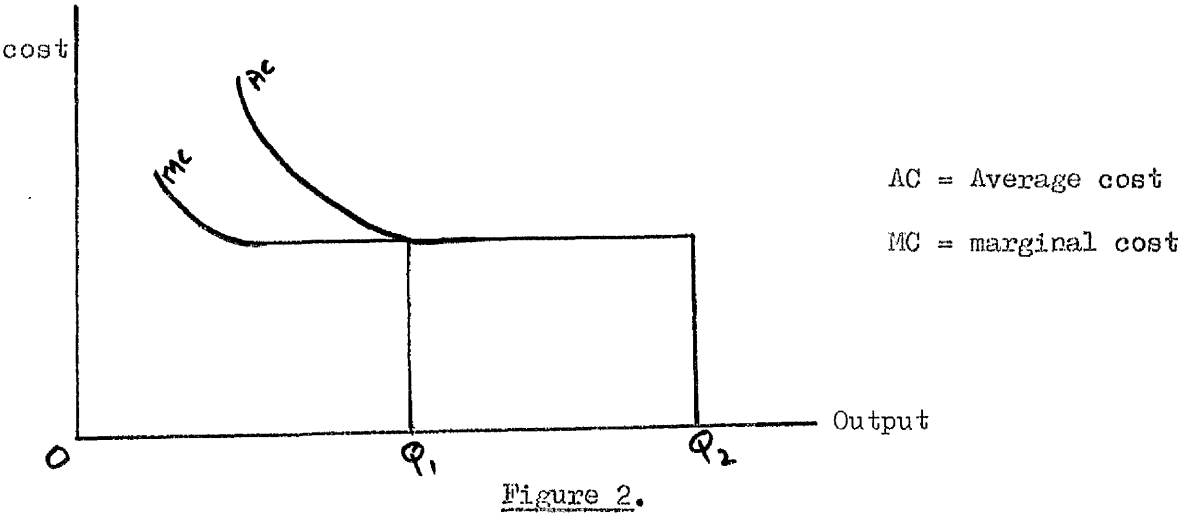



Figure 2.

The rationale behind this shape of the curves are the following:

a) Eventually constant marginal productivity of factors

b) No diseconomies of scale.

According to the above shape of the cost curves, the capacity specifications are as follows:

$$\text{maximum capacity} = oq_2$$

$$\text{optimum capacity} = oq_1 \longrightarrow q_2$$

According to the conventional cost curve analysis, optimum capacity is a point specification whereas according to the empirical cost studies the optimum capacity is a range specification. If there exists a range for optimal capacity that allows for entrepreneurs to adjust their normal level of production within that range according to the market conditions. Under-utilization of capacity arises if the production falls below the lower limit of the range of optimal capacity.

In summary, we have seen that capacity is a very important concept in a number of fields of economic importance. The concept of capacity has been defined in various ways, and this has led to some confusion amongst researchers. The most common error is that many people appear to believe that capacity utilization and capital utilization are synonymous. In other words, in constructing capacity utilization series they have actually constructed capital utilization series and called these capacity utilization series.

Very recently, people have recognised and have emphasised the importance of differentiating between capacity utilization

and utilization of single individual factor inputs such as capital utilization, labour utilization etc. We have introduced this differentiation as a distinction between the"aggregate capacity' concept "and the"disaggregate capacity concept". We have defined the former as the capacity which fully utilizes all factor inputs and the latter as the capacity which fully uses one single individual factor input.

We have also emphasised the importance of analysing capacity in relation to various analytical concepts in economics (such as short-run, long run etc.) and have seen that the meaning of various capacity terms (i.e. normal capacity, optimum capacity, sub-optimal capacity etc.) varies according to the context in which they are used. Hence the construction of a capacity-utilization series (at both aggregate and disaggregate levels) will inevitably be a difficult exercise; and in the process, no doubt, there will arise numerous problems which we will discuss in detail in the second part of this chapter.

## Part 2

### 3.2 Capacity Utilization Measures: A Survey

#### 3.2 A. Introduction

There are quite a number of studies on capacity utilization measures which have been applied both at the aggregate level and at the disaggregate level. Most of these studies, however, are based on analyses at the disaggregate level. Again, in the case of work at this level, although we have a number of studies on capital utilization and on labour utilization, studies on land utilization and managerial skill utilization are rare. So our attention will be focused on the following measures:

I Capital Utilization Measures

II Labour Utilization Measures

III Capacity Utilization Measures

respectively.

#### 3.2. B. Capital Utilization Measures

The available measures on capital utilization can be divided into two groups. They are:

I Output based approach

II Direct estimates

We will discuss the output based approach first. This approach can itself be divided into two categories, viz:

(a) The measurement of capital stock over time.

(b) Specification of the variables which determine

the desired usage of the capital stock, for instance, normal hours worked, output, employment of labour, relative price of capital to labour, technical progress etc.

3.2 B I (a) The measurement of capital stock

Let us first discuss the measurement of capital stock over time. Since there are a number of measures which fall into this category, we will try to examine them in a sequential and conformable manner.

To begin with, there are a number of estimates which follow a similar procedure. The Central Statistical Office[29] (London) has estimated the gross capital stock for the U.K., and this study seems to have followed the procedure of the National Industrial Conference Board[30] which obtained estimates for the gross capital stock for the U.S.A. economy. The Central Statistical Office estimate is based on the hypothesis that

> "Assets are assumed to render their services, in equal amounts in each year of their life".[31]

This estimate is based on 1958 replacement cost. Redfern[32] has attempted to estimate net investment rather than the gross capital stock. According to his analysis:

> "Net investment is derived from the change in the written down value of assets, after correction for price changes. Thus the estimates of net investment given, take account not only of changes in the quantity of assets installed but also of changes in their unexpired lives."[33]

Another attempt has been made by Dean[34] to estimate the stock of fixed capital in the U.K. by using a stock of perpetual inventory method, but here a careful definition of inventory is needed. A capital consumption series is estimated by using the estimated gross capital stock. Dean has explained it as follows:

> "Estimates of capital consumption can be derived from estimates of the gross capital stock by dividing them by the assumed length of time."[35]

Obviously this capital consumption series is different from a capital utilization series. All these estimates have assumed average lives for each type of asset and apply these to gross fixed capital formation for earlier years. Except for Redfern, others have made no allowance for depreciation over time; the asset is assumed to be as useful all its life as it was on the day it was made. This type of estimate may be a sensible capital stock estimate to use if we are concerned with the physical capacity of piece of equipment.

3.2 B I (b) Specification of variables which determine the desired usage of capital stock:

Brechling[36] has proposed to measure capital stock by using certain deterministic variables. He assumes that gross investment and retirements have constant arithmetic time trends and that rate of retirements in fact does not deviate from its time trends; on this assumption he derives a fairly simple expression for the level of capital stock from a gross fixed capital formation time series. Brechling's equation takes the following form:

$$C_t = C'_t + A - (I_o^{\gamma} + \frac{d}{2})t - \frac{d}{2}t^2 \qquad (1)$$

where

$C_t$ = the level of capital stock at time 't'

$C'_t$ = the sum of gross investment at time 't' = $(\sum_{j=1}^{t} I_j)$

A = the difference between the level of capital stock and the sum of gross investment at some arbitrary time = $(C_t - \sum_{j=1}^{t} I_j)$

$I_o^r$ = the level of retirement at time 0

d = arithmatic rate of growth of retirement

t = time variable which starts at 0

$I_j$ = gross investment at time j.

A, $I_o^r$ and d are unknown but in many cases they are concerned largely with the cyclical pattern of the capital stock and it is not necessary to know their values. Although this measurement takes into account retirements of capital goods, it leaves the problem of the initial capital stock unsolved. In other words, to calculate capital stock at time t, what we basically do is to add up all the gross investments for the time period from j to t (= $\sum_{j=1}^{t} I_j$). In this case we must either assume that at time period j there is zero capital stock or simply neglect it; an alternative would be to assume an arbitrary constant for capital stock at time j.

Having derived the capital stock at time t, Brechling then goes on to determine the relationship between employment and output in British manufacturing industries, which we shall discuss under labour-utilization series section (3.2; C).

Alternatively it would be possible to construct a function to demonstrate capital utilization using the similar deterministic variables which Brechling used in his study. It would take the following form:

$$C^{*}_{t} = f\ (Q_{1},\ H_{t},\ E_{t},\ T_{t}) \qquad (2)$$

where

$C^{*}_{t}$ = the usage of the capital stock at time t

$Q_{t}$ = output at time t

$H_{t}$ = normal hours worked by labour for time t

$E_{t}$ = employment of labour

$T_{t}$ = technical progress which is a function of time

The behaviour of independent variables in relation to the dependent variable is as follows: normal hours worked by labour is effectively a proxy for the number of hours that a given piece of capital equipment is normally used, and it is expected that the proportion of the stock in use will depend positively on this. Employment of labour here, is a proxy for the availability of labour to work the machines, and represents a positive relationship. A price variable is not included here. This can be justified for the short-run, assuming that the manufacturers do not change their production technique in response to price changes. Furthermore, the price variable that is required relates to the cost of using capital rather than labour and in general this is capital that already exists, and is owned by the entrepreneur. The marginal cost of using the existing capital is likely to be very small in the short-run. But in the case of the long-run, it is necessary to include a price variable(37) to give effect to long-run adjustments due to relative price changes. For the moment, a linear form of the function (2) is assumed for our discussion which is given below:

$$C^*_t = B_0 + B_1 Q_t + B_2 H_t + B_3 E_t + B_4 T_t \qquad (3)$$

Here we need to know the appropriate weights to be given to each of the variables. One way of doing this is to impose some form of prior restrictions on (3). Burman(38) in his study of capital utilization has followed this procedure, assuming that the simple relationship between the capital stock and average output is constant from one cycle to the next.

An alternative prior restriction would be to assume that peak capital utilization in each cycle represents 100 per cent utilization and to interpolate by straight lines between peaks (following the Wharton School method).(39) Pearce and Taylor(40) used this approach in relation to output-capital ratios; and from the interpolation of the peaks in the output-capital series, derived implicit values for capacity output in other quarters. Furthermore, they have revealed a number of interesting phenomina in relation to capital utilization. These are, (a) small margins of spare capacity are associated with high levels of imports of fuel and basic materials(41) (b) export expansion and margins of spare capacity is related negatively(42) (c) a high level of unused capacity is associated with reductions in investment four quarters later while low margins of unused capacity are associated with increase in investment(43). Both 'Burman' and 'Pearce and Taylor' refer to their measures as capacity measures although they study only the relationship between capital and output. So we included them under our discussion of capital utilization series.

Another way of determining the appropriate weights is to use functions of the type shown in (2) directly in the estimation of some variables. This sort of approach has been adopted by Hickman(44). He starts off with a formulation of net investment which is as follows:

$$I_t = b\,(K_t^* - K_{t-1}) \qquad (4)$$

where $I_t$ = investment at time 't'

$K_t^*$ = desired stock at the end year of t

$K_t$ = actual stock at the end year of t

and $0 < b \leq 1$

Equation (4) implies that real net investment (change in net capital stock) in any year (say, t) is proportional to the difference between actual capital stock of a year before (t-1) and desired capital stock in year (t). The desired capital stock is defined as the stock which would be desired in long-term equilibrium under the conditions existing at time t. Then assuming a linear relationship Hickman formulates a function for desired stock of capital in the following way:

$$K_t^* = a_1 + a_2 Y_t^* + a_3 P_t^* + a_4 T \qquad (5)$$

According to the equation (5), desired stock of capital is a function of the expected long-term or 'normal' level of output ($Y^*$), and relative prices ($P^*$) in year (t) plus a time trend. The output and price variables are included on the usual marginal productivity grounds. In Hickman's words:

> "A net increase in the stock of capital goods will be undertaken in proportion to the gap between the desired stock, as established by marginal productivity conditions and the actual stock. It is therefore necessary that the stock of capital be measured in some way that permits direct comparison of the productivity of existing assets with that of new assets to be added."(45)

But here one question arises because, due to technical progress, new assets are generally more productive than older assets of equal real cost. One way to solve this problem (quality improvement in capital goods) is to weight the installed capital goods of each vintage by a "productivity improvement factor" which increases over time. Then what happens is that new capital equipment is "written up" (i.e. in constant quantity units, new capital goods are counted as more physical capital).

An alternative (conventional) procedure is to measure the capital stock at its net depreciated value. Then older capital equipment is written-down in order to make it comparable with new capital goods. However, this does not get us around the "quality improvement" problem. In Hickman's equation (5) above the variable T for time period is regarded as a proxy for technical progress which will affect the efficiency of capital stock over time.

By substituting equation (5) into (4) Hickman derives the following simple form for investment:

$$I_t = b\,a_1 + (b\,a_2)\,Y_t^* + (b\,a_3)\,P_t^* + (b\,a_4)\,T - bK_{t-1} \qquad (6)$$

From equation (6) we can see that investment is proportionally related to the value of the previous capital stock, and this relationship has been used for constructing a capital utilization series.

3.2 B II Direct Estimates:

Direct estimates fall into two categories; they are:

(a) Questionnaire studies

(b) Estimation of capital usage through the use of fuel.

3.2 B II (a) Questionnaire studies:

We have two main questionnaire surveys on capital utilization: they are:

I McGraw Hill survey(46)

II Confederation of British Industry Survey(47)

The above surveys refer in their studies to capacity utilization, though the series derived are of capital utilization. Both the surveys cover only manufacturing industries. It is sufficient here to discuss them in general since differences between them tend to be unimportant.

There are advantages as well as disadvantages of this type of study, the main advantage being the possibility of getting answers from persons who should know the actual facts. Disadvantages are the inclusion of non-random errors and biases such as:

a. Possible inclusion of changes in capacity resulting from mergers and consolidations.

b. Possible error at the industry level because of recording expansions in an incorrect industrial classification.

c. Possible failure to account for reductions in capacity caused by bankruptcies of firms and retirements of services.

d. Possible bias because results depend primarily on replies by large firms.

e. A potential motive bias due to the feelings businessmen have with respect to capacity.

At the level of the firm (specially in the short-run) the share of the market is used often as a measure of business performance. Because of this, industrial expansions may be overstated where firms are reluctant to divulge poor performance. Since capital utilization indices such as that of the McGraw Hill study add cumulatively the reported increases in capacity, the entire index may take an upward turn because of such response biases.

Another problem is the definition of "physical output" in questionnaire studies, because "physical output" is a far more complex concept for multiproduct firms than it is for a single product firm.

This problem can be solved to a certain extent by asking respondents to answer in terms of an aggregate product mix, because of the possibility that expansion may take place in one line or two, while other lines may not expand at all or perhaps may experience contraction.

Respondent's replies to the rate of utilization question may also be influenced by "product mix" and balance of services among processes. Implicitly, more often, questions seem to assume a given mix and a balance of services which are not stipulated for the respondent firm. If there happens to be an extreme imbalance in services among processes then respondent's answers would be incompatible with the implicit assumptions made. So, in order to improve these indices attention must be paid to these problems.

3.2 B II (b) Estimating the Usage of Capital through the Use of Fuel

In an attempt to construct capital utilization series through the use of fuel Heathfield[48] has tried to estimate the utilization of capital via the demand for electricity. This is a new approach and it has the advantage of measuring capital utilization with direct relation to the use of capital. Yet this method is not free of defects by any means. An input like electricity is used not only for manufacturing but also for administrative work as well. If management is 'housed' at the plant site, irregularities may occur in appropriation of demand for electricity between manufacturing and administration if separate records are not maintained for such purposes (practically this may not be possible and may be expensive too).

Similarly if electricity is used for providing the "necessary environment" in order to keep machines in good running order, the use of that electricity may also be included in the electricity bill. Then a decision will have to be made as to whether demand for electricity for such purposes falls under manufacturing or maintenance. If such use of electricity varies from quarter to quarter depending on weather and other conditions, then electricity consumption will vary accordingly, and obviously this need have no direct relationship with the level of output. In such a case, the use of demand for electricity in the measurement of capital utilization would definitely be inappropriate and misleading.

Apart from this, there will be a number of aggregational problems. For instance, if an industry is using different varieties of fuel (not only electricity) the problem of selecting the appropriate weights

to be given to each category of fuel will have to be looked into. Again, once we take the economy as a whole, then the same problem arises when we try to aggregate different industries which use various types of fuel in various proportions. So, the use of fuel as a deterministic variable for capital utilization will have to deal with a number of complications.

### 3.2 C. Labour Utilization Measures

Labour utilization is an area in which numerous studies have been carried out. One set of studies aims at constructing capacity utilization series (see discussion below) while another set[(49)] of studies concentrates on examining labour utilization series with a view to finding out some relationship between labour utilization and other economic variables such as inflation, wage rates, productivity etc. We will limit our discussion to those measures which are directly related to 'capacity'.

Though we can treat capital as a fixed stock at least in the short-run, this cannot be applied to labour even in the short-run. In other words the labour force is flexible to a greater degree. Hence the utilization of labour becomes a multidimensional concept. For instance, the length of working hours of workers may vary from worker to worker, and workers may work on different shift systems. The number of shifts may vary from firm to firm and from industry to industry. The workers may change their industry due to better remuneration or better prospects, and the working hours and other conditions in the new industry may be completely different from the previous one.

Therefore we are faced with two problems; one is to decide whether we should measure labour utilization in terms of men or in terms of man hours; and the other problem is, having decided this, how should we measure the "available labour force" to construct a utilization series?

When we look at labour utilization as a short-run concept, unemployment and unfilled vacancies may be useful variables to calculate in measuring labour utilization. This has been attempted by Dow and Dicks-Mireaux[50] in their study of excess demand for labour. Their study is based on quarterly averages of unemployment and of unfilled vacancies as a percentage of employees. They have stressed the fact that additional attention was paid to hours worked and employment; and labour turnover has been considered as evidence of labour demand.[51] This study has revealed that there is a positive relationship between unfilled vacancies and unemployment. When unfilled vacancies are high unemployment figures also tend to be high and vice versa (the period of their study belongs to 1946-56). They conclude[52] that if unemployment figures and unfilled vacancies each as percentages of employment figures fall to zero, then the rate of utilization of labour is 100 per cent. However, this direct relationship should not be taken as a general phenomenon because it may be possible that there exists some other relationships between these two variables. For instance, at an aggregate level, the relationship between these two variables seems to be a negative one; as Parikh[53] points out:

> "At an aggregate level, negative excess supply (low percentage unemployment) is the same as excess demand (large number of vacancies), whilst positive excess supply (higher percentage unemployment) is equivalent to the negative excess demand (low number of vacancies)[54]

Also, attempts[55] have been made to establish a log-linear relationship between unemployment and unfilled vacancies.

However, there is a growing feeling among researchers that statistical relationships between these two variables may be misleading. To cite a few examples:

> "Various authors accept that meaningful observations about the determinants of unemployment can be made on the basis of the "Unfilled vacancies" relationship. In other words a break in the unfilled vacancies relationship tells us something about unemployment. This approach seems to us to be invalid. In no sense is the vacancy rate the determinant of the unemployment rate and therefore inferences about unemployment based on the unstable unfilled vacancies relationship are suspect though not necessarily incorrect"[56]

> "It is strongly felt that statistical relationships between unemployment and vacancies will be both misleading and of little economic relevance. Such studies can, however, constitute an addition to the literature on measurement without theory"[57]

Therefore, the usefulness of the Dow and Dicks-Mureaux method in the explanation of labour utilization seems rather limited.

An alternative approach is to use employment as an estimate of the demand for labour as suggested by Brechling[58] in his study. However, with regard to the estimation of labour supply we need

some 'prior information' especially on efficiency units, multipurpose work etc.

Apart from the problem of collecting these data there is the question of reliability of employment statistics. However, Brechling has derived a function for demand for labour as shown below:

$$E_t = \alpha_1 + \alpha_2 Q_t + \alpha_3 t + \alpha_4 t^2 + \alpha_5 H_t + \alpha_6 E_{t-1} \qquad (7)$$

where $E_t$ = employment at time 't'

$Q_t$ = output at time 't'

$t, t^2$ = time variables for technical progress

$H_t$ = normal hours worked

$E_{t-1}$ = employment at previous time period.

The inclusion of the variable $H_t$ will be helpful in analysing the effect of the number of hours worked. However, this formulation does not treat the problem of efficiency units. Furthermore, the treatment of unemployment series so as to represent "availability for work" would not be very satisfactory. For example, when workers are made redundant they will be added to the unemployed labour force of that industry. Unemployment statistics may provide a guideline for the level and change of the availability of labour to that industry; but this will be different if the redundant workers can find temporary work elsewhere (until such time as they revert back to their "customary" industry). Now the industry in which the redundant workers have found temporary employment, is hiring workers who are registered "unemployed" in some other industry. So it would be necessary to take these possibilities

into account when using unemployment statistics as a measure for the availability of labour for work.

However, in cases where workers have specialised skills for a particular industry, or where workers are not willing to work in any other industry apart from "the customary one", then unemployment statistics may be useful as an indicator of the availability of labour to the industry concerned.

3.2 D. Capacity Utilization Measures

As we mentioned earlier, capacity and capacity utilization measures refer to achievable outputs rather than achievable inputs. In the case of labour utilization and capital utilization (and for any other factor input) we may use labour and capital "stocks" (or other input stocks) as proxies to represent utilization of the respective factors. Unfortunately this is not possible in the case of capacity utilization unless we are able to find a formula for combining factor inputs to form an index. Hence in order to measure capacity utilization, we need to define "achievable output". A number of approaches have been introduced by researchers to define this and to measure capacity utilization accordingly; these are:

D I Trend-through-peaks method[59] (Wharton School Method)

II Capacity multipliers

(a) Unemployment Approach (A.M. Okun)[60]

(b) Production Function Approach (Klein & Preston)[61]

3.2 D I Trend-Through-Peaks Method:

According to the"Wharton School method" the notion of capacity implies that:

> "Capacity of an industry at a particular time is the maximum sustainable level of output the industry can attain within a very short time if the demand for its products were not a constraining factor when the industry is operating its existing stock of capital at its customary level of industry"(62)

The rate of utilization for an industry in any particular period is the ratio of its actual output to its potential (or capacity) output. The numerator of this ratio is merely the numerical value of the industry's physical output series corresponding to the time period: but the potential output is observable only occasionally. So it must be estimated and to do this "trend-through-peaks method" is used.

The following are the steps to be followed according to this method, for the calculation of potential output:

I. The first is the identification of periods when an industry (or firm) was producing as much as it could. Such times are treated as equal to potential capacity.

II The second is the estimation of the output trend from an interpolation between potential output levels (known from I above)

III The third is an extrapolation for periods before that of the first known potential output and periods after that of the last known one.

In actual fact a time series for potential output is constructed from a trend curve drawn through selected ordinates of a graph of actual outputs. Determining peaks, interpolation and extrapolation for both future time periods and past time periods may pose problems in implementing this procedure. Furthermore, the most obvious problem in the application of this procedure concerns the question as to whether there has been chronic capacity under-utilization in the industry concerned. If so, then the "peak" output could be less than "potential". There may be no way to deal with this problem in general, but if some "prior information" is available then the problem may be solved to a certain extent (we will be dealing with this aspect in detail under 4 B).

According to this procedure, potential capacity between two peaks follows a straight line which implies that potential capacity grows smoothly between peaks with no regard to changes in factor inputs. But there seems to be an implied assumption here, namely that all the factor inputs are available in sufficient quantities over time. It ought to be pointed out that connecting through peaks by straight lines is a simple way of solving what may be a complex problem, and it might be better to find some other formula which would fit into a theoretical explanation of the behaviour of actual output between peaks.(63)

In addition, it is worth mentioning that the "trend-through-peaks" method has been widely acknowledged and applied in a number

of studies; to name a few (a) D.W. Pearce and J. Taylor[64] (b) A.R. Nobay[65] (c) K. Hilton and H. Dolphin[66] (d) J. Taylor D. Winter and D.W. Pearce[67] . The method has been extensively used in econometric research, particularly in the Wharton School Econometric Forecasting Model[68] of the U.S.A. economy; and it has proved to be very successful.[69]

3.2 D II (a) Unemployment Approach

A.K. Okun's approach[70] tries to show that a certain rate of unemployment could be a proxy for potential output. For the U.S.A. economy he has correlated output levels with unemployment rates and has found that the optimum rate of unemployment for the U.S.A. economy is four per cent[71]; and this level provides a proxy for potential output. In addition he has found that a one per cent change in unemployment will bring about a 3.2 per cent change in output.[72]. Though he has suggested the four per cent unemployment rate as a full employment rate, he states[73] that it could be adjusted according to changing circumstances in the economy.

Theoretically, however, the level of output which corresponds to a four per cent rate of unemployment will certainly be below potential capacity output. Using Okun's own data, simple arithmatic shows us that by employing (unemployed) four per cent potential output would be increased by 12.8 per cent. Why then should we not accept that the potential output is equal to that level of output corresponding to the four per cent unemployment rate multiplied

by 112.8 per cent, which would seem to be more sensible than agreeing to maintain a four per cent level of unemployment in the country? Apart from these problems at a theoretical level, there is the usual problem of suitability of unemployment statistics as an indicator of the availability of labour which we have discussed under 3.2 C.

3.2 D II (b) The Production Function Approach

Klein and Preston(74) have introduced the Production function approach to measure capacity utilization, by using a Cobb-Douglas type production function. The actual and full capacity output are defined respectively in the following way:

$$X_t = A e^{rt} L_{et}^{\alpha} K_{ut}^{\beta} V_t \qquad (8)$$

and

$$X_{ct} = A e^{\hat{r}t} L_t^{\hat{\alpha}} K_t^{\hat{\beta}} \qquad (9)$$

where

$X_t$ = Actual output at time 't'

$Le_t$ = Actual man-hours employed at time 't'

$K_{ut}$ = Real capital employed at time 't'

$X_{ct}$ = Full capacity real output at time 't'

$L_t$ = Available man hours at time 't'

$K_t$ = Fully utilized real capital at time 't'

$e^{\gamma t}$ = A proxy for technical change

$V_t$ = Disturbance at time 't'

$\hat{\gamma}$, $\hat{\alpha}$ and $\hat{\beta}$ are estimates of the coefficients of $\gamma$, $\alpha$ and $\beta$, and also it is assumed here that $E(V_t) = 0$. We can see that the rate of capacity utilization is measured by calculating

$X_t/X_{ct}$. To do this we need to collect data on the following variables; $L_{et}$, $K_{ut}$, $L_t$ and $K_t$. Industry data on man hours worked ($I_{et}$) and the stock of real capital ($K_t$) are usually capable of being generated. $K_{ut}$ and $L_t$ (i.e. utilization of capital and available labour force) need to be estimated. Klein and Preston have used[75] the rate of man hour employment (by industry) as a proxy for the estimation of utilization of real capital ($K_{ut}$); and they assume[76] the following relationship:

$$\frac{K_{ut}}{K_t} = \frac{L_{et}}{L_t} \qquad (10)$$

which is that the rate of capital utilization is equal to the rate of labour utilization. And they claim that there are strong reasons[77] to justify this assumption. When the relationship (10) is assumed, properties of the Cobb-Douglas production function permits us to derive the following relationship:[78]

$$\frac{X_t}{X_{ct}} = \left(\frac{L_{et}}{L_t}\right)^{\alpha + B} V_t \qquad (11)$$

Then the initial problem reduces to calculating $L_t$ and then according to the relationship in (11) above the rate of capacity utilization will be equal to the rate of labour utilization in the case where $\alpha + B = 1$ and the disturbance term ($V_t$) approaches one. Still, this approach is a useful one because <u>firstly</u> it provides an opportunity to look at capacity in relation to cost because of the production function approach, and <u>secondly</u>, this approach possesses a great deal of policy significance.

Summary

We have made a comprehensive attempt here to examine critically the available capacity measures and we have found that there is a significant amount of literature on the subject. Firstly, we have arranged available measures under capital utilization, labour utilization and capacity utilization. Secondly, we have tried to link the available measures in each group to follow a sort of logical sequence. We have found that the estimation of the use of capital stock is the main ingredient in the analysis of capital utilization. For this, economists have used a number of 'proxy variables' such as the change in fixed capital stock, net investment and the use of some deterministic variables such as man hours worked, use of raw materials etc.

In the case of labour utilitsation, it is the estimation of availability of labour that becomes the centre of discussion; for the estimation of the availability of labour, researchers have widely used unemployment statistics as a proxy.

In the discussion of capacity utilization we have found that the estimation of potential capacity is the main problem. Peak output levels, the unemployment rate, and an estimated production function are the proxies that have been used for this purpose.

As a general rule, we cannot say which measures are suitable and which are not, because each measure has its advantages as well as disadvantages, and it may be the case that we have to employ

different methods to measure utilization of capacity for various sectors in an economy and for various countries as well.

In the case of developing countries, the study of capacity utilization (or any other area for that matter) is first and foremost constrained by the lack of relevant and accurate data. Subject to this constraint we will have to choose a suitable method for constructing capacity utilization series. Perhaps the best way of selecting a suitable method would be to carry out different utilization series using different methods and then to compare the results of different methods with one another. Of course, this would be an enormous task. In our empirical study of capacity utilization in eleven industrial public corporations in Sri-Lanka, we have chosen the trend-through-peaks method and the reasons for selecting this method will be dealt with in the discussion of the empirical work under 4 B.

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# CHAPTER 4

## CAPACITY UTILIZATION IN ELEVEN PUBLIC SECTOR INDUSTRIES IN SRI-LANKA

### 4 A Introduction

The main purpose of this chapter is to examine the results of our empirical study on the problem of under utilization of capacity in a number of public sector industries in Sri-Lanka. This may enable us to:

i. Understand the extent of under utilization of capacity in these industries.

ii. Find out the reasons for such phenomena

iii. Analyse the economic consequences of under-utilization of capacity.

iv. Find various solutions to the problem of capacity under utilization.

We have some 70 odd public corporations in Sri-Lanka, not all of them are engaged in production (as production is commonly defined) and we have selected eleven public corporations for our study. In selecting these, we gave preference first to those corporations which are engaged in production and second to the availability and the presentability of the data.

The public corporations (with the time periods selected for each one) under study are as follows:

| | | |
|---|---|---|
| 1. | Ceylon Tyre Corporation | $1967^{(1)}$ - $1974^{(4)}$ |
| 2. | Ceylon Hardware Corporation | $1965^{(3)}$ - $1974^{(4)}$ |
| 3. | Ceylon Mineral Sands Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 4. | Ceylon Oil & Fats Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 5. | Ceylon Leather Products Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 6. | Ceyloh Paranthan Chemicals Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 7. | Ceylon Textiles Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 8. | Ceylon Cement Corporation | $1955^{(1)}$ - $1974^{(4)}$ |
| 9. | Ceylon Ceramics Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 10. | Ceylon Eastern Paper Mills Corporation | $1964^{(1)}$ - $1974^{(4)}$ |
| 11. | Ceylon Steel Corporation | $1967^{(1)}$ - $1974^{(4)}$ |

Unfortunately, we have not been able to establish a uniform time period for our investigation. The main reason for this is that the history of industrialization in Sri-Lanka is comparatively recent, and considering the necessity of a fairly lengthy time period for a meaningful investigation, the data are simply not available.

In a macro sense, we can treat these corporations as the respective industries since almost all of them are the sole producers of the products concerned.

## 4 B Methodology

As we have discussed under the Section 3.2 D, there are various ways of estimating capacity utilization in an economy. Estimating capacity utilization in Sri-Lanka has so far been done on the basis of the engineering concept of capacity.[1] This method is often criticised since the estimation is more technical than economic.

Accordingly we have tried here to use the Wharton School method[2] for computing capacity utilization. A question may arise as to why the Wharton School method was chosen among many others. In our discussion of available capacity utilization measures under Section 3.2 D, we have seen that there are only three measures available for computing Capacity-utilization series. Out of these, A.M. Okun's unemployment approach can be applied only at a highly aggregate level[3] (i.e. economy as a whole), and it cannot be applied either at the firm level or at industry level simply because of the non-availability of unemployment data. Since our aim is to investigate the extent of under-utilization of capacity in a number of public corporations in Sri-Lanka, Okun's approach would not be suitable for our purposes.

Then we have the Klein-Preston production function approach. As we have discussed in Section 3.2, D II (b), the application of this method involves the estimation of potential output through the production function. This means that we should have to compute production functions for each industry under study; and undoubtedly this would have been an enormous task and would have clearly been beyond the scope of our study. At the same time, we were faced with the non-availability of suitable data for such an attempt as we mentioned earlier under the sections 3.2 C and 3.2 D II b.

Hence, the obvious choice was the Wharton School method which possesses both simplicity in calculation and methodological superiority over other methods. Furthermore, as was mentioned in Section 3.2 D I,

this method of capacity utilization has been widely acknowledged and has been widely used by many researchers.

Utilization rates are estimated by the "trend-through-peaks" method, using industry indices of physical output. For all the eleven industries the physical output series are computed from the published industrial production data by the Planning Ministry in Sri-Lanka; in each of these eleven industries, monthly physical output series are averaged into quarterly figures, after making adjustments for seasonal variations.

Following the "trend-through-peaks" method it was assumed that a relative peak in an industry's time series of actual output, in fact, represents the potential output that the industry could produce at the time of that peak(4). However, as we pointed out in the section 3.2 D I, if there has been chronic under utilization in an industry historically, then, even the "peak-output" may underestimate the "potential output". This problem arises and attention should be paid especially at the initial stages of an industry's lifespan. It is likely that because of the "infant industry" nature of a young industry, this bias becomes less important in the course of an industry's development.

In attempting to avoid this problem the general rules adopted in selecting peak points are as follows:

I In the case of the initial stages of an industry's lifespan, Decide the initial period of an industry by locating the point where first new investment is introduced. From the commencement of production to the point selected above, choose only one peak which is the highest point during that period.(5)

II In the latter stages of an industry's lifespan,
Select the points which are "relatively" high, as peaks.(6)
As a matter of fact these peaks may coincide (in a certain way) with additional investment points.

We would not have to worry about the rule I if we were studying the capacity utilization of a grown industry.

There are two more points to make clear. One is the possibility of using some other "prior information" in selecting peak points. For instance, if there is sufficient reason to believe that peak levels do coincide with the behaviour of some other appropriate variable, then certainly this could be used for a check. In our case, we used the investment variable. We found that nearly all the peaks selected in all the industries were related to additional investment. In general we found that an additional investment in time period 't' is related to an increase in output in time period t + 2 in the case of the Ceylon Cement Corporation, the Ceylon Textiles Corporation and the Ceylon Ceramics Corporation. For the rest of the Corporations, it was found that an additional investment in time period t is related to an increase in output in time period t + 5.

This is only a subjective judgement made by inspection of output and investment data. A hypothesis of this sort could have been tested statistically, if we had had the quarterly data on investment, but only the annual data on investment in each Corporation was available. Carrying out a hypothesis test of this sort based on annual figures will make no sense in the case where 'peaks' are selected from quarterly data.

The other point concerns the connection of the trend line from the first peak point to the vertical axis. According to the Wharton method, this is done on a rather flexible basis.(7) The general rule followed in this study is as follows:

(I) In the case where the time period under study of an industry stretches to the very beginning of the industry, connect the trend line from the first peak point to the vertical axis by a straight-line drawn parallel to the horizontal axis.

(II) In the case where the time period under study of an industry covers an industry's mature period, connect the trend line from the first peak point to the vertical axis by a straight line with a slope which is equivalent to the slope of the trend line connecting between the first peak and the second peak.

This is the general rule, which we propose and have adopted in our study, but there could be variations if additional information pointed strongly in a contrary direction. Now let us discuss the results of our empirical work in detail, taking each Corporation separately.

## 4 C Analysis of Empirical Work(8)

### I. Ceylon Tyre Corporation

This venture stems from the 1958 technical and economic agreement signed between the U.S.S.R. and Sri-Lanka. Work on the factory began in 1962 and commercial production commenced in 1967. The Corporation was able to commence production on three shifts within five months of commissioning.

The total amount of capital employed at the end of 1974 was Rs. 105685,000/= and the number of employees amounted to 1935 persons. So, the value of per-capita capital is Rs: 54,618/= approximately. The use of local raw materials to the total used of this Corporation has accounted for about 28 per cent on average. This means that nearly two thirds of the total raw material requirements was imported. The profitability of the Corporation was very low. The average rate of return on capital employed for production during the period under study accounted for only 3.5 per cent.

For the time period under study we have selected only one peak which is 1971(4). The reason for this is that there is hardly any peak (in relative terms) apart from the one observable in that year.(4)

The average rate of capacity-utilization for the period was 55.11 per cent, based on the Wharton school method. This rate of capacity utilization is similar to the one calculated using the engineering concept, which was 48.41 per cent.

Now let us examine the reasons for the existence of heavy capacity under-utilization in this Corporation. Low profitability of the Corporation indicates (to a certain extent) that average costs are high. Micro economic analysis shows us that a price reduction could bring a higher rate of capacity utilization as a result of market expansion, provided that the price elasticity of demand is appropriately high. However, even if the management is prepared to face the "uncertainty and risk", the time lag involved in such

a procedure (i.e. the reduction of price ⟶ expansion of market ⟶ increase in production ⟶ lowering average unit costs) may discourage the Corporation from implementing such a policy in the presence of low profitability. Unless the government commits itself to support such a policy, individual corporations may not take an initiative in such a direction.

A second possible reason for the existence of heavy capacity under-utilization is that the import content of raw materials is high and the Corporation may have been faced with the problem of being unable to import raw materials in sufficient quantities in the light of the country's acute foreign exchange shortage. This has been aggravated by soaring prices of raw materials in recent years.

The Corporation itself has given three reasons for the low rate of capacity utilization;(9) Shortages of moulds for the manufacture of tyres, breakdown of machinery and shortages of imported raw materials for the production of tyres and tubes. Here again, the installation of additional moulds also depends mainly on the possibility for importing them. Thus the fulfilment of this requirement has also apparently been held up due to lack of foreign exchange allocations. Hence, in general, apart from the breakdown of the machinery, the major reason for the inability to utilize potential capacity has been the inability to import.

Though the Corporation had been deprived of its necessary import requirements, the country has imported tyres(10) to meet local demand; for instance in the year 1972,

"The low utilization of capacity contributed to an acute shortage of tyres in the market. This was especially felt by the Corporation's main customer namely the Ceylon Transport Board, which had to import to meet its requirements"(11)

It is rather ironical to see the presence of under-utilization of capacity at the same time as the importation of the product concerned which could be produced locally with existing capacity. What is more striking is that the main reason for under-utilization of capacity has been the inability to fulfill the import requirements. If it is the lack of foreign exchange which has led to restricted imports of raw materials for tyre manufacture, then how has it been possible to import tyres? It seems to us that this shows evidence of lack of co-ordination between various levels of planning. In order to overcome this problem a dialogue between various ministries such as Finance, Planning, Industries, Trade etc. should take place. Finally, expanded tyre production would hopefully lead to average cost reductions as capacity becomes more fully utilized.

## II Ceylon State Hardware Corporation

The Ceylon State Hardware Corporation was established in 1963 under the "State Industrial Corporations Act of 1957" primarily for the purpose of manufacturing a wide range of hardware and cast iron products such as pruning knives, coffee and tea pruners, hoes, lead ingots; construction work on the hardware factory commenced in mid 1962 and trial production began in 1966.

We have chosen two peak points in our study; these are, 1968(4) and 1972(4). It seems that these two peaks have followed the increases in employed capital in 1967/68 and in 1970 respectively.

The total amount of capital invested in this Corporation amounted to Rs: 54,986,000/= at the end of 1974, and the number of employees at the end of 1974 amounted to 1501 persons. So the per capita capital amounted to Rs: 37000/= approximately. The local content of raw materials input in this Corporation has been changing rapidly over the years, declining continuously from 86.6% in 1967 to 11.9% in 1974. Clearly, therefore, the import content of the total raw material requirements has been increasing over the years. The Corporation's explanation(12) for this change is that it had been able to find iron from a salvaged ship in the early stages of its production. Among the Corporations we studied, this Corporation is one of the most unprofitable. The average rate of return on capital employed for the period under study was around -7%.

We calculate that the ayerage rate of capacity-utilization of the Ceylon State Hardware Corporation is 44.63 per cent, and this estimate is not distinctively different from the rate based on the engineering concept which amounted to 42.48 per cent.

Unprofitability and the low rate of capacity utilization suggest that the Corporation's Planning, Management and marketing strategies are a failure. Apparently the Corporation is unable to market its products. It may well be that prices are high due to high average production costs as a result of low rates of utilization of capacity, and there are indications to support this view:

> "This relatively poor performance is due to difficulties in marketing more cast iron products in the domestic and foreign markets".(13)

Furthermore the Corporation has estimated the local demand for some products to be well over the installed capacity. For instance:

"The local demand for mamonoties (hoes) at present is in the region of 700,000 per annum and the Corporation has the capacity to manufacture only 480,000 mamonoties (hoes)"(14)

However wrong this estimation may be, it appears to show that a certain level of demand exists in the economy. Now, if we examine this estimation closely it raises two questions; namely (1) whether the calculation of the estimated demand was based on requirements in the island with no reference to price and (2) the rationale of the Corporation's pricing policy. If the estimate was made in relation to the prevailing price, then the Corporation should have been able to utilize its potential capacity to the full. On the other hand, if such a high level of demand really exists, the reason for the inability to expand production may be the high price of hoes. For the reasons mentioned earlier, it may be necessary for the Corporation to lower price in order to sell more. Perhaps the government could intervene by giving a subsidy at least as a short-run measure. At the same time, the Corporation should make an effort to reduce their costs whenever possible. There was no evidence to suggest that raw materials or other shortages were a problem in this industry.

## III Ceylon Mineral Sands Corporation

The largest mineral sand deposit which is situated on the eastern coast of Sri-Lanka, is considered to be one of the richest in the world where Ilmanite and Rutile alone account for approximately 80 per cent of the raw sand. It was primarily for the purpose of exploiting these deposits that the Ceylon mineral Sands Corporation was established in December 1957 under the State Industrial Corporations Act of 1957.

The main objects of the Corporation were to be the mining, separation, refining, treating, processing and preparation of any mineral sands, the manufacture of any products of commercial or industrial value from heavy mineral sands and the sale of such mineral sands and products.

The Ilmanite separating plant, located in close proximity to the mineral sand deposit was commissioned in 1961. The plant originally had an annual capacity (Ilmanite processing) of 70,000 tons and this was expanded by 20,000 tons in 1968. Again in 1970 this was further increased up to 100,000 tons per annum. The industry is based on 100 per cent local raw materials.

At the end of 1974 the amount of capital employed was Rs. 33,957,000/= and the number of employees was 473 persons. So per capita capital of the Corporation was Rs. 71,791/= which is relatively high. On average the rate of return on capital employed during the period of study was 7.59 per cent. The practise of this Corporation so far has been to process raw sands and to export 100 per cent of the processed Ilmanite and Rutiles to foreign markets.

We have chosen four peaks in our study and they are, 1964(3), 1968(3), 1969(4) and 1971(1). These peaks coincide with new capital expenditure in the Corporation. The Mineral Sands Corporation was found to be among the highest in terms of capacity utilization rates in our study. The average rate of capacity utilization was 71.69 per cent as against a rate of 78.34 per cent based on the engineering concept.

Since the industry is 100 per cent export orientated, the level of capacity utilization is mainly determined by exogenous factors such as the level of foreign demand, international market prices of the

products concerned, and the level of competition from other producing countries. The level of profit was also to some extent subject to those conditions. There is evidence to support the contention that the low levels of production were caused by lack of foreign demand at times. For instance:

> "The production of Ilmanite was curtailed due to accumulation of stocks consequent to the cut backs in the import of Ilmanite by Japan."(15)

Hence, maintaining a fairly high level of capacity utilization largely depends upon securing a fairly stable foreign market for the Corporation's products.

Furthermore, the Mineral Sands Corporation has revealed(16) that level of production was badly affected by unfavourable weather conditions (i.e. it has been unable to collect crude sands from the beach and also to transport crude sands to the refinery especially during high tides).

## IV Ceylon Oil and Fats Corporation

The Ceylon Oil and Fats Corporation was established in 1955 under the Government sponsored Corporations Act of 1955 to take over and operate the oil project installed by the Department of Industries in 1954 for the extraction of oil and the manufacture of provender.

Commercial production at the factory commenced in 1957 and for the first ten years manufacture was confined to provender, consisting of poultry, cattle and pig feed and the extraction of oil. Over the years a gradual increase in capital expenditure has taken place.

The peaks selected in our study are 1968(2), 1969(1) and 1972(3). Our estimate of capacity utilization of this Corporation shows a rate of 67.48 per cent on average based on the Wharton School method and according to the engineering concept it shows a rate of 68.53 per cent on average.

The total amount of capital invested in this Corporation at the end of 1974 amounted to Rs. 31,096,000/= and the total number of employees at the end of 1974 was 906 persons. So the per capita capital was Rs. 32,322/=. In this Corporation the percentage content of local raw materials has been quite high, averaging about 75 per cent and so the Corporation is not very dependent on imported raw materials. The profitability of this Corporation is extremely low. On average the rate of profit on the employed capital for the period under study was about 1.83 per cent; and though the Corporation was making a profit some time in the past, in recent years it has recorded losses. This has been attributed to increasing cost consequent on price increases of raw materials.(17) In addition, the Corporation may be surviving in business because of a government subsidy. This subsidy is justified in the following way:

> "Since the Corporation is required to maintain the selling price of provender below the open market price to encourage the local poultry industry, it has been in receipt of a grant since 1967".(18)

As we can see, this Corporation is in a precarious situation. The government wishes to keep the selling price of provender below the open market price in order to encourage the local poultry industry. And the Corporation finds it difficult to keep the cost of production

down, because of soaring prices of raw materials. It looks as if the survival of this Corporation rests on the government's continuing good will. If this is the case then the government should be prepared to support this Corporation indefinitely. Then the question is, would such a policy be viable and proper? Obviously this sort of policy may not encourage the Corporation in achieving efficiency and a high rate of capacity utilization in the long-run.

At the same time, a substantial increase in the price of provender may not be a practical solution due to the following reasons: one is that, since the poultry industry in Sri-Lanka is basically organised as a cottage (small scale) industry, an increase in the price of provender may jeopardize the industry, since at least some units might be unable to meet the increased raw materials costs. The second reason is that the size of the market for poultry products is heavily dependent upon the size of the demand from the lower middle class income earners. If a price increase is effected then the demand for poultry products may go down substantially, resulting in further difficulties to the poultry industry. Therefore, it is likely that the Corporation would be badly affected if the price of provender were increased. As an alternative it would seem to us that the Corporation should make a genuine effort to reduce its costs and also that it should carry out experiments on the possibility of using some other kinds of cheap raw materials as well as on the possibility of introducing some new by-products.

## V Ceylon Leather Products Corporation

The origin of this Corporation can be traced as far back as 1939. In that year the government decided to set up a tannery for the manufacture of chrome leather from local raw hides and skins. But the Corporation's present-day structure was established only after 1960 when it was decided to establish a shoe and leather goods factory which was to be connected to the Tannery. The new factory which was installed with technical assistance from the government of Czechoslovakia, commenced production in the latter part of 1962. In 1969 work commenced on the construction of a new tannery at the site of the old tannery with machinery supplied from Czechoslovakia. The new factory was intended to increase the production of leather.

The peaks selected in our study with regard to this Corporation were 1966(2) and 1969(4). These peaks seem to have followed additional investment in 1965 and 1968/1969 respectively.

By the end of 1974, the total amount of capital employed was Rs. 80,980,000/= and the total number of employees of the Corporation was 966 persons. So the per-capita capital employed was Rs. 83,830/= and capital intensity of this Corporation is seen to have been relatively high. For raw material requirements, the Corporation is equally dependent on local and imported raw materials. For instance for the period under study, the local content of the raw material requirements is about 53.1% on average. This Corporation falls into the category of the most unprofitable public corporations. Thus the average rate of profit on capital employed for the period under study was -6.6 per cent.

The Wharton method estimate shows an average of 64.04 per cent rate of capacity utilization as against engineering estimate of 64.05 per cent for the period under study.

In recent years the output has declined. Corporation sources[19] reveal that the decline in production was mainly due to non-expansion of the local market for its products and its accumulated stocks.

Hence the main reason for under-utilization of capacity has been lack of demand and it would appear that the Corporation should draw up plans with a view of expanding markets. Reduction of price does not seem to be practical[20] since the Corporation is running at a loss. A sales drive may help to a certain extent provided that the costs involved are reasonably small. Since pattern, style and designs are influential in determining demand for shoes the Corporation should think in these terms. Perhaps the Corporation ought to be able to produce inferior quality shoes at a fairly low price and in this way attract consumers. In other words, we suggest that the Corporation should think in terms of producing more for the lower middle-class and the working-class consumers at a price which can be afforded by them.

## VI Ceylon Paranthen Chemicals Corporation

The work on the project for the manufacture of caustic soda, chlorine, D.D.T. and sulphuric acid under this Corporation commenced in 1952 but commercial production was started only in 1960. The original capacity of caustic soda production was 1500 tons per annum and this was later increased up to 1600 tons per annum in 1969.

In our study of capacity utilization we have selected only one peak which is $1967^{(3)}$. The reasons for this are theoretical as well as practical. Thus, after the peak in $1967^{(3)}$ there is no peak in the output figures (in relative terms) which is greater than $1967^{(3)}$. Obviously where there is no evidence[21] to suggest dis-investment taking place, it is logical to assume that either potential capacity has been increasing or has stayed constant after a certain peak. Of course, the best possible assumption[22] according to the Wharton method is to assume that potential capacity has been constant after $1967^{(3)}$.

Paranthan Chemicals shows a relatively high rate of capacity utilization compared to other industries examined. The Wharton School method gives an average rate of capacity utilization of 72.85 per cent against the engineering estimate of 84.59 per cent.

At the end of 1974, the total capital investment in the project amounted to Rs. 16,240,000/= and the total number of employees amounted to 316 persons. So the per capita capital was Rs. 51,392/=. The percentage of local raw materials to the total used is high in this Corporation. During the period under study, the average per centage was 78.8 per cent. Among the Corporations which we examined, this is the most unprofitable one. The average rate of negative profits for the period was 7.89 per cent.

Though the Corporation is working at a loss it exhibits as we have said the highest rate of capacity utilization of the industries examined. One of the main reasons for this phenomenon is that there exists a persistent demand for chlorine and D.D.T from government departments (especially health) and from local councils. In fact,

the Corporation is under an obligation to supply these items to government departments and other institutions regularly. At the same time these principle buyers (government bodies and local councils) do not allow[23] the Corporation to increase prices. Also, the dependance on these customers may contribute to a certain extent to the under-utilization of capacity. Another reason behind the shortfall lies in the Corporation's inability to market its by-products. In its own words:

> "The product of chlorine continued to be a constraint on the activities of the Corporation. It was not possible to increase caustic soda production to meet the country's demand because in the process, the Corporation will be left with a large quantity of unsaleable chlorine, a by-product."[24]

With a view to overcoming this problem the Corporation should, in our opinion, explore the opportunities for selling these by-products in overseas markets, thereby enabling it to utilize its capacity in full.

## VII Ceylon Textiles Corporation

The Ceylon Textiles Corporation's initial objective was to set up a cotton spinning mill. The first stage of the initial project commenced commercial production in 1961, while the second stage was commissioned in 1963. Later on, weaving and finishing sections were added and commercial production commenced in 1967. In 1968 work began on the construction at another site of one of the largest integrated

cotton textile mills in Asia, covering an area of about 13 acres of land under one roof, with machinery and equipment from the German Democratic Republic.

Up to 1970, the capacity of yarn production was 3400,000 lbs. per annum. In 1970 this was increased to 13,600,000 lbs per annum. The total capital invested in the Ceylon Textiles Corporation at the end of 1974 was Rs. 491,128,000/= ahd the total number of employees of the Corporation was 8021. So per capita capital was Rs. 61,230/= which is relatively high. For raw materials this Corporation depends mainly on imports, and the import content of the total raw materials used amounted to 95 per cent on average for the period under study. The profitability of this Corporation was very low, the average rate of return on capital employed in the Corporation was 2.95 per cent for the period under study.

We have selected the following four peak points in our study; 1965(4), 1969(4), 1972(4) and 1974(3). The average rate of capacity utilization for the period under study amounted to 69.27 per cent according to the Wharton School method while the engineering estimate gives a figure of 60.01 per cent.

According to Corporation sources, one of the main reasons for the low rate of capacity utilization is the shortage of trained personnel. The annual review of the Corporation for 1973 explains this as follows:

> "The production in the year 1973 was somewhat higher than in the previous years but the factory continued to operate well below capacity due mainly to a shortage of trained personnel".(25)

Clearly there are insufficient trained skills available in the country for the operation of these machines at full capacity. As we pointed out in 2.2 A and 2.2 B, capital goods embodied with foreign technology have often been injected into the economy from outside, and such technology is often not appropriate to local resource endowments.(26) In this case it has led to low levels of operation.(27) And apart from that, it seems(28) that, even the available skilled manpower has been trained by the donor country. The obvious solution here would be to embark upon an immediate programme to train the intermediate and high level technicians necessary for the industry's operation.

Apart from this, managerial skills will also have to be fostered in this case. Given the fact that there is a big labour force (around 8000) and that the concern happens to be one of the biggest (so it is claimed) textiles mills in Asia, administration and labour relations will be important factors in deciding the rate of utilization of capacity. For these reasons it would seem that a programme should be launched for training managerial skills.

In addition to the reason given by the Corporation for its low rate of capacity utilization, we need to look at other aspects as well. The low profitability of the Corporation implies that the average costs of production are high in relative terms. A price reduction may expand the market but given the high average costs this may not be possible.(29) On the other hand, the Corporation should explore other possibilities for expanding markets. For an item like textiles, the level of demand very much depends on matters like quality, design and fashion. Improvements in these areas might expand markets, and, as a result, prices may be reduced, giving further incentives to market expansions.

Though the Corporation is heavily dependent upon imported raw materials, this has not been cited as a possible cause for the low level of utilization of capacity. But as a long-term measure we feel that the government (Planning Ministry) should take action in setting up and implementing a cotton growing project. The need for such a project would seem to be overwhelmingly justified when one considers the gravity(30) of the foreign exchange situation in Sri-Lanka, and, the sheer size of the textiles mill in question.

## VIII Ceylon Cement Corporation

The manufacture of cement was one of the first major industrial enterprises to be undertaken by the state. The local manufacture of 'Portland Cement' commenced in 1950. The original factory was modernised in 1958 and capacity was increased from 80,000 tons per annum to 160,000 tons per annum. The second factory started its commercial production in 1969 with an annual capacity of 100,000 tons. These two factories together accounted for 260,000 tons capacity per annum at that time.

The first factory was further expanded in 1971 and its capacity of 160,000 tons per annum was increased by a further 110,000 tons per annum. So the combined capacity of the two factories in 1971 was 370,000 tons per annum. The Ceylon Cement Corporation commenced production in the third plant in 1972 with an annual capacity of 220,000 tons per annum and from 1972 onwards the total capacity of cement production in the three plants amounted to 590,000 tons per annum.

We have selected three peak points in our study; these are 1965(2), 1969(1) and 1973(3). The amount of capital invested in this Corporation at the end of 1974 was Rs. 430,124,000/= and the total number of employees at the end of 1974 was 2543 persons, so the per capita capital was Rs. 1,69,140/= which gives the highest capital/labour ratio among the Corporations examined.

The percentage of the import content of the total raw materials used by the Corporation seems to have varied from year to year. During the period under study, it varied between 4.0 per cent and 63.5 per cent. According to Corporation sources,(31) the main reason for this considerable variation was the inability to extract limestone as a result of inundated pits during monsoon periods.

Among the Corporations examined, the Ceylon Cement Corporation has recorded the highest rate of profit. On average the rate of return on capital employed was 19.85 per cent for the period under study.

According to the Wharton School method the average rate of capacity utilization during this period was 61.66 per cent while engineering estimate shows a rate of 64.60 per cent. In general, the cement industry is regarded as the oldest and one of the most efficient enterprises in the public sector. As Injac reports in his study of the profitability of cement industry:

> "Ceylon's cement industry is considered one of the most efficient industries in the public sector."(32)

When commercial profitability is used as a yardstick in measuring efficiency, if the enterprise shows a continuous and positive net return on capital invested it is said to be working efficiently. However, commercial profitability is a poor indicator of economic efficiency where monopoly prices can be charged, as seems to be the case with the cement industry. Injac points out that,

> "Profitability of cement industry is partly due to its relative efficiency and partly due to high local prices of cement".(33)

Comparing with the Indian Cement Industry he affirms that though costs of production are the same, the price of Ceylon cement is much higher. In his words:

> "The production cost of cement industry can, for instance, match with the cost of the Indian cement plants. However, the net sales price (after deducting B.T.T.) is considerably higher than that of Indian cement. It is also higher in respect of the world market price .... For instance the ratio between local price of cement and the c.i.f. import price is about 2.03".(34)

So the high price of cement has been the major reason for high profitability. Being a monopoly the Corporation has been able to fix the price as it wished. One result of this policy may have been the emergence of under-utilization of capacity. In addition, the Corporation may have decided not to make any attempt to reduce its cost because of the high profit margins. Injac in his report emphasises this aspect as follows:

"It is understandable that the government wants to have profitable public corporations. But this profitability should not be achieved through high prices. This, especially, in such a basic industry which influences prices of investment costs and of housing especially. The second bad consequence of the high prices is that they give a big margin of profit which can weaken the efforts of the Corporation to reduce the production costs".(35)

Although we have not been able to collect systematic data on this point, there is a likelihood that similar conditions may apply to other sectors in the economy.

In the case of the Cement Corporation it cannot be argued that demand is a contributory factor to the existence of under utilization of capacity.

In 1972 nearly one third of the country's demand for cement was met by imports. Table 4.1 shows that the country has imported cement continuously in order to meet local demand in accordance with changing levels of local output. Thus, we are witnessing a rather strange coexistence of high rates of profit importation of the product and under-utilization of capacity in local plants. As the pressure of demand exists(36) the only possible reason for under-utilization of capacity would be the inability to maintain a regular supply of raw materials at the required level. It may be the case, when the supply of local raw materials is badly affected due to rough weather(37) that the available imported raw materials at one time may not be sufficient to bridge the gap. What is involved here is a managerial (stock control) problem and steps must be taken to remedy this situation.

TABLE 4.1

Cement: Local Production & import.

| Year | Production | Imports | Consumption |
|---|---|---|---|
| 1964 | 75,657 | 190,573 | 266,230 |
| 1965 | 86,574 | 244,500 | 331,076 |
| 1966 | 75,100 | 252,037 | 357,132 |
| 1967 | 151,193 | 222,305 | 373,498 |
| 1968 | 219,000 | 197,000 | 414,000 |
| 1969 | 279,000 | 187,000 | 423,000 |
| 197[illegible] | 321,000 | 132,000 | 430,000 |
| 1971 | 378,200 | 98,400 | 480,000 |
| 1972 | 376,800 | 139,700 | 520,000 |

Source: "Profitability of Cement Industry in Ceylon" by B. Injac, 1972, page 2.

## IX Ceylon Ceramics Corporation

The Ceylon ceramics Corporation has two factories at two different locations. The first factory originally had an annual capacity of 880 tons of domestic crockery and the items manufactured were limited to a few such as cups and saucers, plates, tea-pots etc. and a fair quantity of miscellaneous fancy and ornamental ware. This capacity was increased to 1340 tons by 1967 and again to 1800 tons by 1969. The second factory was commissioned in 1966 and this factory had a capacity output of 2100 tons per annum of crockery and sanitary ware and this capacity was increased by 800 tons per annum in 1972.

In our study we have selected 1967(1), 1972(1) and 1974(2) as points for the period examined. The total amount of capital employed at the end of 1974 was Rs. 132,837,000/= and the total number of employees amounted to 2759 persons. So the per capita capital employed amounted to Rs. 48,148/=. The supply of raw materials comes mainly from local sources. On average the local content of the total raw materials used amounted to 67 per cent for the period examined, and the Corporation's profitability has been relatively high. The average rate of return on capital employed was about 19.61 per cent.

The average rate of capacity utilization according to our estimate was about 50.06 per cent as against 66.82 per cent on the engineering estimate. The high rate of profits (due to high prices) along with the high rate of under utilization of capacity would again appear to show a degree of monopolistic power, encouraged by the fact that the Ceramics Corporation is working under protection

provided by high tarriffs imposed on imports of ceramics ware.(38) Hence a revision of pricing policy may be necessary for increasing the rate of capacity utilization. It is interesting to note that the Corporation assumes both that sufficient demand is available in the market and that the market will expand. Thus the annual review of the Corporation for the year 1973 states that:-

> "The Corporation is studying the feasibility of establishing another Ceramics Plant for the manufacture of cups and saucers which are in great demand".(39)

However, if the Corporation is interested in increasing potential capacity and wishes to increase the rate of utilization in the installed plants as well, then a downward revision of prices may have to be carried out, sacrificing its profitability to a certain extent.

X. Ceylon Eastern Paper Mills Corporation

The pulp and paper mill of this Corporation was established in 1956 and the original capacity was 6400 long tons per annum. This capacity was increased up to 10,000 long tons in 1966 and subsequently this was increased to 12,000 tons and to 22,500 tons in 1970 and in 1972 respectively.

The total capital employed at the end of 1974 was Rs. 1,92,730,000/= and the total number of employees at the end of 1974 was 2702 persons. So the per capita capital was Rs. 71,329/= and this is relatively high compared to the other Corporations. Nearly half of the raw material requirements are supplied by local sources, the rest being imported. For the period under study, the average import content of the total

raw materials used was about 52.52 per cent. The average rate of return on capital employed was about 11.81 per cent.

In our study, we have selected three peaks and these are: 1966(4), 1972(4) and 1974(4). The average rate of capacity utilization was relatively high, the Wharton School estimate showing a rate of 69.69 per cent while the engineering estimate shows an average rate of 86.25 per cent.

Being the monopolist in paper production this Corporation has been making a high rate of profit because of its price fixing ability. At the same time this may hinder higher rates of capacity utilization. Therefore, we suggest that the Corporation should explore the possibilities for expanding the market for its products with a view to increasing the rate of capacity utilization. There was no evidence to suggest that raw materials or other shortages were a problem in this industry.

## XI Ceylon Steel Corporation

In the Technical and Economic Co-operation Agreement signed in 1958 between the U.S.S.R and Sri-Lanka, the establishment of a steel works was one of the items included. Originally, it was planned to establish an integrated Iron and Steel Works comprising a Charcoal Blast Furnace for steel making and a rolling mill with an annual output of 35,000 tons of mild steel and wire rods. Trial production in the rolling mill commenced in 1967 and in the wire mill soon afterwards.

The total amount of capital employed in this Corporation at the end of 1974 was Rs. 160,050,000/= and the total number of employees was 1269. So the amount of per capita capital was Rs. 126,123/= which shows a high capital intensity in production. This Corporation depends mainly on imported raw materials. For the period we examined, the average import content of the total raw materials used was about 96 per cent. The Corporation's profitability has been extremely low. The average rate of return on capital employed was about 1.45 per cent for the period examined.

In our study we have selected only one peak, that is 1972(3), and that may be justified on the grounds that the industry is still in its infancy and there has been no substantial additions to investment after the commencement of its commercial production. The Corporation is still working far below its potential capacity. According to our estimates based on the Wharton School method, the average rate of capacity utilization is about 52.73 per cent as against 30.12 per cent based on the engineering concept. This discrepancy is due mainly to the fact that the time period available for our examination belongs to the infancy of the industry. This is a general problem which arises in the application of the Wharton School method in the case where the time period for the study belongs to an industry's infancy.(40)

Clearly one of the reasons for heavy under-utilization of capacity is the fact that the industry is still young. The low rate of profit and the low rate of capacity utilization imply that the average costs of the Corporation are high, due to high overhead costs.

and as a result, product prices are high and this may inhibit market expansion. It would seem, therefore, that if the level of production can be raised then average costs and prices may come down. But to raise the level of production, the size of the market itself will need to be expanded. The two problems are mutually interdependent. To solve this the Corporation will have to make a major breakthrough and Corporation sources seem to indicate that this is the nature of the problem to a certain extent.

> "Capacity utilization was far below the installed capacity. The main reasons for this are non-availability of raw materials in sufficient quantities, lack of demand and inability to export due to high costs"(41)

They have cited the non-availability of raw materials too as one of the reasons for under utilization of capacity. This could be true since the Corporation is mainly dependent on imported raw materials. To solve this problem there seems no other way out except to request the government to allocate more foreign exchange.

The growth of this industry may not happen automatically; as we mentioned earlier, the Corporation must make an attempt for a major breakthrough. An expansion of the local market for steel obviously depends on the growth of other industries based upon steel and the government might be advised to make a genuine attempt to create a better economic environment to provide facilities for such industries.

With regard to entering into foreign markets, the chances are very bleak due to a number of reasons. The best region as an

international market for Sri-Lanka would be the Far East because of its location. But the Far Eastern countries produce more than a quarter of world steel output, in comparison to which steel production in Sri-Lanka is negligible. Countries like Japan, China, Australia and India are predominent in steel production in this region. This is shown in Table 4 II.

TABLE 4 II

World Steel Production

| Country ('000 metric tons) | 1973 | 1974 |
|---|---|---|
| Bangladesh | 68 | 73 |
| China | 25,000 | 27,000 |
| India | 6,872 | 6,704 |
| Korean Dem.Peo.Rep. | 2,630 | 2,900 |
| Rep. of | 1,157 | 1,935 |
| Japan | 119,322 | 117,131 |
| Australia | 6,843 | 7,707 |
| Total production of steel of the Far Eastern Countries | 161,892 | 163,450 |
| World Production | 690,900 | 704,800 |

Source: U.N. Statistical Year Book 1975, Department of Economic and Social Affairs Statistical Office, New York, 1976, page 326.

In addition to this, the Far Eastern market for steel products is dominated by developed countries like the German Federal Republic U.S.A., U.K., U.S.S.R. and France, as shown in Table 4 III and

TABLE 4 III

Steel and steel products. Exports to the Far Eastern Countries by: ('000 metric tons)

| Country | 1973 | Country | 1973 |
|---|---|---|---|
| Japan | 9629.0 | German Federal Rep. | 992.8 |
| U.S.A. | 585.6 | Australia | 568.0 |
| U.K. | 412.5 | U.S.S.R | 167.3 |
| Belgium | 162.0 | France | 147.7 |
| Poland | 81.5 | Czechoslovakia | 73.1 |
| The Netherlands | 61.0 | Italy | 60.6 |
| Sweden | 49.2 | Hungary | 49.1 |
| India | 46.1 | Yugoslavia | 28.0 |
| Bulgaria | 18.3 | Spain | 14.3 |
| Austria | 14.0 | South Africa | 11.1 |
| Denmark | 3.7 | Norway | 3.2 |
| Finland | 1.3 | Switzerland | 0.3 |

Source: Compiled from "Statistics of World Trade in Steel 1973" Economic Commission for Europe U.N. New York 1974.

quite clearly, the competition is likely to be very high. On the other hand the demand for steel and steel products depends to a great extent on the quality of products. In this regard too, the country is at a disadvantage.

However, there is one other possibility. That is that the Steel Corporation could offer its products at below average cost to its regional market in the hope of establishing a foothold. Here again,

however, where the product is made out of imported raw materials it is open to question whether such a policy be worthwhile. Perhaps the best strategy for the Corporation would be to find ways and means of expanding the local market first for furthering the rate of capacity utilization.

Finally, as an additional exercise, we decided to estimate capacity utilization indices for the tyre, chemicals and steel industries by taking only the time period from the first peak point onwards. As we discussed above, for these industries we have selected only one peak point in each case, as there were no other relative peaks. So the time periods investigated here for each industry are as follows:

| | | | |
|---|---|---|---|
| Tyre industry | $1971^{(4)}$ | to | $1974^{(4)}$ |
| Chemicals " | $1967^{(3)}$ | to | $1974^{(4)}$ |
| Steel " | $1972^{(3)}$ | to | $1974^{(4)}$ |

The results obtained were as follows:

Capacity Utilisation Indices

| | Wharton School estimate | Engineering estimate |
|---|---|---|
| Ceylon Tyre Corporation | 72.20 (55.11) | 63.43 (48.41) |
| Ceylon Paranthen Chemicals Corpn. | 79.60 (72.85) | 91.52 (84.59) |
| Ceylon Steel Corporation | 59.33 (52.73) | 33.75 (30.12) |

(figures in brackets refer to original estimates)

Accordingly, these results show higher rates of capacity utilization than our original estimates. However, there are two points to be stressed here. One is that when we follow the procedure described in the previous paragraph, it may lead to an upward bias of the indices, especially in the case of infant industries. The other point is (arising from the first one) that the time period to be investigated may not be long enough for a meaningful index to be constructed and for valid conclusions to be drawn.

Naturally, since resources are limited, any kind of waste will create numerous problems. Due to under-utilization of capacity a number of machine hours will be lost and as a result the labour force attached to ventures will be under-employed. In a macro sense, the expected spill-over effect of the ventures concerned, on other sectors as well as on the economy as a whole, will be reduced. When these features tie up with other structural bottlenecks in the system the economy ends up in a form of "vicious circle". When one sector of the economy is under-utilized, other sectors will not grow as fast as they could, and since the inputs required from other sectors may not supply adequately the sector which is under-utilized, it may continue to operate at a very low rate of utilization for many years.

A particularly important type of cost is that the country has to bear the high running and maintenance costs of the ventures concerned. Whether the machines are put to use fully or not they have to be maintained throughout their lives. Up to a certain level of production this maintenance cost tends to remain constant which means that under-utilization carries a high proportionate maintenance cost.

Turning to fixed costs, when capacity is under-utilized, fixed costs per unit of output will be higher than they would be if capacity is fully utilized. Under monopolistic conditions, this will induce firms to raise the price of the product. In actual fact, this is what most of the Corporations (e.g. Cement, Leather Products, Steel and Textiles) have been doing. What we are interested in here is to see whether the converse is true; that is whether the producers will reduce price as a result of a decline in average cost consequent on an increase in the rate of utilization of capacity. Since most of

the public corporations in Sri-Lanka are the sole producers of the respective products, these corporations may not take any initiative to reduce prices unless the government intervenes.

This sort of monopolistic power not only creates inefficiency but may also lead to stagnation at a particular level of activity as in the case with the Ceylon Cement Corporation.

Summary:

All these factors add up to the conclusion that the presence of under-utilization of capacity is a major obstacle to economic growth. Hence a mere injection of capital and technical progress (embodied in capital goods from outside) would not automatically bring high rates of economic growth. Apart from the reasons we discussed above there are some structural bottlenecks in the economy which are contributive factors towards under-utilization of productive capacity. The structure of the economy, attitude of the people towards innovations and advanced new technology, inefficiencies in channelling resources, operational time lags, bureaucratic red tape, political and other sociological barriers in the economy, and the lack of mass participation are all relevant factors to be looked into.

Under utilization of capacity implies under utilization (employment) of factor inputs which in turn implies a low level of economic activity. A low level of economic activity means a low level of income as well as a low level of savings; and a low level of savings implies a low level of investment activity. Hence, overall economic growth will gradually be slowed down. Solutions must be found to remedy this situation and we will discuss some suggestions and recommendations in order to overcome under utilization of capacity in the next chapter.

## Notes and References

(1) U.N.D.P. Special Fund - op cit - page 3.
"No studies to enlist the data for estimating capacity has been undertaken in Ceylon .... consequently it was decided to use some rough notion of capacity from the engineering side".

(2) See for further detail - section 3.2, DI.

(3) See discussion under 3.2, DII a.

(4) See for example, L.R. Klein and R. Summers - op cit.

(5) By doing this we can minimize the possible bias which seems to appear during such periods.

(6) See for example, Klein and Summers - op cit - page 4.
The general procedure to follow here is to select points in such a way that each successive peak should be higher than its predecessor, assuming that industry is expanding over time, unless there is strong evidence to the contrary.

(7) See for example, Klein and Summers - op cit - page 5.

(8) Statistics referred in the discussion, on capital investment, employment of labour, profitability, source of raw materials and capacity utilization are given in the appendix A.

(9) See for example, Annual Review of the Ceylon Tyre Corporation, 1973, page 11.

(10) The value of imported tyres and tubes into the country was RS: 10 million during the year 1972. See for example, Annual Review of the economy, Central Bank of Ceylon 1973, page 249.

(11) Ibid - page 91.

(12) See for example, Annual Review of the State Hardware Corporation 1970, page 12.

(13) Annual Review of the economy, Central Bank of Ceylon, 1974, page 96.

(14) Annual Review of the State Hardware Corporation 1973, page 18.

(15) Annual Review of the economy, Central Bank of Ceylon, 1975, page 76.

(16) See for example, Annual Review of the Ceylon Mineral Sands Corporation 1973, page 17.

(18) Annual Review of the economy, Central Bank of Ceylon, 1971, page 60 and also see Review 1975, page 69.

(19) See for example, Annual Review of the Ceylon Leather Products Corporation, 1974, page 10.

(20) See our discussion under 4. c I.

(21) See the table in Appendix A. I.

(22) See our discussion under 4. B.

(23) See for example, Annual Review of the Ceylon Paranthan Corporation, 1972, page 5.

(24) Annual Review of the Ceylon Paranthan Chemicals Corporation, 1973, page 9.

(25) Annual Review of the Ceylon Textiles Corporation, 1973, page 14.

(26) Clark - op cit - page 15.

(27) See our discussion under 2. 2, c IV (a).

(28) See for example, Annual Review of the Textiles Corporation, 1972, page 12.

(29) See our discussion under 4. c I.

(30) See tables 2. VII and 2. X.

(31) See for example, Annual Review of the Ceylon Cement Corporation, 1970, page 9.

(32) Injac, B., "Profitability of the Cement Industry in Ceylon 1971", page 2.

(33) Ibid - page 22.

(34) Ibid - page 23.

(35) Ibid - page 16.

(36) See quotation (34) above.
By imposing a tarriff the government has made the price of imported cement be equal to the price of locally produced cement.

(37) See for example Annual Review of the Ceylon Cement Corporation, 1972, page 18.

(38) See for example, Annual Review of the Central Bank of Ceylon, Economy, 1972, page 84.

(39) Annual Review of the Ceylon Ceramics Corporation, 1973, page 29.

(40) See our discussion in section 4. B.

(41) Annual Review of the Ceylon Steel Corporation, 1973, page 7.

(42) See our discussion in 2. 2, c.

# CHAPTER 5

## CONCLUSIONS AND RECOMMENDATIONS

### 5 A Introduction

We have seen how a developing country like Sri-Lanka can become heavily dependent upon foreign loans and aids for its capital goods accumulation and technical progress. And we have examined how this process has led to a number of problems such as the emergence of public monopolies (resulting in high price and inefficiency), shortages of raw materials, lack of skills (technical and managerial), exdessive plant scales and adjustment problems. We have found also that these factors have been responsible to a great extent for the existence of under-utilization of capacity in a number of public corporations in Sri-Lanka. Furthermore, the results of our empirical study leadus to believe that the parastatal sector as a whole is faced with a similar problem, and it could be surmised that the causes of under-utilization found in our study may equally apply to the industrial sector in general. For these reasons the search for various measures which may help to overcome this problem is likely to be an important task.

### 5 B Infant Industry Argument is Invalid:

First, let us examine the implications of the "Infant Industry" argument for under-utilization of capacity. According to this argument, at the infancy of an industry, its potential capacity is bound to be under-utilized, average costs of production and product prices will be

relatively high and, therefore, protection must be given to the industry during this period (e.g. by imposing tarriffs) in order to prevent an influx of imports. Under protection the industry will eventually mature and start to exploit its full potential.

However, this argument depends on a number of assumptions such as expanding markets, realization of economies of scale and the ability to minimise costs per unit of output via trial and error experience. If those assumptions are not valid (as is the case in our study) we cannot expect such a self-corrective procedure to take place. For instance, the performance of the Ceylon Cement Corporation which has been in operation for nearly 25 years, would not appear to bear out the predictions of the infant industry argument. We have seen that the Ceylon Cement Corporation continues to operate below potential capacity charging high prices; and at the same time the country continues to import cement to meet local demand. Also we have seen that the Ceylon Steel Corporation, the Ceylon Hardward Corporation and the Ceylon Ceramics Corporation are each operating in their "infancies". Yet there seems no sign of a breakthrough for the realization of full capacity. Therefore it would appear to us that positive action should be taken with a view to increasing the rate of capacity utilization in Sri-Lanka.

5 C Supply of Raw Materials:

The solution to any problem can best be found in its causes. Since most of the Corporations (e.g. Tyre, Steel, Cement and Textiles) were badly hit by lack of raw materials, it would seem that steps should be taken to maintain the supply of these in sufficient

quantities. There are two aspects to be looked into here. One is that steps must be taken to make sure that raw materials are delivered at the factory gate at the right time and in sufficient quantities. The other is the provision of foreign exchange requirements for the importation of raw materials. The first step is a managerial problem and with respect to this aspect it would seem that the implementation of a system of programming and scheduling raw material supplies should be adopted by each Corporation.

With regard to importing raw materials the government should take definite steps to allocate foreign exchange as required. There is no point in importing products without allocating sufficient foreign exchange for importing raw materials to produce the same product in the presence of heavy under-utilization of capacity in the industry concerned.(1)

To wipe out irrationalities such as those mentioned above, co-ordination and consultation between various government departments (Trade, Treasury, Foreign Exchange, etc.) is urgently required. However, considering the foreign exchange problem with which the country has been faced for many years, the continued dependence on imported raw materials will make things worse. Even if foreign exchange were allocated in sufficient quantities for the present, this policy may not be applicable for the future. Hence, as a long-term measure we suggest that each Corporation which is heavily dependent upon imported raw materials should think in terms of conducting research in order to find local substitutes for imported raw materials. This is strongly recommended for the Paper Mills Corporation, the Oil and Fats Corporation, the Textiles Corporation and the Chemicals Corporation.

5 D Provision of necessary skill:

Secondly steps should be taken to provide necessary skills (technical & managerial) which are badly needed by the public sector industries. Expansion of existing training programs and inauguration of new training schemes should be expedited. It may also be advisable for the government to set up a training complex to train the skilled and semi-skilled labour required for various industries in this country. In this case the government may seek foreign assistance in setting up such a complex. In the case of tied aid the government could send suitable personnel to the donor countries for training.

5 E Expansion of markets (home and abroad)

Thirdly, steps should be taken to expand markets at home and abroad as this has been a major constraint on full utilization of capacity. First, we will consider this aspect in general. Domar has suggested the same thing by recommending the reduction of the marginal propensity to save so as to overcome capacity under-utilization(2) but his suggestion is a more general proposition based on macro-economic policy and it may bring an over all change in demand for goods and services which in turn may bring unfavourable results in certain other sectors. Pearce and Taylor(3) have asserted this consequence in their study of spare capacity in British manufacturing industries as follows:

> "The absorption of spare capacity through short-term policies designed to increase demand is limited not only by the effect on the balance of payments but also by an inflation in prices that sooner or later results in expansion being checked and the engines reversed".(4)

Hence the policies to be designed with a view to expanding the market must be specific to the industries concerned. As we explained(5) in the case of the Steel industry, policies should be designed to expand and establish steel based industries on the island. With regard to the textiles industry, the Corporation should concentrate on improving quality and developing new designs for expansion of demand. Reduction in prices of the products concerned may help to a certain extent. For example, in the case of the Ceramics Corporation and the Oil and Fats Corporation this may induce market expansion. In this context, it would be a very useful exercise for these Corporations to investigate various ways and means in which they could reduce operating costs since this would make it easier to bring down product prices and thereby to expand the market.

With regard to boosting export markets, the situation is not very encouraging. Entering into and establishing a trade name in the international market very much depends on the quality of product (among other things), because of severe competition. We have discussed this aspect in detail with regard to the Steel industry(6) but this aspect as a general constraint has been accepted. For instance, the Central Bank of Ceylon Reports:

> "For a small economy that has to depend heavily on imports, export orientation of local industry seems most essential. But heavy protection provided to local industries and the lack of competition from imports inhibits any tendency of these industries to reach the levels of quality and efficiency that are required for export orientation".(7)

In the above statement, though the rationalization of the export promotion case is debatable, it affirms the low quality of our products. Before we set out to find export markets, improving the quality of our products is urgently required and recommended. The government should take initiatives towards this objective by setting out a system (authority) for quality control purposes. At the same time, individual Corporations should be encouraged to take whatever possible measures are necessary for improving the quality of their products.

As we know in international trade (especially in developing countries) politics as well as economics plays an important role. Therefore, the country should use its political alliances for promoting products in international markets. If the country finds it difficult to face competitiveness in international markets, then it may be advisable for the country to search for bi-lateral trade agreements with its alliances to market appropriate products. This would enable excess capacity to be utilized in those industries and might also lead to increased earnings of foreign exchange. Perhaps, for instance, a Corporation could enter into a bi-lateral trade agreement in order to exchange finished products for imported raw materials. Such a strategy would also help to overcome the problem of lack of badly needed raw materials.

5 F. <u>The need for Re-programming</u>

Finally, there is one point which should be stressed and that concerns bad planning which as we have seen is a cause of numerous problems including that of under-utilization of capacity. With this regard the U.N.D.P. Special Fund reports that:

"In some cases excess capacity cannot be put to use, but rather reflects bad planning, imbalanced procurement of equipment, uneconomic location etc."(8)

As a matter of fact, the industrialization process of Sri-Lanka is not planned at all. It rather represents the results of ad-hoc decisions to get up various factories at various stages. Examples of this are numerous, namely, the steel industry, the textile industry (even though the suitable climatic conditions are available, no plans were drawn up for growing cotton as a source of raw materials) and the sugar corporation (It is not exaggerating to say that when the plants were installed the Corporation had not grown a single acre of sugar cane even for the use of trial production.)

Indeed, the Ceylon Sugar Corporation has found its economic viability in Spirits production which is a by-product, rather than in producing sugar itself. This can be seen from Table 5 I, and from a recent statement by the Central Bank of Ceylon:

"The highly remunerative production of spirits, however, might establish its economic viability in the long-run".(9)

TABLE 5 I

Profit and Loss of the Ceylon Sugar Corporation

| Year | Sugar Production (Rs.) | Spirits Production (Rs.) |
|---|---|---|
| 1966 | -4999 | + 15,579 |
| 1967 | -12950 | + 11,352 |
| 1968 | -11934 | + 17,881 |
| 1969 | -12900 | + 20,423 |
| 1970 | -13486 | + 22,375 |
| 1971 | -11927 | + 24,139 |
| 1972 | -14584 | + 29,327 |
| 1973 | -18439 | + 24,951 |

Source: Central Bank of Ceylon Annual Report, Colombo 1974, page 114.

Finally there is evidence that poor planning is affecting other industrial sectors in the economy.

this aspect is the setting up of
One of the major consequences of/excessively large scale plants[10]. For example, the Leather Products Corporation, the Textiles Corporation (one of the largest mills in Asia), the Steel Corporation and the Sugar Corporation (Plant capacity installed by this Corporation is said to be more than enough to meet the demand for sugar in the whole Asian region). Therefore, in some cases any attempt to search for measures which would help to utilize capacity to the full may be in vain. It may be advisable in these cases (such as sugar, steel) to re-programme the industries in question in order to delete excess capacity. If it is not possible to put the installed scale of production into operation in the foreseeable future there is little point in maintaining a situation which is an additional burden to the economy.

5 G The need for setting up an Independent Planning Authority

Though Sri-Lanka has been following (for the last two decades) and practising development planning, no independent planning authority exists. Planning has been carried out by the Ministry of Planning which comes under the Prime Minister. Hence, as governments change, planning objectives, planning policies and planning projects also change. In other words, the country has never had a "perspective plan". All the development plans are short-term plans and have no relation with a longer perspective. This has led to many irregularities and discontinuities in various undertakings as governments have changed from time to time. In the absence of an independent planning authority, the Ministry of Planning seems to represent the views of the political party in power rather than to think in terms of the national interests.

It would seem, therefore, that one of the most important and urgent steps to be taken should be the setting up of an independent planning authority in the country. The formation and the functioning of such an authority should be made as little vulnerable as possible to political interference and should not be affected by change of governments. Such an authority would be responsible for setting up perspective plans (as in India) by establishing long term objectives, allocation priorities, strategies, policies and the desirable long term growth path of the economy. The government would then be given the option of preparing its own short-term plan within the perspective plan.

Summary

Finally, we believe that we have been able to support our basic hypothesis that in the absence of an endogeneous capital goods sector, the injection of capital from outside has adversely affected the growth of an economy like Sri-Lanka.

The exogeneity of capital (embodied with technical progress) has led to a number of problems and these problems coupled with inherent obstacles within the economy have led to under-utilization of capacity. We have also suggested some measures to overcome excess capacity in the case of existing industries. And, for the future, extreme care should be taken not to repeat the same mistakes again in setting up new industries. Within the present system of planning there is no way of ensuring this, unless an Independent Planning Authority is set up.

However, it must be emphasised here that our empirical work

has been restricted due to the non-availability of data (apart from those published officially and information collected on an informal basis through personal contacts).

Clearly the attitude of public corporations in Sri-Lanka towards such studies has been rather apathetic. We hope that our study has been a success in giving at least a glimpse of the gravity of the problems with which the public corporations in Sri-Lanka are faced, and we sincerely hope that our study may advocate and encourage the need for further extensive research in this direction.

## References

(1) - See for example, Section 4 C I

(2) - See for example, Section 2 1 C

(3) - Pearce and Taylor - op cit.

(4) - ibid - page 9

(5) - See for example 4 C XI

(6) - ibid

(7) - Annual Review of the Economy. Central Bank of Ceylon, 1975, page 40.
Also see 1974 Review, page 20 and 21.

(8) - U.N.D.P. Special Fund Report - op cit - page 17.

(9) - Annual Review of the Economy, Central Bank of Ceylon, 1975, page 67.

(10) - See for example Section 2.2 C III.

# APPENDIX A

Statistical data on capacity utilization study supplementary to Chapter 4.

The Corporations referred by (1) - (11) in Tables A 1 to A 4 are as follows:

(1) Ceylon Tyre Corporation
(2) Ceylon Hardward Corporation
(3) Ceylon Mineral Sands Corporation
(4) Ceylon Oil & Fats Corporation
(5) Ceylon Leather Products Corporation
(6) Ceylon Paranthan Chemicals Corporation
(7) Ceylon Textiles Corporation
(8) Ceylon Cement Corporation
(9) Ceylon Ceramics Corporation
(10) Ceylon Eastern Paper Mills Corporation
(11) Ceylon Steel Corporation

Appendix A I

Capital employed in Public Corporations

| Rs. 000's. Corporation | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 55,031 | 65,624 | 67,525 | 68,124 | 68,879 | 91,915 | 110,300 | 99,376 | 102,580 | 105,685 |
| 2 | 15,127 | 16,704 | 30,170 | 36,167 | 39,620 | 52,314 | 49,000 | 49,633 | 52,837 | 54,986 |
| 3 | 11,100 | 11,100 | 14,600 | 15,225 | 20,860 | 20, 960 | 24,380 | 30,870 | 33,235 | 33,957 |
| 4 | 21940 | 21,940 | 21,940 | 27,940 | 28,540 | 28,540 | 28,500 | 31,300 | 30,146 | 31,096 |
| 5 | 5,200 | 5,200 | 6,245 | 7,147 | 10,148 | 14,429 | 77,432 | 79,325 | 80,135 | 80,980 |
| 6 | 12,321 | 12,321 | 12,802 | 12,802 | 13,306 | 13,907 | 13,700 | 16983 | 16,700 | 16,240 |
| 7 | 50,300 | 51,467 | 69,207 | 98,050 | 20,9400 | 302,824 | 306,500 | 350,184 | 350,686 | 491,128 |
| 8 | 61,442 | 100,533 | 110,138 | 170,114 | 243,341 | 187,360 | 324,900 | 428,272 | 428,685 | 430,124 |
| 9 | 8,075 | 19,000 | 20,000 | 20,030 | 20,030 | 28,224 | 35,400 | 71,114 | 72,216 | 132,839 |
| 10 | 29,000 | 29,000 | 29,000 | 41,228 | 67,424 | 113,831 | 121,300 | 157,039 | 160,780 | 192,730 |
| 11 | 94,395 | 115,900 | 121,000 | 123,000 | 133,000 | 137,707 | 138,000 | 146,969 | 148,775 | 160,050 |

Source: Compiled from Review of Activities of Public Corporation (1966-1974) Ministry of Planning and Economic Affairs, Colombo.

Appendix A II

Employment in Public Corporations in Sri-Lanka

| Corporations | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|
| (1) | 792 | 1095 | 1302 | 1423 | 1644 | 1893 | 2006 | 1935 |
| (2) | 1210 | 1081 | 1085 | 1124 | 1899 | 1425 | 1398 | 1501 |
| (3) | 180 | 389 | 407 | 426 | 449 | 486 | 503 | 473 |
| (4) | 697 | 722 | 770 | 810 | 900 | 938 | 924 | 906 |
| (5) | 613 | 688 | 690 | 864 | 937 | 1045 | 993 | 966 |
| (6) | 312 | 300 | 317 | 321 | 324 | 350 | 374 | 316 |
| (7) | 1816 | 1954 | 2170 | 1700 | 3700 | 6040 | 7102 | 8021 |
| (8) | 1898 | 1786 | 2379 | 2332 | 2529 | 2700 | 2739 | 2543 |
| (9) | 891 | 904 | 978 | 1130 | 1137 | 1256 | 2525 | 2759 |
| (10) | 1333 | 1379 | 1240 | 1380 | 1515 | 2220 | 2655 | 2702 |
| (11) | 950 | 953 | 960 | 927 | 1050 | 1143 | 1167 | 1269 |

Source: Compiled from Review of Activities of Public Corporations (1966-74) Ministry of Planning and Economic Affairs, Colombo.

Appendix A III

Source of Raw materials (local to the total used in percentage)

| Corporation | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | Average Percentage |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 35.0 | 28.0 | 22.0 | 29.0 | 28.0 | 23.0 | 27.7 | 34.6 | 28.42 |
| (2) | 86.6 | 64.3 | 30.0 | 16.8 | 14.3 | 14.7 | 11.9 | 16.3 | 31.87 |
| (3) | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| (4) | 66.0 | 73.0 | 86.0 | 73.3 | 69.9 | 81.4 | 76.9 | 69.8 | 74.53 |
| (5) | 38.0 | 64.0 | 49.2 | 69.4 | 47.8 | 53.9 | 49.1 | 53.8 | 53.15 |
| (6) | 46.0 | 100.0 | 100.0 | 43.0 | 64.0 | 96.0 | 92.3 | 89.1 | 78.8 |
| (7) | 14.0 | 3.5 | 8.8 | 3.4 | 2.8 | 3.9 | 1.8 | 2.6 | 5.10 |
| (8) | 96.0 | 96.6 | 68.9 | 36.5 | 80.2 | 66.7 | 58.6 | 79.5 | 72.80 |
| (9) | 23.0 | 35.0 | 80.0 | 75.0 | 80.0 | 82.0 | 80.0 | 81.0 | 67.00 |
| (10) | 48.0 | 36.5 | 36.5 | 52.0 | 59.6 | 49.7 | 51.3 | 46.2 | 47.48 |
| (11) | Nil | 5.4 | 0.9 | 0.10 | 4.0 | 3.9 | 5.8 | 2.3 | 4.05 |

Source : Compiled from Review of Activities of Public Corporations (1966-74) Ministry of Planning and Economic Affairs, Colombo.

Appendix A IV

## Profitability of Public Corporations

### Return on Capital employed for production

| Corporation | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | Average |
|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.2 | 1.4 | 5.0 | 9.0 | 2.4 | 3.7 | 2.1 | 3.2 | 3.5 |
| (2) | 0.12 | -6.2 | -8.1 | -7.3 | 07.2 | -9.5 | -8.9 | -9.0 | -7.01 |
| (3) | nil | 4.5 | 8.4 | 13.0 | 4.9 | 7.3 | 8.9 | 13.7 | 7.59 |
| (4) | -7.2 | 10.6 | 5.16 | 10.28 | 2.4 | 3.9 | -3.4 | -7.1 | 1.83 |
| (5) | 2.9 | 5.3 | -16.3 | 10.4 | -14.4 | -12.1 | -8.2 | 0.4 | - 6.6 |
| (6) | -8.3 | -9.1 | -9.3 | -9.6 | -10.3 | -11.7 | -6.5 | 1.7 | -7.89 |
| (7) | 4.0 | 2.2 | 4.9 | 1.3 | 0.8 | 4.1 | 2.0 | 4.3 | 2.95 |
| (8) | 17.9 | 21.8 | 27.0 | 12.7 | 19.3 | 20.4 | 17.3 | 22.4 | 19.85 |
| (9) | 20.6 | 22.3 | 16.0 | 21.0 | 20.0 | 16.9 | 15.2 | 24.9 | 19.61 |
| (10) | 16.6 | 16.4 | 11.0 | 6.6 | 10.2 | 8.6 | 10.3 | 14.8 | 11.81 |
| (11) | 0.37 | 0.2 | 3.5 | 0.64 | 0.73 | 1.2 | 1.9 | 3.1 | 1.45 |

Source: Compiled from Review of Activities of Public Corporations (1966-74) Ministry of Planning and Economic Affairs, Colombo.

Table A V. Ceylon Tyre Corporation - Capacity Utilization

| | | Actual Output (Nos) | Potential Output (Nos) | Index of Capacity Utilization |
|---|---|---|---|---|
| 1967 | 1 | 20,200 | 54,900 (62,500) | 36.79 (32.32) |
| | 2 | 11,200 | " " | 20.40 (17.92) |
| | 3 | 21,200 | " " | 38.61 (33.92) |
| | 4 | 20,150 | " " | 36.70 (32.24) |
| 1968 | 1 | 25,600 | " " | 46.63 (40.96) |
| | 2 | 21,400 | " " | 38,97 (34.24) |
| | 3 | 28,800 | " " | 52.45 (46.08) |
| | 4 | 27,200 | " " | 49.54 (43.52) |
| 1969 | 1 | 28,600 | " " | 52.09 (45.76) |
| | 2 | 13,700 | " " | 24.95 (21.92) |
| | 3 | 29,100 | " " | 53.00 (46.56) |
| | 4 | 29,000 | " " | 52.82 (46.40) |
| 1970 | 1 | 19,650 | " " | 35.79 (31.44) |
| | 2 | 13,000 | " " | 23.67 (20.80) |
| | 3 | 21,600 | " " | 39.34 (34.56) |
| | 4 | 19,200 | " " | 34.97 (30.72) |
| 1971 | 1 | 30.100 | " " | 54.82 (48.16) |
| | 2 | 30,800 | " " | 56.10 (49.28) |
| | 3 | 42,550 | " " | 177.50 (68.08) |
| | 4 | 54,990 | " " | 100.00 (87.84 |
| 1972 | 1 | 44,000 | " " | 80.14 (70.40) |
| | 2 | 25,500 | " " | 46.44 (40.80) |
| | 3 | 38,800 | " " | 70.67 (62.08) |
| | 4 | 38,900 | " " | 70.85 (62.24) |
| 1973 | 1 | 41,900 | " " | 76.32 (67.04) |
| | 2 | 30,600 | " " | 55.74 (48.96) |
| | 3 | 25,300 | " " | 46.08 (40.48) |
| | 4 | 52,450 | " " | 95.54 (83.92) |
| 1974 | 1 | 31,200 | " " | 56.83 (49.92) |
| | 2 | 36,550 | " " | 66.58 (58.48) |
| | 3 | 45,800 | " " | 83,42 (73.28) |
| | 4 | 49,350 | " " | 89,89 (78.96) |

Figures in brackets refer to Engineering Estimates

Table A VI Ceylon Hardware Corporation - Capacity Utilization

| | | Actual Output Nos | Potential Output Nos | Index of Capacity Utilization | |
|---|---|---|---|---|---|
| 1965 | 4 | 4,500 | 70,000 (100,000) | 6.43 | (4.50) |
| 1966 | 1 | 18,000 | 71,000 " | 25.35 | (18.00) |
| | 2 | 10,000 | 72,500 " | 13.85 | (10.00) |
| | 3 | 15,000 | 73,500 " | 20.41 | (15.00) |
| | 4 | 12,000 | 75,000 " | 16.00 | (12.00) |
| 1967 | 1 | 35,000 | 76,000 " | 46.01 | (35.00) |
| | 2 | 9,000 | 77,500 " | 11.61 | (9.00) |
| | 3 | 38,000 | 79,000 " | 48.10 | (38.00) |
| | 4 | 31,000 | 80,000 " | 38.75 | (31.00) |
| 1968 | 1 | 61,000 | 81,500 " | 74.85 | (61.00) |
| | 2 | 18,000 | 82,500 " | 20.61 | (18.00) |
| | 3 | 80,000 | 84,000 " | 95.24 | (80.00) |
| | 4 | 85,000 | 85,000 " | 100.00 | (85.00) |
| 1969 | 1 | 39,000 | 86,000 " | 45.30 | (29.00) |
| | 2 | 12,500 | 87,500 " | 14.29 | (12.50) |
| | 3 | 36,500 | 89,000 " | 41.01 | (36.50) |
| | 4 | 40,000 | 90,000 " | 44.44 | (40.00) |
| 1970 | 1 | 17,500 | 91,500 " | 19.14 | (17.50) |
| | 2 | 9,500 | 93,000 " | 10.15 | ( 9.50) |
| | 3 | 16,500 | 94,000 " | 17.55 | (16.50) |
| | 4 | 56,000 | 95,000 " | 58.94 | (56.00) |
| 1971 | 1 | 49,500 | 96,000 " | 51.04 | (49.00) |
| | 2 | 34,500 | 98,000 " | 35.20 | (34.00) |
| | 3 | 89,000 | 99,000 " | 89.89 | (89.00) |
| | 4 | 65,000 | 100,000 " | 85.00 | (65.00) |
| 1972 | 1 | 38,000 | 101,250 " | 37.53 | (38.10) |
| | 2 | 73,520 | 102,500 " | 71.71 | (73.50) |
| | 3 | 99,000 | 103,750 " | 95.42 | (99.00) |
| | 4 | 105,000 | 105,000 " | 100.00 | (105.00) |
| 1973 | 1 | 40,500 | 106,250 " | 38.11 | (40.50) |
| | 2 | 26,000 | 107,520 " | 24.18 | (26.10) |
| | 3 | 63,000 | 108,750 " | 57.93 | (63.00) |
| | 4 | 76,500 | 110,000 " | 69.54 | (76.50) |
| 1974 | 1 | 24,500 | 111,250 " | 22.02 | (24.50) |
| | 2 | 19,000 | 112,500 " | 16.88 | (19.00) |
| | 3 | 49,000 | 113,750 " | 43.07 | (49.10) |
| | 4 | 75,500 | 115,000 " | 65.65 | (75.50) |

Figures in brackets refer to Previous Utilization

Table A VII Ceylon Mineral Sands Corporation - Capacity Utilization

| | | Actual Output Nos | Potential Output Nos | | Index of Capacity Utilization | |
|---|---|---|---|---|---|---|
| 1964 | 1 | 8,100 | 14,400 | (17,500) | 56.25 | (46.28) |
| | 2 | 12,700 | 14,950 | " | 84.95 | (72.57) |
| | 3 | 15,500 | 15,500 | " | 100.00 | (88.57) |
| | 4 | 10,650 | 16,000 | " | 66.56 | (60.85) |
| 1965 | 1 | 13,450 | 16,550 | " | 81.27 | (76.85) |
| | 2 | 11,400 | 17,050 | " | 66.89 | (65.14) |
| | 3 | 16,300 | 17,600 | " | 92.61 | (93.14) |
| | 4 | 12,650 | 18,200 | " | 69.56 | (72.28) |
| 1966 | 1 | 13,250 | 18,700 | " | 70.85 | (75.21) |
| | 2 | 12,350 | 19,200 | " | 64.32 | (70.57) |
| | 3 | 9,000 | 19,800 | " | 45.45 | (51.42) |
| | 4 | 10,650 | 20,350 | " | 52.33 | (60.85) |
| 1967 | 1 | 10,300 | 20,900 | " | 49.28 | (58.85) |
| | 2 | 15,450 | 21,400 | " | 72.20 | (88.28) |
| | 3 | 9,350 | 21,950 | " | 42.60 | (53.42) |
| | 4 | 13,150 | 22,500 | " | 58.44 | (75.14) |
| 1968 | 1 | 20,150 | 23,050 | (22,500) | 87.42 | (89.55) |
| | 2 | 16,700 | 23,600 | " | 70.76 | (74.22) |
| | 3 | 24,200 | 24,200 | " | 100.00 | (107.55) |
| | 4 | 12,150 | 24,650 | " | 49.29 | (54.00) |
| 1969 | 1 | 14,500 | 25,150 | " | 57.65 | (64.44) |
| | 2 | 22,850 | 25,650 | " | 89.08 | (101.33) |
| | 3 | 17,350 | 26,200 | " | 66.22 | (77.11) |
| | 4 | 26,750 | 26,750 | " | 100.00 | (118.88) |
| 1970 | 1 | 23,00 | 26,850 | (25,000) | 85.66 | (81.20) |
| | 2 | 7,950 | 27,000 | " | 29.44 | (30.80) |
| | 3 | 13,650 | 27,100 | " | 50.37 | (54.60) |
| | 4 | 26,600 | 27,250 | " | 97.61 | (106.24) |
| 1971 | 1 | 27,400 | 27,400 | " | 100.00 | (109.60) |
| | 2 | 22,950 | 27,500 | " | 83.45 | (91.80) |
| | 3 | 27,000 | 27,650 | " | 97.65 | (108.00) |
| | 4 | 14,000 | 27,750 | " | 50.45 | (56.00) |
| 1972 | 1 | 25,500 | 27,900 | " | 91.40 | (102.00) |
| | 2 | 24,400 | 28,000 | " | 87.14 | (97.60) |
| | 3 | 19,200 | 28,150 | " | 68.21 | (76.80) |
| | 4 | 12,000 | 28,300 | " | 42.42 | (48.00) |

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|---|---|---|---|---|---|---|
| 1973 | 1 | 26,300 | 28,400 | " | 92.61 | (105.20) |
| | 2 | 20,900 | 28,550 | " | 73.21 | (83.60) |
| | 3 | 24,100 | 29,650 | " | 81.28 | (96.40) |
| | 4 | 21,000 | 29,750 | " | 70.59 | (84.00) |
| 1974 | 1 | 25,000 | 29,900 | " | 83.62 | (100.00) |
| | 2 | 14,700 | 30,000 | " | 49.00 | (58.80) |
| | 3 | 19,520 | 30,100 | " | 62.90 | (78.00) |
| | 4 | 20,200 | 30,200 | " | 63.12 | (80.80) |

Figures in brackets refer to Engineering Estimates

Table A VIII

Ceylon Oil & Fats Corporation - Capacity Utilization

| | | Actual Output (Tons) | Potential Output (Tons) | Index of Capacity Utilization |
|---|---|---|---|---|
| 1964 | 1 | 4,600 | 6,200 (9,000) | 76.45 (51.11) |
| | 2 | 2,800 | 6,800 " | 41.18 (31.11) |
| | 3 | 5,300 | 7,400 " | 71.62 (58.88) |
| | 4 | 4,000 | 8,000 " | 50.00 (44.44) |
| 1965 | 1 | 6,300 | 8,600 " | 73.26 (70.00) |
| | 2 | 7,400 | 9,200 " | 80.43 (82.22) |
| | 3 | 4,000 | 9,700 " | 41.24 (44.44) |
| | 4 | 6,000 | 10,300 " | 58.25 (66.66) |
| 1966 | 1 | 5,200 | 10,900 " | 47.71 (57177) |
| | 2 | 7,300 | 11,500 " | 63.48 (81.11) |
| | 3 | 8,750 | 12,100 " | 72.48 (97.22) |
| | 4 | 8,000 | 12,700 " | 62.99 (88.88) |
| 1967 | 1 | 9,600 | 13,300 " | 72.18 (106.66) |
| | 2 | 4,300 | 13,800 " | 31.16 (47.77) |
| | 3 | 6,800 | 14,450 " | 47.06 (75.55) |
| | 4 | 8,250 | 15,050 " | 54.82 (91.66) |
| 1968 | 1 | 11,900 | 15,600 (12,000) | 76.28 (99.17) |
| | 2 | 16,200 | 16,200 " | 100.00 (135.00) |
| | 3 | 10,500 | 16,800 " | 65.22 (87.50) |
| | 4 | 12,850 | 17,400 " | 73.85 (107.08) |
| 1969 | 1 | 18,000 | 18,000 (16,000) | 100.00 (112.50) |
| | 2 | 16,000 | 18,150 " | 88.15 (100.00) |
| | 3 | 15,500 | 18,250 " | 84.93 (96.87) |
| | 4 | 10,500 | 18,350 " | 57.22 (65.62) |
| 1970 | 1 | 11,250 | 18,450 (24,000) | 60.16 (46.87) |
| | 2 | 11,950 | 18,530 " | 64.42 (49.79) |
| | 3 | 11,900 | 18,650 " | 63.81 (49.58) |
| | 4 | 13,300 | 18,750 " | 70.93 (55.41) |
| 1971 | 1 | 15,700 | 18,850 " | 83.29 (65.41) |
| | 2 | 12,450 | 19,000 " | 65.53 (51.87) |
| | 3 | 12,400 | 19,050 " | 65.12 (51.66) |
| | 4 | 11,850 | 19,200 " | 61.72 (49.37) |
| 1972 | 1 | 16,100 | 19,300 " | 83.42 (67.08) |
| | 2 | 14,500 | 19,400 " | 74.74 (60.41) |
| | 3 | 19,550 | 19,550 " | 100.00 (81.45) |
| | 4 | 16,600 | 19,650 " | 84.48 (69.16) |

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|---|---|---|---|---|---|---|
| 1973 | 1 | 13,700 | 19,750 | (24,000) | 66.84 | (55.00) |
| | 2 | 11,800 | 19,850 | " | 59.45 | (49.16) |
| | 3 | 19,500 | 19,950 | " | 99.74 | (81.25) |
| | 4 | 10,300 | 20,050 | " | 51.37 | (42.91) |
| 1974 | 1 | 14,400 | 20,150 | " | 71.46 | (60.00) |
| | 2 | 10,350 | 20,250 | " | 51.11 | (43.12) |
| | 3 | 11,700 | 20.350 | " | 57.49 | (48.75) |
| | 4 | 9,100 | 20.450 | " | 44.50 | (37.91) |

Figures in brackets refer to Engineering Estimates

Table A IX Ceylon Leather Products Corporation - Capacity Utilization

| | | Actual Output Nos | Potential Output Nos | Index of Capacity Utilization | |
|---|---|---|---|---|---|
| 1964 | 1 | 50,000 | 74,000 | (86,250) | 67.56 (57.97) |
| | 2 | 32,000 | " | " | 43.24 (37.10) |
| | 3 | 54,000 | " | " | 72.97 (62.60) |
| | 4 | 48,000 | " | " | 64.86 (55.65) |
| 1965 | 1 | 56,000 | " | " | 75.67 (64.92) |
| | 2 | 31,000 | " | " | 41.89 (35.94) |
| | 3 | 48,000 | " | " | 64.86 (55.65) |
| | 4 | 49,000 | " | " | 66.21 (56.81) |
| 1966 | 1 | 63,000 | " | " | 85.13 (73.04) |
| | 2 | 74,000 | " | " | 100.00 (85.79) |
| | 3 | 72,000 | 76,400 | " | 94.24 (83.47) |
| | 4 | 37,000 | 79,000 | " | 46.83 (42.89) |
| 1967 | 1 | 65,000 | 81,700 | " | 79.55 (75.36) |
| | 2 | 74,000 | 84,000 | " | 88.09 (85.79) |
| | 3 | 76,000 | 86,700 | " | 87.65 (88.11) |
| | 4 | 45,000 | 89,500 | " | 50.27 (52.17) |
| 1968 | 1 | 70,000 | 92,000 | (100,000) | 76.08 (70.00) |
| | 2 | 87,000 | 94,500 | " | 92.06 (87.00) |
| | 3 | 72,000 | 97,000 | " | 74.22 (72.00) |
| | 4 | 46,000 | 99,800 | " | 46.09 (46.00) |
| 1969 | 1 | 63,000 | 102,800 | " | 61.28 (63.00) |
| | 2 | 91,000 | 105,000 | " | 86.66 (91.00) |
| | 3 | 95,000 | 107,500 | " | 88.37 (95.00) |
| | 4 | 110,000 | 110,000 | " | 100.00 (110.00) |
| 1970 | 1 | 64,000 | 110,000 | (100,000) | 58.18 (64.00) |
| | 2 | 20,200 | " | " | 18.36 (20.20) |
| | 3 | 63,000 | " | " | 57.27 (63.00) |
| | 4 | 56,800 | " | " | 51.63 (56.80) |
| 1971 | 1 | 65,700 | " | " | 59.72 (65.70) |
| | 2 | 68,000 | " | " | 61.81 (68.00) |
| | 3 | 73,000 | " | " | 66.36 (73.00) |
| | 4 | 74,600 | " | " | 67.81 (74.60) |

| | | | | | |
|---|---|---|---|---|---|
| 1972 | 1 | 70,200 | " | " | 63.81 (70.20) |
| | 2 | 76,000 | " | " | 69.09 (76.00) |
| | 3 | 52,300 | " | " | 47.54 (52.30) |
| | 4 | 33,700 | " | " | 30.63 (33.70) |
| 1973 | 1 | 65,400 | " | " | 59.45 (65.40) |
| | 2 | 43,900 | " | " | 39.90 (43.90) |
| | 3 | 40,700 | " | " | 37.00 (40.70) |
| | 4 | 57,100 | " | " | 51.90 (57.10) |
| 1974 | 1 | 59,400 | " | " | 54.00 (59.40) |
| | 2 | 66,900 | " | " | 60.81 (66.90) |
| | 3 | 77,100 | " | " | 70.09 (77.10) |
| | 4 | 42,600 | " | " | 38.72 (42.60) |

Figures in brackets refer to Engineering Estimates

Table A X Ceylon Paranthan Chemicals Corporation - Capacity Utilization

| | | Actual Output (Tons) | Potential Output (Tons) | Index of Capacity Utilization | |
|---|---|---|---|---|---|
| 1964 | 1 | 218 | 453 (375) | 48.12 | (58.13) |
| | 2 | 245 | " " | 54.08 | (65.33) |
| | 3 | 269 | " " | 59.38 | (71.73) |
| | 4 | 110 | " " | 24.28 | (29.33) |
| 1965 | 1 | 296 | " " | 65.34 | (78.93) |
| | 2 | 267 | " " | 58.94 | (71.20) |
| | 3 | 304 | " " | 67.10 | (81.06) |
| | 4 | 214 | " " | 47.24 | (57.06) |
| 1966 | 1 | 308 | " " | 67.99 | (82.13) |
| | 2 | 255 | " " | 56.29 | (68.00) |
| | 3 | 312 | " " | 68.87 | (83.20) |
| | 4 | 125 | " " | 27.59 | (33.33) |
| 1967 | 1 | 372 | " " | 82.11 | (99.20) |
| | 2 | 396 | " " | 87.41 | (105.60) |
| | 3 | 453 | " " | 100.00 | (120.80) |
| | 4 | 358 | " " | 79.02 | (95.46) |
| 1968 | 1 | 369 | " " | 81.45 | (98.40) |
| | 2 | 381 | " " | 84.10 | (101.60) |
| | 3 | 412 | " " | 90.94 | (109.86) |
| | 4 | 301 | " " | 66.44 | (80.26) |
| 1969 | 1 | 369 | " (400) | 81.45 | (92.25) |
| | 2 | 381 | " " | 84.10 | (95.25) |
| | 3 | 402 | " " | 88.74 | (100.50) |
| | 4 | 293 | " " | 64.67 | (73.25) |
| 1970 | 1 | 301 | 453 (400) | 66.44 | (75.25) |
| | 2 | 322 | " " | 71.08 | (80.50) |
| | 3 | 398 | " " | 87.85 | (99.50) |
| | 4 | 335 | " " | 73.95 | (83.75) |
| 1971 | 1 | 340 | " " | 75.05 | (85.00) |
| | 2 | 320 | " " | 70.64 | (80.00) |
| | 3 | 394 | " " | 86.97 | (98.50) |
| | 4 | 365 | " " | 80.57 | (91.25) |

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|---|---|---|---|---|---|---|
| 1972 | 1 | 369 | " | " | 81.45 | (92.25) |
| | 2 | 367 | " | " | 81.01 | (91.75) |
| | 3 | 395 | " | " | 87.19 | (98.75) |
| | 4 | 368 | " | " | 81.23 | (92.00) |
| 1973 | 1 | 384 | " | " | 84.77 | (96.00) |
| | 2 | 362 | " | " | 79.91 | (90.50) |
| | 3 | 397 | " | " | 87.64 | (99.25) |
| | 4 | 337 | " | " | 74.39 | (84.25) |
| 1974 | 1 | 316 | " | " | 67.76 | (79.00) |
| | 2 | 374 | " | " | 82.56 | (93.50) |
| | 3 | 295 | " | " | 65.12 | (73.75) |
| | 4 | 369 | " | " | 81.46 | (92.95) |

Figures in Brackets are Engineering Estimates

Table A XI Ceylon Textiles Corporation - capacity utilization

| | | Actual Output (lbs) '000s | Potential Output (lbs) '000s | | Index of Capacity Utilization | |
|---|---|---|---|---|---|---|
| 1964 | 1 | 475 | 775 | (850) | 61.29 | (55.88) |
| | 2 | 550 | 785 | " | 64.33 | (64.70) |
| | 3 | 335 | 790 | " | 42.41 | (39.41) |
| | 4 | 385 | 800 | " | 73.13 | (45.29) |
| 1965 | 1 | 660 | 805 | " | 81.99 | (77.64) |
| | 2 | 585 | 815 | " | 71.78 | (68.82) |
| | 3 | 575 | 825 | " | 69.70 | (67.64) |
| | 4 | 825 | 825 | " | 100.00 | (97.05) |
| 1966 | 1 | 500 | 835 | " | 59.88 | (58.82) |
| | 2 | 585 | 850 | " | 68.80 | (68.82) |
| | 3 | 525 | 855 | " | 61.40 | (61.76) |
| | 4 | 625 | 865 | " | 72.25 | (73.52) |
| 1967 | 1 | 530 | 825 | " | 64.24 | (62.35) |
| | 2 | 400 | 880 | " | 45.45 | (47.05) |
| | 3 | 580 | 895 | " | 83.45 | (68.23) |
| | 4 | 430 | 900 | " | 47.47 | (50.28) |
| 1968 | 1 | 510 | 910 | " | 56.04 | (60.00) |
| | 2 | 700 | 920 | " | 76.09 | (82.35) |
| | 3 | 475 | 925 | " | 51.35 | (55.88) |
| | 4 | 695 | 930 | " | 75.26 | (81.76) |
| 1969 | 1 | 700 | 945 | " | 74.07 | (82.35) |
| | 2 | 695 | 950 | " | 73.67 | (81.76) |
| | 3 | 725 | 952 | " | 76.57 | (85.29) |
| | 4 | 960 | 960 | " | 100.00 | (112.94) |
| 1970 | 1 | 600 | 1075 | (3,400) | 55.81 | (17.64) |
| | 2 | 475 | 1175 | " | 40.42 | (13.97) |
| | 3 | 575 | 1295 | " | 44.40 | (16.91) |
| | 4 | 535 | 1400 | " | 37.50 | (15.73) |
| 1971 | 1 | 650 | 1525 | " | 42.62 | (19.11) |
| | 2 | 655 | 1625 | " | 40.31 | (19.26) |
| | 3 | 1100 | 1730 | " | 63.58 | (32.35) |
| | 4 | 1330 | 1850 | " | 71.86 | (39.11) |

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|---|---|---|---|---|---|---|
| 1972 | 1 | 1560 | 1960 | " | 79.59 | (45.88) |
| | 2 | 2075 | 2075 | " | 100.00 | (61.02) |
| | 3 | 1900 | 2465 | " | 77.07 | (55.88) |
| | 4 | 2900 | 2900 | " | 100.00 | (85.29) |
| 1973 | 1 | 2455 | 2930 | " | 83.78 | (72.21) |
| | 2 | 1680 | 2960 | " | 56.75 | (49.41) |
| | 3 | 2745 | 2990 | " | 91.80 | (80.74) |
| | 4 | 2785) | 3020 | " | 98.84 | (81.91) |
| 1974 | 1 | 2830 | 3050 | " | 92.78 | (83.24) |
| | 2 | 1745 | 3080 | " | 56.65 | (51.32) |
| | 3 | 3100 | 3110 | " | 100.00 | (91.18) |
| | 4 | 1995 | 3140 | " | 63.53 | (58.68) |

Figures in brackets refer to Engineering Estimates

Table A 1 XII Ceylon Cement Corporation - Capacity-Utilization

| | | Actual Capacity tons | Potential Capacity tons | Index of Capacity Utilization |
|---|---|---|---|---|
| 1955 | 1 | 15,750 | 32,000 (20,000) | 48.31 (78.75) |
| | 2 | 17,400 | " " | 53.37 (87.00) |
| | 3 | 19,200 | " " | 58.89 (96.00) |
| | 4 | 13,700 | " " | 42.02 (68.50) |
| 1956 | 1 | 21,300 | " " | 65.33 (106.50) |
| | 2 | 22,900 | " " | 70.24 (114.50) |
| | 3 | 24,900 | " " | 76.38 (124.50) |
| | 4 | 15,000 | " " | 46.01 (75.00) |
| 1957 | 1 | 22,000 | " " | 67.48 (110.00) |
| | 2 | 19,000 | " " | 58.28 (95.00) |
| | 3 | 21,000 | " " | 64.41 (105.00) |
| | 4 | 13,700 | " " | 42.02 (68.50) |
| 1958 | 1 | 28,000 | " " | 85.88 (140.00) |
| | 2 | 15,000 | " " | 47.85 (78.00) |
| | 3 | 19,950 | " " | 61.19 (99.75) |
| | 4 | 14,900 | " " | 45.70 (74.50) |
| 1959 | 1 | 11,000 | " " | 33.74 (55.00) |
| | 2 | 13,500 | " " | 41.41 (67.50) |
| | 3 | 15,000 | " " | 46.01 (75.00) |
| | 4 | 8,750 | " " | 26.84 (43.75) |
| 1960 | 1 | 20,000 | " (40,000) | 61.34 (50.00) |
| | 2 | 23,000 | " " | 70.55 (57.50) |
| | 3 | 23,300 | " " | 71.47 (58.25) |
| | 4 | 13,400 | " " | 41.10 (33.50) |
| 1961 | 1 | 25,000 | " " | 76.68 (62.50) |
| | 2 | 26,800 | " " | 82.20 (67.00) |
| | 3 | 30,900 | " " | 94.78 (77.25) |
| | 4 | 12,700 | " " | 38.95 (31.75) |
| 1962 | 1 | 17,000 | " " | 53.14 (42.50) |
| | 2 | 26,000 | " " | 79.75 (65.00) |
| | 3 | 20,500 | " " | 62.88 (51.25) |
| | 4 | 15,000 | " " | 46.01 (37.50) |

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|---|---|---|---|---|---|
| 1963 | 1 | 23,600 | 32,000 | (40,000) | 72.39 (59.00) |
| | 2 | 22,400 | " | " | 68.71 (56.00) |
| | 3 | 24,000 | " | " | 73.61 (60.00) |
| | 4 | 15,700 | " | " | 48.15)(39.25) |
| 1964 | 1 | 21,900 | " | " | 67.17 (54.75) |
| | 2 | 19,300 | " | " | 59.20 (48.25) |
| | 3 | 26,300 | " | " | 80.67 (65.75) |
| | 4 | 13,700 | " | " | 42.02 (34.25) |
| 1965 | 1 | 18,000 | " | " | 53.21 (45.00) |
| | 2 | 32,600 | " | " | 100.00 (81.50) |
| | 3 | 15,000 | 34,000 | " | 44.11 (37.50) |
| | 4 | 16,000 | 35,700 | " | 44.81 (40.00) |
| 1966 | 1 | 24,000 | 37,000 | " | 64.69 (60.00) |
| | 2 | 18,200 | 38,500 | " | 47.27 (45.50) |
| | 3 | 22,000 | 40,000 | " | 55.00 (55.00) |
| | 4 | 12,700 | 41,600 | " | 30.52 (31.75) |
| 1967 | 1 | 20,800 | 43,000 | " | 48.37 (52.00) |
| | 2 | 22,500 | 44,400 | " | 50.67 (56.25) |
| | 3 | 24,100 | 45,800 | " | 52.62 (60.25) |
| | 4 | 18,500 | 47,200 | " | 39.19 (46.25) |
| 1968 | 1 | 26,800 | 48,800 | " | 54.91 (67.00) |
| | 2 | 20,300 | 50,100 | " | 40.51 (50.75) |
| | 3 | 21,500 | 50,600 | " | 42.49 (53.75) |
| | 4 | 18,250 | 53,000 | " | 34.43 (45.62) |
| 1969 | 1 | 54,800 | 54,800 | 65,000 | 100.00 (84.30) |
| | 2 | 41,900 | 58,000 | " | 72.24 (64.46) |
| | 3 | 48,500 | 61,800 | " | 78.47 (74.61) |
| | 4 | 43,500 | 65,000 | " | 66.92 (66.92) |
| 1970 | 1 | 61,500 | 68,500 | " | 89.78 (94.61) |
| | 2 | 50500 | 72,300 | " | 69.84 (77.69) |
| | 3 | 61,000 | 76,000 | " | 80.26 (93.84) |
| | 4 | 46,000 | 78,500 | " | 58.59 (70.76) |

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|---|---|---|---|---|
| 1971 | 1 | 54,500 | 83,000 (92,500) | 65.66 (58.91) |
| | 2 | 42,000 | 86,700 " | 48.44 (45.40) |
| | 3 | 48,500 | 90,000 " | 53.88 (52.43) |
| | 4 | 43,500 | 93,700 " | 46.42 (47.02) |
| 1972 | 1 | 64,300 | 97,200 (147,500) | 66.15 (43.59) |
| | 2 | 81,800 | 100,900 " | 81.07 (55.45) |
| | 3 | 84,500 | 104,100 " | 81.17 (57.28) |
| | 4 | 93,000 | 107,700 " | 86.35 (63.05) |
| 1973 | 1 | 94,000 | 111,400 " | 84.38 (63.72) |
| | 2 | 75,000 | 114,700 " | 65.38 (50.84) |
| | 3 | 118,000 | 118,500 " | 10[illegible].00 (80.00) |
| | 4 | 91,200 | 121,900 " | 74.81 (61.83) |
| 1974 | 1 | 105,000 | 127,700 " | 82.22 (71.18) |
| | 2 | 91,900 | 129,500 " | 70.96 (62.30) |
| | 3 | 102,600 | 132,700 " | 77.31 (69.55) |
| | 4 | 77,300 | 136,000 " | 56.83 (52.40) |

Figures in brackets refer to Engineering Estimates

Table A XIII Ceylon Ceramics Corporation - Capacity Utilization

| | | Actual Output (Tons) | Potential Output (Tons) | | Index of Capacity Utilization | |
|---|---|---|---|---|---|---|
| 1964 | 1 | 235 | 566 | (220) | 41.51 | (106.81) |
| | 2 | 230 | 588 | " | 39.11 | (104.54) |
| | 3 | 240 | 612 | " | 39.21 | (109.09) |
| | 4 | 175 | 631 | " | 27.73 | (79.54) |
| 1965 | 1 | 230 | 655 | " | 35.11 | (104.54) |
| | 2 | 240 | 675 | " | 35.55 | (109.09) |
| | 3 | 238 | 698 | " | 34.09 | (108.18) |
| | 4 | 142 | 720 | " | 19.72 | (64.54) |
| 1966 | 1 | 188 | 742 | (620) | 25.33 | (30.32) |
| | 2 | 270 | 763 | " | 35.38 | (43.54) |
| | 3 | 250 | 785 | " | 31.84 | (40.32) |
| | 4 | 295 | 808 | " | 36.50 | (47.58) |
| 1967 | 1 | 830 | 830 | (825) | 100.00 | (99.40) |
| | 2 | 718 | 850 | " | 84.47 | (85.98) |
| | 3 | 507 | 850 | " | 58.07 | (60.71) |
| | 4 | 514 | 873 | " | 57.43 | (61.55) |
| 1968 | 1 | 540 | 917 | " | 58.88 | (64.67) |
| | 2 | 688 | 939 | " | 73.26 | (82.39) |
| | 3 | 571 | 960 | " | 59.47 | (68.38) |
| | 4 | 734 | 982 | " | 74.74 | (87.90) |
| 1969 | 1 | 595 | 1004 | (975) | 59.26 | (61.02) |
| | 2 | 483 | 1027 | " | 47.03 | (49.53) |
| | 3 | 604 | 1050 | " | 57.52 | (61.94) |
| | 4 | 407 | 1073 | " | 37.93 | (41.74) |
| 1970 | 1 | 474 | 1095 | (975) | 43.28 | (48.61) |
| | 2 | 408 | 1117 | " | 36.52 | (41.84) |
| | 3 | 481 | 1138 | " | 42.26 | (49.33) |
| | 4 | 448 | 1162 | " | 38.55 | (45.94) |
| 1971 | 1 | 399 | 1184 | " | 33.69 | (40.92) |
| | 2 | 541 | 1204 | " | 44.93 | (55.48) |
| | 3 | 542 | 1226 | " | 44.20 | (55.48) |
| | 4 | 634 | 1247 | " | 50.84 | (65.02) |

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| | | | | | |
|---|---|---|---|---|---|
| 1972 | 1 | 1271 | 1271 (1175) | 100.00 | (108.17) |
| | 2 | 585 | 1274 " | 45.91 | (49.78) |
| | 3 | 664 | 1277 " | 52.00 | (56.51) |
| | 4 | 749 | 1280 " | 58.52 | (63.74) |
| 1973 | 1 | 672 | 1283 " | 52.37 | (57.19) |
| | 2 | 394 | 1286 " | 30.64 | (33.53) |
| | 3 | 851 | 1289 " | 66.49 | (72.93) |
| | 4 | 982 | 1292 " | 76.01 | (83.57) |
| 1974 | 1 | 464 | 1295 " | 35.83 | (39.49) |
| | 2 | 1298 | 1298 " | 100.00 | (110.46) |
| | 3 | 712 | 1301 " | 54.73 | (60.59) |
| | 4 | 332 | 1304 " | 25.46 | (28.25) |

Figures in brackets refer to Engineering Estimates

Table A XIV Ceylon Eastern Paper Mills Corporation - Capacity Utilization

| | | Actual Output (Tons) | Potential Output (Tons) | Index of Capacity Utilization |
|---|---|---|---|---|
| 1964 | 1 | 1,460 | 2,670 (1,000) | 54.68 (91.25) |
| | 2 | 1,540 | " " | 57.67 (96.25) |
| | 3 | 1,670 | " " | 62.54 (104.37) |
| | 4 | 1,245 | " " | 46.62 (77.81) |
| 1965 | 1 | 1,850 | " " | 69.28 (115.62) |
| | 2 | 1,935 | " " | 72.47 (120.94) |
| | 3 | 2,045 | " " | 76.59 (127.81) |
| | 4 | 1,545 | " " | 57.86 (96.56) |
| 1966 | 1 | 2,260 | " (2,500) | 84.64 (90.40) |
| | 2 | 2,120 | " " | 79.40 (84.80) |
| | 3 | 2,090 | " " | 78.27 (87.60) |
| | 4 | 2,670 | " " | 100.00 (106.80) |
| 1967 | 1 | 2,560 | 2,775 " | 92.25 (102.40) |
| | 2 | 2,125 | 2,865 " | 74.17 (85.00) |
| | 3 | 2,510 | 2,965 " | 84.65 (100.40) |
| | 4 | 2,155 | 3,070 " | 70.19 (86.20) |
| 1968 | 1 | 2,000 | 3,165 " | 63.19 (80.00) |
| | 2 | 2,340 | 3,260 " | 71.77 (93.60) |
| | 3 | 1,675 | 3,350 " | 50.00 (67.00) |
| | 4 | 2,435 | 3,450 " | 70.57 (97.40) |
| 1969 | 1 | 2,165 | 3,550 " | 60.98 (86.60) |
| | 2 | 1,990 | 3,650 " | 54.52 (79.60) |
| | 3 | 2,390 | 3,740 " | 63.90 (95.60) |
| | 4 | 1,150 | 3,835 " | 56.06 (86.00) |
| 1970 | 1 | 2505 | 3940 (3000) | 63.57 (83.50) |
| | 2 | 1890 | 4040 " | 46.78 (63.00) |
| | 3 | 2225 | 4135 " | 53.80 (74.17) |
| | 4 | 2475 | 4225 " | 58.57 (82.50 |
| 1971 | 1 | 2560 | 4325 " | 59.19 (85.33) |
| | 2 | 2245 | 4475 " | 50.16 (74.83) |
| | 3 | 2530 | 4530 " | 55.84 (84.33) |
| | 4 | 2085 | 4620 " | 45.12 (69.50) |

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| | | | | | |
|---|---|---|---|---|---|
| 1972 | 1 | 2550 | 4720 | (5625) | 54.02 (45.33) |
| | 2 | 2220 | 4800 | " | 46.25 (39.46) |
| | 3 | 3420 | 4940 | " | 65.18 (60.80) |
| | 4 | 4985 | 4985 | " | 100.00 (88.62) |
| 1973 | 1 | 4290 | 4990 | " | 85.97 (76.26) |
| | 2 | 4850 | 5200 | " | 97.00 (86.22) |
| | 3 | 4170 | 5005 | " | 83.23 (75.91) |
| | 4 | 4960 | 5010 | " | 99.00 (88.17) |
| 1974 | 1 | 3980 | 5020 | " | 79.28 (70.75) |
| | 2 | 4640 | 5030 | " | 92.24 (82.48) |
| | 3 | 4000 | 5040 | " | 79.36 (82.48) |
| | 4 | 5050 | 5050 | " | 100.00 (89.77) |

Figures in brackets refer to Engineering Estimates

Table A XV Ceylon Steel Corporation - Capacity Utilization

| | | Actual Output (Metric Tons) | Potential Output (Metric Tons) | Index of Capital Utilization |
|---|---|---|---|---|
| 1967 | 1 | 5050 | 12,800 (22,500) | 39.45 (22.46) |
| | 2 | 4120 | " " | 32.19 (22.44) |
| | 3 | 5530 | " " | 41.64 (23.68) |
| | 4 | 5160 | " " | 40.31 (22.93) |
| 1968 | 1 | 8920 | " " | 69.69 (39.64) |
| | 2 | 6360 | " " | 49.69 (28.26) |
| | 3 | 9170 | " " | 71.64 (40.75) |
| | 4 | 9930 | " " | 77.58 (44.13) |
| 1969 | 1 | 7350 | " " | 57.42 (32.66) |
| | 2 | 5030 | " " | 39.30 (22.35) |
| | 3 | 7880 | " " | 61.56 (35.02) |
| | 4 | 7160 | " " | 55.94 (31.82) |
| 1970 | 1 | 6980 | " " | 54.53 (31.02) |
| | 2 | 3470 | " " | 27.11 (15.42) |
| | 3 | 7720 | " " | 60.31 (34.31) |
| | 4 | 5160 | " " | 40.31 (22.93) |
| 1971 | 1 | 6970 | " " | 54.45 (30.97) |
| | 2 | 5560 | " " | 43.44 (24.71) |
| | 3 | 6950 | " " | 54.30 (30.88) |
| | 4 | 7080 | " " | 55.31 (31.46) |
| 1972 | 1 | 4980 | " " | 38.91 (22.13) |
| | 2 | 3750 | " " | 29.30 (16.66) |
| | 3 | 12,800 | " " | 100.00 (56.88) |
| | 4 | 10,370 | " " | 81.02 (46.08) |
| 1973 | 1 | 4070 | " " | 31.80 (18.09) |
| | 2 | 3320 | " " | 25.93 (14.76) |
| | 3 | 8530 | " " | 66.64 (37.91) |
| | 4 | 8010 | " " | 62.58 (35.60) |
| 1974 | 1 | 7470 | " " | 58.36 (33.20) |
| | 2 | 6960 | " " | 54.38 (30.93) |
| | 3 | 7410 | " " | 57.89 (32.93) |
| | 4 | 6990 | " " | 54.61 (31.07) |

(Figures in brackets refer to Engineering Estimates)

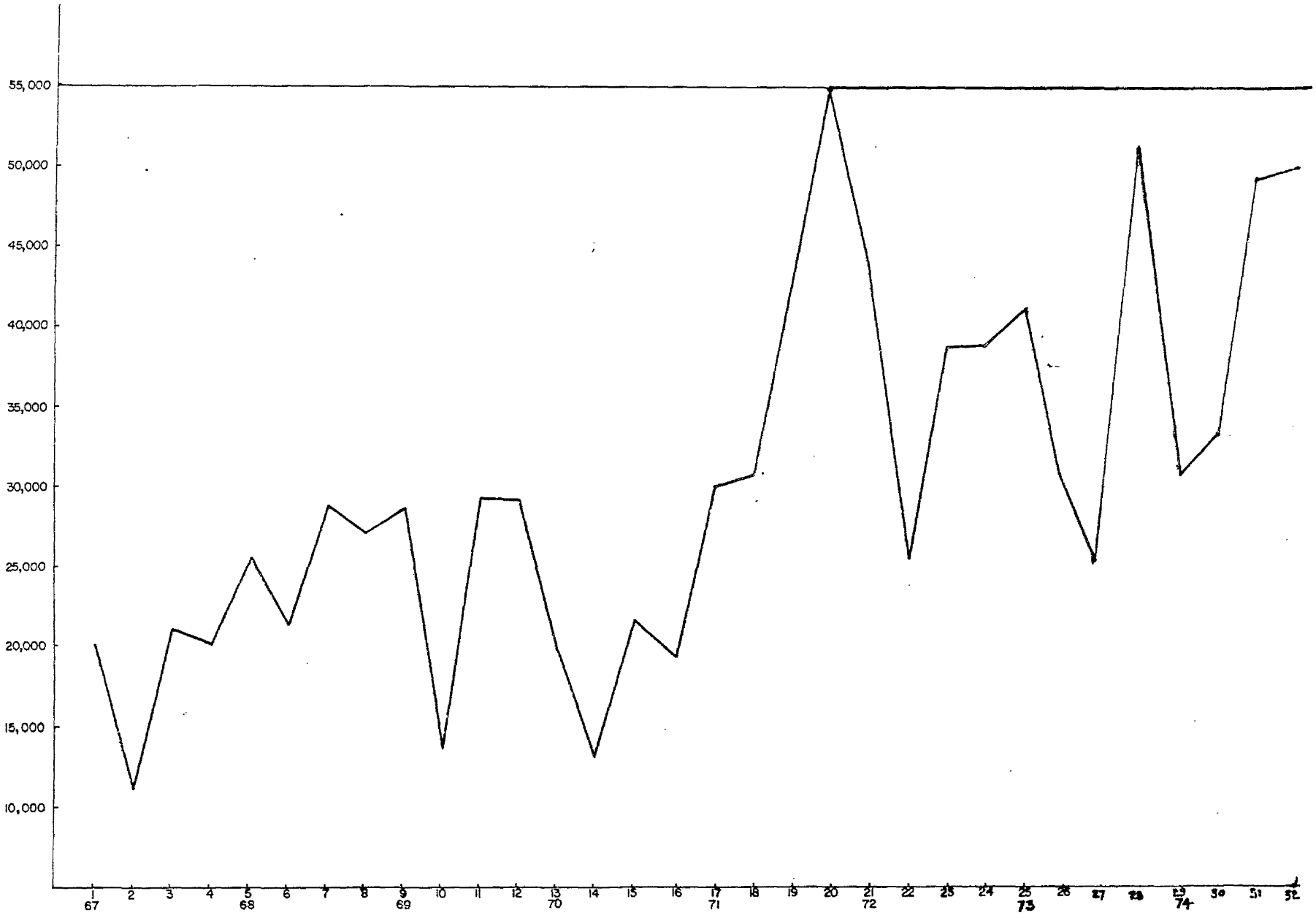
Appendix A XVI

Average rate of capacity utilization

| Corporation | Wharton Method Estimate | Engineering Estimate |
|---|---|---|
| Ceylon Tyre Corporation | 55.11 | 48.41 |
| Ceylon Hardward Corporation | 44.63 | 42.48 |
| Ceylon Mineral Sands Corpn. | 71.69 | 78.34 |
| Ceylon Oil & Fats Corpn. | 67.48 | 68.53 |
| Ceylon Leather Products Corpn. | 64.04 | 64.05 |
| Ceylnn Paranther Chemicals " | 72.85 | 84.59 |
| Ceylon Textiles Corporation | 69.27 | 60.01 |
| Ceylon Cement Corporation | 61.66 | 64.60 |
| Ceylon Ceramics Corporation | 50.06 | 66.82 |
| Ceylon Eastern Paper Mills " | 69.69 | 85.26 |
| Ceylon Steel Corporation | 52.73 | 30.12 |
| Total average | 61.75 | 63.02 |

# APPENDIX B

## Graphical Presentation of Capacity Utilization Study (Supplementary to Chapter 4)




SOURCES: QUARTERLY PROGRESS REPORTS,

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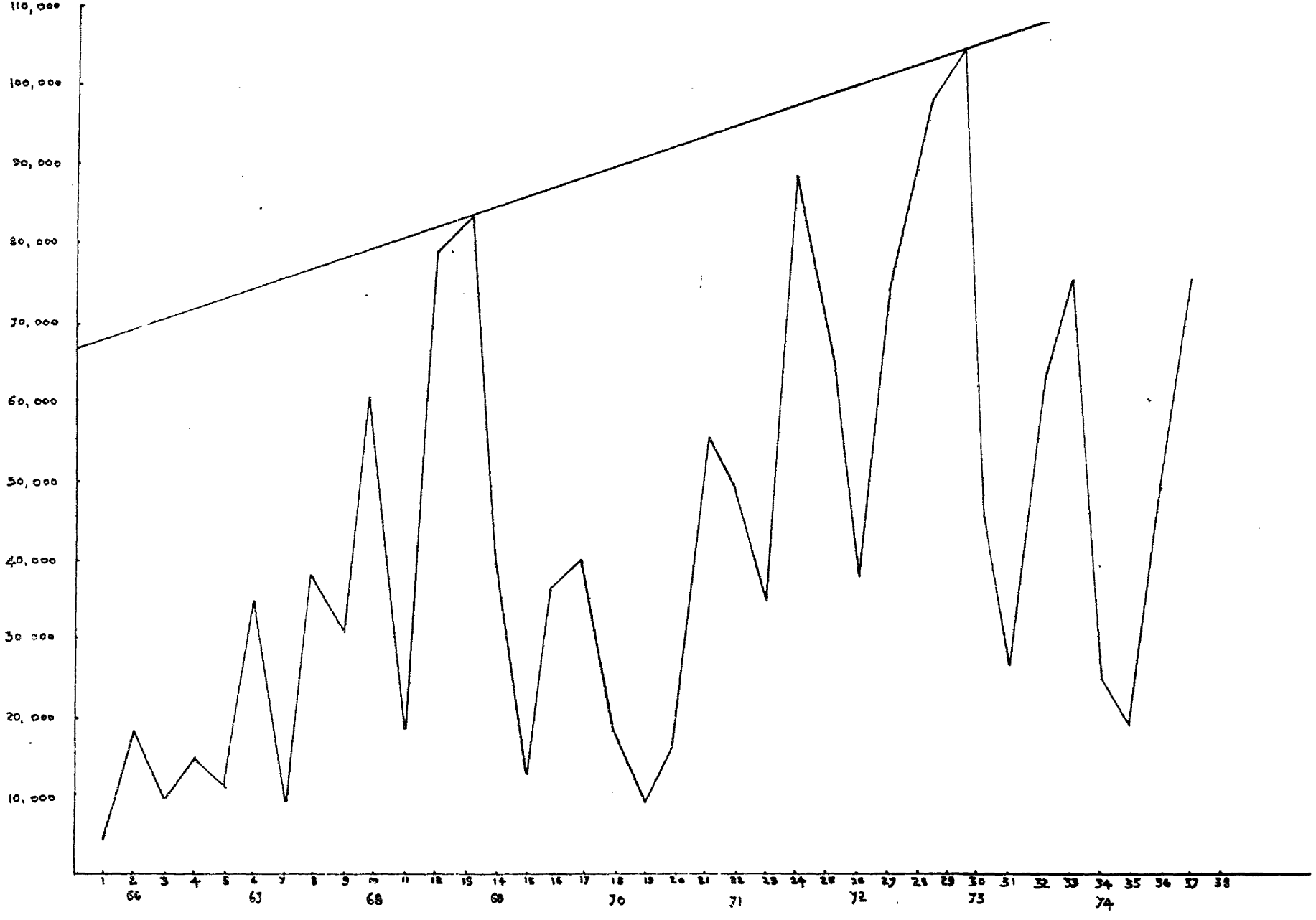
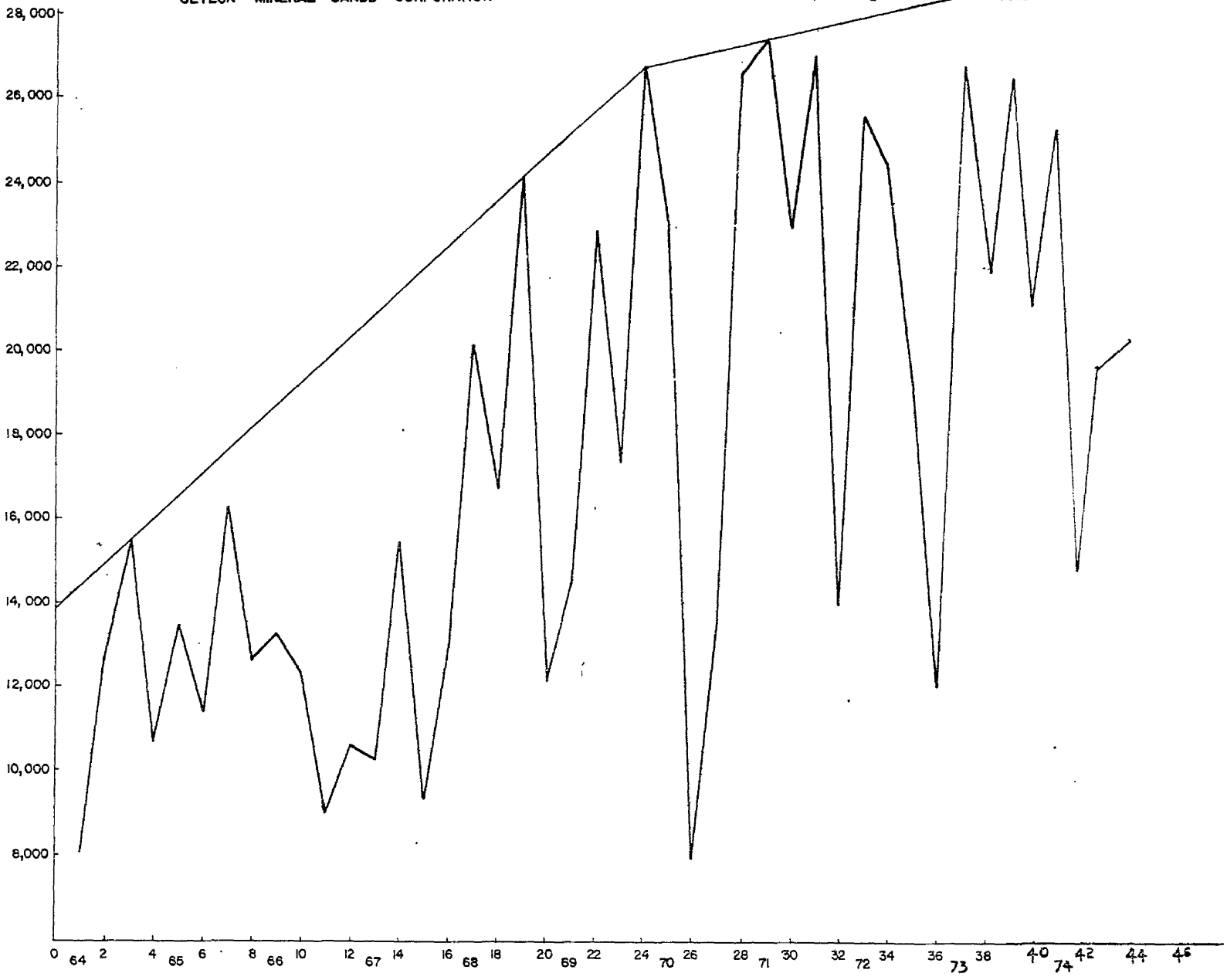



SOURCES: QUARTERLY PROGRESS REPORTS,
MINISTRY OF PLANNING & ECONOMIC AFFAIRS.

CEYLON MINERAL SANDS CORPORATION

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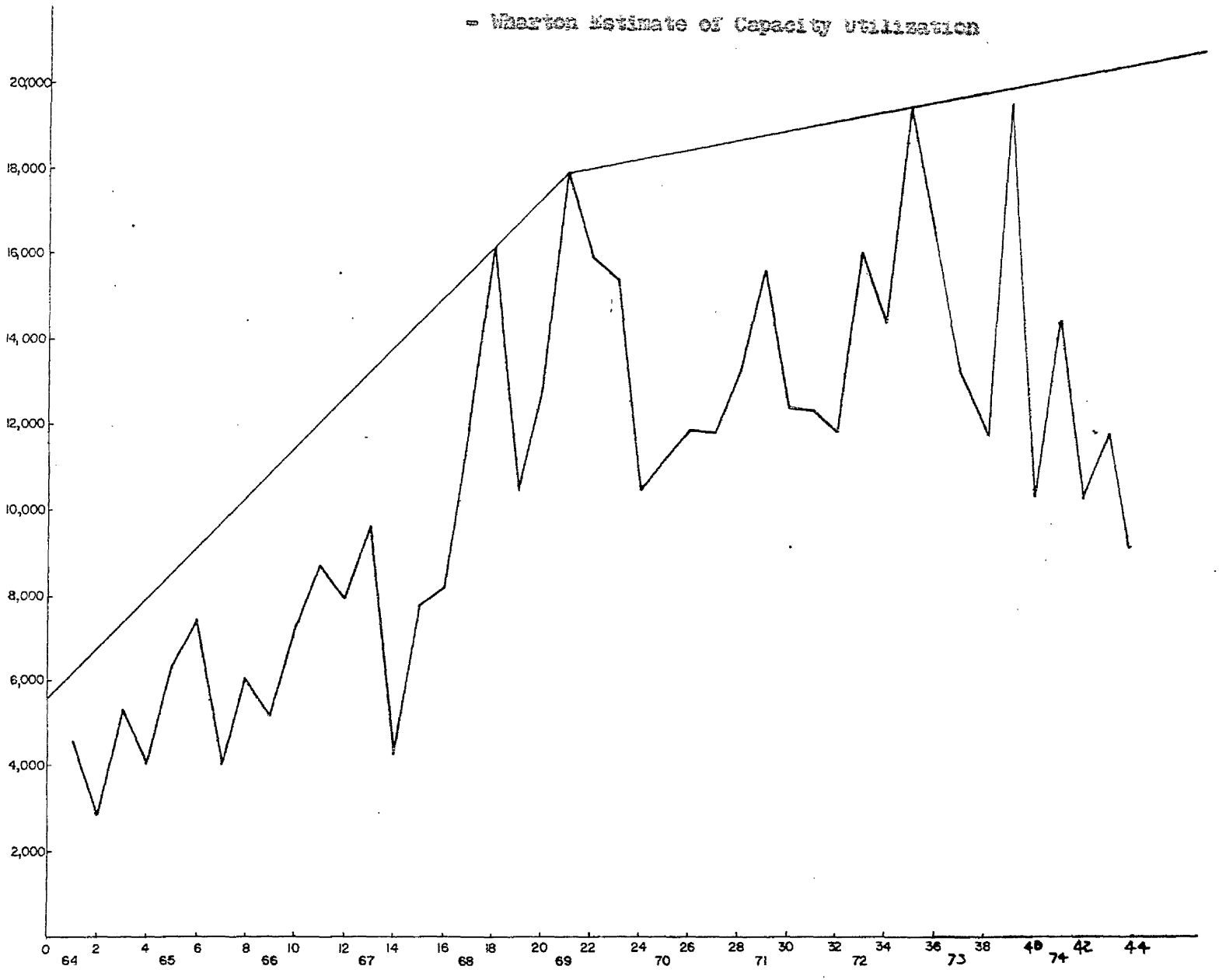


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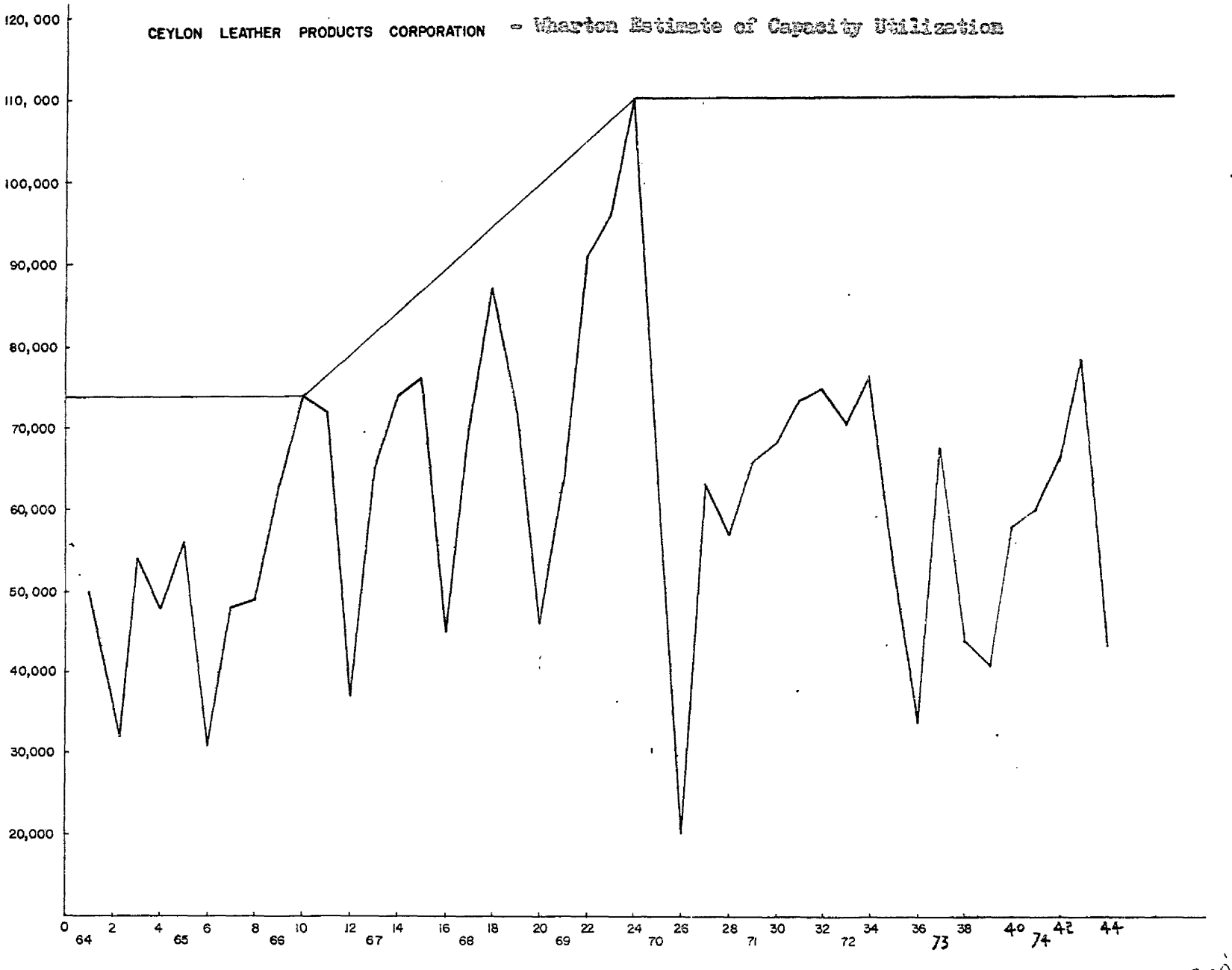
MINISTRY OF PLANNING & ECONOMIC AFFAIRS.




SOURCES: QUARTERLY PROGRESS REPORTS,
MINISTRY OF PLANNING & ECONOMIC AFFAIRS.

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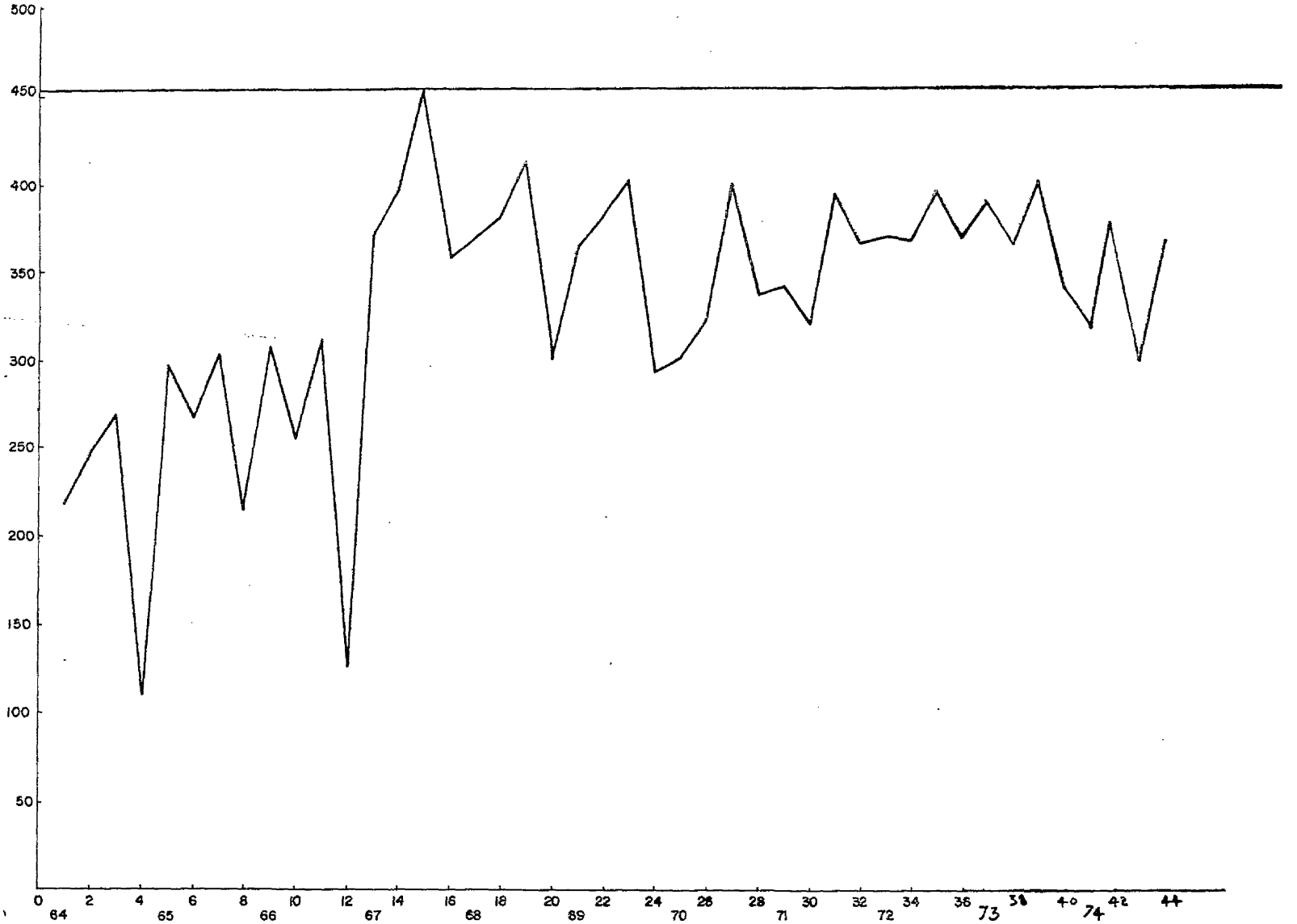
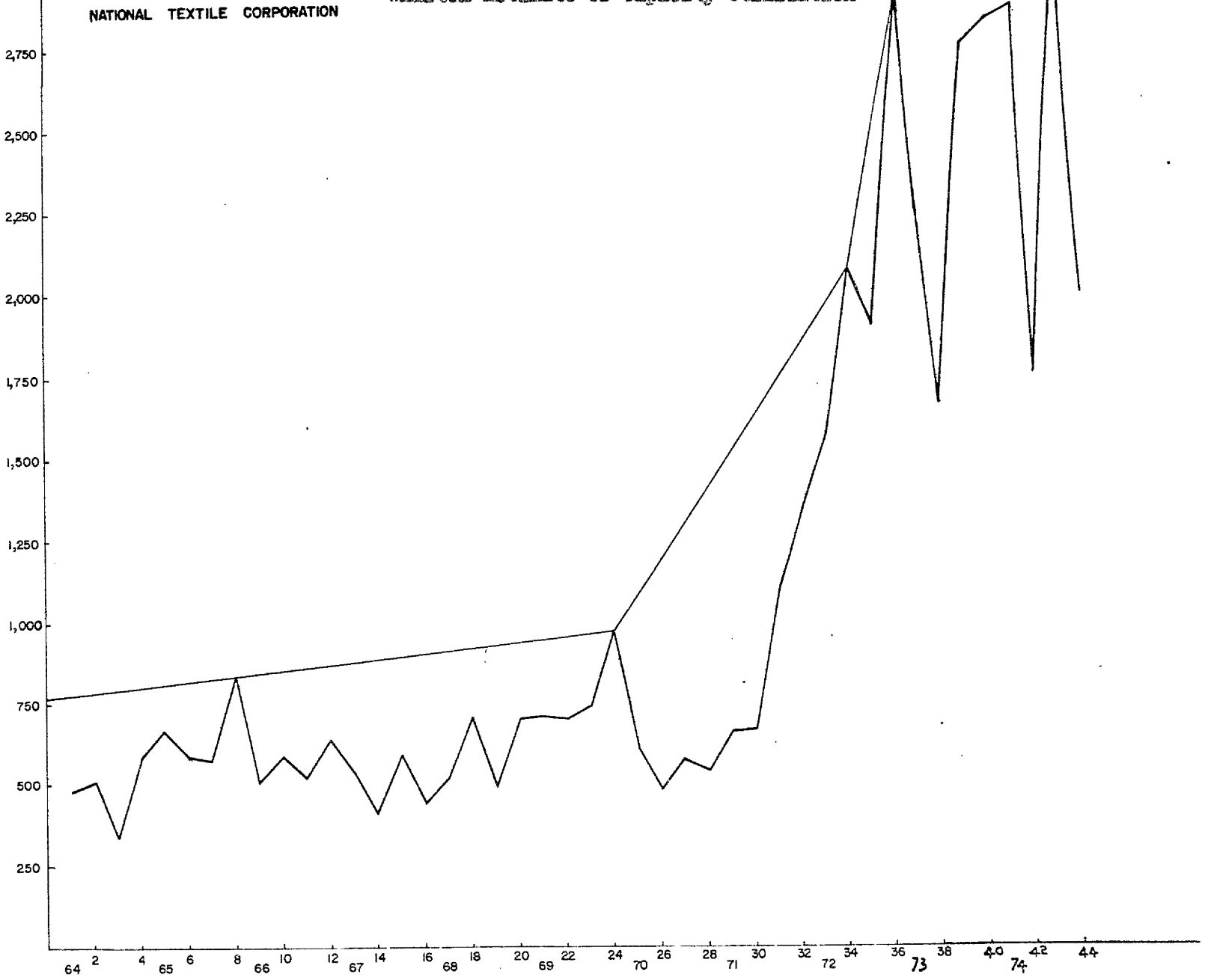
PARANTHAN CHEMICALS CORPORATION - Wharton Estimate of Capacity Utilization




SOURCES: QUARTERLY PROGRESS REPORTS,
MINISTRY OF PLANNING & ECONOMIC AFFAIRS.

NATIONAL TEXTILE CORPORATION

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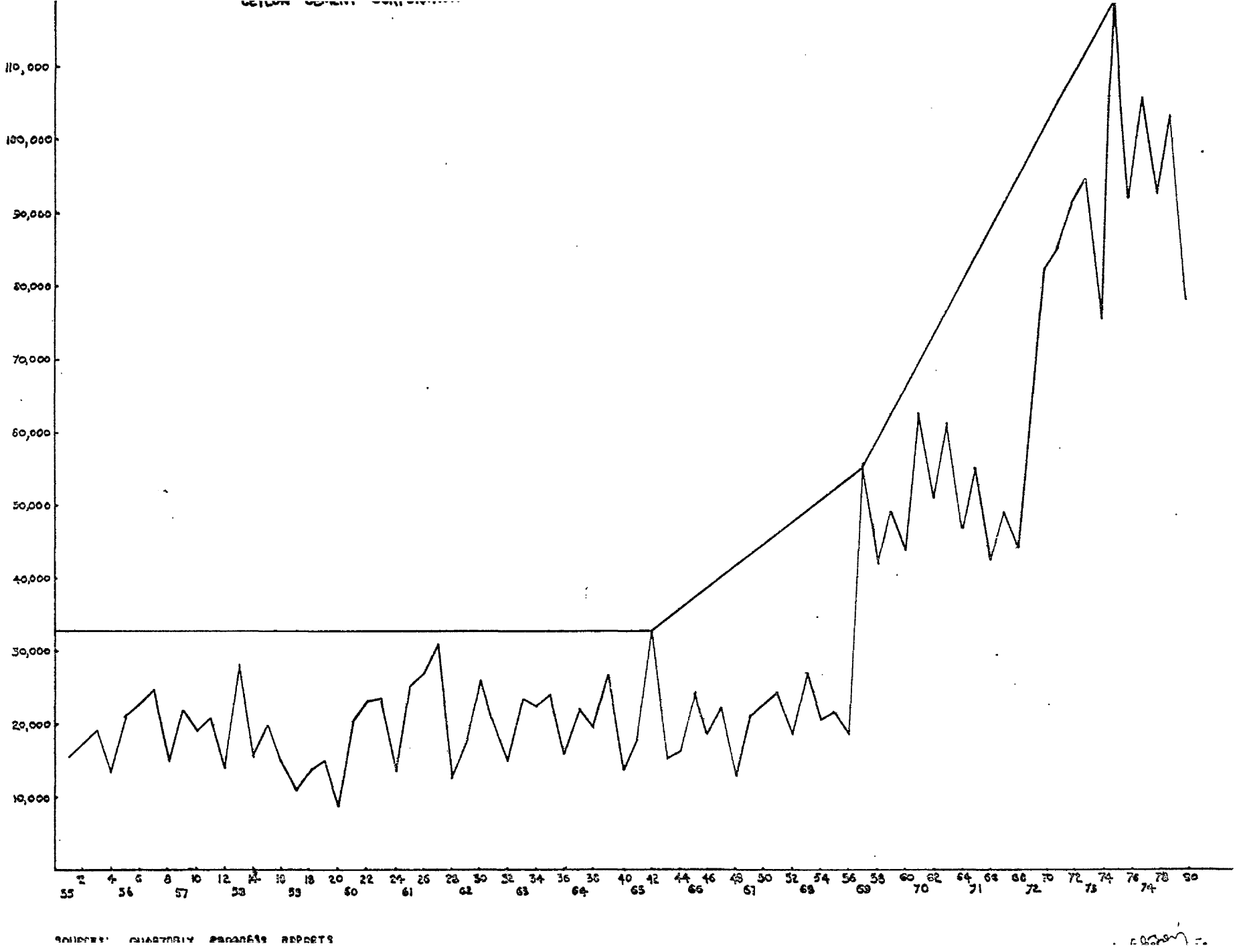
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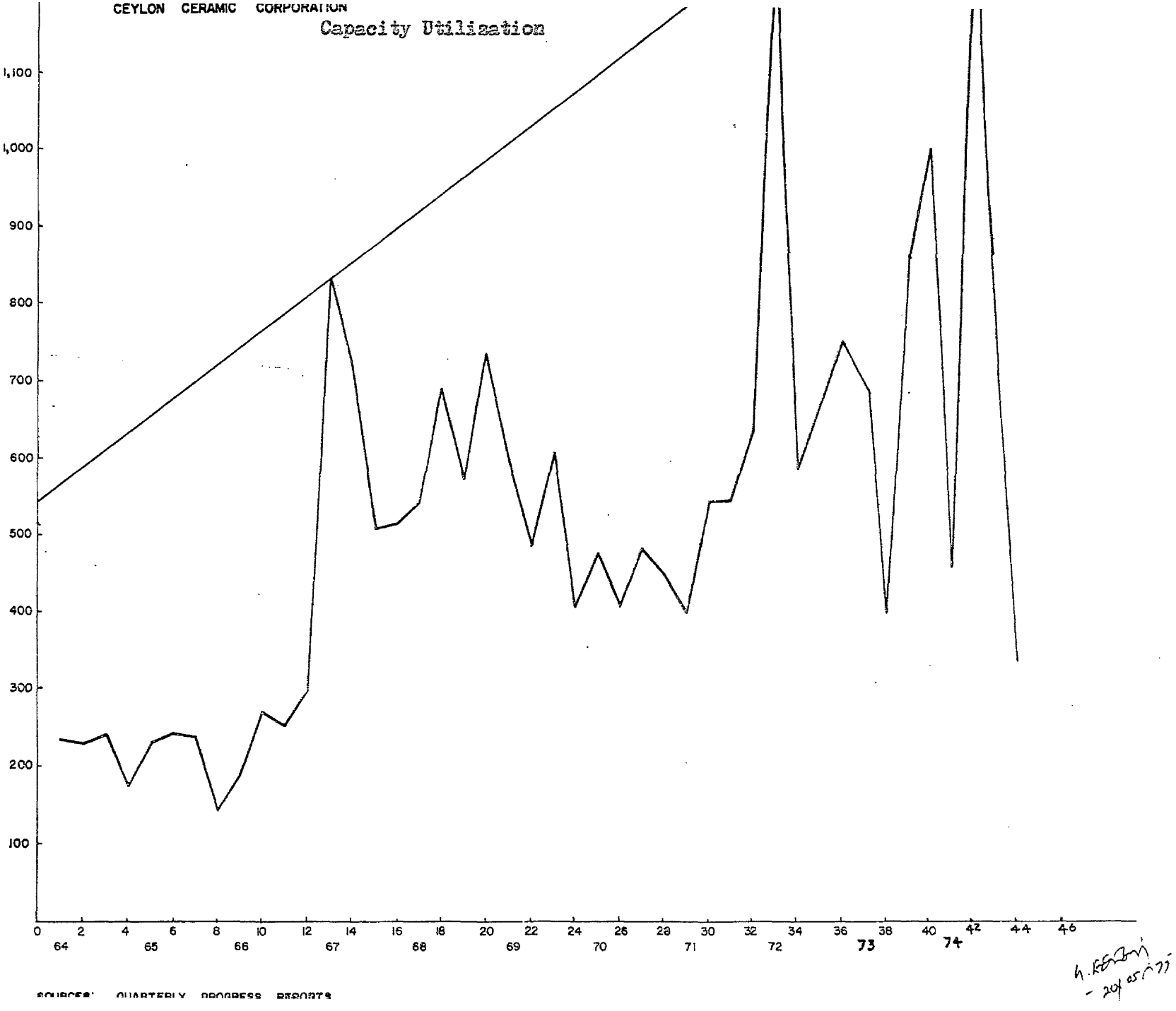
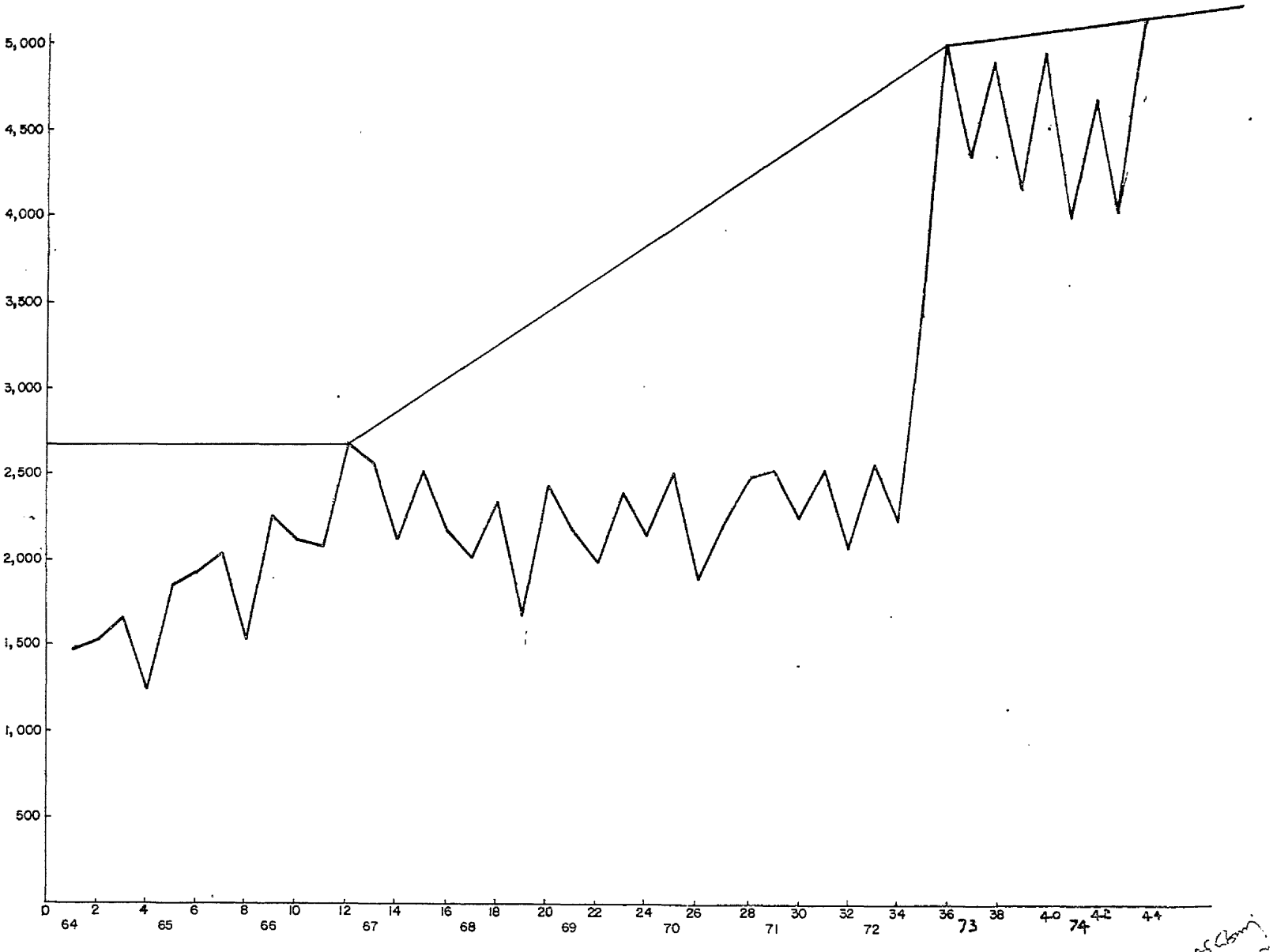


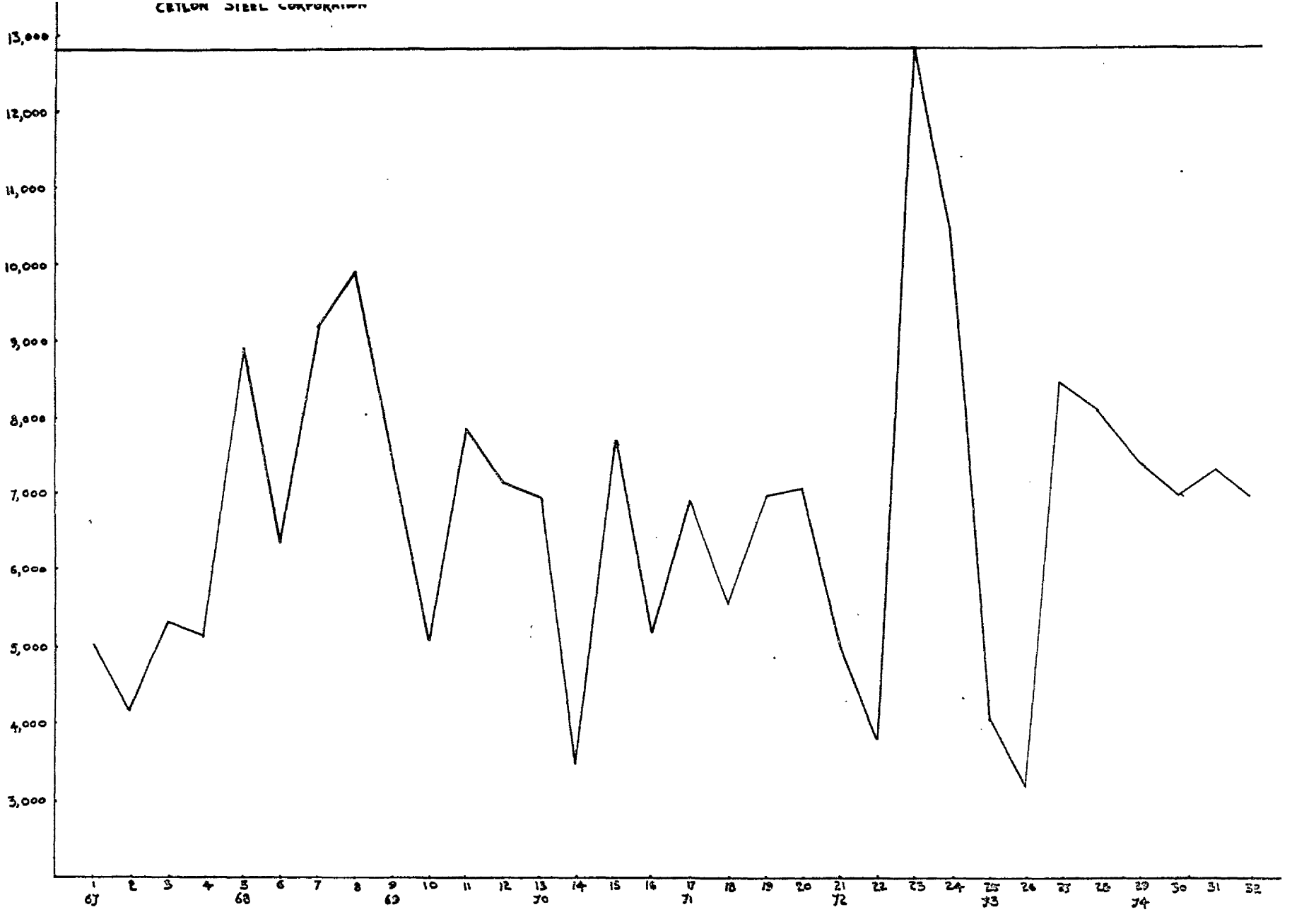

SOURCES: QUARTERLY PROGRESS REPORTS

H. Kelegama - 29/05/77

EASTERN PAPER MILLS CORPORATION - Wharton Estimate of Capacity Utilization




SOURCES: QUARTERLY PROGRESS REPORTS,
MINISTRY OF PLANNING & ECONOMIC AFFAIRS.




SOURCES: QUARTERLY PROGRESS REPORTS,
MINISTRY OF PLANNING & ECONOMIC AFFAIRS.

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