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Actual, Desired and Full Levels of Capital Utilisation in Malaysian Manufacturing

By David Lim

Abstract
This paper shows that capital utilisation in West Malaysian manufacturing, though higher than that in other less developed countries, still leaves capital plant idle for a considerable proportion of the total available time. These findings, based on a modified McGraw-Hill measure and on the Winston time-measure of capital utilisation, therefore calls into question the wisdom of an industrial investment incentive programme which aims primarily at maximising the volume of capital expenditure, and which pays no attention at all to the level of utilisation of the existing stock of capital.

It is generally believed that capital utilisation exists on a massive scale in manufacturing in less developed countries [Little, Scitovsky and Scott, 1970:93]. However, little empirical data on the level of capital utilisation have been presented so far and there may well have been a tendency to generalise from the findings of only a few studies. This paper attempts to provide some of the empirical basis for the discussion in West Malaysia by presenting some estimates of the actual level and what the business community considers to be the desired and the full levels of capital utilisation in the manufacturing sector.

I

Two measures of the actual level of capital utilisation are used. The first is a modified version of the McGraw-Hill measure of capacity utilisation, U_a m [McGraw-Hill, 1972]. Following tradition, U_{am} is obtained by asking entrepreneurs the percentage of the 'full capacity' their plants are operated, with 'full capacity', as in the case with the Federal Reserve Board and the Wharton School indices [de Leeuw, 1966; Klein and Sumners, 1966; Perry, 1973], only loosely described as the maximum capacity to produce under 'normal' circumstances. U_{am} is thus a subjective measure but may be useful in an operational sense for business managers are the people who make investment decisions and it is.their assessment of the utilisation level, no matter how subjective, which decides whether new equipment and machinery should be installed or the existing equipment and machinery utilised more intensively and whether new workers have to be employed or the existing labour force utilised more intensively. Capacity as implied in U_{am} refers to the capacity to produce when all of the factors of production are taken into account. We use a slightly different version of the traditional McGraw-Hill approach and interpret 'full capacity' as the capacity output associated with a given stock of plant and equipment.

The second measure of the actual level of capital utilisation is the Winston time-measure, U_t, which gives the number of hours the plant is operated a year as a percentage of 8,760 hours, the total number of hours available in a year [Winston, 1974]. In associating 24 hours a day and 365 days a year with 'full capacity', U_t is similar to the electricity-measure, another popular measure of capital utilisation, in assuming 'full capacity' to be equivalent to the continuous operation of the plant throughout the year. This is not a particularly realistic assumption as time has to be set aside for compulsory holidays and for repairs and maintenance. The inclusion of the first category of stoppages in the denominator will tend to understate the level of capital utilisation for all industries while the inclusion of the second category will lead to an overall understatement and to biases in the inter-industry comparison. The period required for repairs and maintenance varies between industries and between firms within the same industry if different techniques of production are used. In spite of these weaknesses $U_t$can still be useful as a first approximation of capital utilisation, especially if it is used in conjunction with the modified McGraw-Hill measure, U_{am}.

The use of U,and U_{am} together can provide what the business manager considers to be the 'full capacity' of their plants in terms of time. The first step is to interpret U_{am} in terms of time. If, as in Figure 1, MN refers to the 24 hours available in a day, MH_a the actual number of hours the plant is operated and MHfthe manager's estimate of the 'full capacity' equivalent number of hours, then U_{am}will be represented by MHa/MHfand $U_t$by MHa/MN. The use of U_{am} as a measure of capital utilisation has been criticised for not having a standard and measurable value for MH ffor each

industry, yet the business manager's estimate of the 'full capacity' of his plant will have been incorporated in the value he gives for U_{am}. This estimate of the 'full capacity' of the plant can be argued to be quite a reliable one, coming as it does from the person who actually runs the plant.

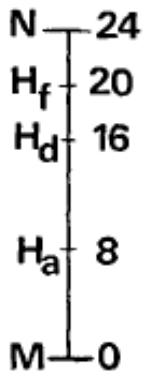

Figure 1

The second step is to divide U,by U_{am} to give MHf/MN, which may be called a McGraw-Hill-type measure of the entrepreneurial estimate of 'full capacity' in terms of time (Uf^). Thus if U_{am} is given as 40 per cent and U_t as 33 per cent then the 'full capacity' number of hours of operation a day is around 20 hours. This figure may perhaps enable us to say from the social point of view, given that the actual operation is only eight hours a day, that the firm ought not to be encouraged by government policy to expand its existing productive capacity in the near future.

This information has obvious significance for planning investment decisions, especially if some estimates can be obtained of the entrepreneurial desired level of capital utilisation in terms of time. If the entrepreneur is asked the desired number of hours of operation per day and this is then expressed as a percentage of 24 hours, this would give a measure of the desired level of capital utilisation in terms of time (U_d ^). In terms of Figure 1, Udt would be given by MHd/MN if MH_d denotes the desired number of hours of operation per day. U_{dt} may be interpreted as the entrepreneur's estimate of the economic capacity of his plant and UV_m as his estimate of its engineering capacity, with U dt being generally expected to be lower than Ufm. If estimates of Udtshow that the desired number of hours of operation per day is, say, 16 hours, then an actual operation schedule of only eight hours, as in the above example, would indicate considerable excess capacity and confirm the earlier view that no expansion plans can be expected. If the difference between the economic and the engineering capacity levels is significant the firm concerned may have considerable leeway in increasing its output before embarking on an expansion of its capacity.

II

Table 1 shows the values of U_b U_{am} Udt and U_{fm} for 350 West Malaysian manufacturing establishments for 1972, broken down into" the 28 industrygroups at the 3-digit level of the Malaysian Industrial Classification (MIQ/U.N. International Standard Industrial Classification (ISIC).[2] The weight used was the replacement value of the fixed assets of the establishment. When an establishment's plant consisted of more than one section and the sections were run differently the shares of the sections in the total replacement value of the plant were used as the weights in calculating the capital utilisation for the plant as a whole.[3]

The values of U_t show that the capital stock in West Malaysian manufacturing is utilised to a level that is higher than that in corresponding industry-groups in Pakistan, South Korea and other less developed countries for which capital utilisation studies have been made.[4] However, the actual difference may be much smaller in view of the underestimation of capital utilisation inherent in the electricity and the shift measures of capital utilisation used in these other studies.[5]

TABLE 1
ACTUAL, DESIRED AND FULL LEVELS OF CAPITAL UTILISATION IN WEST MALAYSIAN MANUFACTURING, 1972

MIC/ISIC	*Description*	*No. of Est.*	U_t	U_{am}	U_{dt}	U_{fm}
311	Food	42	62	74	70	84
312	Other food	9	52	81	60	65
313	Beverages	10	64	82	73	79
314	Tobacco	13	50	99	48	51
321	Textiles	18	85	86	79	98
322	Wearing apparel	4	45	100	45	45
323	Leather and leather products	3	26	78	39	34
324	Footwear	3	29	65	28	44
331	Wood and rattan products	31	53	85	58	63
332	Furniture	3	46	100	38	46
341	Paper and paper products	4	55	83	61	67
342	Printing and publishing	20	53	90	46	60
351	Industrial chemicals	7	86	87	94	99
352	Other chemical products	18	42	74	43	57
353	Petroleum and coal products	5	87	96	80	91
355	Rubber products	48	78	85	81	92
356	Plastic products	10	73	82	74	89
361	Pottery, china, etc.	3	36	100	27	36
362	Glass and glass products	3	94	97	100	97
369	Non-metallic mineral products	23	91	96	93	95
371	Iron and steel products	11	89	91	91	98
372	Non-ferrous metal products	3	88	91	83	97
381	Fabricated metal products	16	57	74	68	78
382	Machinery	12	32	79	28	41
383	Electrical machinery	13	71	71	54	100
384	Transport equipment	12	35	81	26	43
385	Professional equipment, etc.	3	76	86	29	88
390	Other manufacturing	3	85	100	76	85
3	TOTAL manufacturing	350	75	89	73	84

The values of U_{am} are much higher than those for U_t in most industries. In terms of Figure 1, MH_f is considerably smaller than MN for most industries. The comparative figures for U_{am} and U_t also bring out the basic difference between the McGraw-Hill and the Winston measures. For example, the U_{am} for pottery and the other manufacturing industries were both given as 100 but the latter operated its capital plant and equipment for a much longer period. In certain cases, as for example when the food and the pottery industries are compared, the use of U_{am} can lead to the situation where one industry (pottery) reports a higher U_{am} than another (food) but is actually running its equipment for a shorter period of time. Under such circumstances the use of U_{am} and Ut can produce different rankings of industries by their level of capital utilisation. The Spearman rank correlation coefficient for the values of U_t and U_{am} is 0-24, which is not statistically different from zero at the 99 per cent level of confidence.

The combination of U_{am} and U_t to produce U_{fm} may provide a useful indicator, when weighed against estimates for Udt, of future investment plans.[6] Table 1 shows that the actual level of operation (U,) was reported to be lower than the desired level (Udi) in 14 of the 28 industry-groups. The establishments in these 14 industry-groups accounted for the majority (67 per cent) of the total value added of the 350 establishments sampled. The differences recorded in the. other chemical products and the plastics industries were minimal but even if these two industries were omitted the establishments which believed that they were operating below their economically optimum levels still accounted for 60 per cent of the total value added. This finding assumes further and perhaps greater significance when considered against the values obtained for Ufm. The values of U_{rm} are, by and large, significantly greater than those for Udt and therefore U_t .[7] Even though the overall level of utilisation was high in West Malaysian manufacturing the unweighted values of U_t are less than 57 for 15 of the 28 industry-groups [Lim, 1976:156], suggesting therefore that the opportunity exists for a large proportion of West Malaysian establishments to increase their level of utilisation to at least the full two-shift level.[8] This finding together with those that U, is less than U_{dt} and that U_{dt} is less than U_{fm} would therefore suggest that capital utilisation in West Malaysian manufacturing still leaves capital idle for a substantial proportion of the total available time.

Ill

This section attempts to establish qualitatively the reasons as to why capital utilisation was not higher in West Malaysian manufacturing in 1972. Table 2 shows the percentage of the total number of establishments sampled in each industry-group that reported a lower level of capital utilisation than desired. It can be seen that 213, or 61 per cent of the 350 establishments sampled, reported that their utilisation level was lower than the desired

level. A number of reasons were given by the entrepreneurs for their inability to operate their plants at the desired level and an understanding of these, factors and their relative importance might help not only to increase the actual level of utilisation to the desired level but also perhaps beyond that to the full capacity level.

The reasons given are:

1. a lack of demand because of foreign competition and/or because of a surfeit of producers within Malaysia.
2. the unavailability of imported inputs which are essential to the production process for technological reasons at the appropriate time because of logistics problems.
3. a shortage of domestic inputs because of supply bottlenecks.
4. difficulty of obtaining supervisory staff either because of a shortage of such personnel per se or because of the unwillingness of supervisors to work the night or dawn shifts.
5. a shortage of skilled and semi-skilled workers because of deficiencies in manpower planning.
6. unexpected government intervention such as the more determined enforcement of the regulation that the labour force should reflect the racial composition of the population at the national level.

Table 2 gives the percentage distribution of what entrepreneurs considered to be the most important reason for their inability to operate at the desired level of capital utilisation by industry-group. For example, in MIC/ISIC industry-group 311 (food), 53 per cent of those establishments which could not operate their plants as planned, said that the most important reason for the shortfall was the shortage of demand, while 39 per cent believed that it was the shortage of domestic inputs. Only 5 per cent and 3 per cent thought that the shortage of imported inputs and unanticipated government regulations respectively were the crucial factors. The lack of supervisory and other forms of skilled personnel was not considered important at all.

It can be seen that entrepreneurs in West Malaysia believed that by far the most important reason of capital under-utilisation in West Malaysian manufacturing is the shortage of demand arising out of a surfeit of producing units for the domestic market. Over 50 per cent of them saw the lack of demand as the crucial factor for their inability to operate as planned compared to the next largest group, 16 per cent, which considered the shortage of domestic inputs to be the most important constraint. An equal number of entrepreneurs, 12 per cent each, cited shortages of supervisory staff and government regulations as the crucial bottlenecks while 8 per cent of them blamed it on the shortage of imported inputs and 2 per cent on the shortage of skilled labour.

The reference period for the survey was a calender year so that seasonal variations in demand per se would not have been an important reason for any reported capital under-utilisation. The year for the survey, 1972, was a prosperous year in the trade cycle so that a cyclical downturn could not have been blamed for any capital under-utilisation.

The notion of demand deficiency for an industry is valid even though there are some establishments within that industry for which $U_t = Udt$, provided that these establishments have values for U_t which are lower than the values for Uireported by those establishments for which $U_t < Udt$. The former would be establishments which have low values for their Udt and which therefore would not have reported problems of demand deficiency. Table 2 shows that there are 25 industry-groups in which the percentage of establishments which reported $U_t < U_{dt}$ lies between 0 and 100. In 17 of these industry-groups the values of U_t for those establishments where U, < Udtare greater than the values of U_t for those establishments where $U_t = U$ at- In the other eight industry-groups deficiency in demand was not listed as the most important cause for U_t for being smaller than U<jt.

TABLE 2
QUALITATIVE REASONS FOR CAPITAL UNDER-UTILISATION IN WEST MALAYSIAN MANUFACTURING

MIC/ ISIC	No. of est.	Percent of est. which believed $U_t < U_{dt}$ in 1972	Percent distribution of most important cause given by est. which believed $U_t < U_{dt}$ for 1972[1]						U^2_t	
			1	2	3	4	5	6	Est. where $U_t = U_{dt}$	Est. where $U_t < U_{dt}$
311	42	86	53	5	39	0	0	3	43	52
312	9	44	50	0	0	0	25	25	45	52
313	10	40	100	0	0	0	0	0	27	67
314	13	61	62	25	13	0	0	0	38	41
321	18	50	33	33	0	11	0	23	66	85
322	4	50	0	0	0	50	0	50	28	53
323	3	100	100	0	0	0	0	0	—	—
324	3	67	100	0	0	0	0	0	26	54
331	31	94	17	0	48	14	4	17	61	43
332	3	67	50	0	0	50	0	0	55	27
341	4	25	100	0	0	0	0	0	50	62
342	20	45	78	11	0	0	0	11	52	41
351	7	29	50	0	0	50	0	0	100	59
352	18	72	84	0	0	8	0	8	25	40
353	5	20	100	0	0	0	0	0	82	83
355	48	48	40	13	13	17	0	17	76	69
356	10	40	50	50	0	0	0	0	77	71
361	3	33	0	0	0	0	0	100	30	31
362	3	67	100	0	0	0	0	0	58	100
369	23	35	25	13	13	12	0	37	69	63
371	11	64	14	29	14	29	14	0	68	46
372	3	67	100	0	0	0	0	0	55	96
381	16	75	42	8	0	25	0	25	46	47
382	12	50	67	0	0	17	0	16	27	38
383	13	85	55	0	0	36	0	9	56	65
384	12	75	89	11	0	0	0	0	26	45
385	3	100	33	0	0	33	34	0	—	—
390	3	0	—	—	—	—	—	—	—	—
TOTAL	350	61	50	8	16	12	2	12	51	57

1. The causes are (1) shortage of demand, (2) unavailability of imported inputs (3) unavailability of. domestic inputs, (4) shortage of supervisory personnel, (5) shortage of skilled and semi-skilled labour and (6) unexpected government intervention.
2. These are unweighted values

The overall impression given by these answers is consistent with what is generally known about the industrialisation programme of West Malaysia. An import-substituting strategy was adopted in 1958 with generous provisions for tax exemption and capital subsidies that led to the establishment of large and capital-intensive producing units [Lim, 1973: Chap. 12] There was also very little systematic planning in the initial stages and this resulted, among other things, in a multiplicity of firms in areas which could have been adequately served by a smaller number of producing units. In fact it was noted over a decade ago that the domestic Malaysian market was too small to sustain three dairy product firms, six paint and varnish firms, six plastic firms, three match firms and five pharmaceutical firms and that in most of these cases 'one firm could produce sufficient for the entire market, working on a three-shift basis, so maximising the productivity of expensive capital equipment and minimising unit costs of production' [Wheelwright, 1965: 113]. At the same time the nominal and the effective rates of protection were relatively \ow[Power, 1971] so that the small domestic market had to be shared with foreign suppliers, and entry into the international export market was not easy. Under such circumstances it is easy to see why entrepreneurs should consider the lack of effective demand to be a very important reason for their inability to operate at the desired level of utilisation. Eighteen industry-groups saw it as the most important factor and of these seven in fact considered it to be the only constraint.[9]

The relative insignificance of the shortage of imported inputs is not surprising as Malaysia, unlike so many other less developed countries, does not suffer from any shortage of foreign reserves.

Moreover, a significant proportion of West Malaysian manufacturing establishments are under foreign ownership and such establishments usually have easy access to imported inputs.[10] The importance of the shortage of domestic inputs is somewhat exaggerated by the overall figure as only six industry-groups mentioned it as a determining factor and the overall figure of 16 per cent would have been much lower if it were not for the higher percentages recorded in the two industry-groups, food and wood (MIC/ISIC 311 and 331), which are the second and the third largest of the 28 industry-groups in terms of value added. Moreover, the shortage reported in the wood industry-group refers specifically to the unavailability of electricity for running timber processing plants which are situated in remote parts of the country.

It is not unexpected for the shortage of supervisors to be mentioned as a constraint because Malaysia, like so many other less developed countries, lacks supervisory and other forms of skilled personnel. What is rather surprising is the very small number, of establishments which considered the shortage of skilled and semi-skilled workers a problem. Perhaps this can be explained by the difficulty or the arbitrariness of classifying employees between those who are supervisors and those who are skilled and semiskilled. The former could easily have been included in the latter and it may have been more useful to group the two categories together.

It is also quite possible for establishments which gave the shortage of skilled workers as a constraint to be grouped with those that blamed it on government action. For example, electronics companies which have their plans to mount a second shift thwarted by government regulations which forbid female workers to work after ten at night are as likely to blame it on the government as on the shortage of skilled labour.'[1] Another possible source of the misclassification of the shortage of skilled labour as a cause is the regulation that the racial composition of all levels of the labour force should correspond to the racial composition of the population (Malays, 50 per cent, Chinese, 38 per cent, and Indians and Pakistanis, 12 per cent) [Malaysian semi-skilled industrial workers of Malay origin at the moment and a firm wishing to work another shift may have to employ Malay workers with little or no industrial skill and experience. The firm may then decide, in view of expected losses in productivity, which can be substantial, to shelve its plans temporarily* and the reason it will give can either be government regulations or a shortage of skilled (Malay) workers.

IV

This paper has provided estimates of the actual level of capital utilisation in West Malaysian manufacturing by using a modified version of the McGraw-Hill measure and by using the Winston time-measure. An important finding is that capital utilisation in West Malaysian manufacturing is high relative to that observed in manufacturing in other less developed countries. However, the paper has also shown that the actual level of utilisation was lower than the desired level and that capital was left idle for a considerable proportion of the total available time for a considerable number of establishments and industry-groups. Our findings may therefore be said to lend support to the increasingly widespread belief that there may be a paradox in the utilisation of capital in capital-scarce less developed countries. They certainly call into question the wisdom of an industrial investment incentive programme in Malaysia which aims primarily at maximising the volume of capital expenditure and which pays no attention at a.11 to the level of utilisation of the existing s'ock of capital. This is especially so in view of the overriding importance which entrepreneurs ascribed to the shortage of demand as a factor in preventing them from operating their plants at the desired level of utilisation.

NOTES

1. See Foss, [1963] for a discussion of the electricity measure.

2. The 350 establishments represented about 10 per cent of the total number ofmanufacturing establishments in West Malaysia in 1972 and were divided among the 28industry-groups according to the share of each industry-group in the total value added of themanufacturing sector. The only constraint imposed on the selection was that each industrygroupmust have at least three establishments in order to obtain more meaningful figures forthe minor industry-groups. The selection at the establishment level was carried out randomly.

3. Capital is the weight used because the study is about the extent to which capitalequipment is utilised.

4. See Little, Scitovsky and Scott [1970: Chap. 3], Winston [1971], Kim and Kwon [1971].

5. See Lim [1976], for the reasons behind this underestimation.

6. The reference period used for Udt is a week, as a year was considered too long formeaningful answers to be given. As such the reference periods for Udt and Ut are not the samebut this difference should not affect the comparison of the two measures significantly as thevalue for Udt was requested for a 'standard' or 'normal' week.

7. The exceptions recorded in the leather and the glass industries could be explained byeither the smallness of the sample used in each case (3) or the predominance of family concernswhich did not maintain accurate production schedules. In any case the differences recordedare very small.

8. On the assumption that a shift lasts for eight hours and that there are 52 compulsoryholidays a year, the values of Ut which correspond to the one-shift, two-shift and three-shiftlevels of operation are 28.6, 57.2 and 85.8 respectively.

9. These industry-groups include those which are generally considered to carry substantialexcess capacity. A good example of this is the assembling of motor cars (MIC/ISIC industrygroup384) where there are six assembly plants, associated with 21 brands of cars, producing80 models for an annual market of around 20,000 cars. See Kanapathy [1970].

10. The distribution of our sample by nationality corresponds largely to the overallnational distribution by nationality. Of the 350 establishments selected, 191 or 54.4 per centwere completely owned by Malaysians and 159 or 45.6 per cent were either owned orcontrolled by foreign interests.

11. Traditionally electronics and textile companies prefer female to male workers becauseof the greater manual dexterity of the former.

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