Capacity Utilization in Manufacturing Industries of Pakistan

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Introduction

It is a well-known fact that capital is scarce in most of the developing countries and thus some of the production factors, such as labour, remain unemployed, leading to a lower growth rate of G.N.P. than would be possible under full employment. Additions to the stock of capital not only increase the rate of growth but also provide new job opportunities. However, in many developing countries, capital is utilised less than one-third of the time [10, p. 38]. The underutilization of capital obviously shrinks the growth rate of less developed countries still further. Capacity underutilization discourages technological progress which leads to an inefficient industrial structure. This presents us with a paradox: if capital is scarce in developing countries, why is it underutilized? A number of hypotheses have been advanced to explain this paradox. Some of these hypotheses relate to oligopolistic structure of the market, deficient demand, non-availability of complementary factors of production (such as skilled labour), imported inputs and government licensing policies. Moreover, when aid is available for specific projects, there is a tendency to build up additional capacity because the recipient countries prefer some aid to no-aid. However, very little has been done so far in building a theoretical framework which could be used in empirical analysis to throw light on the possible causes of capacity underutilization. Marris's theoretical framework [4] and Winston's empirical investigation of capacity utilization in Pakistan [10] are exceptions.

Marris [4] has presented a systematic analysis of shift work. The main thrust of his argument concerns the wage differential paid to the night shift workers. Wage differentials are not paid in most of the labour surplus economies, including Pakistan. The Marris analysis, though very illuminating, can do little to explain causes of capacity underutilization in Pakistan.

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Winston, on the other hand, has explored capacity utilization more heuristically by attempting to find those factors which are highly correlated with the varying levels of capacity utilization observed among industries. Using data drawn from a special survey of capacity utilization in Pakistan, Winston finds that four variables, viz., capital-output ratio, the share of competing imports in total supply, exports as a percentage of production and average size of firm, explain more than eighty percent of the variations in capacity utilization. Yet, Winston's analysis is incomplete on two accounts. First, he does not persent any theoretical model of managerial choice which can lend support to the statistical regularities which he identifies. Because of the complexity of the issues involved in the capacity utilization decision, general theories may be impossible, but even partial theories would go a long way toward providing a foundation for empirical analysis. Second, Winston's results of empirical analysis may be misleading because multiple regression analysis presupposes that the partial effects of each explanatory variable are linear and continuous. As we will show in the third section, the "binding constraint" nature of some of the explanatory variables prevents this assumption from holding.

In this paper, we develop a model which identifies the relative profitability of the three different shifts, and from this model possible causes of capacity underutilization can be more clearly understood. Empirical tests of the hypothesis derived from profitability model are carried out using data on large scale industries in the former West Pakistan. The paper is divided into five sections. In the first section, the extent and nature of capacity underutilization are discussed. The next section presents the model of the relative profitability of shift work and is followed by another section which reports empirical tests of some of the hypotheses implied by the model. In the following section, a review of the policies pursued by the Pakistan Government so far is reported, and contains a discussion of the possible ways to increase capacity utilization. The last section summarises the findings and makes several recommendations for policy.

Capacity Underutilization: Nature and Extent

In the literature on the economics of firm, two concepts of production capacity, viz., engineering and economic, are distinguished. The engineering concept of capacity is the technical maximum level of output obtainable during a year under normal conditions wherein due allowance is made for the time required for repairs, maintenance and workers' holidays. The economic concept of productive capacity is usually defined as the output which can be produced a minimum average total cost, given the existing plant and organization of production and factor prices [1]. It is the latter concept which is more relevant to economic analysis.

However, the economic concept of full capacity poses a number of difficulties for empirical analysis as the average cost curves for firms can only be estimated very roughly. Moreover, it is possible that a firm's average cost curve is shaped like a saucer with a long flat bottom rather than have a single minimum point. In view of these difficulties, we have opted for a third definition which, we feel, is not inconsistent with the economic concept of full capacity utilization and which, additionally, approximates the engineering concept. For the purpose of this study, we have defined full capacity to be the level of output achievable if plants were operated for 7,200 hours during a year.

In Table I, the extent of capacity underutilization is shown. The table is based on the data for the year 1967-68 and covers almost eighty percent of the production of large scale units.

Table I

Pakistan: Capacity Utilization in Manufacturing Industries, 1967-68

Capacity Utilization (%)	Number of Industries
0 — 20	10
20 — 40	22
40 — 60	14
60 — 80	11
80 — 100	3
	60

Source: [5]

It can be observed that more than fifty percent of industries were operating on one shift or even less. Clearly, one-shift rule is prevalent in most of the industries. As the data pertain to the year 1967-68, which was a normal year, low capacity utilization could not have been due to cyclical fluctuations. Since one reason for low capacity utilization may be seasonal fluctuation we have modified the maximum of 300 days suitably for seasonal industries. Thus, in the case of the sugar industry, maximum production in 160 days is taken to be the capacity output.

Capacity utilization level is almost the same for consumer goods industries, intermediate goods industries and capital goods industries. The means of capacity utilization are 44.39 and 33 percent respectively. The average level of capacity utilization is slightly more than fifty percent, whatever the weights used for individual industry. Capacity utilization is very high in such industries as are based on indigenous materials. Almost half of the capital employed in manufacturing is concentrated in such industries, e.g., cotton textiles, cigarettes, sugar and vegetable ghee.

Model of Relative Profitability

In an analysis of capacity utilization in developing countries, two problems can be distinguished:

(*i*) Why is the existing capital not fully used? and
(*ii*) Inspite of idle capital, why is more capacity added in industries which are already suffering from idle capacity.

In the short run, when additions to capital are not possible, the management's decision concerning capacity utilization depends upon considerations of absolute profitability. As long as an increase in utilization brings more profits, producers will increase the capacity utilization. However, in the long run, when the option of adding a new plant is open to the producer, absolute profitability becomes a necessary but not a sufficient condition for increasing capacity utilization. It is then the profitability of increasing utilization relative to the profitability of installing a new plant which determines the level of capacity utilization.

Absolute Profitability[1]

If the profits from the first shift are positive, the entrepreneur will increase capacity utilization, i.e., work for a second shift. The necessary condition for increasing capacity utilization is that profits are positive in the second shift. Net profits from the second shift are:

$$\pi_2 = (PX_2 - L_2 - iWK_2 - DG_2)(1 - t) + (DG_2 - DA_2) \ldots\ldots 1$$

where

π	=	Profits
P	=	Price of the product
X	=	Output
L	=	Labour cost
M	=	Cost of material inputs
i	=	Interest rate
WK	=	Working Capital
DG	=	Depreciation allowed by government
DA	=	Actual depreciation
t	=	Tax rate, and

Subscript refers to the first or second shift.

To an entrepreneur faced with a downward sloping demand curve, an increase in production would imply a fall in prices which may result in negative profits. Thus in an oligopolistic structure of the market, capacity utilization level tends to be low.

Relative Profitability

Over the long run, a producer has an option of installing a new plant instead of utilizing more intensively the existing plant. Obviously, his decision depends on relative profitability of the two alternatives. Profits from a new plant operating on a one-shift basis are:

$$\pi_2 = (PX_2 - L_2 - M_2 - iWK_2 - iFK - DG_2)(1 - t) + (DG_2 - DA_2) \ldots\ldots\ldots 2$$

where FK is fixed capital.

The producer will opt for increasing the intensity of capital use if $\pi_2 > \pi_1$, i.e.,

$$(PX_2 - L_2 - M_2 - iWK_2 - D_2)(1 - t) + (DG_2 - DA_2) >$$
$$(PX_1 - L_1 - M_1 - iWK_1 - DG_1 - iFK)(1 - t) + (DG_1 - DA_1) \ldots\ldots\ldots\ldots 3$$

[1]This analysis is based on [2] and [9].

The price received by the producer will obviously be the same irrespective of the fact that the production is carried out in the first or second shift. However, it is possible that the output of the second shift will be less than that of the first, i.e., $X_2 < X_1$. There is some empirical evidence [2] to substantiate it for the cotton textiles of Pakistan. In a labour surplus economy like Pakistan's no wage differential for shift work exists, so that $L_2 = L_1$. We assume that interest on working capital is the same for both the shifts, i.e., $iWK_1 = iWK_2$.

As regards material inputs, the inputs are partly acquired from the domestic market and partly imported. The material inputs acquired from the domestic market cost the same to the producer for either of the shifts. However, in Pakistan, licences are generally granted in amounts sufficient only for one-shift operation. Thus the cost of imported material inputs used in a second shift is higher than that of the similar inputs used in the first because the purchases must be made in the open market. We further assume that $DA_1 = DA_2$.[3]

Thus assuming $L_1 = L_2$, $iWK_1 = iWK_2$ and $DA_1 = DA_2$, Equation (3) can be rewritten as:

$$(PX_2 - M_2 - DG_2)\ (1-t) + DG_2 > (PX_1 - M_1 - DG_1 - iFK)\ (1-t) + DG_1 \quad \ldots 4$$

Dividing both the sides by (1—t) and rearranging them, we get:

$$iFK - \frac{t}{1-t}(GD_1 - DG_2) > (M_2 - M_1) + P(X_1 - X_2) \quad \ldots\ldots\ldots\ldots 5$$

The inequality has several interesting implications. The left hand side of the inequality is the real cost of capital to the producer, i.e., interest to be paid on capital minus savings of tax due to a higher depreciation allowance for the newly installed plant. On the left hand side, we have an increase in the costs in the second shift over the first shift consisting of the increased costs of material inputs and the decrease in outputs associated with the second shift.

Thus if $M_1 = M_2$ and $X_2 = X_1$ there would be no addition to capital stock as the capital which was lying idle can be profitably employed. For increasing capacity utilization, the following policy implications can be drawn from Equation (5):

(*i*) Interest rate in most of the developing countries, especially in Pakistan, does not reflect the scarcity value of capital. If interest rate is increased so that it reflects scarcity value of capital, the capacity utilization level will rise;

(*ii*) As fast depreciation is allowed in the initial years, especially in the first year, there is a saving of tax which again encourages building of more capacity. Thus if depreciation rules are made in line with the actual depreciation, installation of a new plant will become more expensive; and

(*iii*) The licensing policies of the Government of Pakistan in the past permitted one to import raw material enough for one shift only. As a result, $M_2 > M_1$. Although raw material inputs are put on free list in Pakistan, the experience of most of the developing countries shows that after a lag, when

[3]This assumption implies no technological change. Moreover, it is possible that because of an addition of a shift, depreciation may increase disproportionately. However, this assumption is made for the sake of simplicity. The argument is not affected if DA_1 is not equal to DA_2.

foreign exchange becomes overvalued, licensing procedures come back into policy. Thus policies should be framed in such a way that input cost is the same for both the shifts. Moreover, the absolute and relative profitability models show that:

(*a*) Industries having monopolistic/oligopolistic structure will show lower capacity utilization when the demand curve slopes downwards; increasing of production may lead to losses;

(*b*) Imported inputs as percentage of the inputs coupled with licensing practices is an important variable in determining capacity utilization level. The higher the imported inputs, the lower the utilization; and

(*c*) Industries in which capital cost is higher should show higher utilization.

Empirical Tests of Hypotheses

In this section we shall conduct empirical tests of some of the hypotheses suggested by the analysis of relative profitability. Using data on capacity utilization for the year 1964-65, Winston [10] used multiple regression analysis to explore the causes of underutilization. However, when there are several sufficient causes operating simultaneously on some variable (capacity utilization, for example) each such cause becomes, in effect, a constraint, and the level of the affected variable is influenced solely by the level of the most constraining of the different causes. When a specific cause is not "binding," its value is superfluous. But multiple regression analysis presupposes that all explanatory variables substitute for one another in some degree. With all other explanatory variables constant, an increase or decrease in one explanatory variable will have a linear and continuous effect on the dependent variable, i.e., the variable being explained. But, as suggested above, the presence of multiple sufficient causes, of which only one can be binding, rules out the substitution presumed by multiple regression analysis. The only technique to determine the quantitative effects of the different explanatory variables is to subdivide the universe of observations into different sub-groups in which the same explanatory variable is binding.

Thus, the sample has been divided into two groups: (i) industries where inadequate demand is likely to be the binding constraint on capacity utilization, and (ii) the industries in which demand is not a binding constraint. An industry exporting more than ten percent of the output is taken as an industry with sufficient demand. This is a sufficient, but not a necessary, condition. Industries like cement, sugar and vegetable ghee, although not export industries, are generally regarded as having sufficient demand. Thus, we selected a sample where the demand is not deficient. The industries selected are shown in Appendix I.

We shall test three hypotheses which are derived from the absolute and relative profitability models. The hypotheses to be tested are:

(*i*) There is a positive relationship between the imported inputs as a proportion of the total intermediate inputs and level of capacity utilization;

(*ii*) There is a positive relationship between the average size of the firm and capacity utilization level, whereas average size of the firm is defined as value of fixed assets per firm; and

(*iii*) There is a positive relationship between the number of the firms and capacity utilization.[8]

The sample of the industries having sufficient demand was further subdivided into the industries with competitive and non-competitive structure. Wherever three large firms contributed eighty or more than eighty percent of the production, the industry concerned was regarded as non-competitive and was excluded from the sample to see the effect of imported raw materials on capacity utilization. We have fitted both linear and log-linear functions. The estimates are:

$$Y = 0.73 - \underset{(2.55)}{1.03}\ FX$$

$$R^2 = 0.33$$
$$F = 6.52$$
$$D.W. = 2.24 \qquad ; \text{and}$$

$$\log Y = 1.35 - \underset{(2.69)}{.32} \log F(x)$$

$$R^2 = 0.37$$
$$F = 7.26$$
$$D.W. = 1.74$$

Y : Capacity utilization

FX: Imported inputs as a proportion of total inputs.

It turns out that imported inputs play a significant part in determining the level of capacity utilization. The coefficient is significant and has the correct sign as expected *a priori*.

For this sample, we ran a regression using capital size as an additional variable, and the results are:

$$\text{Log } Y = -2.47 + \underset{(2.74)}{0.25} \log S - \underset{(0.20)}{0.03} \log F(x)$$

$$R^2 = 0.64$$
$$F = 9.35$$
$$D.W. = 1.77$$

Where S = Size of firm defined as value of fixed assets in an industry/ Number of the firms in the industry.

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[8]We ran regressions on capacity utilization taking capital-output ratio as one of the independent variables, but it does not explain more than two percent of the variations, and the regression coefficient is insignificant.

The relation reveals that imported inputs become insignificant. It is interesting that when we try a linear relation, FX becomes significant and S becomes insignificant. The linear relation is:

$$Y = 0.72 + \underset{(.44)}{0.00004S} - \underset{(1.83)}{0.972\ FX}$$

$$R^2 = 0.63$$
$$F = 20.27$$
$$D.W. = 1.74$$

Another regression on a larger sample, i.e., the total sample where demand was not deficient, also shows that S is significant. Regression results for that are:

$$\log Y = -2.07 + \underset{(3.53)}{0.19 \log S}$$

$$R^2 = 0.41$$
$$F = 12.44$$
$$D.W. = 1.98$$

To see the effect of market structure on the utilization rate, we have used two explanatory variables, viz., the number of the firms in the industry and the concentration ratios, as a measure of competitiveness of the market. The relations estimated are:

$$\text{Log } Y = -0.84 + \underset{(0.47)}{0.15N}$$

$$R^2 = 0.02$$
$$F = 0.22$$
$$D.W. = 2.31$$

$$\log Y = -0.88 + \underset{(1.17)}{0.16\ C}$$

$$R^2 = 0.12$$
$$F = 1.37$$
$$D.W. = 2.63$$

Where N = Number of firms
C = Concentration ratio.

The coefficients of both N and C are insignificant. It appears that market structure does not influence the level of capacity utilization. One reason may be that except in a few industries the number of firms was almost the same, and similarly there is little variation in concentration ratios.

The regression analysis shows that imported raw materials and size of the firm are important variables explaining the level of capacity utilization if the deficient demand is not a binding constraint. Structure of the market has turned out to be an insignificant variable.

Review of Government Policies

There has been a realisation of the problem of capacity utilization in Pakistan which is evident from Government publications. For example, in the *Economic Survey* [6, page 11] which is issued every year by the Finance Ministry, it is stated that "to cope with the reduced availability of financial resources, the strategy of Third Plan was revised in 1966 which aimed at fuller utilization of industrial capacity..." Although the problem was realised, not much was done to increase the utilization rate. The Survey further mentions "that the revised strategy did not, however, yield expected results. The restricted supply of raw materials kept the industries working below their capacity..." Given limited foreign exchange, the foreign exchange for raw materials was allocated on the basis of residual left over after meeting the import requirements of public sector and capital goods.

The only major policy which could affect the capacity utilization level is the capacity tax. Capacity tax increases the cost of additional plant and discourages the build-up of capacity in the presence of idle capital. This can be shown with the help of the model presented earlier.

Suppose there is an excise tax (t_B) per unit of output X. Let the price of X after tax be P'. Then the relative profitability criterion asserts that the utilization level would increase if and only if:

$$[P'X_2 - M_2 - DG_2 - t_B X_2]\ [1-t] + DG_2 >$$
$$[P'X_1 - M_1 - DG_1 - iFK - t_B X_1]\ [1-t] + DG_1 \ldots\ldots\ldots\ldots (7)$$

Where P' is the price after imposition of excise tax, t_B. Let $P' = P + t_A$, where t_A is the amount of tax transferred to the consumer. Then rearranging (7)

$$iFK - \frac{t}{1-t}(DG_1 - DG_2) + (t_B - t_A)\ (X_2 - X_1) >$$
$$P'(X_2 - X_1) + (M_2 - M_1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Now, suppose that instead of an excise tax per unit of output, capacity tax, irrespective of production, is introduced. The relative profitability criterion gives the following condition for increase in utilization:

$$[P'X_2 - M_2 - DG_2]\ [1-t] + DG_2 > [P'X_1 - M_1 - DG_1 - iFK - CT]\ [1-t] + DG_1 \ldots\ldots\ldots (9)$$

where CT is capacity tax

which, after rearrangement, becomes

$$CT + iFK - \frac{t}{1-t}\ (DG_1 - DG_2) > P'(X_2 - X_1) + (M_2 - M_1) \ldots\ldots\ldots\ldots (10)$$

A comparison of Equation (10) with Equation (8) shows that capacity tax has made the option of new plant less attractive.

Capacity tax was introduced in 1967-68. However, this tax was levied only on a few products and the industries included had already quite high utilization. This can be observed from the following table:

Capacity Utilization Rates

	Period	Cotton Yarn	Cotton Fabrics	Cement	Soda Ash	Sugar	Vege-table Ghee
Pre-Capacity Tax Period	1964-65	1.022	0.851	0.891		0.657	0.664
	1965-66	0.952	0.804	0.832		1.224	0.715
	1966-67	1.007	0.814	0.862	0.747	0.914	0.607
	1967-68	1.007	0.851	0.843	0.738	0.630	0.800
Post-Capacity Tax Period	1968-69	1.059	0.877	0.936	0.769	0.917	0.695
	1969-70	1.079	0.896	0.799	0.861	1.051	0.735
	1970-71	1.120	0.972	0.844	0.992	1.167	0.728
	1971-72	1.164	0.763	0.826	0.965	0.688	0.867
	1972-73	1.118	0.883	1.142	0.915	0.687	0.999

The above table shows that capacity utilization increased to some extent. However, utilization was quite at a higher level already. Moreover, there is a trend in utilization ratios. Capacity figures for the cotton textiles industries show that there was disinvestment of about 8% in looms in post-tax period. This was due to the fact that installation of new looms meant unnecessarily higher costs since the same could be obtained from existing looms and this is what our model suggests.

When capital is so scarce and an increase in the intensity of use is socially desirable, how can the utilization level be raised? Distortions in the economy introduced by various government policies are mainly responsible for capacity underutilization. Capital and foreign exchange are very scarce in the developing economies and their scarcity value must be reflected. When market interest rate is very low, real rate is even negative sometimes[3], and foreign exchange is overvalued, cost of capital is very low. As our model shows, capital cost is one of the major determinants in a choice of installing a plant vis-a-vis greater capacity utilization. Moreover, because of overvalued exchange rate, foreign exchange is rationed to equate supply and demand. Foreign exchange allocated to imported inputs is not sufficient to use capacity for three shifts. Imports of raw material should be allowed on liberal terms and should not be linked with the capacity for if the licences for raw materials are sanctioned on the basis of capacity, it may be worthwhile to add to capacity which may remain idle but is essential to obtain raw materials. Accelerated depreciation is allowed in the first year. Government allows fifty percent of normal depreciation for another shift. If the depreciation allowance for the additional shift is 100% of normal depreciation, capacity utilization would increase.

Deficient demand is one of the binding constraints on utilization. This can be observed from the reports issued by the Tariff Commission. They show a considerable increase in the level of capacity utilization after they are protected. Encouragement to exports can raise the demand and at the same time would provide necessary foreign exchange to import raw materials.

Conclusions

In Pakistan, capacity utilization in large scale manufacturing was low in both 1964-65 and 1967-68. However, it appears to have risen between the two years. Winston [10] showed that under the most favourable definition, capacity utilization did not exceed 40 percent. The data in that study pertained to the year 1964-65. Our study shows that whatever industry characteristic is used as weights, i.e., capital stock, employment cost or value of production, capacity utilization is almost 55 percent, which is a considerable rise. Moreover, capacity utilization is very high in those industries which have sufficient demand and were established long ago. Moreover, these industries are technologically very simple. Such industries include cotton textiles, sugar, vegetable ghee and cement, and they show a rising trend over the time.

Our model implies, and our empirical work confirms, that the important determinants of capacity utilization are the degree of dependence on imported raw materials, and the demand for the product. The capacity tax imposed by Pakistan appears to have raised the utilization level, but it covered only a few products, and these products already had very high utilization rates. Such a tax should encompass all the excisable items, subject to administrative feasibility, since it discourages a build-up of capacity in the presence of idle capital.

Recent devaluation has helped a lot in eliminating the problem of overvalued exchange rate. Raw materials have been put on the free list which means that the operation of additional shift will not require the purchase of imported raw materials at premium prices. However, in most of the developing countries, after a lag, foreign exchange becomes overvalued and exchange rationing starts again. If the government follows the very widely recommended policy of uniform tariff instead of rationing the foreign exchange, the cost of running another shift on raw materials will remain the same.

Exports should be encouraged. This will increase the capacity utilization in two ways: firstly, by removing the deficiency of demand, and, secondly, by utilising the foreign exchange earned for imports of raw material. To conclude, the scarcity value of capital and foreign exchange must be reflected in the market to raise the level of capacity utilization.

Appendix I

Table I

Capacity Utilization Rates in Manufacturing Industries of Pakistan: 1967-68
(*Percentage*)

1.	Cotton Textiles	0.75	36.	Bleaching Powder	0.15
2.	Steel Rerolling	0.13	37.	Industrial Gases	0.33
3.	Agricultural Implements	0.22	38.	Rayon	0.47
4.	Wire Drawing	0.29	39.	Sheets and Plate Glasses	0.30
5.	Enamelware	0.37			
6.	Diesel Oil Engines	0.28	40.	Food Processing	0.22
7.	Pumps, all sorts	0.25	41.	Fish Processing	0.06
8.	Sewing Machines	0.44	42.	Sugar	0.70
9.	Dry Cell Batteries	0.18	43.	Edible Oils	0.21
10.	Accumulator Batteries	0.16	44.	Vegetable Ghee	0.80
11.	Electric Lamps	0.50	45.	Cigarettes	0.86
12.	Electric Motors	0.39	46.	Plywood	0.60
13.	Switch Gears	0.03	47.	Paper	0.16
14.	Transformers	0.59	48.	Hardboard, Chipboard	0.67
15.	Radio Assembly	0.34	49.	Soaps and Detergents	0.28
16.	Radio Components	0.69	50.	Salt	0.23
17.	Bus Bodies	0.28	51.	Beverages	0.62
18.	Auto Assembly	0.36	52.	Dyes and Colours	0.51
19.	Cycle, Complete	0.65	53.	Fertilizers	0.57
20.	Baby Cycle	0.56	54.	Petroleum Refineries	0.75
21.	Pharmaceuticals	0.30	55.	Cutlery	0.31
22.	Leather Tanning	0.39	56.	Textile Machinery	0.29
23.	Insecticides	0.21	57.	Electric Fans	0.58
24.	Marble	0.19	58.	Surgical Instruments	0.43
25.	Ceramics	0.68	59.	Optical Goods	0.43
26.	Tyres & Tubes	0.38	60.	Matches	0.41
27.	Sulphuric Acid	0.69			
28.	Paints and Varnishes	0.31			
29.	Soda Ash	0.73			
30.	Asbestos Sheets	0.43			
31.	Petro-Chemicals	0.21			
32.	Cement	0.92			
33.	Sulphur Refining	0.08			
34.	Caustic Soda	0.46			
35.	Chlorine	0.42			

Source: [5]

Table II

1967-68 *Data on Explanatory Variables used in Regression Analysis of Selected Industries of Pakistan*

	Industry	Size of Firm* (000 Rs.)	Number of Firms or Industry	Concentration Ratio	Imported Inputs
1.	Canning, Preservation of Fruits and Vegetables	107	41	7	0.03
2.	Sugar (1)	25,867	20	11	0.08
3.	Edible Oils (1)	3,239	30	11	0.19
4.	Salt (1, 2)	561	13	2	0.00
5.	Beverage Industries (1)	1,131	40	5	0.06
6.	Cigarettes (1, 2)	5,131	21	3	0.09
7.	Cotton Textiles (1)	5,319	145	60	0.03
8.	Ply Wood (1, 2)	622	8	2	0.16
9.	Paper & Paper Board	8,185	23	3	0.33
10.	Tanning & Leather Finishing (1)	316	36	5	0.08
11.	Tyres & Tubes (1, 2)	3,944	9	3	0.01
12.	Dyes & Colours	661	13	3	0.30
13.	Fertilizers (1, 2)	61,773	10	2	0.17
14.	Paints & Varnishes (1)	441	30	9	0.05
15.	Pharmaceuticals	863	78	15	0.18
16.	Soaps (1)	207	114	26	0.35
17.	Insecticides	3,960	13	2	0.11
18.	Petroleum Refineries	42,700	3	2	0.36
19.	Glass Products	1,427	35	7	0.08
20.	Refractory	1,459	14	4	0.10
21.	Cement (1)	2,377	9	6	0.04
22.	Cutlery (1)	251	21	14	0.21
23.	Agricultural Implements (1)	155	507	186	0.37
24.	Diesel Oil Engines	376	170	27	0.29
25.	Textile Machinery	302	24	8	0.25
26.	Pumps	269	43	14	0.27
27.	Transformers (1)	1,091	9	5	0.36
28.	Electric Fans (1, 2)	411	49	15	0.35
29.	Electric Lamps	1,036	4	2	0.17
30.	Cycles (1, 2)	842	5	2	0.16
31.	Surgical Instruments (1)	326	37	30	0.17
32.	Optical Goods	133	20	5	0.42

Source: [5]
*Value of fixed assets in the Industry divided by the Number of Firms in the Industry.

Note: The figures in parentheses against the names of industries have the following meanings:
(1) Industries not suffering from inadequate demand market.
(2) Industries with non-competitive structure.

Appendix II

Data Problems

Data on dependent variable, i.e., capacity utilization ratio, are taken from [5]. The directory reports sanctioned and installed capacity and the production figures for the year 1967-68. The data were collected by the Department of Industrial Promotion and Supplies. In data collection, many relevant organisations were consulted and data collected at the disaggregated level of firms. The information on capacity is in response to a question: how much maximum production could be obtained from the capital? The figures reported are roughly on the basis of 2-1/2 shifts. For cotton textiles, it is customary to take 300 days (7,200 hours) to be the maximum working days. The data revealed that the hours worked were as high as 7,500. Thus we used 7,500 hours as the maximum number of hours worked during a year for cotton textiles. For Sugar, we have taken 160 days (crushing season) to be the maximum number of working days, and calculations were made on that basis.

Data on average size of firm, capital-output ratios and imported inputs as a proportion of total inputs are calculated from the Census of Manufacturing Industries. Data on the number of firms are obtained from [5]. Concentration ratios are calculated on the basis of the data reported in [5].

As regards the quality of the data, the data have the usual shortcomings. Production is understated to avoid tax and capacity is shown at a higher level to obtain licence for raw materials. However, the excisable items show very high utilization rates, implying that the problem is not very serious.

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