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Upstream

$MC = 2$

Find MR

$P = 10 - Q$

$TR = (10 - Q)Q$

$TR = 10Q - Q^2$

$MR = 10 - 2Q$

Find P_U^* and Q_U^*

$MR = MC$

$10 - 2Q = 2$

$8 = 2Q$

$Q = 4$

sub $Q = 4$ in $P = 10 - Q$

$P = 10 - 4$

$P = 6$

Downstream

$MR = 10 - 2Q$ $MC = P_U^* = 6$

$MR = MC$

$10 - 2Q = 6$

$4 = 2Q$

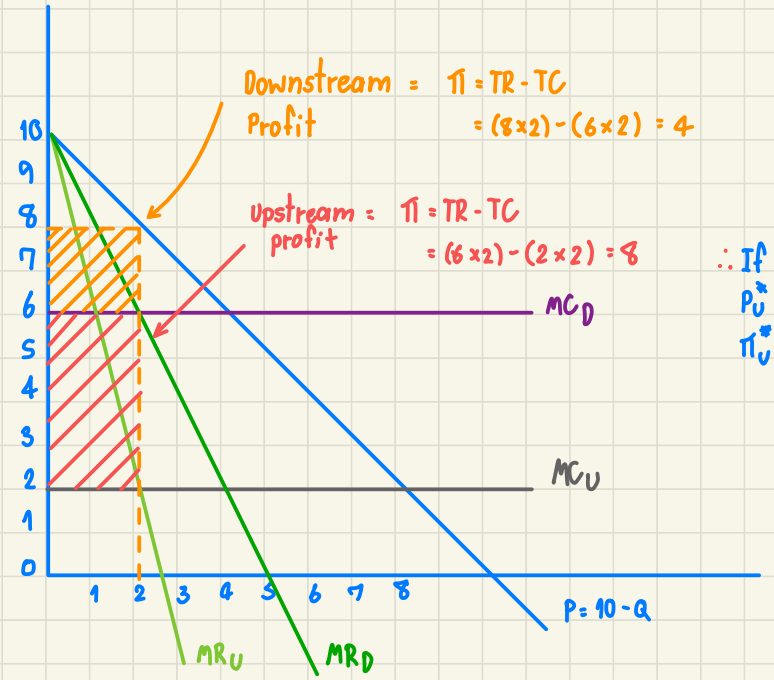
$Q = 2$

sub $Q = 2$ in $P = 10 - Q$

$P = 10 - 2$

$P = 8$

Case 2 firm



∴ If there are 2 firm

$P_U^* = 6$, $Q_U^* = 4$, $P_D^* = 8$, $Q_D^* = 2$

$\Pi_U^* = 8$, $\Pi_D^* = 4$

Case merge firm

$MR = MC$

$10 - 2Q = 2$

$8 = 2Q$

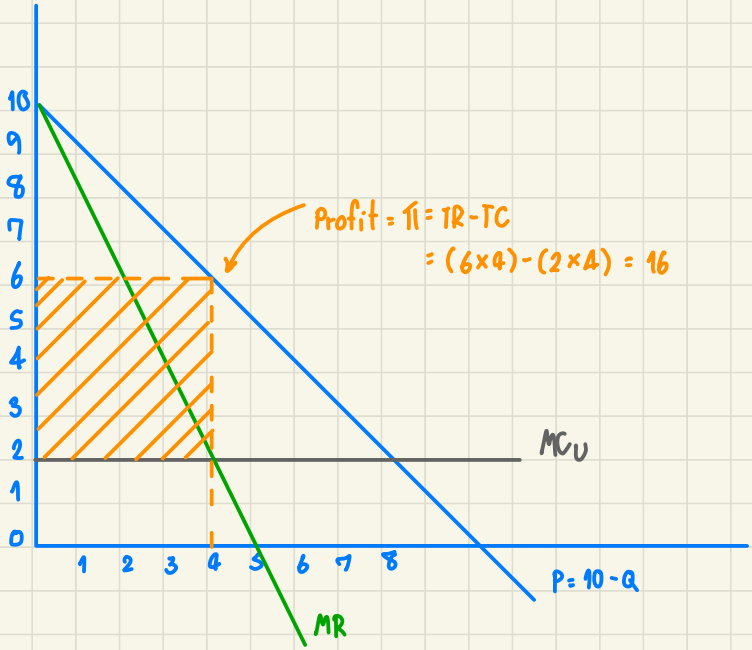
$Q = 4$

sub $Q = 4$ in $P = 10 - Q$

$P = 10 - 4$

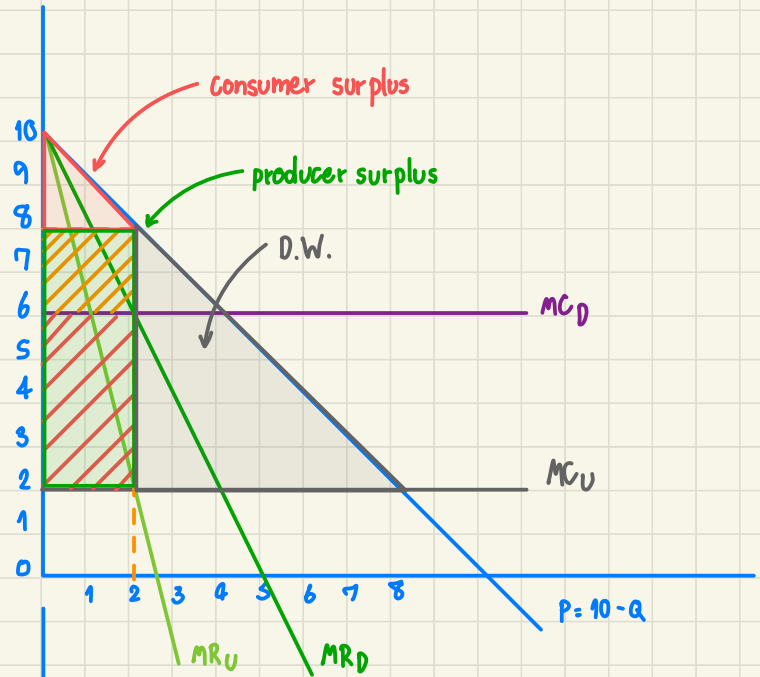
$P = 6$

$\therefore$ If merge firm $P^* = 6, Q^* = 4, \Pi^* = 16$

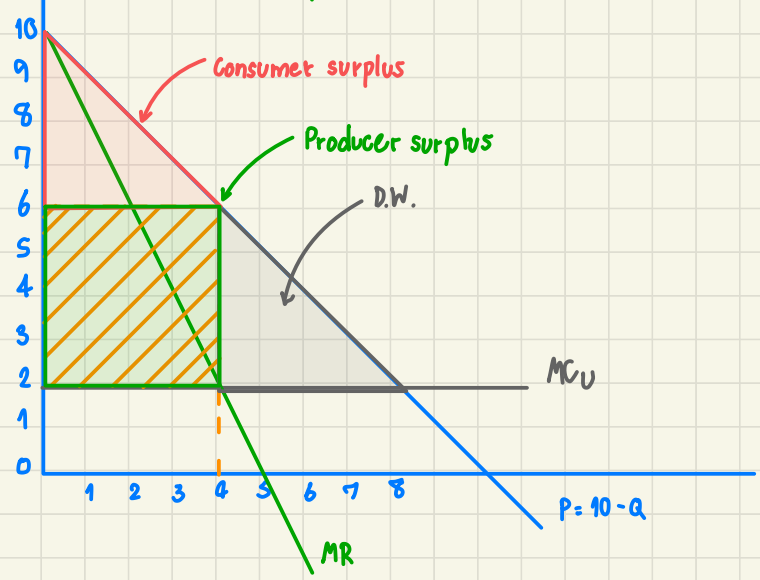


Welfare

Case 2 firm



case merge firm



∴ As the firm merge both consumer and producer will have a gain in the economic welfare as the size of dead weight loss get decrease.