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THE NEDA-WORLD BANK CAPITAL UTILIZATION SURVEY OF PHILIPPINE MANUFACTURING

By

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Introduction and Background

Underutilization of installed machinery and equipment in typically capital-poor less developed countries (LDCs) is a widely-observed paradox which has planning and policy implications for output growth, employment generation and other LDC objectives. Policy efforts to increase the utilization of existing industrial capital, if successful, could raise productivity in the manufacturing sector, reduce average and incremental capital-output ratios, generate additional employment opportunities and expand more rapidly industrial output (hence, disinflationary) at low social costs (cf. [15]). The payoff assumes greater importance once industrial planning and promotion procedures seek constantly to improve the utilization of capital investments.

Benefits to be expected from increased capital utilization are premised on the recognition that the capital input in any production function constitutes a service flow which is determined by the amount of installed capital and its utilization rate. Thus increasing capital utilization is substitutable to capital accumulation. This may be illustrated using the standard two-factor Cobb-Douglas production function with a technological progress term,

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(1) $$Y_t = e^{a_o t} K_t^{a_1} L_t^{a_2}$$

where Y_t, K_t and L_t represent rates of flow at time t of output, capital services, and labor services, respectively; a_o is the (constant) rate of disembodied technical change; and a_1 and a_2 are the capital and labor *service* elasticities of output, respectively. Since K_t is the product of the capital stock $\bar{K}_t$ and utilization rate U_t, differentiating the logarithms of eqtn (1) with respect to t yields an expression for the growth rate of output r_y as follows:

(2) $$r_y = a_o + a_1 (r_u + r_{\bar{k}}) + a_2 r_l$$

where r_u, $r_{\bar{k}}$ and r_l denote rates of change in utilization capital stock and labor services, respectively.

Eqtn. (2) provides the basis of aggregative sources-of-growth studies pioneered by Solow and Denison, except that the effect of inter-temporal changes in the capital utilization rate is frequently left out in the analysis. That r_u might be an important consideration is well demonstrated in the work of Jorgenson and Griliches [8] on U.S. manufacturing, which obtained re-estimates of capital productivity challenging the Solow and Denison figures.

Similarly, studies of postwar Philippine economic growth, e.g. [10] and [14], have generally ignored the effect of possible changes in industrial capital utilization on the growth of manufacturing output. One notable exception is the Power-Sicat study on Philippine industrialization and trade policies, which hypothesized "that decontrol permitted a fuller utilization of resources" [12, p. 57] accompanying the observed improvement in resource allocation. On the other hand, the present writer had tentatively concluded that excess industrial capacity increased from 1961 to 1969 [3]. This conclusion, however, was based on certain restrictive assumptions and very aggregative data.

Recent empirical findings on levels and trends of industrial capital utilization in other countries appear to suggest two things: (1) there is substantial underutilization of capital stock in both developed and developing countries; and (2) observed changes over time in the utilization level vary significantly from country to country. Foss [7] has estimated that existing industrial capital in the United States was being operated at about 21 per cent in the mid-1950s. In the LDCs, Winston [15] has recently given an estimate of 14 per cent for West

Pakistan, Kim and Kwon [9] about 17 per cent for South Korea, and Thoumi [13] a relatively high estimate of 30 per cent for Columbia. In regard to changes in capital utilization rates, Foss' study indicates an increase for U.S. manufacturing from 15.2 per cent in 1939 to 20.9 per cent in 1954. The average utilization rate in South Korean manufacturing industries has been estimated to double over 1962-1971, while in India observed changes in the level of utilization from 1961 to 1970 have been insubstantial [11].

Although these estimates are not exactly comparable, they all purport to indicate the proportion of time that installed capital equipment and machinery were being operated on the average. This represents a departure from the usual measures of capacity utilization shaped by developed countries' concern with business fluctuations and national income forecasting. The utilization measures adopted (e.g. by McGraw-Hill and the Wharton School) reflect the deviation of actual utilization from the desired (intended, expected) level — without specifying the latter in absolute terms. If fuller use of existing capital is deemed socially desirable in the LDCs, development planning and policy should be concerned not only with correcting the divergence of actual from desired utilization but also with raising the latter by the removal of obstacles and/or provision of incentives so that intended capital idleness is minimized. Such distinction is significant in view of the emerging evidence that anticipated capital idleness represents the more important contribution to the observed excess capacity even in the LDCs.

There is at present no available information on the time utilization of capital equipment and machinery in Philippine manufacturing for any year. Indeed, apart from the survey for 1961 conducted by the present writer [2] several years ago, there has not been any comprehensive primary data-gathering and publication relating to industrial capital utilization (however measured) in the Philippines. In exploring the scope for economic policy in influencing capital utilization, it would seem necessary to establish first an adequate data base which may then be analyzed in the light of theory and prevailing policies. Such need for a capital utilization survey of Philippine manufacturing industries has been felt and expressed previously [4], but plans to undertake one have not materialized.

The NEDA-World Bank survey on Philippine manufacturing was one of the first full-scale attempts at collecting detailed capital utilization data by direct interviews with plant managers, which

were done from mid-October 1973 to February 1974. Similar surveys were being conducted at about the same time in three other developing countries, viz., Colombia, Israel and Malaysia, in which the World Bank had also closely collaborated.

When the study was being planned, no other studies had been done using the interview method to obtain comprehensive information on industrial capital utilization in the LDCs. Since then two other interview surveys have been undertaken. One was reported in a recently submitted Ph.D. dissertation at the Massachusetts Institute of Technology [1]; it covered 121 manufacturing firms in Kenya. The other study is still in progress, involving several countries in Latin America, under the direction of a research group headed by Professor Rosenstein-Rodan at the Center for Latin American Development of Boston University. In comparison with the present investigation these two studies cover a narrower range of utilization-related variables.

The necessarily large budget entailed in survey interviews would seem to be the principal reason for the use of mailed questionnaire surveys and published data in all previous studies of capital utilization in the LDCs. The experience with mail surveys conducted in the LDCs has been that the questionnaire must be very brief to have any chance of being completed. Using a one-page questionnaire soliciting utilization-related data easily known to production managers, the above-mentioned survey on 1961 capacity utilization in Philippine manufacturing yielded a 35 per cent response rate despite the use of facilities of the Bureau of the Census and Statistics.

Reliance on published data in the study of industrial capital utilization is also subject to certain disadvantages. For one thing, information gathered by annual surveys of manufactures and periodic censuses do not really provide conceptually valid measures of the utilization of existing capital. The electricity-based measure, which is very popular, actually represents the extent of utilization of installed electric motors, recent evidence [5] suggesting that it substantially understates capital utilization. Moreover, published data are invariabley presented in the aggregate by industry, limiting the scope for the explanation of interplant variation in utilization rates.

Apart from overcoming these difficulties associated with the use of mail survey or published data, interview studies provide opportu-

nities for collecting more reliable and detailed information that could meet the requirements of an acceptable measure of capital utilization, get at the important reasons for plant underutilization, and inform development policies intended to change firms' utilization practices. The practical knowledge and insights to be gained from visiting industrial plants and talking with production managers should serve to enrich any study of capital utilization.

Survey Methodology and Data Processing

The population consists of manufacturing establishments employing 20 or more workers in 1972, the year for which survey data were solicited. There was simply no way of obtaining a complete list of establishments classified by the Bureau of the Census and Statistics in its annual surveys as "small" (employing less than 20 workers). Not much is lost, however, in concentrating on the "large" subsector of Philippine manufacturing since it accounts already for about 95 per cent of total value added and value of fixed assets in "organized manufacturing", comprised of establishments with 5 or more workers.

From this population a stratified random sample of 400 establishments was selected. Stratification was done to the 4-digit ISIC level, the number of sampled establishments in each 4-digit industry determined by the industry's relative contribution to manufacturing value added in 1969 (the latest year for which value added figures are available to the 4-digit level). Sampling was random within each 4-digit industry with no limitations on firm size and geographical location. An additional feature of the sampling procedure was the random selection of "reserve" establishments equal in number to those in the main sample for each industry (if there existed sufficient establishments) to replace possible cases of non-response, preserving therefore randomness of the final sample. These reserves were drawn upon during the field work in the order of their selection as indicated in the reserve list for each 4-digit industry.

The allocation of a predetermined number (400) of sampled establishments to the different 4-digit industries according to the latter's value added contribution is of course inferior to having the industrial sample weights determined by the relative amounts of the industries' capital assets. After all, the intent of the study is to investigate the utilization of industrial capital. But reliable capital figures were not available when the sampling was done, and the use

of value added was resorted to as a second-best solution.

Two difficulties were encountered in trying to apply the sampling procedure uniformly to all industries. Firstly, there were cases in which the stratification required less than three firms to be sampled in a given 3-digit sector (because the 4-digit industries within it were not sufficiently important contributors to total manufacturing value added). It was decided that the sample should be brought up arbitrarily to three for the sector to facilitate generalization to the population of that sector. Leather products (ISIC 323), pottery (361), and scientific equipment (385) were some such sectors.

The other extreme case, that of large-scale industries, presented another problem that was not anticipated in designing the sample. A few 4-digit industries (sugar milling, petroleum refining and cement manufacturing) were such heavy contributors of value added that the sampling procedure required more firms than the actual number of establishments in the population. This difficulty was handled by including all firms in the industry sample and then using the left-overs to "fill in" the small-scale sectors up to three as described above, any excess being distributed *pro rata* over the whole sample according to the original procedure. Not all firms in these industry categories responded to the survey, resulting in our having even fewer sampled establishments compared to the required number for these industries.

A common questionnaire was adopted with the three other survey studies in the countries involved. It was developed over a period of several months on a collaborative process among the principal investigators, including the pre-testing of a preliminary version in each country. The final survey questionnaire is reproduced in Appendix A.

The measure of capital utilization agreed upon at the outset is one that would reflect the proportion of time and intensity of operation of installed machinery and equipment (cf. [4]). Items 2, 3 and 3* in the questionnaire are therefore the basic questions asked in the interviews with production managers and other officials in the sampled establishments. The computation of the plant's time and intensity capital utilization is based on the response to these questions (cf. last two pages of the questionnaire form). The rest of the questionnaire seeks detailed information on plant characteristics, seasonal pattern of utilization, work hours, labor payments and

productivity, other inputs, product demand variations, market structure, perceived excess capacity and reasons for plant idleness. These are intended to shed light on the influences on plant utilization in later analysis of survey findings.

The field work for the survey spanned a period of 4-1/2 months but most of the interviews were done from mid-October to mid-December 1973. The delay in completing the survey by the end of November (as planned) was caused by the increasing reluctance of plant managers to be disturbed for interviews as the holiday season was being approached. (One lesson for similar interview surveys in the future is that seasonal periods of peak production should be avoided.) Moreover, strenuous efforts, necessarily time-consuming, were made to cover as many of the establishments as possible in industries that required full representation in the sample.

Although a large number of "reserve" establishments had to be used, there was a general willingness of firms to grant interviews. This could be attributed, perhaps in large part, to the martial law situation and the covering letter signed by the NEDA Director-General endorsing our survey which the president/general manager of each sampled firm received together with a copy of the questionnaire about two weeks in advance of the proposed interview date. A telephone call from the interviewer would follow up the letter to finalize the appointment with the production manager.

What caused some inconvenience and delay in the survey was the high incidence of sampled establishments which (a) could not be reached due to incorrect address or discontinued operation (56 cases), or (b) were engaged in non-manufacturing activities, e.g. services, distribution and sales (15 cases). Six firms situated in troubled areas in South Mindanao were also dropped. From among those that we were able to contact, roughly 65 per cent agreed to grant the interview at the proposed date, 27 per cent asked for postponement and were interviewed eventually, and the remaining 8 per cent either refused outright or kept postponing the interview appointment until we gave up on them. Survey results for 9 establishments were discarded due to inaccuracy, inconsistency and/or incompleteness of information provided. It is difficult to judge whether the substitution of responsive firms for those in the original sample that in the end were not included had biased the results in any way.

The interview itself lasted approximately one hour in most cases, although in some visits interviewers had to stay longer for invited plant tours, or shorter due to demands on the interviewees' time. Usually, the production manager in large firms would not be in a position to provide information on sales, value of assets and value added, so that the accountant had to be consulted too. Survey enumerators were instructed thoroughly on how to derive value added from the firm's profit-and-loss statement as it proved to be a generally unfamiliar concept to firm officials. Replacement value of capital is another elusive item in the questionnaire. Because of its importance to the study, extra efforts were made to get the estimates of knowledgeable firm officials; failing to do that in several cases, relevant plant data were obtained for the estimation of capital replacement values (assuming straight-line depreciation). Survey data on sales and book value of assets of sampled establishments included in the top 1000 corporations in 1972 as compiled by *Business Day* were checked against published information and found to be generally comparable. Other items in the questionnaire appeared to have been handled satisfactorily for the 400 establishments that made it to the final sample.

Questionnaire coding was done on the basis of the specifications agreed on in the January 1974 seminar at the World Bank by the principal investigators in the four countries involved. For each of the 400 establishments of the final sample, a total of 105 "bits" of information drawn from the survey results were coded, punched into six computer cards, verified, and transcribed in a magnetic tape for data processing. Altogether, therefore, 42,000 "bits" of information on 2,400 cards served as basic data input for the analysis part of the Philippine study.

For purposes of intercountry comparison, summary data tables have been prepared that aggregate most of the survey findings on the sampled establishments at the 4-digit and 3-digit ISIC levels and the entire manufacturing sector for each of the four countries. A small part of the summary data for the Philippine study has been presented in [6]. Since they comprise a bank of entirely original data on Philippine manufacturing industries which in complete form might also be of interest to others, the contents of these summary tables are described in Appendix B of this paper. Any data given in these tables can be provided by the author on request.

The survey findings on capital utilization rates among 3-digit and

4-digit industries in Philippine manufacturing are presented in the next section. Other classifications of the sampled establishments are also examined for differences in the extent of capital use. Together with factor service prices and wage premium variables, they form the basis for the specifications used in the regression analysis of the determinants of capital utilization done in [6].

Survey Results on Levels of Capital Utilization for 1972

Our findings tend to support the hypothesis of low capital utilization in Philippine manufacturing industries. A large proportion of the plants interviewed operate normally on an eight-hour one-shift basis, their production facilities utilized for only a few hours on Saturdays and left entirely idle during Sundays and holidays (at least 82 days each year). Even at seasonal peak levels of production, the majority of plants remain unutilized for a minimum of 16 hours a day. The 400 manufacturing establishments in our survey sample are distributed by number of shifts operated at peak production as follows: 1 shift — 180, 2 shifts — 73, and 3 shifts — 147.

In view of the variation in observed shift patterns across industries, the number of shifts does not determine the number of hours worked by machinery and equipment. Incorporating in our measure of capital utilization rate (CUR) the proportion of time that the plant is in operation and intensity of capital use, the average CUR for "all manufacturing" is computed at 41.61 per cent, indicating that close to three-fifths of installed capital in the sampled establishments has remained unutilized in 1972. The distribution of individual CURs of the firms interviewed is as follows:

Less than 20 per cent	— 74
Between 20 and 40 per cent	— 154
Between 40 and 60 per cent	— 77
Between 60 and 80 per cent	— 50
Greater than 80 per cent	— 45

The pattern of CURs is one of considerable variability across industries and to a lesser extent across firms in the same industry. This may be gleaned from Tables 1 and 2, which show average capital

Table 1
Average Capital Utilization Rates from Survey Data for 1972, by 3-digit ISIC industry (in per cent)

ISIC No.	No. of Plants	Name of Industry	Simple average of CURs	Standard deviation of CURs
311	76	Food manufactures	42.99	22.60
312	20		47.27	28.72
313	21	Beverages	40.04	26.28
314	20	Tobacco manufactures	26.41	18.76
321	33	Textiles	57.93	24.25
322	10	Wearing apparel	38.51	24.34
323	3	Leather products	24.29	9.30
324	5	Footwear	14.96	8.15
331	26	Wood and wood products	35.31	24.78
332	7	Furniture and fixtures	35.72	9.01
341	11	Paper and paper products	51.84	22.83
342	11	Printing and publishing	40.87	21.32
351	13	Basic chemicals	53.62	27.94
352	30	Other chemicals	32.29	21.67
353	3	Petroleum refineries	67.49	14.66
355	11	Rubber products	37.70	25.41
356	4	Plastic products	37.93	5.24
361	3	Pottery, etc.	39.01	13.36
362	6	Glass and glass products	46.01	34.36
369	21	Other non-metallic mineral products	57.72	30.74
371	7	Iron and steel	50.19	18.93
372	4	Non-ferrous metal	34.94	7.62
381	18	Other metal products	36.18	17.27
382	8	Machinery	31.38	17.73
383	11	Electrical machinery	37.99	28.71
384	9	Transport equipment	23.88	4.06
385	3	Scientific equipment	63.64	31.16
390	6	Other manufacturing	29.13	16.70

Table 2

Average Capital Utilization Rates from Survey Data for 1972
by 4-digit ISIC Industry (in per cent)

ISIC No.	No. of Plants	Name of Industry	Simple average of CURs	Standard deviation of CURs	Capital Weighted mean of CURs
3111	6	Slaughtering & preserving meat	23.92	10.39	39.82
3112	8	Dairy products	42.01	27.94	47.55
3113	6	Canning of fruits & vegetables	31.48	14.61	52.70
3114	4	Canning & processing of fish & similar foods	13.85	5.07	11.43
3115	8	Vegetable & animal oils	72.02	29.59	77.80
3116	10	Grain mills products	39.20	11.74	47.58
3117	3	Bakery products	24.03	8.67	31.11
3118	25	Sugar and refineries	48.57	14.75	51.14
3119	6	Sugar confectioneries	48.11	24.98	56.18
3121	17	Food products, n.e.c.	50.93	29.25	67.23
3122	3	Animal feeds	26.54	15.18	32.48
3131	4	Distilling & blending spirits	33.44	15.74	51.18
3132	5	Wine industries	19.58	7.63	19.39
3134	12	Soft drinks	50.76	28.91	59.42
3140	20	Tobacco manufactures	26.41	18.76	46.67
3211	24	Spinning, weaving & finishing textiles	62.03	24.23	71.95
3212	2	Made-up textile goods	56.97	13.71	48.76
3213	4	Knitting mills	40.12	24.04	65.66
3214	1	Carpet and rugs	27.67	0.0	27.67
3215	2	Cordage, rope & twine industries	60.41	28.08	70.85
3220	10	Wearing apparel	38.51	24.34	63.00
3231	3	Tanneries & leather finishing	24.29	9.30	28.01
3240	5	Footwear, except rubber or plastic	14.96	8.15	17.54
3311	17	Sawmills	42.61	25.80	62.96
3312	2	Wooden and cane containers	18.67	13.50	20.97
3319	7	Wood & cork products, n.e.c.	22.33	17.68	22.32
3320	7	Furniture and fixtures	35.72	9.01	35.56
3411	4	Pulp, paper and paperboard	53.13	33.06	70.92
3412	7	Containers of paper & paperboard	51.10	17.90	63.86
3420	11	Printing, publishing & allied industries	40.87	21.32	53.35
3511	5	Basic industrial chemicals	55.02	35.23	74.21
3512	1	Fertilizers & pesticides	83.56	0.0	83.56
3513	7	Synthetic resins & plastic materials	48.35	23.46	57.83
3521	5	Paints, varnishes & lacquers	25.47	22.99	27.69
3522	14	Drugs and medicines	25.96	14.38	36.77
3523	7	Soap & cleaning preparations	42.28	28.55	78.84
3529	4	Chemical products, n.e.c.	45.50	24.06	40.15
3530	3	Petroleum products	67.49	14.66	65.23
3551	5	Tires & tubes	57.62	22.70	80.19
3559	6	Rubber products, n.e.c.	21.10	12.31	14.91
3560	4	Plastic products, n.e.c.	37.93	5.24	38.36
3610	3	Pottery, china & earthenware	39.01	13.36	49.66
3620	6	Glass & glass products	46.09	34.36	64.26
3691	5	Structural clay products	39.37	28.08	78.46
3692	11	Cement, lime & plaster	77.10	15.00	77.49
3699	5	Non-metallic mineral products, n.e.c.	33.44	34.39	74.91
3710	7	Iron and steel	50.19	18.93	55.33
3720	4	Non-ferrous metal	34.94	7.62	34.91
3811	1	Cutlery & general hardware	27.21	0.0	27.21
3812	2	Metal furniture & fixtures	27.94	0.39	27.95
3813	8	Structural metal products	39.95	16.63	38.43
3819	7	Fabricated metal products, n.e.c.	35.50	21.60	34.21
3822	1	Agricultural machinery & equipt.	27.67	0.0	27.67
3829	7	Machinery & equipment except electrical, n.e.c.	31.91	19.08	60.30

ISIC No.	No. of Plants	Name of Industry	Simple average of CURs	Standard deviation of CURs	Capital Weighted mean of CURs
3831	1	Electrical industrial machinery	19.58	0.0	19.58
3832	1	Communication equipment	7.73	0.0	7.73
3833	3	Electrical appliances & housewares	23.23	12.98	28.46
3839	6	Electrical apparatus & supplies, n.e.c.	53.49	30.18	70.01
3843	8	Motor vehicles	24.07	4.30	26.51
3844	1	Motorcycles and bicycles	22.35	0.0	22.35
3851	1	Professional & scientific equipt.	85.92	0.0	85.92
3852	2	Photographic & optical goods	52.49	34.60	55.91
3902	1	Musical instruments	16.49	0.0	16.49
3909	5	Miscellaneous	31.66	17.33	39.65

utilization rates at the 3-digit and 4-digit ISIC levels, respectively, and the standard deviation of firm CURs for each industry. Some industries with markedly wide dispersion of plant CURs around the mean value are pulp and paper (3411), basic industrial chemicals (3511), dairy products (3112), oils and fats (3115), soft drinks (3134) and wood mill products (3311).

In general, values of the capital-weighted CURs are higher than the simple averages, implying that larger-sized plants tend to operate at higher utilization levels. For "all manufacturing", the difference between the two means is quite substantial — about 19 per cent. Some industries that exhibit large disparities are tobacco manufactures (314), wearing apparel (322), wood products (331), rubber products (355) and machinery (382). On the other hand, differences in the simple and capital-weighted CUR means are very small in leather products (323), footwear (324), furniture (332), petroleum products (353), plastic products (356), metal products (371, 372, 381) and transport equipment (384).

Examining the simple average CURs across 4-digit industries, we find a heavy concentration of high values among those producing intermediate goods such as fertilizers and pesticides (83.56%), cement (77.10%), oils and fat (72.02%), petroleum products (67.49%), tires and tubes (57.62%) and basic industrial chemicals (55.02%). The arithmetic mean of the CURs of plants in the sample producing intermediate goods is computed at 49.4 per cent.

In contrast, the utilization of installed capacity in the capital goods sector appears to be very low. From Table 2, sampled firms

belonging to industries producing all types of machinery and equipment (ISIC Nos. 3822, 3829, 3831, 3843, 3844 and 3851) have average CURs ranging from 19.58 to 31.91 per cent (mean = 27.0) which are significantly lower relative to the average for the entire sample.

Most consumer goods industries also show comparatively lower values of the average CUR. Well-known labor-intensive industries like those producing garments, footwear and other leather products, and wood products (including furniture) are conspicuously underutilizing installed machinery and equipment. There are however a few, notably some textile industries (3211, 3212 and 3215), that operate at high CURs. The average utilization level of the sampled firms belonging to the consumer goods sector is 39.2 per cent.

About three-fifths of the sampled establishments rely on imported raw materials in varying extent. As a group they show an average CUR value of 41.91 per cent, which is almost identical to that found for non-importing firms (41.23 per cent).

Export-oriented firms are observed to operate at higher utilization rates on the average relative to the non-exporting group (50.77 vs. 38.56 per cent). Some heavily exporting industries that exhibit significantly higher plant utilization rates are coconut oil (3115), made-up textile goods (3212) and cordage, rope and twine (3215).

The survey results reveal no significant differences in average CURs of foreign vs. domestic and public vs. private firms, either in ownership or in management. However, utilization rates in establishments with mixed public and private ownership are found to be generally very low (mean = 22.24%). There exists also a significant difference in the average CURs of firms classified by legal form: corporations show a mean value of 43.75 per cent and a standard deviation of 24.96 per cent, as contrasted with the corresponding figures of 28.24 and 17.37 per cent for non-corporations. Distinguishing firms by ownership and management into Filipino and Chinese (including naturalized Philippine citizens of Chinese extraction), our survey findings disclose a mean CUR in the latter group lower by six per cent, the wide dispersion of intra-group utilization levels in both cases making the difference in mean values statistically not significant, however.

Degree of market control is represented in our questionnaire data

by the number of firms considered as competitors by the respondents. There are 29 establishments which thought of themselves as having no competition; 130 firms having from 1 to 7 competitors (tight oligopoly); 100 firms with 8 to 20 competitors (loose oligopoly); and 141 firms with competitors numbering more than 20. The emerging pattern of average CUR values are as follows: monopoly — 54.54 per cent, tight oligopoly — 43.91 per cent, loose oligopoly — 42.20 per cent, and competitive — 36.49 per cent. Only the mean utilization rate for monopolistic firms is found significantly different from the overall mean CUR.

Production workers are paid on a daily basis in the majority of firms interviewed. These establishments exhibit an average utilization rate of 42.36 per cent, which is slightly lower than the 44.53 per cent observed for 88 firms whose workers receive hourly wages. Firms paying production workers weekly and monthly have relatively lower CURs on the average — 37.74 and 30.98 per cent, respectively. The lowest utilization rates are found among the nine establishments with workers paid on piecework basis, which averaged 18.36 per cent.

As might be expected, the subjective measure of excess capacity given by production managers (in response to Item 9.1 of the questionnaire) generally understates the extent of capital idleness as defined in our CUR measure. Of the 400 firms interviewed, the results indicate 354 with perceived capacity utilization levels higher than the corresponding CUR values. That the former is more than double the time and intensity utilization rate in the majority of cases would seem to indicate two things. One is that capacity utilization estimates obtained from usually very casual surveys done by some government agencies are likely to understate significantly the extent of existing capital underutilization. In addition, such finding serves to confirm the much greater significance of the deviation of desired utilization levels from the maximum attainable in comparison with the extent of unintended excess capacity. The exceptions would be the continuous process industries (from which came the 46 other firms replying to Item 9.1) where capacity utilization is not reflected in the length of time that the plant is in operation but in the amount of raw materials inflow (e.g., in petroleum refineries) or the speed at which certain machineries are being operated (e.g., the kiln section in cement manufacture).

APPENDIX A

Capital Utilization Survey Questionnaire

0. Introduction

Name of enterprise: _____

Address of plant visited: _____

Date: _____

Enumerator: _____

Respondent(s) Name(s) and Title(s) _____

Telephone number _____

We are doing a study of industrial capital utilization partly in collaboration with the World Bank which is conducting surveys in several countries. We are trying to learn more about patterns of production and production scheduling. Your firm has been selected as one of those in the study. The questionnaire should take about half an hour or so. Your answers will be entirely confidential; they will appear in the study only as statistics and without attribution. The list of firms interviewed will not be made public.

1. Plant Characteristics

1.1 Product(s):

Product _____ % Total Sales _____(%) [ISIC No.__]
% Sales Abroad ____

Product _____ % Total Sales _____(%) [ISIC No.__]
% Sales Abroad ____

Product _____ % Total Sales _____(%) [ISIC No.__]
% Sales Abroad ____

1.2 Size of Plant:

Total Employees _____(number)
Book Value of Assets _____(value)
Replacement Value of Assets _____(value)
Annual Sales _____(value)
Value Added _____(value)

1.3 Age of Plant (making present products):

First built (date) _____

Last major expansion (date)_____ If none, is expansion gradual? _____(Yes/No)

1.4 How many other plants (in country) owned/operated by same firm? _____

Do they produce the same product? _____

1.5 Firm Ownership: public/ private/ mixed/ domestic/ foreign/ corporation/ other/

1.6 Top Management of firm (in country): domestic/ foreign/

2. The Level of Utilization — Time

2.1 How many entire days was the entire plant idle during the last calendar year (365 days)?_____(days). (Report all days idle including *weekends, holidays,* time for *maintenance* and *repairs.*)

2.2 So you operated at least a part of the plant during 365 minus the answer above days?_____(yes/no)

2.3 *During* the typical *operating* day, how many hours was the entire plant idle on the average?_____(hours)

2.4 So in the typical operating day, you ran some part of the plant for 24 minus the answer to 2.3 hours?_____(yes/no)

2.5 During how many Saturdays did you operate at least part of the day?_____((days)

2.6 How many hours did you typically operate when you operated on Saturdays?_____(hours)

2.7 Did you have to shut down plant at least partly because of the July-August floods? If yes, for how long?_____(days)

3. The Level of Utilization — Intensity

3.1 During operation, how much of the plant is typically in use?_____(%)

3.2 Do you operate different parts of the plant ("sections") a different number of hours per day?_____(yes/no)

3.3 Do you typically operate different parts of the plant a different number of days per year?_____(yes/no)

IF THE ANSWER TO 3.2 OR 3.3 IS "YES" COMPLETE A SUPPLEMENTARY SHEET QUESTION 3* FOR EACH SECTION OF THE PLANT THAT OPERATES A DIFFERENT SCHEDULE.

3* The Level of Utilization — Separate Plant Sections

This sheet describes the _____ section

3*.1 How many days was the entire section idle during the past calendar year (365 days)?_____(days)

3*.2 So at least part of the section operated during 365 minus the answer to 3*.1 days?_____(yes/no)

3*.3 During the typical operating day, how many hours was the entire section *idle* on the average?_____(hours)

3*.4 So in a typical operating day, some part of the section operated for 24 minus the answer to 3*.3 hours?_____(yes/no)

Check question

3*.6 During operation, how much of the section is typically in use? _____(%)

3*.8 What proportion of the plant does this section represent? _____(%)

4. The Pattern of Utilization Over the Year

4.1 Are there periods during the year of more or less operation? _____(yes/no)

4.2 If "Yes", what is (are) the month(s) with the most operating time?_____(name of month). Why?

4.3 During that period, approximately how many days per week does the plant operate?_____(days/week)
How many hours per day?_____ (hours/day)

4.4 Does the plant operate at or near that peak level for *more* than one month of the year?_____(yes/no). How many? _____(number).

4.5 What is the period with the least time of operation? _____(name of month) Why?_____

4.6 During that period, approximately how many days per week does the plant operate?_____(days/week)
How many hours per day?_____(hours/day)

4.7 Does the plant operate at or near that level for more than one month of the year?_____(yes/no). How many? _____(number)

4.8 Does the plant have periods of full shut-down? ____(yes/no)
How long?_____(number)
When? _____(brown outs)
Did you include that in estimating idle days above?_____

4.9 Is it difficult or expensive to shut the plant down and interrupt production for a short period, say 24 hours? _____ (yes/no)
Why? _____

5. Hours of Work

5.1 How many hours per *day* does a production worker typically work?_____(hrs)

5.2 How many hours per *week* does a production worker typically work?_____(hrs)

6. Labor Payments — Wages and Shift Premia

6.1 Are production workers' wages determined by
the number of *hours* they work?_____
the number of *days* they work?_____

the number of *months* they work? _____
the amount of output they produce (piece work)? _____

6.2 For production workers what is (complete the *ONE* that is appropriate to 6.1):

the average daytime wage rate _____ (P_____ per day) or,
the average *hourly* wage rate _____ (_____ per hour) or,
the average *weekly* wage _____ (_____ per week) or,
the average *monthly* wage _____ (_____ per month).

6.3 Are production workers typically paid a *higher* wage for working (complete *ALL* that are appropriate):

during nights? _____ (amount or percentage),
during Sundays? _____ (amount or percentage),
overtime? _____ (amount or percentage).

6.4 Do you pay other costs for labor:

food? _____ (amount per worker or percentage of wage),
transport _____ (" " " "),
medical _____ (" " " "),
lay-off costs? _____ (amount per worker or percentage of wage),
other _____ (amount per worker or percentage of wage).

7. Labor and Productivity

7.1 How many production workers are at work in the plant *during a* typical day shift? _____ (number)

7.2 Is output per man-hour: (a) higher for day work? _____
(b) higher for night work? _____
(c) about the same for both? _____

8. Other Inputs

8.1 Firms often use inputs and raw materials that are not produced domestically. Does your plant use any such inputs? Yes [ ] No [ ]

What _____ (name), % of total inputs _____ (%)
What _____ (name), % of total inputs _____ (%)

8.2 Firms often use things in production whose *prices vary* seasonally or monthly, even weekly. Does your plant use any such inputs?

What _____ (name); % price change _____ (%)
% total production cost _____ (%)
What _____ (name); % price change _____ (%)
% total production cost _____ (%)

8.3 Does the plant use any inputs that are regularly *unavailable* during parts of the year?

What? _____ / _____ / _____ / name(s)

9.01 Does the plant then shut down?_____(yes/no)
9.02 Does the plant then inventory that input_____(yes/no)

9. Excess Capacity

9.1 At what percent of full capacity did you operate last year___(%)

9.2 What would you consider to be a desirable "standard" or "normal" level in the future?_____

9.3 Was actual operation last year different from this desired level? (yes/no)
Why? List reasons given (in order of importance);_____/_____/_____/_____

[After he's had time to respond on his own, offer this list for his comment: CAN'T SELL PRODUCT because of (a) recession (b) unexpected competition (c) price too high/quality too low (d) foreign competition; CAN'T GET INPUTS (ask which ones and why).]

10. Product Demand Variations

10.1 How long can your product be stored without serious loss of value from deterioration?_____
(specify hours, days, weeks or years)

10.2 Is the demand for your *product* fairly *steady* throughout the year?_____(yes/no)

10.3 If demand is *not* steady:

10.31 By how much does the best week of demand exceed the average week _____(%)

10.32 Is there a pattern of demand changes; do you know when to expect peaks and troughs?_____(yes/no)

10.33 If "yes", what is that pattern (describe)_____
_____

10.4 Is domestic demand more steady than export demand?___
(yes/no)_____(no difference)

11. Market Structure

11.1 How many domestic firms do you compete with in selling the product(s)_____(number)

11.2 How many are larger than your firm?_____(number);
smaller_____(number)

12. Free Association

What are the reasons why the plant is not operated all the time? Days, nights, weekends, year round?_____
_____
_____
_____

W.1 WORKSHEET (To be completed immediately after interview)

Enumerator's Comments:

W.2 Computation of utilization rate when all of plant operates same schedule (fill out W.2* when different sections operate different schedules)

a. Number of days per year IDLE (2.1) _____

a[1] Number of days operate per year 365 — (a) _____

b. Number of hours idle on typical day (2.3) _____

c. Number of Saturdays operated (2.5) _____

d. Hours of operation on Saturdays (2.6) _____

e. Yearly Saturday hours, (c) x (d) _____

f. Number of days operated other than Saturdays (365 — a — c) _____

g. Hours of operation on typical day (24 — b) _____

h. Yearly non-Saturday hours (f) x (g) _____

i. TOTAL hours of operation per year (g) + (h) _____

j. Percent utilization (i) — 8760 x 100 = _____

k. Check: does (a) + (c) + (f) = 365? _____

l. Intensity of use _____

m. Plant utilization — (j) x (n) _____

W.3 Code: **A** **B** **C** **D** **F**

W.4 Check List:

Enter ISIC number(s) in (1.1) (If necessary, re-check with respondent.)

W.2* **Computation of Utilization Rate when Different Sections Operate Different Schedules**

		Sect. 1	Sect. 2	Sect. 3	Plant
a.	Number of days per year IDLE (3*.1)				
b.	Number of hours idle on a typical day (3*.3)				
c.	Number of Saturdays operated* (2.5)				
d.	Hours of operation on Saturdays (2.6)				
e.	Yearly Saturday hours, (c) x (d)				
f.	Number of days operated other than Saturdays (365 - a - c)				
g.	Hours of operation on typical day (24 - b)				
h.	Yearly non-Saturday hours (f) x (g)				
i.	TOTAL hours of operation per year (e) + (h)				
j.	Percent utilization [(i) ÷ 8760] x 100 =				
k.	Check: does (a) + (c) + (f) = 365				
l.	Proportion of the plant represented by this section (as %)				Σ = 100%
m.	Average unadjusted utilization time (l) x (j)				Σ =
n.	Intensity of use (3*.5)				
o.	Plant utilization — Time and intensity Intensity — (m) x (n)				Σ =

*"Saturdays". If these part-day operations are not specifically mentioned as being different for the different sections, assume that all sections operate the same Saturday schedule — answer (2.5).

Represent sums of the separate sections.

APPENDIX B

Description of Summary Tables

Note: Numbers in parentheses refer to the coding form columns. In most tables there are three sets of data — at the 4-digit, 3-digit and country levels.

TABLE 1. Characteristics of the Sample

1. ISIC Number (6)
2. Number of establishments sampled, N.
3. City size (3) — mean; std. deviation
4. Quality of interview (5) — mean, std. dev.
5. Product concentration; percent sales represented by major product (7) — mean; std. dev.
6. Single product plants — count number of plants less multiple product plants [N – (9)].
7. Exports of major product (ISIC product above) as per cent — mean; std. dev.
8. Exports of second product as percent — mean; std. dev.
9. Total employees — count, report number for 4-digit, 3-digit, country.
10. Average employees/firm — compute 9/N, std. dev.
11. Total production employees — count.
12. Average production employees/firm — compute 11/N, std. dev.
13. Total sales — count.
14. Average sales/firm — compute 13/N, std. dev.
15. Total value added — count
16. Ave. value added/firm — compute 15/N, std. dev.
17. Total value of capital — count.
18. Value of capital/firm — compute 17 /N, std. dev.
19. Average age — mean, std. dev.
20. Multi-plant firms — count those reporting more than 1.
21. Multi-plant firms — count those reporting more than 2.

TABLE II: Utilization

1. Plant Utilization, *capital* weights — questionnaire Col. (47) weighted by questionnaire col. (18). Report mean, std. dev. and test on significance of the difference from the country mean.
2. Plant utilization, *employment* weights — questionnaire Col. (47) weighted by questionnaire col. (13). Mean, std. dev., significance of difference from country mean.
3. Plant utilization, *value added* weights — Col. (47) weighted by Col. (17). Mean, std. dev., significance of difference from country mean.
4. Plant utilization, *unweighted* — mean, standard deviation, significance of difference from country mean.

NOTE that the averaging from 4- to 3-digit industries is to be by value of *capital* regardless of the method of aggregation into the 3-digit sectors.

TABLE III: Ownership and Management

1. Ownership type — frequency (express each reported type as a percentage of total reporting).
2. Ownership nationality — frequency
3. Ownership legal form — frequency
4. Management nationality — frequency
5. Management ethnic groups — frequency

TABLE IV: Time Patterns of Utilization

1. Hours/day typically operated — mean, std. dev.
2. Days/year typically operated — mean, std. dev.
3. Section schedules different over year — count Yes/No
4. Of those with uneven schedules [Yes to (48): ave. days/wk peak (50)] — mean, std. dev.
5. Of those with uneven schedules [Yes to ave. days/wk trough (55)] — mean, std. dev.
6. Of those with uneven schedules [Yes to ave. hours/day peak (51)] — mean, std. dev.
7. Of those with uneven schedules [Yes to ave. hours/day trough (56)] — mean, std. dev.
8. Peak month — frequency; count (49) in each of the twelve months.
9. Trough months — frequency; count (54) in each of twelve months.
10. How many shut down — count Yes/no (59)
11. How long shut down — mean, std. dev.
12. Shut-down costly — Yes/No count

TABLE V: Labor

1. Average workday per worker (61) — mean, std. dev.
2. Average workweek per worker (62) — mean, std. dev.
3. Wage scheme (63) — frequency each type as % total.
4. Wage rate per hour computed in domestic currency — mean, std. dev.
5. Night shift premium (65) — Yes/No count
6. Night shift premium (66) as percent hourly wage rate (compute) — mean std. dev. (computed only for Yes in (65), of course).
7. Weekend wage premium (67) — Yes/No count
8. Weekend wage premium (68) as percent hourly wage rate (compute) — mean, std. dev. again, only for Yes in (67)

9. Overtime wage premium (70) as percent — mean, std. dev. [for Yes in (69)]
10. Fringe benefits — count number Yes under each heading, Col. (72) to (75)
11. Fringe costs as percent hourly wage rate — mean, std. dev.
12. Crew size day/night, compute [(77) — (76)]/(77) which gives the difference between day and night crew size as a percent of day crew — mean, std. dev.
13. Labor productivity (79) — frequencies, each category.

TABLE VI: Factor Proportions

1. Factor proportions computed (18)/(77) — mean, std. dev.

TABLE VII: Material Inputs

1. Imported inputs percent (80) — mean, std. dev.
2. Rhythms: input/price — count Yes [any non-zero entry in (81) or (83)]/No (zero entries).
3. Cost rhythms percent compute (81) times (82) — mean, std. dev.
4. Materials unavailable (85) — Yes/No count
5. Shut down when unavailable — of those who answered Yes to (85) count yes/no.
6. Inventory when unavailable — of those who answered Yes to (85) count yes/no.

TABLE VIII: "Capacity"

1. Percent of "capacity" operated last year (88) — mean, std. dev.
2. Normal hours/wk of operation (89) — mean, std. dev.
3. Is "normal" same as full capacity (90) — Yes/no, count
4. If yes to (90), normal hours — mean, std. dev.
5. Expect to operate normal in future (91) — Yes/No count
6. If yes 91 and yes 90, average normal hours — mean, std. dev.
7. If operation less than normal, reason — these were to have been listed in order of importance, so take first three columns — most important three reasons — and do separate frequency counts for the seven possible reasons for each. So there will be three separate frequency distributions among the seven possible reasons — one showing the most important; the next showing second most important; the last showing third most important.

TABLE IX: Product Demand Variations

1. Storage time in days (computed from (93)) — mean, std. dev.
2. Yearly demand stable (94) — Yes/No count
3. If (94) No, percent change — mean, std. dev.
4. If (94) No, is pattern regular — Yes/No count

5. If (94) No *and* (96) Yes (pattern regular), pattern -frequency each pattern.
6. Domestic demand more stable — frequency of four possibilities

TABLE X: Market Structure
1. Number of firms compete with — mean, std. dev.
2. Position this firm, compute ratio (100)/(101) — mean, std. dev.

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