Institute of Economic Development and Research
SCHOOL OF ECONOMICS
University of the Philippines

Discussion Paper No. 72-22 July 28, 1972

ON EXCESS CAPACITY IN PHILIPPINE MANUFACTURING

by

Romeo M. Marcelo Bautista, 1941-

NOTE: IEDR Discussion Papers are preliminary versions circulated privately to elicit critical comment. References in publications to Discussion Papers should be cleared with the author.

to the very real need to understand more fully the problem and implement policy measures to reduce excess capacity.

General knowledge of the extent of capacity underutilization among Philippine industries for the recent years is at best impressionistic. Although a few scattered inquiries have been made by certain industrial associations and government offices, there is an absolute lack of published information relating to recent levels of industrial capital utilization. Some time ago the present writer conducted a sample survey of capacity utilization among manufacturing establishments for 1961.[1/] Although affected by both conceptual and statistical difficulties, the results of that survey would seem to provide the only comprehensive picture for any year of capacity utilization in the Philippine manufacturing industries.

In Section 2 of this paper we make use of the survey findings for 1961 and relevant data from, among others, the 1969 Annual Survey of Manufactures to estimate capacity utilization rates among 2-digit ISIC manufacturing industries for 1969. Section 3 gives some indication of the benefits foregone due to the existence of manufacturing excess capacity in 1969. An attempt to explain quantitatively industrial capacity utilization using 1961 data is reported in Section 4. Section 5 argues the case for a more

---

1/ See [1] and [2].

meaningful interpretation and measurement of capital utilization for the LDCs, which has implications for the information needs of policy-making to influence utilization. The concluding section draws attention to the relative neglect, in discussions of Philippine industrialization, of policy effects on the extent of capital use.

2. Estimates of 1969 capacity utilization rates

The underlying assumption used in deriving capacity utilization estimates for 1969 is equality in 1961 and 1969 of the ratio of installed capital stock to capacity output, both in real terms, for each 2-digit industry.[2/] The capacity utilization rate for any industry i, is then expressible in terms of the 1961 and 1969 current values and prices of capital and actual output, and the capacity utilization rate for 1961. More specifically,

$$(1) \quad U^i_{69} = U^i_{61}\left[Y^i_{69} / K^i_{69}\right]\left[K^i_{61}/Y^i_{61}\right]\left[P^k_{69}/P^k_{61}\right]\left[P^i_{61}/P^i_{69}\right]$$

where, for each industry i,

U^i_{69} = capacity utilization rate in 1969

[2/] Fixed capital-capacity output ratio is used in the estimation of industrial capacity utilization in the United States by the National Industrial Conference Board Federal Reserve Board and Fortune magazine [10, p. 12n].

Y^i_{61} = value in 1961 prices of actual output in 1961

Y^i_{69} = value in 1969 prices of actual output in 1969

K^i_{61} = book value of equipment and machinery on Jan.1, 1961

K^i_{69} = book value of equipment and machinery on Jan. 1, 1969

P^i_{61} = 1961 wholesale price index of output

P^i_{69} = 1969 wholesale price index of output

U^i_{61} = 1961 capacity utilization rate

and

P^k_{61} = wholesale price index of machinery and transportation equipment in 1961

P^k_{69} = wholesale price index of machinery and transportation equipment in 1969

Data for Y_{61} and K_{61} were obtained from the 1961 Economic Census, for Y_{69} and K_{69} from the 1969 Annual Survey of Manufactures[3/], and for P^k from the Central Bank Statistical Bulletin.[4/] The survey on 1961

[3/] In either source, only for "large establishments--employing 10 or more laborers in / 4 / and 20 or more in / 5 /--are the required data available. Since establishments with 11 to 19 employees produce only a small portion of total manufacturing output, such difference in definition can be tolerated for the purpose of this study.

[4/] The Central Bank wholesale price index of machinery and transportation equipment is also used by the National Economic Council as deflator for durable equipment in the national income accounts.

manufacturing capacity utilization referred to earlier provided data for U^i_{61}. Values of P^i were computed from Central Bank data on the general wholesale price index of domestic products sold in Manila. Averages of the CB price indices for the 4-digit SITC commodities were taken using 1961 value of products sold as weights to obtain the price index values for the corresponding 2-digit ISIC industries. These data are shown, together with the computed capacity utilization rates for 1969, in Table 1.

Before commenting on the computed levels of capacity utilization for 1969, a brief description of the derivation of the 1961 estimates would seem in order. In addition to actual production data for 1961, three kinds of information were elicited from sampled establishments in the survey, each providing a measure of capacity output: (1) the maximum monthly output actually produced in 1961; (2) the maximum level of production, given the input and output prices in 1961, as estimated by the production manager; and (3) the capacity utilization rate in 1961 as determined (subjectively) by the production manager. Three measures of capacity utilization rates can thus be obtained for each responding establishment. However, very few of the responding establishments in fact gave all the information; it turned out that the two or three values of utilization rates so computed were in most

cases very close so that the scope for personal judgment in choosing the final estimate was rather limited.

Table 1: Values of variables in eqtn. (1)

ISIC No.	U_{61} (%)	Y_{69} (₱M)	Y_{61} (₱M)	K_{69} (₱M)	K_{61} (₱M)	P_{69} (1955=100)	P_{61} (1955=100)	U_{69} (%)
20	70	2895	1083	6703	1867	185.6	131.2	46
21	88	689	226	894	248	163.4	104.6	59
22	87	630	209	502	119	112.9	107.3	73
23	60	783	298	3769	1487	132.6	104.3	60
24	76	184	148	403	193	163.8	144.2	49
25	69	446	244	1551	744	121.3	81.6	50
26	79	59	28	100	37	148.9	102.3	52
27	70	312	123	1095	384	153.7	134.0	67
28	61	194	104	657	342	155.8	126.6	60
29	53	27	16	60	25	204.9	117.6	26
30	90	238	142	552	307	153.2	146.9	99
31	72	1372	477	2312	569	146.8	111.5	48
32	82	773	333	1261	268	244.6	225.7	46
33	84	409	132	3570	604	101.8	82.5	44
34	68	502	150	861	292	189.8	152.9	77
35	47	426	130	806	222	155.0	150.0	51
36	89	99	86	285	133	160.6	141.5	53
37	81	304	82	566	153	165.6	137.5	83
38	79	414	104	514	140	254.8	186.2	77
39	75	123	48	408	153	127.4	107.2	79

P^k_{69} = 202.1 P^k_{61} = 163.5

A quick glance on the second and last columns of Table 1 reveals the generally higher rates of underutilization in 1969 compared to those observed in 1961. Only five of the twenty 2-digit industries show higher rates of capacity utilization in 1969 and not by significantly wide margins at that. The decline in utilization rates from 1961 to 1969, on the other hand, are quite dramatic in most cases, e.g., in Food Manufactures (ISIC no. 20), Beverages (21), Footwear (24), Furnitures (26), Leather (29), Chemicals (31), Nonmetallic Products (33), and Machinery (36).

Such findings are highly interesting, especially if one views the existence of industrial excess capacity to be largely policy-induced. The year 1961 was part of a transition period in the Philippine economy when controls on imports and foreign exchange adopted in the preceding decade were gradually being lifted. The succeeding years witnessed also the thrust of economic policy shifting away from tax exemption privileges to the use of government credit subsidies and protective tariff as incentives for rapid industrialization. To the extent that the assumptions underlying the derivation of the 1969 estimates of capacity utilization are valid,[5/] the major implication of the results

---

[5/] If the degree of capital intensity decreased from 1961 to 1969 as a result of better resource allocation, U_{69} would be higher than the computed levels.

would seem to be that the implementation of the latter policies served to promote greater excess capacity for the manufacturing sector in general and the 2-digit industries mentioned in the preceding paragraph in particular. This conflicts with the conjecture made by Power and Sicat "that decontrol permitted a fuller utilization of resources" [11, p.57] which accompanied the improvement in resource allocation. There is need to probe this matter more deeply to see whether the discriminatory aspects of recent government policy are complementary to the industrial priorities in the overall development strategy. For example, if the promotion of export-oriented industries is of primary concern to economic planners, the question may properly be raised whether actual policy relating to government lending and effective tariff structure in fact induces greater utilization of existing capital. The possibility cannot be ruled out of course that capacity is being augmented through government subsidy without consideration of the extent of capital use of the recipient industries, which may find it advantageous to hoard capital.

3. Benefits from full-capacity operation

It is unquestionable that excess capacity represents a waste of the typical LDC's scarce resources,

namely, capital and foreign exchange. There are economic benefits foregone as a result, for example, in terms of the additional output producible, given that complementary non-capital inputs are available. Most LDCs are labor-surplus economies with high rates of unemployment and hence (1) increasing the utilization of installed capital equipment and machinery would reduce the number of unemployed and presumably also the (2) inequality in the distribution of income so characteristic of present-day LDCs. (3) Finally there are dynamic gains from higher capacity utilization in terms of the higher growth rates of the economy in subsequent periods due to the de facto increase in saving rate and/or capital productivity [14].

Elsewhere [3] I have made some rough calculations of the effects of a hypothetical full-capacity operation of Philippine manufacturing industries in 1961, assuming that fixed production coefficients prevailed. The same procedure may be followed in determining the quantitative benefits foregone in 1969 due to the existence of excess capacity. The important qualification has to be made that interindustry relations expressed in terms of forward and backward linkages, although providing the mechanism for the expansion of output among interdependent industries, could prevent the simultaneous attainment of full-capacity operation in all

industries due to possible bottlenecks in input supply and/or product demand.

One implication of the magnitude and pattern of manufacturing capital underutilization found to prevail in 1969 is that, if it had been possible to raise by one percent the rate of utilization in each 2-digit industry, the overall effect on manufacturing output would be an increase in value by ₱203.4 million (in 1969 prices).

An extreme but interesting possibility to consider is where 100 per cent capacity utilization were achieved. In such a case, the value of manufacturing output would have been higher by ₱9,466 million, or by 87.0 per cent of the actual value in 1969. Assuming a fixed value added ratio to value of output of .445 based on the actual figure for 1969, it would have meant ceteris paribus an increase in national income by about ₱4,212 million, which is approximately 15.2 percent its actual value in 1969.

Full-capacity operation in the manufacturing sector in 1969 would also have meant absorption of about 351 thousand unemployed laborers into gainful employment. This represents roughly 40 per cent of the openly unemployed labor force; alleviation of urban unemployment,

however, would be to a much greater extent in view of the concentration of organized manufacturing activities in urban areas.

It is to be noted that such increases in output and employment are obtainable without any cost in terms of the real resources of the economy. Additional saving does not have to be generated and there is no need to set aside scarce foreign exchange to import capital equipment and machinery because they have been purchased and installed. It is not entirely without basis therefore that people tend to associate low levels of capacity utilization with industrial inefficiency. In a capital-poor, foreign exchange-constrained economy it does constitute a most visible manifestation of resource wastage.

4. Determinants of excess capacity

It seems clear that proper understanding of the existence of excess capacity in the LDCs can be gained only by due consideration of the factors influencing the decision on the part of producers to underutilize existing capital stock. Such understanding is necessary in the reformulation of policy to induce greater utilization of industrial capital.

The reasons for capital underutilization cited in industry studies in the LDCs are varied though not unrelated: lack of raw material inputs (especially imports), shortage of skilled labor, inadequate demand, competition from imports, overcrowded industry, uneconomic scale of operation, etc. Each represents a shortage in either input supply or product demand. Clearly, only a proper identification of the specific factors that bear heavily on the capital utilization problems of each individual industry could provide the necessary guide to a rational policy or planning effort.

In an attempt to gain quantitative knowledge on the extent to which Philippine manufacturing industries conform to these explanations, I did some regression analysis of the available data pertaining to the 2-digit ISIC industries. Due to data limitations, only proxy variables were used for the supply and demand conditions that are supposed to prevent or encourage attainment of full-capacity. Data for the following explanatory variables, each expressed as a percentage of industry sales, were obtained from the UP-BCS Interindustry Relations Study as reported in [9]:

(1) imports of raw materials

(2) wage cost —

(3) profits —

(4) exports of the product

(5) competing imports

(6) indirect taxes less subsidies

Some additional variables used to explain the level of capacity utilization are:[6/]

(7) dummy variable on product durability

(8) average size of firm

(9) economic life of equipment

(10) capital intensity

(11) rate of return on fixed assets

There are standard, intuitively appealing interpretations to the presumed direction of effect of the above variables on industrial capital utilization. Some of these are discussed by Winston [14], who also offers some novel ways of locking at the relationships based on the institutional forces at work in the country of his study (Pakistan). It is not necessary here to enter into such discussion because the explanatory variables listed above, except for the last two, did not turn out to have significant correlation to the average capacity utilization in 1961 of Philippine manufacturing industries at the 2-digit aggregation level. Of the

---

[6/] Data were obtained from [1] and [4].

multitude of regressions ran involving different combinations of these explanatory variables, the only result worth reporting is the following:

$$(2)\quad CU = 40.4 + \underset{(3.19)}{46.9}\ CC + \underset{(3.78)}{10.0}\ PR$$

$$\bar{R}^2 = .418 \qquad s = 9.17 \qquad D.W. = 2.35$$

where CU = percent capacity utilization, CC = ratio of net value of total capital to value of capacity output, and PR = ratio of profits to net value of fixed assets. (Numbers underneath the regression coefficients are their t-values.)

Marris [8] has developed a cost adjustment explanation to the positive relationship between capital intensity and capacity utilization, which may be valid at the level of the firm. In the present context it is rather disturbing that the less capital intensive industries suffered from excess capacity relatively more, at least for 1961. If it had been the case that under-utilization of capacity was caused by an unfavorable policy environment, then the more labor intensive industries were the ones adversely affected--a perverse penalty indeed in an economy characterized by surplus labor.

We may also note here that firms owned and/or controlled by foreigners tend both to adopt capital

intensive processes and to operate at high levels of utilization. The first has been the result of factors having a profound effect on techniques brought in with foreign investment. The second arises possibly from existing arrangements of foreign firms (e.g. with affiliates abroad) concerning purchases of material inputs and sale of their products.

The influence of the profit rate is expectedly positive: firms with higher rates of return are more able to realize other objectives (e.g. higher sales, growth rate, etc.) with greater utilization of capacity. Again, we may note that foreign firms are known to earn relatively higher profits compared to Filipino producers [16].

Although the t-values imply statistical significance of the coefficients, less than half of the variation of utilization rates is explained by the two explanatory variables together. This suggests, in conjunction with the very limited success of the entire exercise, that the data set used in the regression analysis is at best inadequate, and that information beyond what is currently available would be needed to further our understanding of the problem of underutilized capital in Philippine manufacturing.

The most striking limitation of the data used above is the high level of aggregation (to the 2-digit ISIC) which has been resorted to on account of the absence of a more disaggregative set of comparable data. With wide differences in levels of capital utilization exhibited by firms belonging to the same 2-digit industry,[7/] the information loss associated with averaging utilization rates becomes substantial, reducing the effectiveness of regression analysis to discern actual correlations with the explanatory variables. Moreover, the choice of explanatory variables was also hampered by data availability, some of them being merely proxy variables only remotely related to the cost and demand factors they are supposed to represent.

Ideally, the basic information for the analysis of capacity utilization should pertain to the individual establishment inasmuch as different firms might be subject to different conditions constraining their decision on the degree of capital utilization. This would allow recognition of causes of excess capacity common to all firms in the industry and those peculiar to one or a few

---

[7/] Fifteen of the twenty 2-digit manufacturing industries have values of the range of capacity utilization rates among establishments sampled exceeding 20 per cent ; nine have over 30 per cent. For values of the coefficient of variation, see Table 1 in [2, p. 210].

firms. Such micro-data for Philippine manufacturing are unfortunately not available at present.

The suggestion has been made in [3] that a capacity utilization survey would be necessary to obtain an adequate data base for the explanation of the magnitude and pattern of excess capacity in Philippine manufacturing. The collection of new data through a survey always requires the commitment of resources having opportunity costs that must be equalled at least by the benefits to be derived from the undertaking, which in turn is dependent on the extent to which the information needs for policy-making are met. Much thought should be devoted therefore to the decision on the kind of information to be elicited from the respondents of the survey, in the present case, manufacturing establishments. For one thing, the survey questionnaire should be designed to complement the quantitative information about the sampled establishments already available from the Annual Survey of Manufactures. Moreover, the questionnaire must reflect the main rationale for the survey, which is to find out <u>why</u> scarce capital is underutilized.[8/]

[8/] Some suggested questions for the capacity utilization survey are given in [3], pp. 12-14.

5. Alternative definition of capacity utilization

Thus far we have not paid close attention to the concept of capacity output involved in the measurement of capacity utilization. It may be observed from the method employed in deriving the estimates of capacity utilization rates for 1961 that capacity output has been taken to mean some desired level of production. Excess capacity then represents the deviation of actual production from the desired level of output. It stems from unanticipated difficulties in product demand and/or supply of inputs, to use the apt terminology of Winston [15]. It is well known, however, that capital equipment and machinery are left idle part of the time on account of the anticipated characteristics of the market. For example, "building ahead of demand" in industries subject to economies of scale would imply some expected excess capacity (at least in the early stage) which is built-in the investment decision. So would be the case where the market is characterized by regular peak-load demand cycles (e.g., electricity generation) and seasonality of input supply (e.g., sugar cane milling and other agriculturally-based industries). To be exhaustive one should also include as a source of anticipated excess capacity the day-night dichotomy in labor availability and pricing, less evident as a factor in capital underutilization but which is

actually responsible for a large portion of the total time that installed capital equipment and machinery remain unutilized.

Within such anticipated constraints in production there is some optimal (desired) level of output to be aimed at but which may not be achieved in actuality because of unanticipated changes in market conditions as discussed earlier. The concept of capital utilization used so far has to do with the extent to which actual production approaches the desired level rather than the maximum technologically feasible. The question that arises is: Shouldn't the critical scarcity of capital in the LDCs suggest an interpretation of capacity utilization that considers the technological maximum level of production as full utilization? As Winston has cogently argued [14], development policy should be concerned not only with correcting the divergence of actual production from the desired level but also with raising the latter to the maximum by the reduction of obstacles (provision of incentives) so that intended capital underutilization can be minimized.

There is at present no available information that could provide the basis for determining the maximum extent to which our manufacturing industries are capable of increasing output, given the existing stock of capital,

if industrial policy were made conducive to greater capital utilization. The presumption has to be that the benefits in terms of higher output, employment and growth would be considerable; the results of the earlier calculations based on a less stringent definition of excess capacity would certainly be magnified.

On the measure of capacity utilization so defined, obtaining the length of time that capital is in use (relative to the period of "continuous" operation with allowance for the normal time of repair and maintenance) seems a more manageable task than the determination of actual output relative to the maximum attainable, in view of the likelihood of different product-mixes among different establishments belonging to the same industry and temporal changes in product-mix of even the same establishment. Such proportion of time as a measure of capital utilization has the added advantage of being easier to compare among different industries, in different countries and at different time periods. That it is also an imperfect operational measure can be seen from the ambiguity introduced by changes in the intensity of capital use over time and differing levels of utilization among the various components of capital equipment and machinery within the same plant.

It would be most useful if the survey on capacity utilization mentioned earlier can provide information on how far the desired level of capital utilization differs from the maximum that could be attained. Moreover, the deviation of actual utilization from the desired level should also be disclosed by the survey results. Finally, and most importantly, the specific reasons for the divergences among the three utilization levels (actual, desired and maximum attainable) in each responding establishment should be established. Clearly, the nature of the policy implications of the findings of the survey will be determined by the relative importance in the existence of excess capacity of anticipated/unanticipated difficulties in product demand/input supply.[9/]

6. Concluding remarks

Analytical studies of postwar Philippine economic development have been concerned mainly with the allocative effects of economic policies adopted during the period.

[9/] The importance of prevailing night-day wage rate differentials has been suggested in some recent studies for Pakistan [14] and Colombia [13]. If the same is found true for Philippine industries, then purposeful reform of labor legislation would seem necessary to increase the amount of shiftwork at night and hence capital utilization. Given the severe problem of urban unemployment in the Philippines, it is inconceivable that workers' preferences for daytime work would be responsible for the existence of substantial excess capacity in manufacturing activities.

The system of import and foreign exchange controls of the 1950s has been roundly criticized for the distortions it created in both factor and product markets. In the decontrol period of the 1960s, with tariff and government lending policies assuming greater improtance, recent research purports to show that modest improvement in resource allocation took place /12/.

Surprisingly little attention, however, has been given to the degree of industrial capital utilization over the years.[10] The tentative evidence presented in this paper shows that excess capacity in the manufacturing industries has generally increased from 1961 to 1969. More conclusive findings must await the results of a survey on capacity utilization, which should also provide information on the specific causes of capital idleness and delineate the scope for policy in promoting greater utilization of existing capacity. At any rate the re-examination of past and present instruments of development policy (generally considered highly discriminatory) should be made not only for their effects on capital allocation but also on the extent of capital use. Clearly both inefficient allocation and ...

---

[10] The Power-Sicat study alluded to earlier seems to be the only exception.

underutilization of capital stand in the way of achieving the maximum growth rate of the economy and other benefits.[11/]

[11/] Reference may be made here with Leibenstein's useful distinction between allocative efficiency and X-efficiency [7]. One of the sources of X-inefficiency is underemployment of existing resources; hence an increase in capital utilization would raise X-efficiency. According to Leibenstein, empirical findings for the LDCs indicate that gains in output from increasing X-efficiency are far more substantial than those from a more efficient allocation of resources.

REFERENCES

/1/ Bautista, R.M., Capital Coefficients in Philippine Manufacturing Industries: Estimation and Analysis, unpublished M.A. thesis, University of the Philippines, 1966.

/2/ _____, "Capital Coefficients in Philippine Manufacturing," Philippine Economic Journal, V (Second Semester 1966), pp. 205-228.

/3/ _____, "Notes Toward the Collection of Capacity Utilization Data for Philippine Manufacturing," IEDR Discussion Paper No. 72-10, School of Economics, U.P. (May 11, 1972).

/4/ Bureau of the Census and Statistics, 1961 Economic Census, Manila.

/5/ _____. 1969 Annual Survey of Manufactures, Manila.

/6/ Central Bank of the Philippines, 1970 Statistical Bulletin, Manila.

/7/ Leibenstein, H., "Allocative Efficiency vs. 'X-Efficiency'," American Economic Review, LXI (June 1966), pp. 392-415.

/8/ Marris, R., The Economics of Capital Utilization (Cambridge: Cambridge University Press, 1964).

/9/ Mijares, T.A. and Valdepeñas, V.B., Jr. "An Interindustry Study of the 1961 Philippine Economy," IEDR Discussion Paper No. 68-25, School of Economics, U.P. (August 7, 1968).

/10/ Phillips, A., "Measuring Industrial Capacity in Less Developed Countries," Discussion Paper No. 110, Department of Economics, University of Pennsylvania (January 21, 1969).

/11/ Power, J. and Sicat G.P., The Philippines: Industrialization and Trade Policies (London: Oxford University Press, 1971).

/12/ Sicat, G.P. and Williamson, J.G., "Technical Change and Resource Allocation in Philippine Manufacturing: 1957-1965," IEDR Discussion Paper No. 68-21, School of Economics, U.P. (June 15, 1968).

/13/ Thoumi, F.E. "Industrial Capacity Utilization in Colombia: Some Empirical Findings," University of Minnesota (undated); mimeo.

/14/ Winston, G.W., "Capital Utilization in Economic Development," Economic Journal, LXXXI (March 1971), pp. 36-60.

/15/ _____, "The Four Reasons for Idle Capital," (September 1971); mimeo.

/16/ Yoshihora, K., "A Study of Philippine Manufacturing Corporations," The Developing Economies, IX (September 1971), pp. 268-289.