

## Handout-Week 13

### Topics

- Cournot Duopoly
- Price Leadership
- Collusion

### Cournot Duopoly

Consider the market for central processing units (CPUs), a key component in modern computers. This market consists of two firms: Intel and AMD. For simplicity, assume that both Intel and AMD have identical cost structures, where  $MC = AC = 30$  (we would change this later) for each firm. On any given day, the market demand for CPUs is given by  $P = 120 - Q$ .

- Suppose the market for CPUs was controlled by a monopoly with the same cost structure as Intel and AMD. How many CPUs would this monopoly produce (call this  $Q_M$ ), and what price would it charge  $P_M$ ?
- Suppose instead the market for CPUs was perfectly competitive, with every firm having the same cost structure as Intel and AMD. What would be the market equilibrium quantity  $Q_{PC}$  and price  $P_{PC}$ ?
- Now return to reality, where Intel and AMD compete as Cournot duopolist. What is the reaction function of Intel? What is the reaction function of AMD?
- Find the quantity produced by each firm in a Cournot equilibrium,  $q_{Intel}^*$  and  $q_{AMD}^*$ . Then find the market quantity  $Q_C$  and market price  $P_C$  under this Cournot duopoly.
- Compare the three industrial structures: monopoly, Cournot duopoly, and perfect competition. Rank these in terms of firms profits and the welfare of consumers (Hint:there is no need to calculate anything here. Use your intuition to rank these by comparing prices and quantities only.)
- Suppose Intel's marginal cost is  $MC = 20$ . What's Intel's reaction function?
- Find the new quantity produced by each firm in a Cournot equilibrium,  $q_{Intel}^*$  and  $q_{AMD}^*$ . Can you use the  $\frac{2}{3}$  rule.

### Price Leadership

Consider the price leadership model of oligopoly in the market for tablet computers. Suppose the market demand for tablets is given by

$$P = 100 - \frac{1}{10}Q_M$$

Suppose the dominant firm, Apple, has a marginal cost function  $MC_D$  given by

$$MC_D = \frac{9}{10}Q_D + 2.5$$

Furthermore, suppose there are 20 other identical small firms that produce tablets, EACH with marginal cost function  $MC_{SF}$  given by

$$MC_{SF} = 2q_{SF} + 5$$

- (a) Find the supply curve for small firms as a function of price.
- (b) Find the residual demand function for the dominant firm,  $Q_D$ . (Make sure you find all 3 segments of this curve, yielding a piecewise demand function. The easiest way to do this is to find the two kink points.
- (c) Solve for the quantity produced by the dominant firm in equilibrium,  $Q_D^*$ .
- (d) Find the equilibrium price  $P^*$ .
- (e) Find the quantity produced by the small firms in equilibrium  $Q_{SF}^*$  and the market quantity in equilibrium  $Q_M^*$ .

### Collusion

Suppose there are 3 countries that are the only countries in the world to produce oil. The market demand for oil is  $P = 260 - 2Q$ . Marginal cost is \$20 on each unit sold.

- (a) Suppose they choose to collude. They first figure out how to maximize total profits and then divide the production and profits between them. How much do they each produce in this scenario? What profits does each earn?
- (b) Suppose one of the 3 countries cheats and produces an extra 20 barrels. What are the profits of the 3 countries in this scenario? Does it pay to be the cheater?
- (c) Now suppose all 3 countries cheat and produce the extra 20 barrels. What are the profits of each?