Competitive Fringe and Dominant Firm Example

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Suppose each firm i of the competitive fringe has $MC_i(q_i) = 2 + 10q_i$. To get the supply curve, which is a function of price, we must invert,

$$q_i = \frac{P-2}{10}$$

If there were 10 firms in the industry:

$$Q_F = 10q_i = 10\frac{(P-2)}{10}$$

You can get more details on this procedure from my notes Firm and Industry Supply Curves.

$$Q_F = P - 2$$

We invert back to find the MC of aggregate of the fringe firms (F).

$$MC_F(q_F) = 2 + q_F$$

Suppose the inverse demand was $Q = 10 - P$ and the marginal cost of the dominant firm (D) were $MC_D = 3$. F will set the price of it's residual demand equal to MC.

$$P = 10 - (q_D + q_F) = 2 + q_F = MC_F$$

$$q_F = \frac{8 - q_D}{2}$$

Now D will face the following inverse residual demand:

$$P_D = 10 - \left(4 - \frac{q_D}{2} + q_D\right)$$

$$P_D = 6 - \frac{q_D}{2}$$

D is a monopolist when it faces its residual demand, so it will set $MR_D = MC_D$.

$$MR_D = 6 - q_D = 3 = MC_D$$

$$q_D = 3$$

Therefore, the price that D faces on its residual demand curve will be

$$P_D = 6 - \frac{3}{2} = \frac{9}{2}$$

$$q_F = \frac{8-3}{2} = \frac{5}{2}$$

You can check that your derivation by plugging the joint quantity back into the aggregate demand.

$$P = 10 - \left(3 + \frac{5}{2}\right) = \frac{9}{2} = P_D$$

The steps we followed are just like those of Stackelberg competition where we treat aggregate of the fringe firms as the 2nd mover.