

Module 6 Market Structure

Duopoly

A duopoly is a type of oligopoly, characterized by two primary corporations operating in a market or industry, producing the same or similar goods and services. The key components of a duopoly are how the firms interact with one another and how they affect one another. There are many duopoly models in Economics. We will be learning the basic model developed by Cournot.

The Cournot Model:

The oldest determinate solution to the duopoly problem is by the French economist, A.A. Cournot in 1838, who took the case of two mineral water springs situated side by side and owned by two firms A and B.

Assumptions:

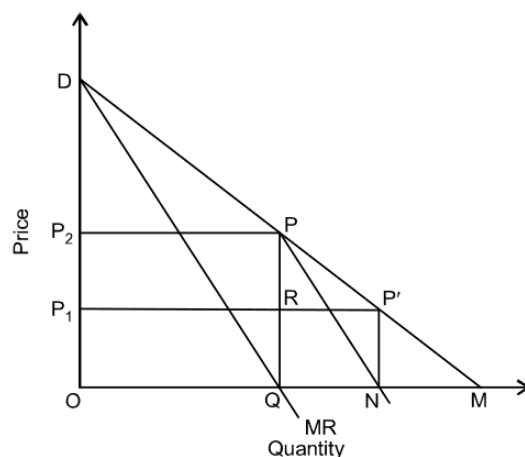
The Cournot model is based on the following assumptions:

- (1) There are two independent sellers. In other words, interdependence of the duopolists is ignored.
- (2) They produce and sell a homogeneous product, mineral water.
- (3) The total output must be sold out, being perishable and non-storable.
- (4) The number of buyers is large.
- (5) Each seller knows the market demand curve for the product.
- (6) The cost of production is assumed to be zero.
- (7) Both have identical costs and identical demands.
- (8) Each seller decides about the quantity he wants to produce and sell in each period.
- (9) But each is ignorant about his rival's plan about output.
- (10) At the same time, each seller takes the supply or output of its rival as constant.
- (11) Neither of them fixes the price for its product, but each accepts the market demand price at which the product can be sold.
- (12) The entry of firms is blocked.
- (13) Each seller aims at obtaining the maximum net revenue or profit.

Explanation:

Given these assumptions, suppose there are two mineral water springs exploited by two firms, A and B. The market demand curve is DM, and its marginal revenue curve is MR, as shown in Figure 1. The marginal costs of both A and B are assumed to be zero so that they coincide with the horizontal axis.

Suppose firm A is the only producer in which case it produces and sells OQ1 ($=\frac{1}{2} OM$) quantity when its MR, equals its marginal cost curve (horizontal axis) at point Q. It charges the monopoly price QP ($=OP_2$) and earns P_2PQO as monopoly profits.



Now let B enter the market. He finds that the market open to him is QM which is half of the total market. That is, he can sell his product in the remaining half of the market. B assumes that A will not change his output because he is making maximum profit. Specifically, B assumes that A will continue to sell OQ at prices OP_2 . Thus, the market available to B is QM and the relevant part of the demand curve is PM. Given his demand curve PM, his MR curve is given by the curve PN which bisects QM at point N where $QN = NM$. In order to maximize his revenue, B sells QN at price OP_1 . His total revenue is maximum at $QRP'N$ which equals his total profit. Note that B supplies only $QN = \frac{1}{4} = (1 - \frac{1}{2})/2$ of the market.

Let us now see how A's profit is affected by the entry of B. With the entry of B, price falls to OP_1 . Therefore, A's expected profit falls to OP_1RQ . Faced with this situation, A assumes, in turn, that B will not change his output QN and price OP_1 as he is making maximum profit. Since $QN = \frac{1}{4}$ th of the market, A assumes that he has $\frac{3}{4}$ ($= 1 - \frac{1}{4}$) of the market available to him. To maximize his profit, A supplies $\frac{1}{2}$ of the unsupplied market ($\frac{3}{4}$), i.e., $\frac{3}{8}$ of the market. It is noteworthy that A's market share has fallen from $\frac{1}{2}$ to $\frac{3}{8}$. Now it is B's turn to react. Following Cournot's assumption, B assumes that A will continue to supply only $\frac{3}{8}$ of the market and the market open to him equals $1 - \frac{3}{8} = \frac{5}{8}$. To maximise his profit under the new conditions, B supplies $\frac{1}{2} \times \frac{5}{8} = \frac{5}{16}$ of the market. It is now for A to reappraise the situation and adjust his price and output accordingly.

This process of action and reaction continues in successive periods. In the process, A continues to lose his market share and B continues to gain. Eventually, a situation is reached when their market share equals 1/3 each. Any further attempt to adjust output produces the same result. The firms, therefore, reach their equilibrium where each one supplies one-third of the market and both charge the same price.

Determinants of market share by duopoly firms

<i>Period</i>	<i>Seller A</i>		<i>Seller B</i>
I	$\frac{1}{2}(1) = \frac{1}{2}$	$\longrightarrow$	$\frac{1}{2}\left(\frac{1}{2}\right) = \frac{1}{4}$
II	$\frac{1}{2}\left(1 - \frac{1}{4}\right) = \frac{3}{8}$	$\longleftarrow$ $\longrightarrow$	$\frac{1}{2}\left(1 - \frac{3}{8}\right) = \frac{5}{16}$
III	$\frac{1}{2}\left(1 - \frac{5}{16}\right) = \frac{11}{32}$	$\longleftarrow$ $\longrightarrow$	$\frac{1}{2}\left(1 - \frac{11}{32}\right) = \frac{21}{64}$
IV	$\frac{1}{2}\left(1 - \frac{21}{64}\right) = \frac{43}{128}$	$\longleftarrow$ $\longrightarrow$	$\frac{1}{2}\left(1 - \frac{43}{128}\right) = \frac{85}{256}$
...	...		...
...	...		...
N	$\frac{1}{2}\left(1 - \frac{1}{3}\right) = \frac{1}{3}$	$\longleftarrow$ $\longrightarrow$	$\frac{1}{2}\left(1 - \frac{1}{3}\right) = \frac{1}{3}$

Arrows show the direction of actions and reactions of sellers A and B.

Cournot's equilibrium is stable when they reach at the point where each firm sells 1/3th of the total supply.

Note: Cournot's equilibrium can be expanded to cases with more firms.

Its Criticisms:

The cournot model has been criticised on the following grounds:

1. The main defect in Cournot's solution is that each seller assumes his rival's supply fixed, despite repeatedly observing changes in it. Joseph Bertrand, a French mathematician, criticising Cournot in 1883 pointed out that seller A in order to regain all the customers lost to B, will fix a price slightly below that fixed by B and price cutting may continue until the price becomes zero. Thus, Bertrand argued that there would not be any limit to the fall in price since each seller could by doubling his produce, and underbid his rival. This would tend to drive down the price to the competitive level in the long-run.

2. The model is silent about the period within which one firm reacts and adjusts its output to the moves of the other. Thus it is a static model.
3. The Cournot solution is unrealistic because it assumes zero cost of production.
4. It is a closed model because it does not allow entry of firms.
5. The assumption that each duopolist can act without any output reaction from the other is unrealistic. It is, in fact, a no-learning-by-doing model.
6. Marshall, therefore, regarded Cournot's model as "incapable of a universal solution." This is because it is not possible to find an actual duopoly market where each duopolist acts autonomously and output is the 'sole parameter of action'.

Advanced models [not needed as per syllabus]: Stakelberg model, Chamberlin model