

Practice Set 5

Strategic Competition

This set contains problems for your own practice. Do not just read the provided solutions — try to solve the problems first, and use the solutions only when you are stuck. Reading solutions without attempting the problems first has the same value for your preparation as watching someone else run a marathon and then expecting to be able to run it yourself. If you are unable to comprehend the solution of a problem even after reading the instructional answer key, you have most likely missed the relevant part of the material underlying this problem. Direct any questions about this problem set to your section's teaching assistant.

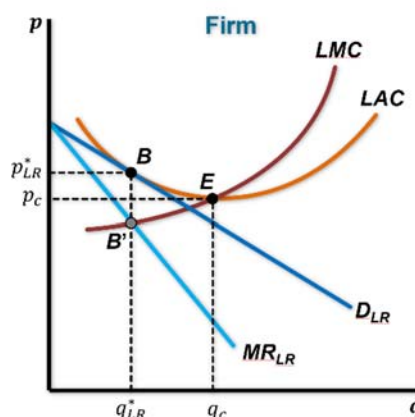
1. Explain why we concluded that “a Monopolistically Competitive firm has *excess capacity* at the L-R equilibrium” and that “Monopolistic Competition allows for more than optimal firms to survive in the L-R”.
2. Firm 1 and firm 2 compete by setting quantities. Market demand is $p = 14 - Q$. Each firm has zero fixed costs and constant $MC = 2$.
 - (a) Find the Cournot reaction functions for the two firms.
 - (b) Find the Cournot equilibrium quantities and price.
 - (c) Find the profit for the two firms under Cournot competition.
 - (d) Find the quantities and price if the two firms agree to collude.
 - (e) Find the profit for the two firms under collusion.
 - (f) If firm 1 produces its collusion quantity, what is the quantity that maximizes firm 2's profit?
 - (g) What will be the price, if firm 2 cheats?
 - (h) What will be the profit for each firm, if firm 1 colludes and firm 2 cheats?
 - (i) If firm 1 believes that firm 2 is going to cheat, and firm 2 indeed cheats, what would firm 1's reaction be and what would the price be?
 - (j) If firm 1 believes that firm 2 is going to cheat, and firm 2 indeed cheats, what will the profit for each firm be?
3. Firm 1 and firm 2 compete by setting *prices*. Market demand is $p = 14 - 2Q$. Each firm has zero fixed costs and constant $MC = 2$. Find the price, the profit maximizing quantities, and the profits for the two firms.
4. In the kinked-demand model, if a 2% price decrease from the prevailing price causes a 5% increase in quantity demanded, what should you expect for a 2% price increase over the prevailing price?
5. A radio commercial includes the message: “*Buy now before prices go up in October!*” Explain how this message can facilitate collusion.
6. A radio commercial includes the message: “*If you find a better price, we will pay you back double the difference.*” Explain how this message can facilitate collusion.
7. A radio commercial includes the message: “*We will give you the same price that we give to our own employees — no one gets a lower price than you!*” Explain how this message can facilitate collusion.

Answer Key

1. Explain why we concluded that “a Monopolistically Competitive firm has *excess capacity* at the L-R equilibrium” and that “Monopolistic Competition allows for more than optimal firms to survive in the L-R”.

According to LAC, the cost-effective quantity is q_c . The monopolistically competitive firm, however, maximizes its profit at $q_{LR}^* < q_c$. That is, the firm chooses to produce less than the quantity at which LAC is minimized. It therefore has unused capacity equal to $q_c - q_{LR}^*$. This is excess capacity.

If fewer firms operated in this market, each remaining firm would need to serve a larger share of demand, pushing its equilibrium quantity closer to q_c . So, the fact that $q_{LR}^* < q_c$ implies that more firms are in the market than would be needed if each operated at efficient scale. This is why monopolistic competition is said to allow more firms than optimal to survive in the long run.



2. Firm 1 and firm 2 compete by setting quantities. Market demand is $p = 14 - Q$. Each firm has zero fixed costs and constant $MC = 2$.

- (a) Find the Cournot reaction functions for the two firms.

Firm 1 sees the demand as $p = 14 - q_1 - q_2$ or $p = (14 - q_2) - q_1$. Marginal revenue is: $MR = 14 - q_2 - 2q_1$ (applying the double gradient rule only to q_1 which firm 1 controls). Setting $MR = MC$: $14 - q_2 - 2q_1 = 2$, so $q_1 = (12 - q_2)/2$, which is firm 1's reaction function. Because the firms are symmetric, firm 2's reaction function is $q_2 = (12 - q_1)/2$.

- (b) Find the Cournot equilibrium quantities and price.

At the Cournot equilibrium, $q_1 = q_2$. Substituting into firm 1's reaction function: $q_1 = (12 - q_1)/2$, so $q_1 = q_2 = 4$. From the demand we can calculate the price consumers are willing to pay for 8 total units of output: $p = 14 - 8$, so $p = 6$.

- (c) Find the profit for the two firms under Cournot competition.

Since MC is constant and $FC = 0$, we know that $AC = MC = 2$. This is because when every additional unit costs the same to produce, the average cost of all units must equal that constant — there is no fixed cost to spread across units. Profit for firm 1: $\Pi_1 = (p - AC) \cdot q_1 = (6 - 2)4 = 16$. By symmetry, $\Pi_2 = 16$.

- (d) Find the quantities and price if the two firms agree to collude.

When firms collude, they act as a single monopolist facing the full market demand $p = 14 - Q$. The combined marginal revenue is $MR = 14 - 2Q$. Setting $MR = MC$: $14 - 2Q = 2$, so $Q = 6$. By symmetry, each firm produces $q_1 = q_2 = 3$. The market price is $p = 14 - 6 = 8$.

- (e) Find the profit for the two firms under collusion.

$\Pi_1 = (p - AC)q_1 = (8 - 2)3 = 18$. By symmetry, $\Pi_2 = 18$. Each firm earns more under collusion (18) than under Cournot competition (16), which is why firms would want to collude.

- (f) If firm 1 produces its collusion quantity, what is the quantity that maximizes firm 2's profit?

Firm 2's reaction function gives its best response to any quantity firm 1 produces. If firm 1 sticks to its collusion quantity $q_1 = 3$, firm 2's optimal response is $q_2 = (12 - q_1)/2 = (12 - 3)/2 = 4.5$ — more than the collusion quantity of 3. This means firm 2 has an incentive to cheat.

- (g) What will be the price, if firm 2 cheats?

If firm 2 cheats and produces 4.5 while firm 1 produces 3, total output is $Q = 3 + 4.5 = 7.5$. The market price falls to $p = 14 - 7.5 = 6.5$ — lower than the collusion price of 8 but higher than the Cournot price of 6.

- (h) What will be the profit for each firm, if firm 1 colludes and firm 2 cheats?

Firm 1, which honored the agreement, earns $\Pi_1 = (p - AC)q_1 = (6.5 - 2)3 = 13.5$ — less than under collusion (18) and even less than under Cournot (16). Firm 2, which cheated, earns $\Pi_2 = (p - AC)q_2 = (6.5 - 2)4.5 = 20.25$ — more than under either collusion or Cournot. This illustrates the incentive to cheat: cheating is individually profitable as long as the other firm does not cheat.

- (i) If firm 1 believes that firm 2 is going to cheat, and firm 2 indeed cheats, what would firm 1's reaction be and what would the price be?

If firm 1 anticipates that firm 2 will cheat and produce 4.5, its best response is $q_1 = (12 - 4.5)/2 = 3.75$. Total output is $Q = 3.75 + 4.5 = 8.25$ and the market price falls to $p = 14 - 8.25 = 5.75$. Both firms produce more than under collusion, pushing the price down further.

- (j) If firm 1 believes that firm 2 is going to cheat, and firm 2 indeed cheats, what will the profit for each firm be?

$\Pi_1 = (p - AC)q_1 = (5.75 - 2)3.75 = 14.063$ and $\Pi_2 = (p - AC)q_2 = (5.75 - 2)4.5 = 16.875$. Firm 1 improves its position by knowing that firm 2 intends to cheat — profit for firm 1 now is 14.063 compared to 13.5 when firm 1 was ignorant.

3. Firm 1 and firm 2 compete by setting prices. Market demand is $p = 14 - 2Q$. Each firm has zero fixed costs and constant $MC = 2$. Find the price, the profit maximizing quantities, and the profits for the two firms.

Under Bertrand competition, firms undercut each other's price until no further undercutting is profitable. This continues until $p = MC = 2$ — any higher price would be undercut by the rival, and any lower price would mean selling at a loss. Substituting $p = 2$ into the demand: $2 = 14 - 2Q$, so $Q = 6$. By symmetry, $q_1 = q_2 = 3$. Profit for each firm: $\Pi_1 = (p - AC) \cdot q_1 = (2 - 2)3 = 0$. By symmetry $\Pi_2 = 0$.

4. In the kinked-demand model, if a 2% price decrease from the prevailing price causes a 5% increase in quantity demanded, what should you expect for a 2% price increase over the prevailing price?

In the kinked-demand model, rivals match any price cut — fearing a loss of market share — but do not follow a price increase, since they gain customers by staying put. This asymmetry makes demand more elastic above the prevailing price (a price increase sends customers to rivals who don't follow) and less elastic below it (a price cut is matched, so little market share is gained). Since a 2% price decrease causes a 5% increase in quantity and demand is more elastic above the prevailing price, a 2% price increase should cause quantity to decrease by more than 5%, since the firm loses a disproportionately large share of its customers.

5. A radio commercial includes the message: "Buy now before prices go up in October!" Explain how this message can facilitate collusion.

By broadcasting this message publicly, the seller signals to rivals that it intends to raise prices in October. This serves as a coordinating device: rivals who hear the message know that if they also raise prices in October, they will not be undercut — because the sender has already committed to doing the same. A public commercial can achieve coordination when explicit contact between firms is difficult.

6. A radio commercial includes the message: "If you find a better price, we will pay you back double the difference." Explain how this message can facilitate collusion.

By making this promise publicly, the firm commits to matching — and then exceeding — any lower price offered by a rival. This commitment is a credible threat: it is binding because customers can claim the refund, so the firm cannot back down without cost. Any rival that cuts its price knows the firm will immediately respond with an even lower price, triggering a price war that hurts everyone. Knowing this, rivals have no incentive to cut prices in the first place. The result is that all firms maintain the current price level, achieving tacit collusion without any explicit agreement.

7. A radio commercial includes the message: "We will give you the same price that we give to our own employees — no one gets a lower price than you!" Explain how this message can facilitate collusion.

This message signals to rivals that the firm will not secretly offer lower prices to any customer. The commitment is credible because it is contractually binding: if the firm were to secretly cut prices for some customers, all other customers would be entitled to the same discount under this clause — making secret price cuts enormously costly. Rivals can therefore trust that the firm will not undercut them, removing the incentive to start a price war. The result is that all firms maintain the prevailing price level, achieving tacit collusion without explicit coordination.

Please report any typos, mistakes, or suggestions for improvement to kmarinakis@smu.edu.sg.