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**Lecture 19: Oligopoly—Bertrand**

1. Oligopoly
   1. Recall that an *oligopoly* is a market with just a few firms.
   2. Thanks to barriers to entry, each firm has price setting power but this power is not absolute: each firm must consider the actions of other firms to achieve profit maximization.
   3. Economists model oligopolies in two different ways: either assuming each firm sets quantity to maximize profit or assuming each firm sets price to maximize profit. We start with the latter with the Bertrand model.
      1. Some game theory is useful here so we will be employing that as well.
      2. In each model, we will assume the market demand curve is known.
2. Bertrand
   1. Joseph Bertrand (1883) assumes each oligopolistic firm sets price at the same time. Each firm assumes the others’ prices are fixed.
      1. Note the game theory here: keeping the other player’s actions constant, what’s your best strategy?
   2. The pure Bertrand model with homogenous goods doesn’t get us very far in describing oligopolies.
      1. If a firm undercuts another, the undercutting firm captures the whole market. Thus in equilibrium, P=MC. But this occurs even if there are just two firms.
   3. So let’s remember Hayek’s criticism of perfect competition: firms differentiate products. Suppose two firms sell similar, but not identical, products.
      1. Assume fixed costs total $20.
      2. Assume no variable costs.
      3. Firm 1’s Demand: Q1 = 12 – 2P1 + P2

Firm 2’s Demand: Q2 = 12 – 2P2 + P1

* + 1. As one firm increases its price, that firm not only sells less, the other firm sells more. (Note this is not a one-for-one swap.)
  1. For Firm 1, its profit (π1) is revenue (P1Q1) minus costs ($20).
     1. π1 = P1Q1 – 20 = 12P1 – 2P12 + P1P2 – 20
     2. To maximize profit: P1 = 3 + 0.25P2
     3. Since both firms are the same, Firm 2 faces a similar incentive structure: P2 = 3 + 0.25P1
     4. These equations are called *reaction curves*—the relationship between a firm’s profit-maximizing output and the amount it thinks its competitors will produce
  2. Substituting one reaction curve for either P will get you where the curves cross. This is the Nash equilibrium.
     1. P1 = 3 + 0.25(3 + 0.25P1) = 3.75 + 0.0625P1 = 4
     2. We can summarize this result graphically:

P2

P1

6

5

4

3

2

1

0

1

2

5

3

6

4

**F1**

**F2**

Nash Equilibrium

Collusive Equilibrium

Competitive Equilibrium

7

7

* + 1. Competitive equilibrium is 0 for each firm. Why?
  1. Collusive equilibrium is 6 from each firm. How do we know?
     1. If they cooperate, then we would combine their demand curves into one function: Q = 24 – 4P + 2P = 24 – 2P
     2. MR = 24 – 4P = 0; P = 6