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INDUSTRIAL CAPITAL UTILIZATION IN THE PHILIPPINES

by

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Romeo M. Bautista*

I. Postwar Economic Development

The Philippines shares with several other contemporary LDCs a development performance in the postwar period that is fairly impressive using the conventional yardstick of aggregate output growth but can stand substantial improvement when assessed in other ways. Based on official estimates, net domestic product has increased during 1949-1973 at an average annual rate of 6.2 per cent in real terms. Taking into account the country's rapid population growth, the average rate of increase in NDP per capita is slightly higher than 3 per cent. Estimated national income per capita in 1973 is 1,427 pesos, which at the prevailing exchange rate (1 U.S. dollar = 6.7 pesos), is equivalent to $213.

Table 1 gives data on overall and sectoral growth rates of net domestic product during subperiods within 1949-1973. The economy is seen to have grown markedly faster in the 1950s, NDP increasing at an average rate of 7.6 per cent per annum from 1949 to 1961. Rates of output increase in manufacturing, services and agriculture were particularly higher than the corresponding values in the 1960s, the latter period

TABLE 1: Average sectoral growth rates of net domestic product (1967 prices) in the Philippines, 1949-1973, in per cent

Sector	1949-53	1953-57	1957-61	1961-65	1965-69	1969-73	1949-73
Agriculture	7.59	4.49	8.17	3.98	5.10	2.06	5.23
Manufacturing	14.05	11.05	7.41	4.80	7.00	7.95	8.71
Services	8.82	7.88	8.56	4.70	3.63	4.30	6.32
Other Sectors	7.51	3.65	4.91	6.08	4.16	7.18	5.58
N D P	6.68	6.92	7.34	4.40	4.85	4.99	6.20

SOURCE: Basic data obtained from the National Economic and Development Authority, Manila.

also showing a significant decline in the annual growth rate of NDP to less than 5 per cent. On the whole one would still consider the postwar output performance of the Philippine economy to be quite respectable for a small country that has just emerged from more than four centuries of colonial rule.

In the face of such substantial increases in national income over the years, however, there has not taken place a wider sharing of the benefits of economic development. As evidenced by the large inequality in family incomes which does not show any sign of improvement (cf. Table 2), the uneven pattern of Philippine development has provided economic gains to only a relatively small segment of the population. This would seem intimately related to another disturbing observation that has engaged the attention of social scientists and policymakers in recent years, namely, the severe underutilization of the labor force. While the proportion of openly unemployed workers has decreased and the average number of hours worked increased slightly, underemployment (both "visible" and "invisible", using standard labor force terminology) and real wages have not improved generally and in certain sectors have even worsened.[1/] There has also been a continuing problem of widespread educated unemployment and underemployment, educational policy efforts in this direction culminating recently in the implementation of a Presidential Commission recommendation to restrict entry to college

TABLE 2: Size Distribution of Family Incomes in the Philippines

	Percent of total family income:			
	1956	1961	1965	1971
Top 5 per cent	27.7	29.0	28.7	24.3
Top 10 per cent	39.4	41.0	40.0	36.9
Top 20 per cent	55.1	56.4	55.4	53.9
Top 40 per cent	74.9	75.7	75.6	75.0
Middle 40 per cent	20.6	20.1	20.9	21.1
Bottom 20 per cent	4.5	4.2	3.5	3.8
Gini coefficient	.48	.50	.51	.49

SOURCE: Basic data from the BCSSH Family Income and Expenditure Surveys: 1956, 1961, 1965, 1971.

education. Employing the recently developed ODA - CAMS labor force utilization framework which takes into account open and "passive" unemployment, worker productivity and mismatch of occupation and education, Hauser calculates that about one-half (50.4 per cent) of the Philippine labor force in 1968 is utilized inadequately.[2/]

The failure of postwar output expansion in the Philippines to stimulate the demand for labor commensurately is in part related to the changes in economic structure that have taken place. Thus, among the seven major industrial categories in the national accounts, the relatively more labor-intensive sectors, viz., agriculture, construction, transportation and commerce,[3/] showed lower rates of output growth over most of the postwar period. Moreover, the degree of sectoral labor use, measured by the ratio of employment to value added, has changed over the years in the direction of lower relative utilization of labor.[4/] The shift in the distribution of employment over time to the relatively less labor-using sectors is evident from Table 3.

Given the labor-surplus character of the Philippine economy, it is also paradoxical, at least on surface, that export industries with lower direct and indirect labor content have expanded their share of total exports relative to the more labor-using ones.[5/] Finally, within the manufacturing sector where much hope has been attached for the alleviation of the

TABLE 3: Sectoral Employment Distribution in the Philippines, 1956-1972

Sector	1956		1959		1962		1965		1968		1972	
	Thousand	Percent	Thousand	Percent	Thousand	Percent	Thousand	Percent	Thousand	Percent	Thousand	Percent
Agriculture	4,548	59.4	5,298	62.0	5,898	61.6	5,725	56.9	5,631	54.0	6,794	54.0
Mining	31	0.4	35	0.4	40	0.4	24	0.2	43	0.4	56	0.4
Manufacturing	962	12.6	992	11.6	1,052	11.0	1,101	11.0	1,234	11.8	1,319	10.5
Construction	198	2.6	210	2.5	236	2.5	295	2.9	342	3.3	402	3.2
Transport, etc.	254	3.3	271	3.2	316	3.3	361	3.6	399	3.8	547	4.3
Commerce	803	10.5	811	9.5	911	9.5	1,114	11.1	1,130	10.8	1,497	11.9
Service	859	11.2	921	10.8	1,123	11.7	1,435	14.3	1,658	15.9	1,975	15.7
TOTAL	7,655	100.0	8,538	100.0	9,576	100.0	10,055	100.0	10,437	100.0	12,590	100.0

SOURCE: BCSSH Labor Force Series, various issues.

Philippine employment problem, postwar development performance has also been adverse to labor absorption in terms of the shifts in industrial and size structure favoring lower relative labor use. To a large extent these changes were brought about by the trade and industrialization policies adopted during the period.

2. Economic Policies and Industrial Performance

Postwar policy efforts in the Philippines to encourage manufacturing has entailed effective discrimination in resource allocation against agriculture and other production sectors of the economy. Furthermore, the benefits provided by the industrialization policies have gone mostly to industries producing import-substituting consumer goods and to a lesser extent intermediate goods. Production of export manufactures has not received as much policy incentives, nor have industries producing capital goods.

Import substitution as an industrialization strategy began in the Philippines in late 1949 when controls on imports and foreign exchange were instituted as an ad hoc response to a balance of payments crisis. At the same time that the overvalued currency was being protected, the allocative function inherent in a system of trade controls provided an effective means of influencing the pattern of industrial development. The criterion of "essentiality" in foreign exchange allocation and import control created a strong bias toward the local production of substitutes for finished industrial consumer goods, imports of which were considered inessential, while the raw material and physical capital needs of these industries were liberally imported at artificially low prices (in terms of the domestic currency). This is reflected in Table 4,

TABLE 4: Philippine imports classified according to end-use, in per cent

Classification	1949	1953	1957	1961	1965	1969	1972
Consumer goods	37.3	20.3	16.8	15.8	18.5	9.6	9.4
Durable	2.4	1.5	1.0	0.9	0.9	0.9	0.4
Non-Durable	34.9	18.8	15.8	14.9	17.6	8.7	9.0
Producer goods	62.7	79.7	83.2	84.2	81.5	90.4	90.6
Mach. & Equipt.	9.9	10.1	11.2	18.3	18.8	21.5	16.0
Raw materials	42.6	51.6	57.4	58.8	57.3	64.5	69.5
Supplies	10.2	18.0	14.6	7.1	5.4	4.4	5.1
Total Imports							
Per cent	100.0	100.0	100.0	100.0	100.0	100.0	100.0
$ Million	585.9	452.4	613.3	611.3	807.6	1131.5	1229.6

SOURCE: Central Bank of the Philippines, Department of Economic Research

which shows the composition of Philippine imports shifting toward "essential" producer goods at the expense of consumer goods through the 1950s.

As indicated in Table 1, there was rapid industrial growth until the late 1950s, manufacturing value added (at constant prices) increasing at an average annual rate of 12.6 per cent from 1949 to 1957. This is explained by the sudden profitability of manufacturing investment as a result of the protective walls newly set up against foreign competition. In the second half of the decade, however, saturation of the domestic market for import-replacing industrial consumer goods became increasingly evident. At the same time the limit to the rising share of producer goods in the import bill was being approached, exhausting the elbow room provided previously by "inessential" imports (cf. Table 4). The result was a sharp deceleration in manufacturing growth beginning 1957. This was attended also by a weakening trade balance on account of the heavy dependence on imports of the evolving industrial structure and, as may be discerned from Table 5, the increasing inability of the traditional exports to expand foreign exchange earnings sufficiently.

Continuing deterioration of the balance of payments left the authorities no option but to rationalize the unrealistic exchange rate, instituting a multiple rate system which effectively devalued the domestic

TABLE 5: Principal exports of the Philippines, 1949-1973, in per cent of total exports

Commodity	1949	1953	1957	1961	1965	1969	1973
Logs and lumber	1.3	7.2	10.4	18.4	21.0	26.4	18.3
Copra	36.1	29.3	30.6	17.6	22.1	10.2	7.1
Sugar (centrifugal and refined)	18.2	24.0	19.2	28.2	17.7	17.5	15.4
Coconut oil	7.0	4.2	4.9	3.2	8.8	5.9	8.4
Copper ores and concentrates	1.0	0.8	3.5	5.4	6.0	15.5	15.7
Plywood	0.0	0.0	0.5	1.6	2.2	2.2	3.0
Dessicated coconut	7.8	3.9	3.3	2.9	2.6	1.8	1.8
Abaca	11.6	9.7	9.0	5.7	3.1	1.6	1.3
Canned pineapple	2.7	2.7	1.0	2.1	1.1	2.0	1.1
Copra cake and meal	1.5	0.9	0.9	0.8	1.5	1.0	1.2
Bananas	0.0	0.0	0.0	0.0	0.0	0.1	1.5
Total principal exports	87.2	82.7	83.3	85.9	86.1	84.2	74.8
Per cent	217.1	331.7	361.7	431.3	666.0	724.1	1345.5
$ Million							
Total exports	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent	247.8	398.2	431.1	499.5	768.4	854.6	1788.0
$ Million							

currency in import transactions at the same time that foreign exchange and other import controls were being gradually lifted. In 1962 the peso was made freely convertible at the market rate, formal devaluation from 2 to 3.9 pesos per U.S. dollar taking place in 1965.

Industrial growth was hampered apparently by these changes in trade policy, at least in the transition. From Table 1 we find the growth rate of manufacturing value added at its lowest value during 1961-1965. It picked up after 1965, however; this is attributable in part to the increased government expenditure and other inflationary policies in the second half of the sixties.

As argued by Power and Sicat,[6] the policy reforms did not alter very much the incentive structure favoring import-substituting industries that produce consumer goods only at the finishing stages. The import restrictions and currency overvaluation of the 1950s were merely replaced by a highly protective tariff system (instituted in 1957 but was made redundant by the import controls) with a "cascading" structure serving to maintain the qualitative biases of the predecontrol period against backward integration and export expansion. They surmised however that some slight improvement in resource allocation has taken place, the lifting of import controls also permitting a fuller utilization of resources.

By the end of the 1960s the economy was facing again a balance of payments crisis, precipitated by the need to service short-term foreign credit which financed the trade deficits of the second half of the decade and the increased liquidity occasioned by the 1969 election spending. The peso was floated in early 1970, the exchange rate moving to about 6.4 pesos per U.S. dollar by the end of the year. Domestic prices rose sharply, which is understandable in view of the absence of import liberalization measures following the devaluation (import quotas and bans were reimposed in the late sixties, albeit not as extensively as in the 1950s). A new tariff schedule took effect in January 1973 but which even increased the level of protection generally and in particular for "inessentials".[7] With wages lagging behind prices, there was increasing profitability in manufacturing production, especially among import-replacing and export-oriented industries. This would seem to explain the continuing acceleration of industrial growth through 1973 (cf. Table 1).

On the whole Philippine manufacturing has had a fairly satisfactory output performance during the postwar period. Indeed, the average annual growth rate of value added over 1949-1973 is highest in manufacturing among the broad industry categories given in Table 1, where it is also seen that manufacturing has been the leading sector throughout the period except the first half of the sixties. Evaluated in terms of its contribution to employment generation, however, manufacturing

growth in the Philippines would register a very low score. From Table 3, for instance, the share of manufacturing to total employment has remained roughly constant at about 12 per cent over the years, notwithstanding the sector's relatively faster growth of output. Moreover, the bulk of the industrial labor force has remained in the "unorganized" subsector characterized by low labor productivity and a high incidence of underemployment.8/ The concentration of industrial growth in the Philippines has been in "organized" manufacturing, but even here postwar changes in the industrial and size composition and in technology choices have not been conducive to greater absorption of labor.

Production in the more labor-using industries, e.g., furniture, footwear, leather products, wood products and printed materials, has not grown as rapidly in the postwar period as in the rest of organized manufacturing, as evidenced by the declining relative contribution of these industries to total manufacturing value added (cf. Table 6). The effect on the pattern of industrial growth of the policy bias toward import-substituting industries would seem also reflected in the changing composition of manufacturing value added. Until 1962, for instance, such industries as textiles, paper products, leather products, transportation, equipment, machinery and electrical equipment which cater mainly to the domestic market have expanded relatively faster. These products are mainly import-replacing consumer goods (durable and nondurable).

TABLE 6: Distribution of value added (at constant prices) in organized manufacturing in the Philippines, in per cent

ISIC Number	Name of Industry	1948	1956	1959	1962	1965	1968	1971
311, 312	Food manufactures	30.8	30.1	29.4	31.4	25.0	23.8	23.6
313	Beverages	25.1	9.2	8.3	8.0	19.6	8.1	9.6
314	Tobacco products	4.7	5.4	4.5	4.5	5.4	6.3	5.4
321	Textile products	2.6	3.8	4.8	5.8	6.1	7.2	7.4
322, 324	Footwear and wearing apparel	6.6	6.5	5.1	2.9	2.6	2.4	1.6
323	Leather products	0.2	0.4	0.3	0.4	0.3	0.3	0.2
331	Wood products	9.7	4.6	4.1	4.5	5.1	5.6	4.9
332	Furniture and fixtures	1.8	1.1	0.9	0.7	0.8	0.6	0.5
341	Paper and paper products	0.0	1.5	1.8	1.8	2.3	2.8	2.7
342	Printed materials	3.7	3.4	3.3	2.5	3.9	3.0	2.5
351, 352, 356	Chemicals	2.9	8.9	8.9	8.2	10.5	11.8	12.8
355	Rubber products	0.6	0.9	4.0	3.0	2.7	2.8	2.1
361, 362, 369	Non-metallic mineral products	2.1	3.6	3.4	4.0	5.2	5.2	5.4
371	Iron and steel	1.9	0.8	1.5	1.5	2.1	2.3	2.5
372, 381	Other metal products	1.9	3.9	4.0	3.7	4.6	4.0	3.2
382	Machinery, except electrical	0.5	1.6	1.4	1.6	0.6	0.9	0.8
383	Electrical machinery and equipment	0.5	1.0	3.5	4.2	4.2	3.3	3.1
384	Transportation equipment	1.0	5.1	3.7	4.1	3.6	3.6	2.7
353, 385, 390	Miscellaneous manufactures (includes petroleum products)	5.7	8.2	7.1	7.2	5.4	6.0	9.0
	All manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: S.C. Umaña, "Growth of Output of Philippine Manufacturing, 1902-1960", paper presented in the Conference on Growth of Output in the Philippines, December 9-10, 1966, Los Baños, Laguna; BCS Annual Survey of Manufactures, 1969 and Annual Survey of Manufactures, 1971, Manila.

In the subsequent "decontrol" period industries producing chemicals, iron and steel and nonmetallic mineral products show markedly higher shares in total manufacturing value added, suggesting that import substitution has moved on to intermediate goods. Until very recently, export manufactures have been effectively discriminated against by postwar economic policy and, as indicated earlier, their expansion has been favored only in the more capital-intensive industries.

As regards shifts in size structure and technology choices in organized manufacturing, recent studies[9/] indicate that the inherently more capital-using large establishments have increased production far more than small-scale manufacturing, especially in the control period 1956-1962. Value added in the former group has increased more than six-fold from 1956 to 1971, while that for small establishments merely doubled. Particularly with respect to large-scale manufacturing, there has been an apparent shift during most of the postwar period toward less labor-using production techniques and products. Such nature of industrial development as shaped by the economic policies adopted serve to explain the fact that organized manufacturing employment in the Philippines grew at an average annual rate of only 5 per cent from 1956 to 1971 despite the observed increase in value added (at constant prices) of about 9 per cent per annum.

3. Capital Utilization Rates in Philippine Manufacturing

Increasing the utilization rate of existing industrial capital offers a potentially inexpensive means of raising both output and employment in the LDCs. Such possibility has not been given much recognition in past Philippine economic policy despite the very real need, as should be clear from the discussion above of the character of postwar economic development, to implement measures that could contribute to the growth of national income as well as to the absorption of idle workers into productive employment.

Analytical studies of Philippine economic development likewise have been concerned mainly with the allocative effects of economic policies adopted, surprisingly little attention being paid to the possible consequences on the extent of capital use across industries and over time.[10/] Two sources-of-growth studies à la Denison-Solow, for instance, fail to mention possible changes in capital utilization as a source of bias in their estimates of the contribution of capital accumulation to Philippine manufacturing growth.[11/]

That the possibilities of greater utilization of installed capital as a source of industrial output and employment growth have been largely neglected in the Philippines could perhaps be attributed to a dearth of information on capital utilization rates in Philippine manufacturing cross-

sectionally and temporally. Indeed, apart from some occasional surveys by certain government agencies on a few industries and one comprehensive survey for 1961 conducted by the present writer some time ago,[12] there has not taken place any systematic collection and publication of primary data on the extent of industrial capital use in the Philippines. The capital utilization survey for the year 1972 of 400 manufacturing establishments undertaken in the present study is therefore long overdue in terms of providing through its results a possible data base for considering policy changes to reduce the capital wastage entailed in any observed underutilization of installed machinery and equipment.

3.1 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 idle entirely during Sundays and holidays (at least 62 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 and intensity of use that the plant is in operation, 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 7 and 8, which show average capital 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

TABLE 7: 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	Capital Weighted mean of CURs
311	76	Food manufactures	42.99	22.60	51.24
312	20		47.27	28.72	65.62
313	21	Beverages	40.04	26.28	49.52
314	20	Tobacco manufactures	26.41	18.76	46.67
321	33	Textiles	57.93	24.25	70.92
322	10	Wearing apparel	38.51	24.34	63.00
323	3	Leather products	24.29	9.30	28.01
324	5	Footwear	14.96	8.15	17.54
331	26	Wood and wood products	35.31	24.78	62.54
332	7	Furniture and fixtures	35.72	9.01	35.56
341	11	Paper and paper products	51.84	22.83	67.82
342	11	Printing and publishing	40.87	21.32	53.35
351	13	Basic chemicals	53.62	27.94	67.27
352	30	Other chemicals	32.29	21.67	47.51
353	3	Petroleum refineries	67.49	14.66	65.23
355	11	Rubber products	37.70	25.41	59.82
356	4	Plastic products	37.93	5.24	38.36
361	3	Pottery, etc.	39.01	13.36	49.66
362	6	Glass and glass products	46.01	34.36	64.26
369	21	Other non-metallic mineral products	57.72	30.74	77.55
371	7	Iron and steel	50.19	18.93	55.33
372	4	Non-ferrous metal	34.94	7.62	34.91
381	18	Other metal products	36.18	17.27	36.37
382	8	Machinery	31.38	17.73	56.00
383	11	Electrical machinery	37.99	28.71	42.21
384	9	Transport equipment	23.88	4.06	26.48
385	3	Scientific equipment	63.64	31.16	70.10
390	6	Other manufacturing	29.13	16.70	39.41

TABLE 8: 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

Table 8: Average Capital Utilization Rates ...

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
35.29	4	Chemical products, n.e.c.	45.50	24.06	40.15
35.30	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
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

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[13/] 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 8, 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 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.[14] 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).

3.2 Estimates of Utilization Rates for 1972 from Supplementary Survey on Electricity Data

What may be called simply the "electricity measure" of capital utilization represents a frequently used approximation of the proportion of time that installed machinery and equipment are in operation by the relative extent of electric motor use. It requires data on actual consumption of electric energy and the rated capacity of installed electric motors with appropriate adjustment relating to the conversion of electrical into mechanical power. Murray Foss first applied this measure to the U.S. economy for the years 1929, 1939, and 1954 in his comparison of prewar and postwar capital utilization.[15] The same method was used subsequently, among others, by Jorgenson and Griliches for U.S. manufacturing in 1954 and 1962, and by Kim and

Kwon for South Korean industries over the period 1962-1971.[16/]

The chief virtue of the electricity measure is the relative ease with which one can obtain the required data for the estimation of the capital utilization rate. Information on electric energy consumption and installed electric motor capacity is generally available with industrial breakdown from published sources reporting the results of periodically conducted manufacturing censuses or even annual surveys. In the Philippines the two postwar censuses of manufactures undertaken in 1961 and 1967 provide the necessary data up to the 4-digit ISIC (old) level of disaggregation. Such information, however, are not solicited in the Annual Survey of Manufactures (ASM). If it can be shown that the electricity measure does proxy reasonably well for the time-intensity utilization of installed machinery and equipment, then a strong case might be made for the ASM to provide supplementary electricity data (entailing very low additional cost) and become an annual source of information on industrial capital utilization in the Philippines.

In seeking to establish, if at all possible, a link between the electricity and time-intensity measures of capital utilization, we follow closely the widely used method of computing the utilization rate of installed electric motors by comparing the amount of electric energy actually consumed with the maximum amount, i.e., with continuous

operation of the electric motors, for any given year. The electricity measure is commonly represented by the following formula:[17]

$$U^m_{it} = \frac{E^m_{it} \times 100}{C_{it} \times 8760 \div 0.90}$$

where

U^m_{it} = electric motor utilization rate in plant (industry) i in year t, in per cent

E^m_{it} = amount of electric energy consumed by electric motors in plant (industry) i in year t, in kilowatt-hours

C^m_{it} = rated capacity of electric motors in plant (industry) i in year t, in kilowatts

8760 is the number of hours in one year and 0.90 is the efficiency of electric motors on the assumption that 10 per cent of the electric energy input is dissipated in the form of heat.

The rationale for using this measure as proxy to the proportion of time worked by machinery and equipment "is that electricity is the dominant source of energy in modern manufacturing; and to learn how intensively the electric motors are worked is to know how intensively the machinery driven by the electric motors is operated".[18] It would seem an empirical matter to test whether such premise is valid, however.

Our source of information in the derivation of the electricity measure at the establishment level is our own mailed questionnaire

survey which supplemented the earlier interviews with plant managers for the determination of the CUR measure based on time and intensity of capital use. Of the 400 "large establishments" (employing 20 or more workers) to which the supplementary survey questionnaire was sent, only 271 replied -- from which in turn 209 replies were found usable.[19] None of the latter provided a breakdown of electricity consumption into electric motor use and others, i.e., only the last line of the questionnaire form (cf. Appendix A) was fully answered.

Our survey data consist therefore of the rated capacity of electric motors[20] and actual consumption by the entire plant of electric energy (purchased and self-generated). To obtain the amount consumed by electric motors alone, we used the estimates given by Foss and Kim and Kwon of the percentage of total electricity consumption contributed by motors among the different industries.[21]

Computed values of the electric motor utilization rate U^m by establishments, arranged according to their 3-digit ISIC categories are presented in Appendix B. Also shown are the corresponding CUR estimates obtained from the original survey, and average U^m and CUR values for each 3-digit industry. The industrial CUR values derived from these subsets of establishments turn out to be very close to the actual values observed for each industry from the original random sample of 400 firms (cf. Table 7). It seems safe to assume, therefore that the electric motor

utilization rates are representative values across 3-digit industries. There are 25 industries which are included in the table; the missing ones, viz., ISIC 353, 372, 385, and 390, are not represented by at least three firms responding to the survey on electricity data.

The first observation to make is that the computed utilization rates of electric motors generally understate the time-intensity utilization of installed machinery and equipment. The difference between the two values is quite significant in most cases, as is evident from a visual comparison of the industrial averages. Only 7 of the 209 responding establishments show a higher U^m than the CUR, and they are noticeably operating at relatively lower utilization levels.[22/]

Two reasons may be cited for any observed divergence of electric motor utilization from the extent of actual capital use. One is the existence of other primemovers in the plant which are being operated more or less intensively than the installed electric motors. In sugar mills, for instance, heavy machineries like cane crushers and rollers are usually being driven by steam engines and turbines rather than by electric motors. Another reason is that some manufacturing plants have major pieces of equipment which require for their operation direct heat input rather than mechanical or electrical energy. The burning section (kiln) in cement manufacture, furnaces in the metal

industries and ovens in food manufacturing are examples of such equipment the operation of which is not governed by the actual use of electric motors in the plant.

Since industries vary in the relative significance of electric motor use vis-a-vis other primemovers and direct heat-using equipment, there will exist industrial differences in the relationship between the electricity and time-intensity measures of capital utilization. Having observed from Table 9 that U^m is generally lower than CUR, one could make the inference that equipment and machinery not coupled to electric motors are being operated a greater proportion of the time in Philippine manufacturing. As is to be expected, however, the discrepancies vary across industries, and to a lesser extent across firms under the same 3-digit industry.

From the last line of Appendix B, average utilization rate of electric motors is seen to be nearly three times that of installed machinery and equipment in "all manufacturing". If something similar holds true in South Korea and the United States, then the interpretation and use of the electricity measure to represent the level of capital utilization as done in the studies cited earlier are inappropriate. However, its usefulness in representing temporal changes in the extent of capital use in specific industries is not necessarily invalidated.

That the industrial pattern of capital utilization is also not reflected fully in the interindustry variation in electric motor utilization rates seems clear. Thus, looking at the industry averages, one finds ISIC 371 (Iron and steel) and 341 (Paper and paper products) to have the fourth and fifth highest CUR, respectively, among the 25 3-digit industries entered but which are placed close to the bottom end of the U^m spectrum. More generally, the Spearman rank correlation between U^m and CUR is computed to be .483, indicating no marked correlation. Industries with relatively low ratios (from 1.8 to 2.3) of CUR to U^m are ISIC 324 (Footwear), 313 (Beverages), 361 (Pottery, etc.) and 322 (Wearing apparel), while those showing relatively high values (from 4.0 to 6.3) are ISIC 323 (Leather and leather products), 371 (Iron and steel), 341 (Paper and paper products) and 362 (Glass and glass products).

Our primary interest is in determining whether the electricity measure could be linked with the time-intensity measure of capital utilization. We use here the standard least squares method to correlate paired observations on the sampled establishments of the electric motor utilization rate and time-intensity CUR as listed in Appendix B. A priori considerations mentioned earlier and the above observation of industrial differences within manufacturing in the relationship between the utilization rates of electric motors and installed capital suggest the adoption of as detailed a sectoral breakdown as possible. The industrial

distribution of the responding firms allows the estimation of the empirical relationship between the two measures for the 2-digit categories and also for some more disaggregative industries. The results of the regressions are given in Table 9.

It is evident from the table that there exists a strong correlation between electric motor utilization rate and time-intensity CUR among establishments in the same 2-digit industry group. The values of the t-statistic indicate significance of the regression coefficients at the 5 per cent level, except in the regression for ISIC 37 which involves only five observations. Likewise the results for the finer industry categories considered imply statistical significance of the correlation. The low explanatory power of the regression for certain industries (e.g. ISIC 3118 and 35) is presumably due to the neglect of the other influences on CUR touched upon earlier. As a final remark on the content of Table 9, the differing values of the regression coefficients and test statistics across industries serve to confirm the earlier observation of heterogeneity within the manufacturing sector in the relationship between the electricity and time-intensity measures of capital utilization.

Several things need to be pointed out concerning the possible use of the estimated equations as a means of linking the utilization of electric motors to the extent of industrial capital use. First, these

TABLE 9: Estimated Equations from Regressions of Time-Intensity CUR on Electric Motor Utilization Rates

Industry	No. of plants	Equations	t-value of regression coefficiant	correlative coefficient
ISIC 31	71	$CUR = 14.79 + 1.570\ U^m$	7.21	.656
32	24	$CUR = 9.66 + 1.811\ U^m$	6.44	.809
33	16	$CUR = 14.95 + 1.637\ U^m$	4.57	.774
34	14	$CUR = 21.34 + 2.231\ U^m$	4.27	.777
35	37	$CUR = 25.09 + 1.430\ U^m$	3.66	.525
36	16	$CUR = 20.88 + 1.668\ U^m$	5.67	.834
37	5	$CUR = 17.50 + 8.310\ U^m$	2.29	.798
38	26	$CUR = 6.99 + 2.076\ U^m$	5.37	.739
ISIC 311	20	$CUR = 6.66 + 1.965\ U^m$	3.97	.684
3118	17	$CUR = 35.44 + .698\ U^m$	2.14	.484
312,313,314	34	$CUR = 11.20 + 1.771\ U^m$	4.74	.642
321	14	$CUR = 15.77 + 1.780\ U^m$	4.71	.806
331	12	$CUR = 11.42 + 1.763\ U^m$	3.81	.770

equations are based on a relatively small proportion of manufacturing establishments operating in 1972 (about 10 per cent). Although this is not saying that the data used are unrepresentative of the industry groups considered, one has to exercise caution in interpreting the results from a small information base. It should also be noted that the estimated equations have been derived from cross-section data for one particular year. Their validity for temporal analysis of industry aggregates would depend on whether the intra-industry relationships are stable over time. Lastly, we have used only the simplest of possible specifications in (a) assuming a linear form of the regression and (b) abstracting from factors affecting the time-intensity of capital utilization other than the rate of electric motor use.

The foregoing qualifications would best be accommodated in future detailed studies of individual industries that will place the quantitative relationship between the two measures of capital utilization in the context of the evolving technological characteristics of each industry over time. Until such in-depth studies are actually undertaken, however, our present findings would seem to provide a reasonably sound basis for transforming the relatively easily available electricity data into a meaningful measure of industrial capital use.

3.3 Electric Motor Utilization Rates from Census Data, 1961 and 1967

The electricity measure could be used to examine possible changes in capital utilization rates by industry, availability of the necessary data allowing one to derive electric motor utilization rates in Philippine manufacturing for the economic census years 1961 and 1967. This is attempted in the present section together with a comparison with the 1972 estimates derived in Section 3.2; however, as will be made clear below, the poor quality of the published data renders the results of any such attempt highly tentative. Our objective here is in large part to provide an assessment of the reliability of available electricity data for use in the temporal analysis of capital utilization in Philippine manufacturing industries, which in turn will serve as point of departure for later discussion of the improvement of statistical data gathering and publication.

Roughly 80 per cent of the 4,085 manufacturing establishments classified in the 1961 economic census as "large" (employing ten or more workers) have reported electricity data, the proportion varying significantly across 4-digit ISIC industries. The amount of electric energy consumed is provided, "obtained by deducting the quantity sold from the sum of the quantity purchased and generated by each reporting establishment".[23/] Data on electric motors consist of the number of units

and total rated horsepower. The Economic Census of 1967 provides the same set of relevant data as the 1961 Census, except that the amount of purchased electricity rather than total electricity consumption is reported.[24] In the absence of more recent information, we made the necessary adjustment using the 1961 ratio of total electric energy consumed to the amount purchased by each 4-digit industry.

Computations were made initially at the 4-digit level, the results revealing some absurd values. Specifically, the following industries showed values of the computed electric motor utilization rate greater than 100 per cent: ISIC 3114, 3117, 3119, 3233, 3513, 3720, 3812, 3844 and 3849 -- nine altogether using 1961 data; and ISIC 3114, 3117, 3121, 3140, 3233, 3320, 3513, 3523, 3812, 3831, 3841 and 3844 -- a total of twelve industries on 1967 data.[25] On the basis of this observation alone, one can already say that inaccuracy in the reported data prevailed to a significant degree in both censuses, at least among the 4-digit industries mentioned.

What we have done is discard the data that are patently questionable, mainly due to the suspected lack of correspondence in establishment coverage between the electricity consumption data and rated capacity of installed electric motors by industry. From the pre-screened set of electric motor utilization rates at the 4-digit level, averages for

3-digit industries were obtained using value of fixed assets as weight. The results are presented in Table 10 for the two census years. Immediately apparent is the significant change in utilization levels that seem to have taken place in several industries from 1961 to 1967. For the manufacturing sector as a whole, however, the observed change in electric motor utilization rate is quite small (cf. last line of the table).

Among the 3-digit industries showing increased utilization, ISIC 313 (Beverages), 321 (Textiles), 351 (Basic Chemicals) and 362 (Glass and glass products) have had the most significant gains. On the other hand, the following industries appear to have suffered most from increased underutilization: ISIC 341 (Paper and paper products), 331 (Wood and wood products) and 322 (Wearing apparel). There are quite a few industries that show little change in electric motor utilization rates from 1961 to 1967; some examples are ISIC 353 (Petroleum), 361 (Pottery, etc.), 383 (Transport equipment) and 390 (Other manufacturing), in each of which the utilization rate has changed by less than one percentage point.

In comparison with the findings of our survey on electricity data for 1972 as presented in the preceding section, the utilization rates computed from the 1961 and 1967 Census data are seen to be substantially higher in certain industries as well as in the overall. The food,

TABLE 10: Computed Electric Motor Utilization Rates from Census Data, in per cent

ISIC No.	Name of Industry	1961	1967
311 - 312 (exc. 3118)	Food manufactures except sugar	24.0	26.7
3118	Sugar	25.2	31.8
313	Beverages	28.6	38.6
314	Tobacco manufactures	12.6	*
321	Textiles	27.1	41.1
322	Wearing apparel	19.1	9.3
323	Leather and leather products	7.4	5.3
324	Footwear	8.3	5.0
331	Wood and wood products	26.0	15.2
332	Furniture and fixtures	28.6	*
341	Paper and paper products	52.4	39.4
342	Printing and publishing	14.2	13.0
351	Basic chemicals	17.5	28.0
352	Other chemicals	11.6	7.8
353	Petroleum refineries	14.3	13.7
355	Rubber products	23.2	21.8
356	Plastic products	16.2	10.5
361	Pottery, etc.	13.2	13.8
362	Glass and glass products	27.1	35.9
369	Other non-metallic mineral products	14.2	18.0
371	Iron and steel	15.9	18.7
372	Non-ferrous metal	*	11.1
381	Other metal products	17.3	20.6
382	Machinery	11.8	13.9
383	Electrical machinery	18.9	19.6
384	Transport equipment	11.3	9.9
385	Professional and scientific equipment	18.7	10.5
390	Other manufacturing	10.5	9.6
	All manufacturing	19.1	18.8

*Census data deemed unreliable.

paper, rubber, glass and metal industries are some important examples. In a few industries, however, the utilization rates in 1972 are roughly equal to, if not actually higher than, those computed for 1961 and 1967.

Ignoring the possibility that the three sets of utilization rate estimates may not be comparable because of the observed deficiencies in Census data,[26] one would infer that the manufacturing sector has not availed of the opportunities offered by increased utilization of installed machinery and equipment as a source of output growth. If anything, the utilization estimates indicate an appreciably greater underutilization of existing capital in 1972 compared to the earlier years 1961 and 1967. Further work seems warranted that will improve the data base for the investigation of past changes in industrial capital utilization in the Philippines beyond what we have done in the present study.

4. Determinants of Time-Intensity Capital Utilization

Proper understanding of the existence of substantial excess capacity observed above in Philippine manufacturing can be gained only by due consideration of the factors influencing the decision of producers to underutilize installed machinery and equipment. Such knowledge would seem a necessary precondition to the improvement of policy to induce greater utilization of industrial capital. In this section we inquire into the reasons for the observed pattern of capital utilization using both quantitative and qualitative information elicited from the survey interviews. Firstly, alternative specifications of the behavioral relationship explaining the optimal capital utilization rate suggested by a simplified economic model are tested using cross-section data by establishment and by industry at the 3- and 4-digit ISIC levels. Secondly, we examine additional quantitative influences on capital utilization provided by our survey questionnaire data. Finally, as a useful complement to the quantitative data analysis, we look into the non-quantifiable aspects of capital idleness in Philippine manufacturing, describing some reasons for underutilizing installed capital which are peculiar to certain industries.

4.1 Regression Analysis from Economic Model

Assuming fixed, exogenously determined capital-labor service ratio K/L, cost of owning capital P_k, and a time pattern of wage rates

given by $w(1 + \beta(t))$, where w is the basic wage rate and $\beta(t)$ the amplitude of the wage rhythm (in per cent), Chapter 2 above has shown that optimal (desired, planned) capital utilization rate CUR* in a cost-minimizing firm is determined by relative factor prices, capital intensity of the production process and the amplitude of the wage rhythm,[27] i.e.,

$$(1) \qquad CUR^* = f(P_k/w\ ,\ K/L\ ,\ \beta).$$

Ceteris paribus a higher cost of owning capital penalizes capital idleness more and gives disincentive to underutilize the capital stock in order to avoid any given wage differential (e.g., between day and night shifts). The relevant capital cost measure is not the price of a capital service flow but the price of owning a capital stock over a specified period of time -- a cost that is incurred whether it is being used or not.

Capital intensity has also a positive relationship with utilization rate as it determines the relative importance of capital cost to the total cost of further operating the existing capital. More capital intensive processes imply a greater incentive to economize on the larger capital costs through higher utilization. On the other hand, a labor intensive process may require low capital utilization to avoid paying the more important labor costs in night shifts and week-end work.

The relative cost of operating at different times over the production cycle is determined fundamentally by the amplitude of the wage rhythm. Indeed, if $\beta = 0$, a cost-minimizing firm will plan to utilize capital stock fully ($CUR^* = 1$) under the above assumptions. The greater the wage differential, the greater is the incentive ceteris paribus to operate only during low wage periods (e.g., day-shifts).

If we assume that the difference between actual and desired levels of plant utilization is small relative to the variation across plants, eqtn. (1) would suggest a regression specification explaining actual utilization of the following form:

$$\log CUR = a_0 + a_1 \log \frac{K}{L} + a_2 \log \frac{P_k}{w} - a_3 \log \beta . \tag{2}$$

which should yield, under the assumptions of the model estimated values of a_1, a_2 and a_3 greater than zero.

Using our survey data for the 400 manufacturing establishments gives the following regression results:

$$\log CUR = \underset{}{1.2721} + \underset{(1.94)}{.1816} \log \frac{P_k}{w} + \underset{(7.52)}{.1532} \log \frac{K}{L} - \underset{(-3.72)}{.0691} \log \beta_1 \qquad R = .532 \tag{3}$$

$$\log CUR = 1.1997 + \underset{(1.66)}{.2176} \log \frac{P_k}{w} + \underset{(6.21)}{.1734} \log \frac{K}{L} - \underset{(-2.99)}{.0515} \log \beta_2$$

$$R = .509$$

where

CUR = time-intensity capital utilization rate, in per cent

$\frac{K}{L}$ = ratio of fixed assets at replacement cost to the number of day-shift workers, in thousand pesos

$\frac{P_k}{w}$ = ratio of annual cost of owning capital[28] to the average hourly wage rate of production workers

β_1 , β_2 = wage premia on night-shift and Sunday work, respectively,[29] in per cent

and the numbers in parentheses underneath regression coefficients are their t-values.

The signs of the coefficient estimates are as predicted each of the estimated coefficients also seen to be significantly different from zero to at least the 10 per cent level. The values of the coefficient of multiple correlation (R) indicate that less than 30 per cent of the inter-plant variation in capital utilization rates is explained. Among the three explanatory variables entered in the regression equations, the influence of the factor-price ratio appears the most potent in terms of the induced proportionate change in the utilization rate. The factor proportions

variable follows next and is not far behind; either of the two wage premia is observed to have a relatively weaker effect on the dependent variable.

Roughly similar inferences may be made from the results of regressions using average industry values of the capital utilization rate and the explanatory variables at the 4- and 3-digit ISIC levels, which are as follows:

4-digit industries

(4)

$$\log CUR = 1.2464 + \underset{(2.09)}{.1963} \log \frac{P_k}{w} + \underset{(5.63)}{.1704} \log \frac{K}{L} - \underset{(-2.38)}{.0784} \log \beta_1 \qquad R = .633$$

$$\log CUR = 1.1802 + \underset{(1.93)}{.2213} \log \frac{P_k}{w} + \underset{(5.54)}{.1868} \log \frac{K}{L} - \underset{(-1.98)}{.0594} \log \beta_2 \qquad R = .600$$

3-digit industries

(5)

$$\log CUR = 1.2917 + \underset{(2.32)}{.2311} \log \frac{P_k}{w} + \underset{(3.80)}{.1672} \log \frac{K}{L} - \underset{(-2.01)}{.0990} \log \beta_1 \qquad R = .693$$

$$\log CUR = 1.2279 + \underset{(2.13)}{.2483} \log \frac{P_k}{w} + \underset{(3.65)}{.1653} \log \frac{K}{L} - \underset{(-1.82)}{.0525} \log \beta_2 \qquad R = .687$$

The coefficient estimates for the three explanatory variables are slightly larger than those obtained from firm data, except for the

capital intensity variable in the second equation of (4) using 3-digit industry data. There is also a noticeable increase in the R-values as more aggregative data are used, which is understandable in view of the "smoothing out" of extreme interplant variations when industry average values are obtained.

The major implication of these results is that cost factors bear a significant relationship to capital utilization. However, the rather low explanatory power of the regressions indicate that other influences on the utilization decision have been left out.

Before we present the regression results on specifications with additional explanatory variables, it is interesting to pursue the interpretation of the economic model estimated above. Starting off with the recognition that the factor-price ratio is a determinant of factor proportions, we drop the model's assumption of exogeneity of the latter variable. The following relationship explaining the capital-labor ratio is postulated:

$$(6) \qquad \log \frac{K}{L} = b_0 + b_1 \log \frac{P_k}{w} + b_2 \log VA + b_3 CP + b_4 FT$$

where VA is value added (in thousand pesos) used here as a scale variable; CP is a dummy variable which equals one for continuous process industries and zero otherwise; and FT is a dummy for foreign technology taking on a value of one for foreign owned/controlled firms

and zero otherwise. The coefficient for the factor price variable is expected to be negative and those for VA, CP and FT positive.

Our expectation of a significantly positive coefficient for FT has not been borne out by the regression results, suggesting that capital intensity in Philippine manufacturing is not influenced by foreign ownership and management.[30/] The estimated equations below indicate significance of the regression coefficients for the three other explanatory variables, which are also seen to have the correct signs:

Firms

$$(7) \quad \log \frac{K}{L} = .4735 - \underset{(-2.46)}{.2096} \log \frac{P_k}{w} + \underset{(8.45)}{.4453} \log VA + \underset{(6.71)}{.4114} CP \qquad R = .543$$

4-digit industries

$$(8) \quad \log \frac{K}{L} = .1296 - \underset{(-2.74)}{.2264} \log \frac{P_k}{w} + \underset{(5.76)}{.5492} \log VA + \underset{(3.94)}{.5225} CP \qquad R = .736$$

3-digit industries

$$(9) \quad \log \frac{K}{L} = .3085 - \underset{(-3.21)}{.2642} \log \frac{P_k}{w} + \underset{(6.31)}{.5056} \log VA + \underset{(2.74)}{.4821} CP \qquad R = .831$$

Depending on the equation used, the elasticity of factor-service substitution[31] is estimated to be about .21 - .26. Based on average values of the relevant coefficient estimates in eqtns. (3)-(5) and (7)-(9), a net percentage increase in the capital utilization rate of roughly 8.2 per cent can be expected from a 50 per cent increase in the factor-price ratio. This is obtained by subtracting from the direct effect of the change in relative factor prices on the utilization rate (10.80 per cent) the indirect effect due to the induced reduction in the capital-labor ratio (2.62 per cent).

By way of comparison we may examine the effect on the CUR of an exogenous change in either of the two wage premium variables (which, like factor prices, can be considered to be policy-determined). The average values of the coefficient estimates for β_1 and β_2 in eqtns. (3)-(5) are computed at -.082 and -.054, respectively. Thus, the effect on the utilization rate of a 50 per cent decrease in the night wage differential is to raise it proportionately by 4.1 per cent; with a 50 per cent decrease in the wage premium for Sunday work, it is 2.7 per cent.

4.2 Other Quantitative Factors Affecting Capital Utilization

Apart from input prices and factor proportions, certain industry and firm characteristics appear to be related also to the capital utilization

rate. This is suggested by the discussion of survey findings given earlier, where high average utilization rates are shown to be associated with large-scale production, exporting firms, corporations and intermediate products, among others. Regression analysis allows us to examine the significance of these additional influences on utilization in terms of the extent to which they contribute to the explanation of the variation of observed CURs across firms and across industries.

These additional explanatory variables will be represented in our regression analysis as follows:

VA = value added, a measure of size

X = proportion of output exported

MS = market structure variable; 1 for monopoly, 2 for tight oligopoly, 3 for loose oligopoly and 4 for competitive

Dummy variables:

NC = 1 for noncorporations
0 for corporations

WS_1 = 1 for firms paying monthly wages
0 otherwise

WS_2 = 1 for firms paying wages on piece-work basis
0 otherwise

B = 1 for BOI-registered firms
0 for nonBOI-registered firms

A priori considerations and empirical evidence for other countries also provide justification for hypothesizing that these variables are additional determinants of the capital utilization rate. Thus, scale economies in technology and management favor higher capital utilization rates in the larger-sized firms. Particularly in the LDCs, firm size is also positively related to political power which is sometimes necessary to get around problems bearing on utilization, e.g. those involving supply of raw material imports, short-term capital, etc. Exporting enlarges the market and offers a means of removing any demand bottleneck; hence, other conditions the same, export-oriented firms can be expected to utilize productive capacity more fully. In the case of the Philippines and other LDCs with a recent history of import-substituting industrialization policy biasing investment against export industries, the influence of the export variable on the utilization rate should be greater.[32/] Average firm size and export sales have been found to be significant determinants of industrial capacity utilization in West Pakistan.[33/] For South Korean manufacturing industries, the study by Kim and Kwon also indicate significance of the scale variable but not of exports.

Industrial policy could have a strong influence on the degree of market control. The relationship between market structure and capital utilization therefore merits some attention. Our measure of market control

is quite subjective, based as it is on each respondent's own view of the extent of market competition. But it is not necessarily a defect. What may seem unreasonable is the rather arbitrary nature of the (MS) values assigned to the various market categories. This could not be avoided, however.

The survey findings indicate a significantly higher average CUR for corporations compared to non-corporations. It is therefore desirable to allow a shift of the regression plane by introducing a dummy variable that differentiates between these two types of firms. This variable has been considered the most important determinant of capital utilization in Colombian manufacturing.[34/] Greater "professionalism" in management is attributed to the corporate structure which overcomes some of the difficulties of increased shift work inherent with non-corporations.

Simple averaging of utilization levels of firms classified by wage scheme used yields, as mentioned earlier, relatively lower capital utilization among those paying wages monthly and on piecemeal basis. We used four dummy variables to accommodate the alternative wage schemes in the regression and, anticipating the results to be presented shortly, found WS_1 and WS_2 retaining their significant influence on utilization in certain specifications.

The remaining dummy variable in the above list makes a distinction between firms registered and not registered with the Board of Investments (BOI). The average utilization rate of BOI-registered firms in our survey sample is 53.47 per cent, which is significantly higher than that observed for the non-registered firms (37.70 per cent). Use of the BOI dummy (B) in the regressions allows us to examine the importance of BOI benefits (e.g., preferential access to bank loans and import licences) upon capital utilization jointly with the influence of the other variables.

Each specification considered in the regression trials has P_k/w, K/L and either β_1 or β_2 in combination with a subset of the above explanatory variables and others (to be mentioned later) that did not turn out to be significantly related to the level of capital utilization. Regression results with at least one coefficient having a wrong sign for the three "must" variables were rejected. Those having at least two t-values less than 1.64 were likewise excluded. The specifications that passed such screening have each of the above-listed explanatory variables appearing at least once. The following better-fitting specifications illustrate the general pattern of the statistically acceptable regression results:

Firms

$$\log CUR = 1.2180 + \underset{(1.73)}{.1632} \log \frac{P_k}{w} + \underset{(8.44)}{.1810} \log \frac{K}{L} - \underset{(-2.15)}{.0458} \log \beta_1 - \underset{(-2.23)}{.0859} NC - \underset{(-2.00)}{.1232} WS_1 - \underset{(-1.93)}{.1824} WS_2 + \underset{(3.39)}{.1267} B$$

$$R = .572$$

$$\log CUR = .8766 + \underset{(1.82)}{.1712} \log \frac{P_k}{w} + \underset{(6.27)}{.1425} \log \frac{K}{L} + \underset{(4.81)}{.1046} \log VA - \underset{(2.03)}{.0314} \log \beta_2 - \underset{(1.79)}{.1078} WS_1 - \underset{(1.78)}{.1649} WS_2 + \underset{(3.61)}{.1308} B$$

$$R = .581$$

(10)

$$\log CUR = .8545 + \underset{(1.97)}{.1871} \log \frac{P_k}{w} + \underset{(6.97)}{.1574} \log \frac{K}{L} + \underset{(4.47)}{.0979} \log VA - \underset{(1.98)}{.0421} \log \beta_1 + \underset{(2.55)}{.1284} X + \underset{(2.97)}{.1118} B$$

$$R = .580$$

$$\log CUR = .1105 + \underset{(1.90)}{.1706} \log \frac{P_k}{w} + \underset{(9.30)}{.1954} \log \frac{K}{L} - \underset{(2.11)}{.0334} \log \beta_2 + \underset{(3.09)}{.1571} X - \underset{(-1.74)}{.0673} NC + \underset{(2.71)}{.1041} B$$

$$R = .551$$

4-digit industries

$$\log CUR = 1.4391 + \underset{(2.18)}{.2151} \log \frac{P_k}{w} + \underset{(6.01)}{.1924} \log \frac{K}{L} - \underset{(-2.73)}{.1999} \log \beta_I + \underset{(2.60)}{.3445} X - \underset{(-1.94)}{.0441} MS$$

$$R = .685$$

(11)

$$\log CUR = 1.6628 + \underset{(1.86)}{.1772} \log \frac{P_k}{w} + \underset{(6.17)}{.2076} \log \frac{K}{L} - \underset{(-3.94)}{.3064} \log \beta_2 + \underset{(3.00)}{.3984} X - \underset{(-2.15)}{.0612} MS$$

$$R = .692$$

3-digit industries

$$\log CUR = \underset{}{1.4895} + \underset{(3.41)}{.3664} \log \frac{P_k}{w} + \underset{(4.92)}{.2028} \log \frac{K}{L} - \underset{(-2.22)}{.2065} \log \beta_1 + \underset{(1.91)}{.3778} X - \underset{(-2.21)}{.0739} MS$$

$$R = .762$$

(12)

$$\log CUR = \underset{}{1.6955} + \underset{(2.91)}{.2858} \log \frac{P_k}{w} + \underset{(4.97)}{.2097} \log \frac{K}{L} - \underset{(-2.31)}{.2977} \log \beta_2 + \underset{(2.01)}{.4123} X - \underset{(-2.44)}{.0829} MS$$

$$R = .766$$

One interesting observation to make is that the newly-introduced variables do not add very much to the explanatory power of the original specification involving only the factor price ratio, factor proportions and one of the two wage premium variables. The regression results based on firm indicate an increase in the coefficient of determination (R^2) of only about 5 percentage points; using 4-digit and 3-digit industry averages, the increments in R^2 are from 7 to 11 percentage points. As before, higher values of the correlation coefficient are produced in the industry regressions.

When firm data are used, the estimated coefficients of the original explanatory variables are observed to be of the same order of magnitude as in the earlier regressions based on the simplified model. Based on 4-digit and 3-digit industry average data, however, the

regressions yield relatively higher coefficient estimates, particularly for the wage premium variables.

Also noteworthy is the lack of consistency in the significance of the estimated coefficients for the additional explanatory variables as more aggregative data are used. This is apparently due to the varying degrees of intercorrelation among variables at different levels of data aggregation. For instance, value added is shown above to have a highly significant coefficient in the regressions using firm data. The industry regressions, however, fail to produce t-values for the VA coefficient higher than 1.64, which is attributable to the much stronger correlation between K/L and VA at the 3- and 4-digit levels. There is also a noticeable tendency for the dummy variables to drop out in the "good" regression results based on industrial average data, suggesting the heterogeneous nature of 3- and 4-digit industries in terms of firm characteristics represented by the dummies.

What emerges as a consistently significant additional influence on capital utilization is the export variable. The other explanatory variables found significantly related to capital utilization at the firm level are value added and the dummy variables for noncorporations, wages schemes and BOI registration. Based on the estimated coefficients, the corporation dummy shows the weakest influence among the latter

variables. Using industrial average data, the regressions yield statistically acceptable results with exports and market structure as the only additional explanatory variables having coefficients significantly different from zero.

The negative influence on capital utilization of the market structure variable confirms the suggestion given by the pattern of simple CUR averages classified by degree of market control. This would seem to indicate that increasing competition leads to low utilization, attributable in part to the observed overcrowding in certain highly protected industries spawned by trade and industrialization policies of the past. The negative coefficient of MS might have substituted also for the scale effect since VA does not appear in the estimated equation. We tried using a dummy variable for monopoly firms (instead of MS) in line with the significantly higher average CURs observed earlier for these firms. Such regression trials, however, did not produce "good" results using any of the three data sets.

Some explanatory variables that were also tried but did not show significant coefficients in the regression results are: (1) dependence on imported raw materials, measured by the percentage of material inputs that are imported; (2) age of plant, in years; (3) location of plant, by population size grouping; and (4) product end-use. In

regard to (1), it is not so much the mere dependence on imports that forces a firm to underutilize capacity; the more relevant consideration is the extent to which its import requirements are met. The observed invariance of the utilization rate with respect to the proportion of raw materials imported would seem to indicate that the ability of Philippine firms to obtain adequate supply of imported materials bears no relation to the degree of import dependence. Thus, some garment and electronics firms whose products are internationally subcontracted have no problem with respect to raw material imports. Indeed, in recent years, export-oriented firms generally are well placed in the procurement of import requirements.

The lack of significance of the age of plant as an explanatory variable suggests that "building ahead of demand" is not a general characteristic of Philippine manufacturing, establishments reaching planned production levels within a relatively short period. This is supported by the pattern of average CURs of firms classified by age, which is as follows: less than 3-years - 36.13 per cent, between 3 and 6 years - 42.01 per cent, between 6 and 9 years - 43.30 per cent, and over 9 years - 42.08 per cent.

The location of plants likewise does not have an apparent influence on utilization. Since the distinction made is on the basis of

population size, there would seem to be no additional difficulty associated with siting a plant in the outlying areas (of low population density) in terms of say, hiring managerial and skilled labor.[35]

Introducing two dummy variables to differentiate among firms producing consumer, intermediate and capital goods, we found no strong relationship between product end-use and capital utilization. This contradicts what is suggested by the simple averages of firm CURs which, as shown earlier, are relatively higher for firms producing intermediate goods and lower for capital good producers.

4.3 Qualitative Influences on Capital Utilization

As should be evident from the low values of the coefficient of multiple correlation in the regression results, a large part of the inter-plant variation in capital utilization rates is attributable to factors which have not been included in our quantitative analysis. There is need to examine therefore some of the non-quantifiable causes of capital idleness in Philippine manufacturing as disclosed in the survey interviews, paying attention to the peculiarities of certain industries in regard to the prevailing policies and industry characteristics influencing capital utilization.

Firstly, the wide variation across industries in the seasonality of input supply and product demand has not been taken into account. Final consumption goods such as apparel, footwear, furniture and certain food products are demanded in relatively much larger amounts in November and December. Most producers find it necessary to have enough elbow room to handle orders adequately, operating plants at peak levels of production from early October to mid-December. Industries with forward linkage to the construction sector, e.g., cement, lumber (sawmills) and structural metal products, face seasonally low demands during the rainy season which runs from June to August in most part of the country. Seasonal fluctuations in the supply of principal raw materials also affect capital utilization in some agriculturally-based industries, e.g., sugar, rice and corn milling. Sugar cane, for instance, is available in most sugar centrals for five to six months only each year; throughout such milling season the sugar mills are operated 24 hours a day, all equipment and machinery being idle in the nonmilling period except for maintenance check-up.

The influence on capital utilization of the seasonality factor is of course a function of the perishability of the product and installed storage capacity. The survey interviews provided information on these two characteristics, which differ by industry and to a lesser extent by establishment, explaining in part the observed "bunching" of the

regression residuals in certain industries. Thus, actual utilization rates are generally much lower than the "predicted" CUR values in sugar mills, which have a highly perishable principal raw material, while a lower incidence of such large deviations is observed among sawmills, structural metal plants and cement factories with adequate warehousing facilities.

As mentioned earlier, import substitution policy served to promote the growth of intermediate good industries in the latter part of the 1960s. Recall also that these industries generally show higher-than-average utilization rates in 1972. It is a bit surprising to observe therefore that some firms under such industry categories, e.g. industrial chemicals, iron and steel and non-ferrous metal, have negative regression residuals. This would seem to indicate some overinvestment beyond what is suggested by the artificially lower factor-price ratio (P_K/w) for these favored industries.

Flour milling is an import-substituting industry that was favored in the late 1950s. The very high level of effective protection accorded the flour industry attracted investments so much that substantial excess capacity appeared before long. Government-controlled imports of wheat, on which the flour mills are totally dependent, were being allocated to seven firms in 1972. Changes in product prices were jointly decided by these firms, which comprise therefore a collusive industry. Price

inelasticity being assumed by flour-based products, it is easy to see that they would operate at utilization rates lower than that indicated by the industry characteristics represented in the regression equations.

Transport machinery (motor vehicles) is another import-substituting industry showing widespread capital underutilization (ave. CUR = 24.07 per cent, from Table 8). High tariff rates on imported cars and trucks make it profitable to locally assemble knocked-down components, imports of which are subject to a much lower tax. Overcrowding of the industry has resulted, as evidenced by the multiplicity of makes and models of cars sold to the very limited domestic market, the heavy protection and high prices making possible high rates of return on investment even with substantial excess capacity. Some rationalization of the automotive industry which, among other things, will limit the number of firms to five, has been initiated recently by the Board of Investments.

Declining demand for certain products over time is another reason for the existence of excess capacity which has not been included in the quantitative analysis above. Manufactures of cigars and cigarettes made of native tobacco, for instance, claim that their market (both domestic and international) has deteriorated over the years due to the growing popularity of Virginia tobacco, forcing them to cut down on production. Some have shifted to using Virginia tobacco blends, but which

faced strong competition, at least in 1972, from foreign-produced cigarettes being smuggled into the country in large quantitites. Domestic producers of liquor and wine (except beer) were similarly placed, the substitution of imports facilitated by the existence of an active blackmarket for PX goods. The regression results therefore yield residuals for these establishments showing higher predicted utilization rates than the actual CUR values.

Some industries are observed to operate at higher utilization levels than what the regression equations predict. The notable ones are coconut oil mills, petroleum refineries and glass factories. They are continuous process industries in which a plant shutdown or even a brief interruption entails an opportunity cost far greater than that associated with capital idleness per se., e.g., physical damage to products, costly reheating of furnaces to operating temperature, etc. That positive regression residuals generally appear for such establishments suggests that the capital intensity and relative factor-price variable have not captured the full measure of the cost factor involved.

Quite a few firms gave indication during the interview that operating night shifts on an irregular basis, e.g., only during periods of higher-than-average demand, presents difficulties in the hiring of laborers. Aversion to night work seems particularly strong among

supervisory and skilled workers, which is understandable in view of their relative scarcity and hence employability for the preferred daytime work. Some firms in meat processing, wearing apparel, furniture and fixtures, and electrical machinery and appliances have admitted that inadequate work supervision in night shifts is the principal reason for the lower labor productivity compared to day shifts. Where the labor force consists mainly of women (e.g., in garment and cigarette factories), even production workers are hard to get for night shifts without providing safe transportation to their homes after work.[36/] The observed disparity in CUR values between small and large garment firms, for instance, is due in part to the ability of the latter to provide the necessary amenities of night work.

At least as perceived by firm owners and production managers, the wood and metal working industries seem particularly subject to a severe scarcity of skilled workers. Again the smaller-sized plants appear to suffer relatively more, as evidenced by the frequency of complaints made in the interviews that most of their apprentices and young workers leave them eventually for the large establishments, presumably attracted by the higher wage rates there. Asked why they would not offer the same pay scale if skilled workers really represent the bottleneck in production, the usual answer is that they cannot afford it.

Such reply invariably makes little economic sense to the interviewers, knowing that the consequence of not being able to hire additional workers is leaving idle more than one-half of the expensive machinery and equipment most of the time. We are led to suspect that poor management of these small- and medium-scale enterprises is the underlying reason for the observed underutilization of installed capital. Limited access to short-term credit to finance increases in working capital, which is another frequent claim of the small industrial firms as a dominant reason for capital underutilization (e.g. in garments and other made-up textile products), might in part be attributed also to inefficient management.[37/]

Indeed, it seems safe to infer from our survey results that production management generally must assume some part of the responsibility for the existence of substantial excess capacity in Philippine manufacturing. Our interviews reveal an almost irrational tendency for a large number of the sampled firms not to operate during Sundays and holidays (representing at least 62 days every year). This would seem consistent with the finding that desired utilization levels are near actual CURs and provides the basis for the oft-repeated statement (among others, by two presidents of drug firms) that it is "company policy" not to have their workers work on Sundays and holidays. Such conservative practices (certainly not profit-maximizing) perhaps account in large part for the low explanatory power of the regression

equations. While our quantitative analysis bears out the proposition that the large wage premium for work on Sundays and holidays encourage firms to avoid them, our qualitative evaluation does not preclude non-economic reasons for the extensive plant shutdown observed.

5. Summary and Policy Implications

Industrial development may occur as a result of the continuous accumulation of capital without regard to the extent to which the existing capital stock is being used. However, considering the severe difficulties faced by present-day LDCs like the Philippines in generating the level of investment required to meet commonly stated development objectives, it becomes socially desirable that installed machinery and equipment be utilized to a much greater extent than has generally been observed.

As pointed out earlier, there has not been much policy effort to ensure maximum use of existing industrial capital in the Philippines. It is not even possible in fact to ascertain the time pattern of capital utilization in the manufacturing sector in view of the prevailing lack of consistent data on industrial capital use over time. While the economic censuses of 1961 and 1967 provide the necessary information to estimate electric motor utilization rates among manufacturing industries, the attempt above at discerning temporal changes in utilization has been hampered by the observed deficiencies in Census data, inter alia, the suspected noncomparability in establishment coverage between the electricity consumption data and rated capacity of installed electric motors by industry. If anything, the utilization estimates obtained for

the two Census years, together with those for 1972 based on our own supplementary survey on electricity data, provide grounds for asserting that Philippine manufacturing has not exploited the opportunities offered by increased utilization as a source of output and employment growth.

Our effort to establish a link between the electricity-based and time-intensity measures of capital utilization in Philippines manufacturing has been motivated by the need to convert easily obtainable information on electric motor utilization into a directly usable measure for evaluating the economic cost of existing capital underutilization and benefits to be gained from higher utilization rates. Although admittedly of a preliminary nature which future work of a kind indicated above could improve on, our empirical results, based on survey data for 1972, give quantitative expression to the relationship between the two measures of capital utilization for the 2-digit ISIC industries and a few finer industry categories.

Our estimates of electric motor utilization rates at the 3-digit level reveal a generally substantial understatement of the actual utilization of installed machinery and equipment, the latter being about three times the former on the average. To the extent that such discrepancies are present, previous studies in other countries that made use of the electricity measure as proxy for the level of capital utilization have misinterpreted their data. The error, however, does not necessarily

extend to the use of electric motor utilization rates in representing temporal changes in relative capital use provided that a stable relationship holds between the two utilization variables. For Philippine manufacturing we have shown that there is a significant variation across industries in this relationship; hence any assumed equality of the aggregative trends in capital and electric motor utilization rates must be viewed with caution.

As mentioned already, the economic censuses of 1961 and 1967 have solicited information necessary for the calculation of electric motor utilization rates. Based on our examination of the reported data, however, a strong case could be made for some effort in improving the collection, processing and presentation of the electricity data. Particularly worrisome is the likelihood that the tabulation of the 1961 and 1967 Census data has not ensured the correspondence in establishment coverage between the rated capacity of installed electric motors and the consumption data by industry. For purposes of deriving the electricity measure of capital utilization, it is essential that these data pertain to the same set of establishments. One specific recommendation that we can make here is for the presentation of the two sets of electricity data in a single table in future reports of the economic census of manufacturing.

The information needs of industrial policy formulation will also be served better if a comprehensive source of information on capital utilization in the manufacturing industries is provided by the survey of manufactures conducted annually (since 1956) by the Bureau of the Census and Statistics. It would be adequate to include the items on electricity data in the questionnaire for the large establishments only as they account already for more than 90 per cent of the total value of fixed assets in organized manufacturing. The BCS or the Statistical Office of NEDA could also undertake some special studies designed to firm up the basis for linking electric motor utilization to the time-intensity of industrial capital use that has emerged from the present study.

Based on the results of our interview survey of 400 establishments, there seems little doubt that excess industrial capacity is substantial in the Philippines. We find that, on the average, nearly three-fifths of existing capital in the sampled firms has remained unutilized in 1972. This would seem to suggest an enormous potential for expanding output and employment in the manufacturing sector, especially in view of the wide variation of CUR values observed across industries and across firms.

The significant quantitative influences on utilization rates are shown to be the factor-price ratio, capital intensity, wage premia

on night shifts and Sunday work, proportion of output exported and scale of plant. Legal form of the establishment, wage scheme, and registration with the Board of Investments are some classificatory variables that seem also to affect capital utilization. The relationships are such that ceteris paribus one can expect increasing use of existing capital over time with industrial development -- as the scale of production increases, as more firms become corporations, as manufactured exports flourish, as more establishments turn to daily and hourly wage payments, etc.

Of major policy significance is the important role of the factor-price ratio in the determination of the desired level of utilization. It has a direct positive influence as well as an indirect effect, which is negative, via the capital intensity variable. From the policy viewpoint, the positive relationship between CUR and the capital-labor ratio is meaningful only with the recognition that the latter variable is determined by relative factor prices. Our empirical finding for Philippine manufacturing is that the direct effect of an exogenous change in relative capital cost on the utilization rate outweighs substantially the negative effect due to the induced change in the capital-labor ratio. Thus, the existence of factor market distortions tending to underprice capital relative to labor is prejudicial to employment generation on two counts: (1) it biases technological choice toward capital-intensive processess and

industries; and (2) it creates an economic incentive to underutilize the installed capital stock. For a typical LDC suffering from a severe employment problem such as the Philippines, the policy implication is that effective measures need to be adopted which will eliminate or at least reduce the sources of relative factor-price disequilibrium.

A good starting point for policy action would be the restructuring of prevailing industrial incentives to remove their strongly capital-cheapening bias. As discussed in Appendix C below, economic inducements to promote industrialization in the Philippines during the postwar period have had the effect of lowering the price of capital much beyond its scarcity value. Currently, some of the benefits being provided industrial firms registered with the Board of Investments (BOI) tend to add to the existing factor market distortions caused by low interest and high wage policies, relatively low tariff rates on capital imports, advanced social security legislation, undue dependence on imported technology, etc. Such capital-cheapening BOI incentives as accelerated depreciation allowances, tariff exemption of imported machinery and equipment, tax deduction on expansion reinvestment and others need to be abandoned, perhaps replacing them by inducements that do not distort relative factor costs. This would raise the opportunity cost of owning capital and serve as a disincentive to underutilize installed equipment and machinery.

Interest rate being a direct influence on capital cost, it seems advisable to reform the current low interest policy, particularly with respect to the supply of institutional credit. The monetary authorities have apparently missed a rare opportunity in making a major policy change on interest rates when the Central Bank Monetary Board issued a much-awaited decision in July 1974 revising but marginally the legal ceiling rates on bank deposits and loans. Thus savings banks (but not commercial banks) have been allowed to pay 6-1/2 per cent interest on savings deposits, representing an increase of 1/2 per cent from the previous ceiling rate. Earlier, the ILO Employment Mission has recommended 12-14 per cent as minimum rates of interest on savings and time deposits.

Capital good imports are taxed much less heavily than imported consumer goods in the Philippines,[38/] again providing an inducement for producers to overinvest in plant capacity. Making the tariff structure more uniform can be expected to contribute positively to the utilization of industrial capital, in addition to having a likely favorable effect on allocative efficiency. As mentioned earlier, the revised tariff schedule effective January 1973 did not constitute an improvement in terms of moving toward uniformity of rates.

High labor costs serve as a deterrent to increasing capital utilization. While it is recognized that market wage rates in the Philippines

exceed the shadow prices of unskilled and semi-skilled labor, the unusually high rate of inflation in recent years[39] would seem to preclude any policy changes that will further reduce the real income of workers. Indeed the national government has found it necessary to initiate recently, which became mandatory for all employers eventually, the granting of an emergency allowance of fifty pesos per month for every employee with a monthly income of 600 pesos or less. This was followed by a ten per cent salary increase for all national government employees effective July 1, 1974.

It is perhaps in the additional labor costs of operating plants beyond the usual utilization pattern where certain policy changes might be feasible. The new Labor Code of the Philippines, effective November 1, 1974, has already made possible Sunday work at regular wage rates. Employers are given the right to determine which day to assign as an employee's rest day for every week. Sundays and holidays are considered working days, although work done on a legal holiday (but not a Sunday unless it is the rest day) must be compensated with a 30 per cent premium on top of the normal wage. The premium is increased to 50 per cent if the holiday in which the employee is made to work happens to be his rest day. As before, extra compensation for overtime and night-shift work consists of 25 per cent of the regular wage. Clearly there is room for further reducing incremental labor costs incurred in improving

the utilization of existing capital.

The availability of workers for night shifts has also been mentioned earlier as a problem among firms unable to provide transportation facilities and other night work amenities. In view of the significant scale economies in the provision of such services, a case could be made for improving public transportation and police protection at night, particularly in areas of industrial concentration by the small- and medium-scale enterprises. This could well provide the basis for repealing the provision in the new Labor Code prohibiting women, presumably on grounds of safety, from working "in any industrial undertaking ... between ten o'clock at night and six o'clock in the morning of the following day."[40]

The high cost of skilled and supervisory labor for night work found in certain industries suggests that a utilization-oriented policy should make special efforts at increasing the supply of these types of workers and at weakening their aversion to working at night. Government subsidy to firms hiring such workers at more than the usual wage premia in order to increase shift work would be justifiable in the short run if they constitute the real bottleneck. The assumption is that private profitability understates the social desirability of running shifts. Likewise, on such grounds, industrial apprenticeship programs, on-the-job

training, vocational education and technical institutes contributing to the limited supply of labor skills merit active encouragement.

Increased capital utilization in small- and medium-scale industries needs to be given particular attention because of its potentially significant impact on industrial labor absorption. Based on the qualitative results of our survey interviews, this would require the elimination of existing biases against small-sized enterprises in the access to short-term credit and assistance in the training of technical and managerial skills.

Certain industries appear to have been overcapitalized as a result of planning and policy mistakes of the past. The lesson to be gained is that favoring particular industries in resource pricing and allocation without regard to efficiency considerations could lead eventually to substantial underutilization of installed capital. The possibility cannot be ruled out that productive capacities in favored industries are being augmented through subsidies and other incentives at the expense of having the capital stock utilized inadequately. Perhaps government agencies performing such allocation function need to be reminded every now and then of the resource wastage and resulting social costs associated with idle machinery and equipment. As an example, there is strong interest currently to expand domestic sugar production on

account of favorable prospects in the export market and the country's need to increase foreign exchange earnings to meet the sharply rising import bill. If the low utilization rate among sugar mills observed above for 1972 still prevails, it would be ill-advised to move immediately toward the establishment of new sugar mills while ignoring the cost effectiveness of improving the utilization of already existing mills to increase sugar output. More generally, industrial incentives and penalties could be made contingent on the desirability of having to ensure maximum levels of utilization of existing capital in the manufacturing sector.

The final point should be made that the decision on the extent of capital utilization rests ultimately with the individual firm owners and managers. While policies can be changed to make it more expensive to underutilize existing capital, there is no certainty that a substantial improvement in the overall utilization rate will come about. The policy measures recommended above would be necessary, and it is difficult to imagine any significant increases in utilization without them; however, such policy changes ought to be complemented by a well-publicized campaign to educate industrial plant owners and managers, workers and the general public on the social need to avoid capital wastage from underutilized capacity. The objective is to reduce popular distaste for night and weekend work, which in turn will facilitate a significant response to the economic inducements for increased utilization.

FOOTNOTES

*This is a preliminary draft of the author's chapter contribution to a forthcoming World Bank monograph on industrial capital utilization in developing countries. The National Economic and Development Authority financed the local cost of the research project (done in collaboration with a larger World Bank study), including the comprehensive survey of capital utilization in Philippine manufacturing industries. Another discussion paper will describe the nature of the survey and methodology used. The author is grateful to NEDA Director-General Gerardo P. Sicat for starting him on this study and for encouragement and active support through its completion.

[1]Cf. R.M. Bautista, "Employment Promotion in a Small, Open Economy: The Philippines", in Effective Anti-Poverty Strategies (Bangkok: Friedrich-Ebert-Stiftung, 1973), pp. 134-137.

[2]P. Hauser, "The Measurement of Labor Force Utilization", East-West Population Institute, Honolulu (February 1972); mimeo.

[3]Cf. G.M. Jurado, "The Choice of Industry and Employment in the Philippines: An Exploratory Discussion", paper presented at the SEADAG seminar on "Employment Creation Strategies for Southeast Asian Economies", Atlanta, Georgia, December 7-10, 1972.

[4]Cf. Table 2.A in Jurado, ibid.

[5]Cf. R.M. Bautista, "Employment Effects of Export Expansion in the Philippines", IEDR Discussion Paper No. 73-15, University of the Philippines, School of Economics (August 30, 1973).

[6]J.H. Power and G.P. Sicat, The Philippines: Industrialization and Trade Policies, (London: Oxford Univ. Press, 1971).

[7]Cf. Sharing in Development: A Programme of Employment Equity and Growth (Geneva: International Labour Office, 1974), Vol. 1, Chap. IV.

[8]Cf. R.M. Bautista, "Employment and Labor Productivity in Small-Scale Manufacturing in the Philippines", NEDA Journal of Development, I (First Semester 1974); the Bureau of the Census and

Statistics defines "unorganized" manufacturing to consist of manufacturing establishments employing less than 5 workers.

[9]E.G., R.M. Bautista, "Anatomy of Labor Absorption in Philippine Manufacturing, 1956-1966", Economic Bulletin for Asia and the Far East, XXIII (September 1973); and Sharing in Development ...

[10]The Power-Sicat study referred to earlier would appear to be the only exception.

[11]R.J. Lampman, "The Sources of Post-War Economic Growth in the Philippines", Philippine Economic Journal, VI (Second Semester 1967), pp. 170-188; and J.G. Williamson, "Dimensions of Postwar Philippine Economic Progress", Quarterly Journal of Economics, LXXXIII (February 1969), pp. 93-109.

[12]R.M. Bautista, Capital Coefficients in Philippine Manufacturing Industries: Estimation and Analysis, M.A. thesis, Department of Economics, University of the Philippines (1966).

[13]These plants belong to the following industries: ISIC Nos. 3115, 3411, 3412, 3420, 3551, 3511, 3513, 3560, 3512, 3521, 3530, 3692, 3610, 3691, 3620, 3813, 3819, 3710, and 3720.

[14]The assumption is that utilization rates as perceived by plant managers reflect the relationship between actual and desired levels.

[15]M.F. Foss, "The Utilization of Capital Equipment: Postwar compared with Prewar", Survey of Current Business, XLIII (June 1963), pp. 8-16.

[16]D. Jorgenson and Z. Griliches, "The Explanation of Productivity Change", Review of Economic Studies, XXXIV (July 1967), pp. 249-283; Y.C. Kim and J.K. Kwon, "Capital Utilization in Korean Manufacturing: Its Level, Trend and Structure", Department of Economics, Northern Illinois University (May 1973); mimeo.

[17]Cf. Kim and Kwon, ibid, p.20.

[18]Ibid, p. 7.

[19]The questionable or, more frequently, missing data usually pertain to the capacity of electric motors, which unlike electricity consumption is not given systematic recording in most firms.

[20]In cases where electric motor capacity is given in horsepower, conversion into kilowatts was done by multiplying by the factor 0.746.

[21]The Korean estimates were given preference over those provided by Foss because of the more disaggregative classification of industries done by Kim and Kwon. The variation across industry groups is similar in the two cases.

[22]The values of U^m and CUR are starred in the table for the seven cases.

[23]Bureau of the Census and Statistics, Economic Census of the Philippines, 1961, Vol. III (Manufacturing); p. 221n.

[24]Cf. Bureau of the Census and Statistics, Economic Census of the Philippines, 1967, Volume III (Manufacturing); the proportion of manufacturing establishments that did not report electricity data is also not given in the 1967 Census.

[25]It is worth noting that certain industries, viz., ISIC 3114, 3117, 3233, 3513, 3812 and 3844, exhibit such impossible values of U^m computed from data in both censuses. A more careful scrutiny of the responses of firms in these industries seems called for.

[26]The population in our survey consists of firms employing 20 or more workers, while that of the Census includes establishments with employment of 10 or more. Data deficiencies notwithstanding, the levels of electric motor utilization for Philippine manufacutring industries as presented above are within the range of those estimated for South Korea during 1962-1971; cf. Kim and Kwon, op.cit., pp. 24-28.

[27]Cf. G. Winston, "A Primer on Pure Flow Production Analysis", Williams College (January 1973); mimeo.

[28]See Appendix D for the estimation of P_k in this study.

[29]For sampled plants that did not operate night-shift and/or Sunday work in 1972, average wage differentials in the 4-digit industries under which they are classified were used.

[30]The finding of the Study of Private Foreign Investment in the Philippines by the Central Bank and the Board of Investments that, based on 1970 survey data on fixed assets and total workers, "Filipino firms tended to be more capital intensive than foreign firms" is even more surprsing.

[31]This assumes that (a) replacement value of capital reflects adequately the rate of capital service flow when it is being operated and (b) factor-service prices and marginal products are equalized. The estimated elasticity values conform to the range 0 to 1 supposed by Winston and McCoy in "Investment and the Optimal Idleness of Capital", Review of Economic Studies (forthcoming), where it is also shown that less than unitary elasticity of substitution implies a positive relationship between the utilization rate and P_k/w under profit maximization.

[32]Growth rate of export sales would have been a more appropriate measure of the explanatory variable, but the necessary data were not available.

[33]G.C. Winston, "Capital Utilization in Economic Development", Economic Journal, LXXXI (March 1971), pp. 36-60.

[34]F.E. Thoumi, "The Utilization of Fixed Industrial Capital in Columbia: Some Empirical Findings," Development Economics Department, International Bank for Reconstruction and Development (December 1973); mimeo.

[35]However, given the high degree of regional concentration already existing (in substantial part policy-induced), the sampled establishments located in sparsely populated areas must have had more compelling reasons for being there, e.g., nearness to raw materials in the case of supply-oriented industries.

[36]The resistance to night work by the female labor force in the Greater Manila area easily finds rationale in the high incidence of criminality before the declaration of martial law on September 21, 1972.

[37]Although admittedly there exist some strong biases against small scale industry in the provision of institutional credit.

[38]Cf. J.H. Power, "The Structure of Protection in the Philippines," Chap. 11 in Balassa and Associates, The Structure of Protection in Developing Countries (Baltimore: The Johns Hopkins Press, 1971), pp. 261-287.

[39]There has been a recent rise in prices which is unprecedented in the country's postwar economic history. From mid-1969 to mid-1974 the Central Bank consumer price index in Manila has increased at an average annual rate of 18.3 per cent; the corresponding figure for the general wholesale price index is 27.3 per cent. These contrast sharply with the experience in the 1960s: consumer price index rose by only 4.8 per cent per annum on the average from 1961 to 1969 and the general wholesale price index even lower at 4.1 per cent.

[40]Quotation from Article 128 of the new Labor Code. The prohibition does not apply in cases "where the woman employee holds a responsible position of managerial or technical nature" and others defined in Article 129.

APPENDIX A

Questionnaire Form Used in Supplementary Survey on Electricity Data

Name of Firm: _____

ELECTRIC MOTOR CAPACITY AND ELECTRICITY CONSUMPTION DATA FOR 1972

	Installed Capacity*	Self-generated electricity	NPC or Meralco-supplied electricity	Total Electricity Consumption (self-generated plus purchased)
		kw	kwh	kwh
Electric Motors				
Others				
Total				

*Please indicate whether in kw or hp.

APPENDIX B

Comparison of electric motor utilization rate with time-intensity CUR, 1972

ISIC No.	Electric Motor utilization rate (per cent)			Time-intensity utilization rate (per cent)		
311	9.94	18.32	2.39	26.90	61.44	6.96
. 3118)	23.47	30.18	20.16	58.81	95.20	85.29
	10.69	3.19	16.00*	18.74	17.45	7.85*
d manufactures	21.00	31.61	18.72	76.54	95.07	35.62
ept sugar and	16.13	32.58	29.60	42.62	52.60	54.79
isc. foods)	27.99*	6.38	30.70	27.85*	17.02	48.95
	14.90	26.73		27.58	43.55	
	Average: 19.53			Average: 45.04		
3118	18.54	12.29	16.44	40.98	30.41	53.15
	21.99	12.58	16.23	52.88	45.30	51.82
r	47.67	19.22	20.04	59.18	65.94	81.58
	27.36	37.29	24.86	51.38	60.99	57.72
	23.80	17.54	14.01	56.07	35.07	25.75
	14.45	10.15		42.15	39.43	
	Average: 20.85			Average: 49.99		
312	10.14	21.81	7.32	26.80	58.22	46.31
	26.22	8.82	34.36	67.85	47.77	68.49
r foods	13.90*	11.73	15.01	9.41*	58.32	86.03
	7.73			17.61		
	Average: 15.70			Average: 48.68		
313	11.12	13.45	25.72	20.55	27.67	59.91
	13.55	17.85	21.77	26.57	38.93	28.40
rages	10.30*	14.31	16.53	9.64*	22.37	24.63
	3.47	8.14	18.19	13.61	19.91	49.24
	Average: 14.53			Average: 28.45		

Appendix B: Comparison of electric motor ...

314	17.63	5.93	12.00	57.17	28.19	28.62
	12.79	10.20	9.75	24.75	26.00	33.81
Tobacco manufactures	12.73	4.91	7.32	35.80	13.35	21.60
	4.73	7.59	6.31	19.80	27.39	20.76
		Average: 9.32			Average: 28.10	
321	50.27	23.46	37.31	92.05	44.85	97.26
	41.44	30.06	33.57	80.55	80.64	80.63
Textiles	28.60	21.69	34.36	78.36	46.94	64.09
	14.14*	22.82	6.80	14.06	85.94	22.85
	18.18	15.78		65.75	40.56	
		Average: 27.03			Average: 63.90	
322	8.06	22.31	11.21	22.06	49.63	13.93
Wearing apparel	30.14			79.54		
		Average: 17.93			Average: 41.29	
323	3.93	5.17	2.54	31.50	13.79	27.57
Leather & leather products						
		Average: 3.88			Average: 24.29	
324	7.30	10.17	9.32*	15.79	24.02	8.55*
Footwear						
		Average: 8.93			Average: 16.12	
331	33.43	18.34	40.78	73.91	55.62	83.11
	6.17	28.07	8.21	16.82	36.83	18.10
Wood & wood products	18.00	19.11	10.36	27.10	69.73	28.40
	8.95	15.03	13.78	20.02	68.19	27.51
		Average: 18.35			Average: 43.78	
332	8.67	8.56	8.28	34.71	29.34	28.12
Furniture & Fixtures	6.78			35.04		
		Average: 8.07			Average: 31.80	

Appendix B: Comparison of electric motor ...

341	33.81	4.36	3.82	97.81	55.16	20.08
aper & paper products	12.44	13.63	3.31	71.26	49.12	20.41
		Average: 11.90			Average: 50.31	
342	6.10	17.90	15.37	41.74	69.19	45.75
inting & publishing	2.06	17.02	7.35	24.65	45.77	16.85
	9.65	9.59		24.40	65.51	
		Average: 10.63			Average: 41.73	
351	12.24	32.93	34.56	73.09	86.16	83.56
sic chemicals	8.23	17.53	7.87	57.26	51.65	38.72
	2.89	19.65	18.68	32.49	24.90	95.37
		Average: 17.18			Average: 60.36	
352	13.43	9.90	3.12	28.09	28.12	18.91
	5.39	9.79	3.78	32.31	22.38	21.90
her chemicals	17.51	30.75	29.13	82.03	80.11	42.24
	10.02	12.53	6.13	65.46	25.29	22.83
	13.21	9.26	5.76	28.77	25.69	19.95
	6.87	8.99	7.98	27.48	28.58	25.30
		Average: 11.31			Average: 34.75	
355	27.93	10.88	5.75	85.85	73.23	24.58
ber products	15.21	11.17	8.43	54.75	42.99	14.21
	17.04			46.43		
		Average: 13.77			Average: 49.29	
356	18.64	3.02	12.16	39.32	32.22	44.48
stic products						
		Average: 11.27			Average: 38.67	
361	22.71	27.63	7.07	35.51	53.78	27.75
tery, etc.						
		Average: 19.14			Average: 39.01	

Appendix B: Comparison of electric motor ...

362 Glass & glass products	8.03	12.16	16.07	30.50	48.42	67.72
		Average: 12.09			Average: 48.88	
369 Other non-metallic mineral products	6.93	10.31	48.26	26.15	28.30	88.13
	5.53	8.82	40.14	17.68	54.70	85.67
	17.58	30.57	38.17	42.07	92.70	91.78
	27.35			89.26		
		Average: 23.37			Average: 61.64	
371 Iron and steel	11.74	8.12	8.16	80.90	53.62	60.97
	6.55	7.86		42.57	27.04	
		Average: 8.49			Average: 53.02	
381 Other metal products	5.58	8.33	18.55*	27.21	27.39	14.07
	13.81	20.50	5.97	33.56	62.47	14.67
	11.99	17.99	25.18	26.49	27.21	81.37
	14.45	20.61		33.98	38.57	
		Average: 14.81			Average: 35.18	
382 Machinery	3.68	9.92	7.91	22.14	29.95	27.67
		Average: 7.17			Average: 26.59	
383 Electrical machinery	5.30	3.06	9.31	14.87	13.34	38.18
	8.14	11.71	15.03	18.78	24.57	46.36
	19.65			64.11		
		Average: 10.31			Average: 31.46	
384 Transport equipment	10.80	11.81	9.33	19.37	25.58	27.67
	7.14	8.33		26.02	27.48	
		Average: 9.48			Average: 25.22	
		All manufacturing: 13.80			All manufacturing: 40.70	

APPENDIX C

Industrial Incentives and Factor Price Distortion in the Philippines

Economic policies in the Philippines providing incentives for industrial investment have taken various forms over the postwar period but the general direction of factor use bias appears to have remained the same.

In the 1950s the imposition of foreign exchange and import controls and the overvaluation of the domestic currency oriented the pattern of industrial development toward industries favored by the priorities of the control system. The "essentiality" rule governing the allocation of foreign exchange conferred private benefits to the importation of capital equipment and machineries which were obtainable at artificially low prices. Such policy represented therefore an effective discrimination against labor employment in favored industries with scope for factor substitution. Another powerful incentive that showed clear bias toward capital use was the preferential access to industrial loans from government financial institutions which, due to the low interest rates charged, had the effect of depressing the cost of acquiring capital beyond its scarcity value. Finally, exemption from all taxation granted "new and necessary" industries (for a period of 4 years from date of organization) may also be presumed to have distorted the incentive structure against labor use since some such tax subsidies were

directly related to the acquisition of capital.

With the lifting of controls in the early sixties and policy efforts to make the exchange rate of the Philippine peso more realistic, the burden of industrial promotion fell on tariff policy and government lending to favored industries. As argued by Power and Sicat*, the highly protective tariff structure of the 1960s only served to perpetuate the biases of the control system instituted in the previous decade.

The Investment Incentives Act of 1967 and the Export Incentives Act of 1970 probably represent the two most important pieces of postwar economic legislation concerning inducements for industrial investments ostensibly preferred from the standpoint of national development. They are comprehensive in scope, the benefits offered to both domestic and foreign enterprises being administered by the Board of Investments (BOI) which also determines the preferred areas of investment through its Investment Priorities Plan (IPP) and the Export Priorities Plan (EPP).

Five items in the package of BOI incentives are readily seen to have a capital-cheapening effect. These are:

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*In The Philippines: Industrialization and Trade Policies (London: Oxford University Press, 1971).

(1) Tax exemption on imported capital equipment within seven years from the date of registration of the enterprise. This reduces the cost of acquiring imported capital, given present tariff rates and compensating tax, from 10 to 20 per cent depending on the type of capital good.

(2) Tax credit on domestic capital equipment equivalent to 100 per cent of customs duties and compensating tax that would have been paid on imports of such items.

(3) Accelerated depreciation allowances, as a deduction from taxable income. This permits fixed assets to be depreciated up to twice as fast as the normal rate if expected life is 10 years or less or depreciated over at least 5 years if expected life is more than 10 years.

(4) Tax deduction of expansion reinvestment to the extent of 25 to 50 per cent in the case of non-pioneer projects and 50 to 100 per cent in the case of pioneer projects.

(5) Preference in grant of government loans. This permits BOI-registered firms to have preferential access to low interest credit.

There is one incentive provision that appears to favor labor employment, namely, the deduction from taxable income of one-half of the expenses on labor training (not exceeding 10 per cent of direct labor wage). But this would be true only in cases where the labor skill acquired can substitute for, rather than be complementary to, capital services. Exporting firms, moreover, are provided a wage subsidy equal to the direct labor cost in the manufacture of exports products but not to exceed 25 per cent of the export revenue.

Other benefits afforded registered enterprises relate less directly to the relative costing of factors. The following incentives

seem neutral with respect to factor use: (1) deduction from taxable income all organizational and pre-operating expenses; (2) deduction of net operating loss incurred in any of the first 10 years of operations; (3) exemption from all internal taxes, except income tax, to a diminishing extent over time; (4) for pioneer enterprises, post-operative tariff protection up to 50 per cent of the dutiable value of imported items similar to those being produced; and (5) for exporting enterprises, tax credit equivalent to the sales, compensating and specific taxes and duties on supplies and materials used in the manufacture of the exports products. It should be noted however that the distribution of benefits obtained from BOI registration is highly skewed toward large-sized firms**, which are inherently the more capital-using. Thus, indirectly, such subsidies to favored industries also tend to accentuate the existing bias against labor use. In estimating the annual cost of owning one dollar's worth of capital (P_k) for the establishments in our sample (cf. Appendix D), we assume that these indirect effects are insignificant relative to the impact of the BOI incentives listed earlier that directly reduce capital price.

**A similar bias toward large volume borrowers is evident in the distribution of low interest industrial loans by government financial institutions.

APPENDIX D

Estimation of the Annual Cost of Owning Capital

We follow Jorgenson's assumption that firms seek to maximize the present value of net revenue after taxes.* The stream of future profits resulting from the acquisition of capital goods will normally be taxed at rate u but subject to modification by other existing tax policies. Bearing in mind the major fiscal incentives given to BOI-registered firms as discussed in Appendix C, let us denote, for any firm i,

u_i = profit tax rate

d_i = rate of depreciation

v_i = ratio of tax deductible depreciation charges to actual depreciation

y_i = share of the cost of capital exempted from profit tax

r_i = interest rate used to discount future net revenues

The implicit annual cost, in terms of the domestic currency, of owning one dollar's worth of imported capital is given by

$$P_{ki} = \frac{Z\,(1 + T_{ki})}{1 - u_i}\left[\,(1 - u_i\,v_i)\,d_i + (1 - u_i\,y_i)\,r_i\,\right]$$

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*D. Jorgenson, "Capital Theory and Investment Behavior," American Economic Review, LIII (May 1963), pp. 247-259.

where Z is the exchange rate applicable to capital imports and T_{ki} is the tariff rate on capital goods imported by firm i. We use $Z = 6.29$, representing the three-year average dollar buying rate (regardless of import commodity end-use) for 1972. A tariff rate of 10 per cent ad valorem applies to the majority of capital goods (75 out of the 126 commodity items classifiable as capital machinery and equipment in the 1965 Tariff Code), with most of the remaining capital goods being levied less than 30 per cent. For present purposes, we assume an average of 15 per cent to apply to each importing non-BOI registered firm, ignoring the fact that the average tariff rate on capital imports may vary across industries. For BOI firms in our sample, $T_{ki} = 0$. To be able to evaluate P_{ki} it remains to assign values to u_i, d_i, v_i, y_i and r_i, which is done seriatim in what follows.

u_i : Corporate income tax in the Philippines is 25 per cent and 35 per cent on taxable incomes up to and over ₱100,000, respectively. Firms in our sample are classified into these two categories, using the 1969 proportion of payrolls to value added at the 3-digit ISIC level** to derive estimates of firm profit incomes from our survey data on value added.

d_i : Depreciation rates based on the guideline length of useful life of machinery and equipment among 3-digit ISIC industries in the Asset Depreciation Range System (July 1971) of the U.S. Department of Treasury are used.

**Obtained from the BCS Annual Survey of Manufactures, 1969.

v_i : The accelerated depreciation incentive implies $v_i = 2$ for BOI-registered firms with expected plant life (n) of 10 years or less $v_i = n/5$ for BOI-registered firms with $n > 10$. For the remaining firms in the sample (not registered with the BOI), $v_i = 1$.

y_i : Reinvested earnings are deducted from taxable income to the maximum extent of 50 per cent in the case of non-pioneer BOI-approved projects and 100 per cent in the case of pioneer projects. Taking these maximum figures, we set $y_i = 0.5$ and 1.0 for these two classes of BOI-registered firms, and $y = 0$ for non-BOI firms.

r_i : Assuming that firms discount future earnings by the rate of interest on loanable funds charged on them, we set $r_i = .12$ for the "large" establishments (somewhat arbitrarily, those employing at least 100 workers) and BOI-registered firms in our sample and $r = .14$ for the "small" firms (with less than 100 workers). This recognizes the widely held view that more liberal credit terms are made available to the larger-sized enterprises.***

Values of P_{ki} ranging from .42 to 3.49 have been computed for the 400 sampled firms, the average for "all manufacturing" being 2.16 pesos. Average values for the 3-digit industries are shown in Table D.1.

***As revealed, for example, by the findings of the Greater Manila Survey of four small-scale industries conducted for the ILO Employment Mission in June-July 1973.

TABLE D.1: Estimates of annual cost of owning one dollar's worth of capital goods, in 1972 pesos

ISIC No.	No. of Plants	Name of Industry	Capital cost
311	76	Food manufactures	2.17
312	20		2.17
313	21	Beverages	2.38
314	20	Tobacco manufactures	2.21
321	33	Textiles	2.04
322	10	Wearing apparel	2.17
323	3	Leather products	2.53
324	5	Footwear	2.49
331	26	Wood and wood products	2.84
332	7	Furniture and fixtures	2.31
341	11	Paper and paper products	2.29
342	11	Printing and publishing	2.55
351	13	Basic chemicals	2.03
352	30	Other chemicals	2.17
353	3	Petroleum refineries	2.39
355	11	Rubber products	2.12
356	4	Plastic products	2.29
361	3	Pottery, etc.	2.30
362	6	Glass and glass products	1.74
369	21	Other non-metallic mineral products	1.36
371	7	Iron and steel	1.59
372	4	Non-ferrous metal	2.04
381	18	Other metal products	2.19
382	8	Machinery	2.00
383	11	Electrical machinery	1.73
384	9	Transport equipment	2.38
385	3	Scientific equipment	2.03
390	6	Other manufacturing	1.93
		All manufacturing	2.16