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Economics of Idle Capacity - An Exercise in Methods

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Abstract : Idle capacity in the sense of excess of fixed production faciliteis in relation to normal turnover will add to cost of production without adding to value and also could result in the wastage of capital, a scarce resource. Identification and quantification of idle capacity in fish processing industires is a difficult task given the high seasonality of raw material availability. A given capacity built up to absorb the peak availability of raw material during a short season could remain unused for better part of the year. Under what price and cost conditions such production capacity could turn idle or otherwise is explored using the welknown technique of marginal analysis.

Introduction

Persistence of idle capacity of production facilities is a problem frequently encountered in many industries. Estimation of idle capacity and resultant problems in fish processing industry have received the attention of scientists and managers for quite sometime now. In an environment of cronic scarcity of capital that characterises the Indian economy, industries could ill afford to create idle production capacities. It is imperative that a close watch is kept on capacity utilization in all the industries, so that no part of the funds invested turns into a dead investment. At the same time, the levels of capacities that are required to employ abundant labour are not mistaken for idle capacities for the reason that the rate of utilisation of capacities is uneven. Hence the importance of sharpening and improving the methods of estimates of idle capacity.

Definition

A broadly acceptable definition of idle capacity would be the sinkage of investments and the consequent availability of fixed production facilities significantly in excess of the normal turnover of output for a given period. Idle capacity invariably refers to the excess of fixed capital that has gone into the creation of production infrastructure. The excess of production capacity is reflected in the difference between the optimum output capacity and a lower actual production of an industry for a given period.

In the estimation of idle capacity, the period of production considered for investigation is of crucial importance. In several industries ranging from sugar manufacturing to fish processing, the volume of production tends to peak during a season to fall off later. For a considerable part of the year much of the installed capacity remains unutilized. The estimates should take into account this seasonality of production process necessitated by input supply constraints, especially raw materials.

However, the fluctuations in raw material or input supply alone is not the sole cause of occurance of peaks and troughs in capacity utilization. The

final demand for outputs could be season bound, or even a specific date bound as in the case of mass market for fire crackers. Such industries are forced to syncronise their peak levels of pro duction with peak spells of market demand. In all these cases, the optimal production capacities have to be estimated for a given period. The choice of the period i.e, the length of the period should account for the inherent peaks and troughs in the production process.

Idle capacity always referes to the unutilizable capacity of an industry taken as whole. It does not refer to the unutilized capacity of any specific firm in particular. No doubt, the idle capacity of an industry will ultimately reflect in the unutilzed capacity of individual firms. But each case of unutilized capacity of particular firms need not be constituting elements of idle capacity of the industry. A firm may opt out of production in the face of unfair competition of its rivals. For such non-market reasons, a firm may remain idle even when other firms in the industry operate at full capacity. Such cases of individual firms being reduced to have unutilized capacities may be called cases of spare capacity, that can be used on lease by rival firms.

Idle capacity as such is a situation in which the idustry as a whole has production capacity unutilizable, given the current factor and product prices prevailing in the market.

Model for estimation

Let the chosen period for the investigation of idle capacity be T. The length of T could be that of an year or any convenient spell of time that incorporates in itself both peak and trough in the production process.

The period T can be broken into smaller time segments, t_i, of equal length such that

$$t_1 + t_2 + t_3 + \ldots\ldots t_n = T \qquad (1)$$

Care should be taken to structure t_i in such a way that a recognizable peak or trough falls with in one t_i. Suppose a production process clearly reflects a peak of two months, then the length of each time segment could be set as two months and T could be divided into time segments all equal in length of two months.

Let the quantity of output Q_l represent that quantity of output which can be produced if the fixed production facilities are employed fully for each time segment. Q_l is a possible output not the real output.

Let r_i be that proportion of output which can be realised at time segment t_i by fully employing the capacity. Then

$$r_1 Q_l + r_2 Q_l + r_3 Q_l \ldots\ldots r_n Q_i = Q_l \qquad (2)$$

Where $n\Sigma ri = 1$

Capacity utilization equation (2) has the following properties:

(i) $r_i Q_l$ = $r_j Q_l$ for any two time segments t_i and t_j

(ii) $r_i Q_l$ = The capacity output for time segment t_i.

(iii) If for any reason, actual output in t_i is less tha $r_i Q_l$, the shortfall cannot be made good in any other time segment tj.

(iv) Fixed cost of production, that is the cost of capacity creation for $r_i Q_l$ of output in time segment ti stands incurred whether production actually takes place or not.

The Q_I output distributed from ti to tn as in equation (2) can be viewed as the installed capacity in terms of output. Actual output Qs can be equal to QI but can not exceed it.

$$Q_S \leq Q_I \quad (3)$$

Actual output QI depends upon the rate of utilization represented by si for any time segmetn ti

$$s_1 Q_I + s_2 Q_I + s_3 Q_I + \ldots\ldots s_n Q_I = Q_s \quad (4)$$

$$\sum_{i=1}^{n} S_i \leq 1$$

The relation between S_i and r_i is stipulated as

$S_i \leq r_i$ for anytime segment t_i (5)

Therefore

$Q_s = Q_I$ when $S_i = r_i$ every t_i (6)

Which will hold when there is no unutilized capacity in any time segment t_i

$Q_s < Q_I$ if $S_i < r_i$ for atleast one t_i (7)

Short fall in $S_i Q_I$ in any t_i cannot be made good by increasing production in any other ti

When $Q_s < Q_I$, the installed capacity is not fully used. The less than full use of the capacity may be obeserved in every time segment t_i or only in a few time segments. The following may hold as an extreme case.

$S_i Q_I = 0$ for every $t_i \neq t_j$

$S_j Q_I = r_j Q_I$ for t_j (8)

When condition (8) holds, the whole of realized output Qs is produced in one time segment t_j. It is an extreme case of peak and trough in the production process. The entire output comes from a limited time segment. The fixed capital is unused for all ti≠tj. Thus the capacity is not fully utilised. These is unutilized capacity. Is it also idle capacity? What is the economics of maintaining capacity at Q_I output for an entire period of T when the capacity is used for just one time segment t_j to yield $Q_s < Q_I$. A little more specifically, the production of output of $Q_s < Q_I$ is carried out in single time segment tj, the entire cost of fixed capital i.e. interest and depreciation for a whole period falls on the product of a single time segment. Does the investment on such capacity creation is recommended by economic rationality of investing for profit?

To answer this question, let us consider the effect of cutting down production capacity marginally.

Let Q_m be the marginal reduction in quantity of capacity output.

Since $Q_s = S_j Q_i$ and

$s_j = r_j$

a cut in capacity, Q_I, will cutdown Q_s also by Q_m. This is because, the full capacity of the industry is used in time segmetn t_j to produce Q_s. A reduction in capacity Q_I will reduce:

$$Q_s = s_j Q_I = r_j Q_I \text{ to}$$

$$(Q_s - Q_m) = s_j (Q_I - Q_m) = r_i (Q_I - Q_m) \quad (9)$$

That is the effect of reduction in capacity. What is its effect on cost, revenue and profit

Let C_m be the cost of producing Q_m output and Rm the revenue earned by Q_m

$$C_m = FC_m + VC_m$$

where

FC_m is the fixed cost, or the cost of capital saved by reduction of output by Q_m. It is the cost saved in the form of interest and depreciation for the entire period, T not alone for the time segment tj

VC_m is the variable cost on labour and raw material for Q_m output for the time tj only.

Against a reduction in cost of C_m there is a revenue loss R_m.

$$R_m = PQ_m \qquad (11)$$

The sale proceeds of Q_m output at price P. Between marginal revenue R_m and marginal cost C_m the following relations only hold.

(i) $R_m = C_m$

(ii) $R_m > C_m$

(iii) $R_m < C_m$

These marginal relations serve as the economic indexes of idle capacity.

Suppose relation (i) $R_m = C_m$ holds

From $R_m = C_m$ and $C_m = FC_m + VC_m$

(a) $R_m = FC_m + VC_m$

(b) $R_m - VC_m = FC_m$

Since $R_m = PQ_m$

(c) $PQ_m - VC_m = FC_m$

That is, the sale proceeds of Q_m output is enough to meet the fixed cost and variable fost (a) above. Equivalently the production in one time segment t_j fetches enough revenue to have balance over variable cost to pay for the interest and depreciation charges of capital for the whole period T.

Therefore the quantity of capital retained earns its own retention charges from production at Q_1 even if it remains unused for most part of the period T. It is not idle. From this balancing equation for capital cost we can easily understand that,

When $R_m > C_m$, the revenue yields net surplus over all costs. Therefore the production capacity is profitably retained. It is not kept idle. When Rm $< C_m$, production capacity is in excess of the current requirement. It is in excess of economic use of raw material and labour. Therefore then capacity is idle and need reduction until.

$R_m = C_m$

Cutting down of capacity when $R_m = C_m$ will have the following economic disadvantages.

(i) Factors of production capital, labour are not fully used. Especially gainful and profitable employment of manpower is cutdown.

(ii) Economic use of seasonally available raw material is not effected. Wastages of natural resources occurs.

(iii) Availability of finished product is reduced.

(iv) Let the assumption made at equatiom (8) Sj = rj for time segment t_j is now relaxed $S_i < r_i$ for all t_i and thefore,

$S_i Q_1 < r_i Q_1$

What way this type of underutilization will reflect on our indexes of capacity utilization $R_m = C_m$.

When

$S_i < r_i$ for every retime segment, the industry as a whole is left with less of raw material in each season than what is required to reach the rate of full capacity utilization. Each individual firm in the industry makes a bid to reach its full capacity at the expense of its rival by competitive procurement of raw material. This will bid up the cost of raw material. No firm can bid up the cost indefinitely. There is a limit and that is

$PQ_m = VC_m$

That is the variable cost is equal to sales proceeds. That is the upper most limit for the firms to bid up cost of raw material. They may like to stay in the market to meat the current commitments by producing and selling by meeting the current expenses only. But at that level of

$PQ_m = VC_m$, we have
$PQ_m < VC_m + FC_m$. that is
$R_m < C_m$

A clear index of over capacity caused by raw material shortage.

Thus the marginal cost and marginal revenue relations given in equation (12) lead to unmistakable identification of idle capacity wherever it exists.

In condlusion one more major issue linked to idle capacity may be considered. What is impact of capital subsidy on iddle capacity?

Since $R_m = C_m$ and
$R_m = FC_m + VC_m$

Capital subsidy will render the cost element $FC_m = 0$. The product maximising equation will now read as.

$$R_m = VC_m$$

That is production will be raised to that level at which the sale proceeds meet just variable cost. The capital cost in nil due to subsidy.

Therefore subsidy of capital lead to enhancement of production:

It utilises more raw material and labour and sells more processed output. Where there is a national policy to promote better utilization of raw material than what is possible under pure market mechanism of input and out put prices the capital subsidy serves the policy better. In estimating idle capacity, the volume of capital so supported by the subsidy schemes should be clearly separated from the volume of capital invested purely on marginal cost price equations.

Conclusion

The foregoing exercise in methods of estimating idle capacity takes into account all the principal elements that determine capacity creation and utilization. It links the concept of idle capacity to factor rewards in dynamic market conditions.