CHAPTER 6

REVIEW OF STUDIES ON CAPACITY UTILIZATION IN INDIA

This chapter is a review of the studies of capacity utilization in India. A review of the studies shows that this aspect of the performance of the industrial sector has received very little attention in the literature. A review of the empirical studies on capacity utilization (CU) for Indian industries shows that, so far, only traditional measures which are essentially statistical constructs based on official published data have been estimated.

Also, the studies for India are for specific years or a short time period. The coverage also extends to a limited number of industries or only the aggregate manufacturing sector. No comprehensive studies on capacity utilization exist for India which have been based on an economic notion of capacity and whose coverage is comprehensive in terms of the time period of the study as well as coverage of the industrial sector.

The official publication, Monthly Statistics of Production of Selected Industries (MSP) in India published by the Central Statistical Organization (CSO) gives monthly and annual figures of installed capacity and production in physical units for a wide range of industrial products. This data has been used in many studies to obtain estimates of CU. However the MSP data are subject to a number of limitations as pointed out by Krishna (1972). Also, given the nature of
controls in the Indian economy both installed capacity and actual production data are subject to a number of biases as pointed out by Sahay(1991).

The official Index of Industrial Production available with base periods of 1956, 1960, 1970 and 1980-81 have also been used to obtain CU measures based on trend-through-peak method. Ahluwalia (1985) points to the limitations of this data source, say for e.g. with respect to changing weights and combining indices with different base periods.

In addition to the MSP data on installed capacity and production and the official indices of production, some studies on CU for India have been based on Survey data. Detailed proforma's including questions on installed capacity, actual production, reasons for underutilization of capacity etc. have been mailed to individual firms. These survey data reveal valuable insights at the firm level on causes of underutilization of capacity.

We now review the studies on capacity utilization for India.

One of the earliest traditional estimates of CU for the period 1951-59, based on MSP data on installed capacity and production is given in Budin and Paul (1961). The study covers 75 industries for which installed capacity data are available. The study shows increased utilization of capacity in the industrial sector over the period from 1951 to 1959 (from 62% in 1951 to 91.53% in 1959). The study also analyses inter-industry variations in CU. Industries were classified into three categories - infrastructural, intermediate and consumer goods industries. Almost full utilization in infrastructure during second plan period is indicated by the study. The study also shows that intermediate goods industries and some consumer goods
industries like paper products and enamelware had large excess capacities.

The **NCAER** (1966) study is based on MSP data and mail survey data and covers 276 industrial products classified into two major groups namely metal products and non-metal products. The study is for the period 1955-64. A detailed analysis is made for five groups of industries namely, metal products, machinery other than electrical, electrical machinery and appliances, transport equipment and chemical and chemical products. The study shows that CU rate is 89% for all industries. The mail survey showed a very poor response rate but revealed valuable insights into causes of underutilization. These causes include shortages of raw materials, foreign exchange, spares and machinery and labor unrest.

The study by **Koti** (1967) at the Gokhale Institute gives estimates of CU for the year 1966-67 and analyses the factors affecting it. The study is based on survey data. Out of 1175 companies to whom questionnaires were sent, replies were obtained from 287 companies, of which only 151 companies provided adequate details. The study is thus based on these 151 companies and covers 234 products. Of these 20 were found to have fully utilized capacity. On the whole the study shows that the extent of underutilized capacity is considerable. Products with more than 60% unutilized capacity include chemicals, fertilizers and drugs, steel, rubber, steel forgings and non-ferrous alloys etc.

As regards causes of excess capacity, shortages of raw materials (indigenous and imported) and lack of demand were almost equal in
importance. Labor problems followed by power shortages were the other important causes of underutilization.

On a more extensive basis, estimates of CU have been calculated by the RBI. Two different estimates of CU have been obtained. In the first study (1969), trends in underutilization of capacity for the period 1963-67 using data on installed capacity and actual production were obtained. The study covers 163 industries. Seventy-two of these had high underutilization of over 30%. Twenty-eight industries in 1963 and twenty-one in 1969 had excess utilization, all from the metal and engineering and chemicals group.

The second RBI study (1970) is based on the Wharton Index - a trend-through-peaks method. The RBI index is based on monthly peaks. Manufacturing industries were classified into use-based and input-based groups. The former include basic, capital, intermediate and consumer goods industries. The latter group consists of agro-based industries, metal-based and chemical based industries. The utilization ratio for All Manufacturing industries which was between 87 and 90 per cent during 1960-65 declined to 79.8 and 80.2 per cent in 1968. The later studies by RBI (1970, 1972, 1975) update the series and show further declines in CU to a low 77.4% in 1971.

The explanations for the causes of underutilization of capacity in the RBI studies are offered in terms of the general recessionary trends noticed in the Indian economy since 1965, the performance of the agricultural sector, shortages of raw materials, lack of demand etc.

Another study based on MSP data on installed capacity and production for the period 1961-71 for 42 industries is that by Paul (1974). According to Paul, MSP classifies only 18 product groups
as working on a three-shift basis, 7 on a two-shift basis and all the remaining 275 on a single shift basis while a large number of manufacturing units which are classified under single shift in MSP actually operate on a two or three-shift basis. In this study therefore an adjustment is made for shift work and installed capacity is recomputed similar to Winston's (1971) study for Pakistan. The study recomputes installed capacity assuming 2.5 shifts for MSP industries operating two-shifts and 2 shift for those shown operating single shift.

The study shows that while CU rate is around 80%, when adjusted for shift patterns, utilization rate is no more than 53%. The study also reveals that the overall utilization index increased from 50.4% in 1961 to 55.3% in 1965, declined to 51.3% by 1967 and increased thereafter to 55.3% till 1970 and was 54.3% in 1971.

The study also attempted to explain CU as a function of six variables using regression analysis. The six variables used are market structure, pressure of demand, size of the firm, import substitution, effective rate of protection and import content of production.

The production function method forms the basis of the study by Navar and Kanbur (1976) who obtain estimates of CU for the period 1945-65. CU rates based on both the Cobb Douglas and CES production functions show high utilization rates of over 97 to 99%. Data is mainly from CMI and ASI. Full employment supply of labor services is obtained from the Year Book of Labor Statistics of ILO.

Most of the studies reviewed above are for the early period and are limited in coverage of industries and time period. Besides these some other studies on capacity utilization concentrate only on the conceptual aspects relating to the notion of capacity for eg. Seth
(1986) and Nandamohan (1992). Some studies have also been made for specific industries like coal, fertilizers etc. (Productivity, 1975). For the cotton mill industry in India, the study by Sastry (1980) deserves special mention. A detailed review of the early studies is given in Padma Suresh (1991). In recent years there have been a few more studies on CU for Indian industry. Given below is a review of some of these studies.

Goldar and Renganathan (1991): The main object of this study is to analyze econometrically the effect of market structure and government policies on CU in Indian industries. The methodology adopted is very similar to that of Paul (1974). However, unlike Paul (1974), this study makes an attempt to incorporate explicitly the effect of industrial policy into the econometric analysis.

This study makes use of production and capacity data drawn from DGTD sources. For measuring market concentration the share of the top three firms in total industry sales published by CMIE is used. As a measure of demand pressure, the growth rate of production between 1978 and 1983 was used. To capture the effect of tariff and trade policies on CU, the study uses the level of effective protection enjoyed by industries as an explanatory variable. Also, four dummy variables have been used to reflect the nature of licensing and other controls the industries were subject to.

The study shows a significant positive relationship between demand pressure and CU and also between market concentration and CU. The finding of a significant positive relationship between market concentration and CU reflects to some extent the problem of demand deficiency arising from excessive entry of new firms. The study also
points to an inverse relationship between the level of effective protection enjoyed by the industries and the rate of CV attained by them. However the relationship between CU and the dummy variables representing industrial policy is not very clear, pointing to limitations in data and inadequacies of the methodology adopted to incorporate the influence of industrial policy into the analysis.

Srinivasan (1992): The first study by Srinivasan (1992,a) examines the determinants of CU in Indian industries. Data on full capacity and utilization levels for different industrial sectors is taken from CMIE (1987). An alternative data source used is World Bank (1989) which provides time series on CU ratios from 1970 to 1984. For selected industries from four broad sectors: basic, capital, intermediate and consumer goods. A correlation analysis between actual and capacity outputs and between capacity expansion and lagged outputs or capacity utilization rates was also carried out. While a high correlation was obtained in the former case, no systematic relationship was found in the latter case.

A cross section regression analysis using industry wise data was carried out to determine the factors influencing CU. Only industry characteristics notably capital intensity, scale of operations and variability in demand due to seasonal and other factors were included while other explanatory variables like import substitution, effective rate of protection were not included due to lack of comparative data. The study shows that a high variability in demand leads to lower CU. A positive relation is obtained between CU and the explanatory variables, capital intensity, scale of operation and market concentration.
In a later study, Srinivasan (1992,b) uses methods in disequilibrium and shortage modelling to estimate the extent of slack or shortage in each year for different industries. The supply factors that affect CU include availability of raw materials and inputs, infrastructural bottlenecks such as power shortages and transport bottlenecks etc. The demand factors include changes in domestic or foreign demand caused by changes in tastes or by the general macro economic situation. Industry groups like diesel engines, railway wagons and vanaspati which operate with more than excess capacity face mainly demand constraints. Agricultural tractors and cotton cloth (mill) with excess capacity of more than 25% face mainly supply constraints.

Ajit (1993): The study shows a declining trend in the industrial sector in India over the twenty year period 1970-90. The trends in CU (based on data on installed capacity and actual production from CSO) for 86 industries accounting for one-fourth of weight in Index Number of Industrial Production have been examined using a use-based classification. On an average during 1970-90, nearly one-fourth of installed capacity remained underutilized. CU in all industrial groups have shown a declining trend, although during the 1980's there has been some modest improvement in CU. Average CU at 76.1% in 1980's was higher than the average CU rates of 73.3% in the 1970’s. Among the use-based groups the extent of underutilization of capacity was highest in basic goods industries (37%) followed by capital goods(34%), consumer goods(25%) and intermediate goods(10%). A significant improvement in CU was noticed in basic goods and capital
goods industries in the 1980’s, a conclusion supported by Goldar and Renganathan(1991).

Also CU in the industrial sector was postulated as a function of income (proxy for demand), imports of capital, intermediate goods and a dummy variable to capture the effect of changes in government policy. The predominant factor influencing CU has been demand. Evidence also suggests that easing of government controls etc. does lead to higher CU.

Burange (1992): In this study, CU indices are computed for the period from 1951 to 1986-87 for the organized manufacturing sector of the Indian economy. The index constructed is a weighted arithmetic mean of capacity utilization calculated by the formula:

\[ U = \frac{\sum u_i w_i}{\sum w_i} \]

Where U is the index of CU, \( u_i \) is the capacity utilization (ratio of actual to capacity output) of ith product and \( w_i \) is the capacity output valued added weight of ith product. This study uses data from the MSP on installed capacity and output.

The study reveals that at the one-digit level of industrial classification the aggregate manufacturing sector showed an increase in capacity utilization from 65.97% to 68.51% during 1951 to 1955. It fluctuated between 72.23% and 73.38% during 1956 to 1959, between 68.6% and 77.41 per cent during 1960 to 1969 and between 62.13% and 73.66% during 1970 to 1986-87. At the two digit industrial classification, manufacture of machinery other than electrical showed wide fluctuations in CU over the period of study. CU in manufacture
of electrical machinery increased from 58.0 per cent in 1951 to 94.65 per cent in 1961. Then it declined to 53.78% in 1983-84. CU in manufacture of rubber products, paper and paper products, tobacco manufactures was higher on an average among all industries over the entire period though in paper and paper products it declined throughout. CU in manufacture of chemical and chemical products, manufacture of leather and fur products was lower over the entire period.

This study also classifies the products of organized manufacturing sector into (i) consumer goods, (ii) intermediate goods or raw materials and (iii) capital goods. The consumer goods category is further classified into (a) consumer durable goods and (b) consumer non-durable goods. CU in consumer goods was more or less steady at around 70 per cent. But it fluctuated widely in capital goods industries; increasing from 34.04 per cent in 1951 to 92.18 per cent in 1967 and declining to 47.59 per cent in 1973. From 1974 onwards, it increased again to 79.17 per cent in 1982-83 and again declined thereafter. The intermediate goods showed an increasing trend in CU from 73.32% in 1951 to 81.09 per cent in 1964 and then declined continuously to 55.98 per cent in 1983-84.

Among the consumer goods, CU in consumer durables fluctuated widely from 32.41 to 89.22 per cent over the period. The fluctuations in utilization of consumer non-durables are relatively smaller (between 59.23 to 79.83%) with no long term trend.

Unlike the other studies reviewed the study by Burange (1992) provides us with a continuous series of CU over the entire period from 1951 to 1986-87. But the indices constructed arwe the traditional
indices based on data on installed capacity and production from MSP. As pointed out above the data are subject to a number of limitations while the CU estimates themselves are not based on an economic notion of capacity.

In a later study, Burange (1993) estimates the implications of full capacity utilization of the manufacturing sector in the Indian economy using input-output framework. The study is carried out using the open Leontief model and also the semi-closed model endogenizing household demand. The working of the models are illustrated using 1973-74 data and CU indices constructed in the earlier study, by Burange (1992). The study shows that by fully utilizing the capacity of the manufacturing sector, the output, income and employment increases by 22.86, 16.31 and 14.11 per cent respectively in the open model and will increase by 38.68, 37.08 and 38.59 per cent in the semi-closed model.

Padma Suresh (1991): This study uses the econometric cost minimization framework to obtain two economic measures of capacity utilization for four two digit industries corresponding to the ASI classification for the period 1960-61 to 1982-83. These two digit industries form part of the basic and capital goods industries. The translog variable cost function is specified and estimated. In this study, capacity output corresponds to the minimum point of the shortrun average total cost curve and the tangency between the short and longrun average cost curves. Economic measures of CU obtained in this study are closer to unity and spanned both sides of unity unlike traditional measures. A significant conclusion reached in the study is that since economic measures are closer to unity this suggests that
actual output levels are determined by cost considerations. The low correlations between economic and traditional measures also suggests the importance of deriving economic measures.

**Conclusions:**

The review of the studies on capacity utilization for India reveal the importance of obtaining estimates of CU for a long time period and for a wide range of industries and which are based on an economic notion of capacity. While in developed countries a number of studies have used both the parametric cost minimization and the nonparametric production framework to obtain economically meaningful measures of CU, in India there is a lack of such studies. The present study is based on the nonparametric production frontier and estimates of capacity utilization are obtained for eighteen two digit industry groups of the Factory sector for the period 1960-61 to 1992-93. The results obtained in the study are given in the following chapters.