Multiplant Firms’ Pricing Practices

A firm with market power often produces output in more than one plant. In this situation, it is likely that the various plants will have different cost conditions. The problem facing the firm is how to allocate the firm’s desired level of production among these plant. For simplicity, we assume there are only plants, A and B. Suppose at desired output level, the following situation holds: \( MC_A > MC_B \). In this situation, the manager prefers to produce more in plant B, since cost of producing last unit is lower in plant B. Similarly, if \( MC_A < MC_B \) holds, it is better to produce more in plant A. Thus, production decision among plants stops where \( MC_A = MC_B \). So the rule is: A manager who has \( n \) plants can produce output will maximize profit when the firm produces the level of output and allocates among \( n \) plants so that

\[
MR = MC_1 = MC_2 = \ldots = MC_n.
\]

Note that the pricing and the production in the multiplant with different costs are same as the ones in CARTEL.

EXAMPLE: Suppose again two plants A and B with the following MCs:

\[
MC_A = 28 + 0.04Q_A \quad \text{and} \quad MC_B = 16 + 0.02Q_B
\]

The equation for total marginal cost function (the horizontal summation of \( MC_A \) and \( MC_B \)) can be derived algebraically using the procedure that first solve for \( Q \)s and sum all:

\[
Q_A = 25MC_A - 700
\]

and

\[
Q_B = 50MC_B - 800.
\]

Hence,

\[
Q = Q_A + Q_B = 75MC - 1500 \quad \text{or} \quad MC_T = 20 + 0.0133Q
\]

where \( MC_T \) is the total marginal cost. Now, we need demand equation to decide on the overall profit maximizing output level. Suppose inverse demand function is

\[
P = 50 - 0.01Q,
\]
thus, form $MR = MC$, we can derive the total output, $Q^*$ as

$$MR = 50 - 0.02Q = 20 + 0.0133Q = MC \quad \rightarrow \quad Q^* = 900.$$  

At this output level, marginal revenue and total cost are both

$$MR(Q = 900) = 50 - 0.02(900) = 32 = 20 + 0.0133(900) = MC(Q = 900).$$

In order to minimize the cost of producing 900 units, the production of 900 units should be allocated between plants $A$ and $B$ so that the marginal cost of the last unit produced in either plant is $32:

$$MC_A = 28 + 0.04Q_A = 32 \quad \text{and} \quad MC_B = 16 + 0.02Q_B = 32.$$  

Hence, for plant $A$, $Q^*_A = 100$ and for plant $B$, $Q^*_B = 800$. And the price is $P = 50 - 0.01(900) = 41$. 