April 22, 2001

Monopoly
Handout 2

Comparing Monopoly to Perfect Competition

Main result - All else equal, a monopoly market will have higher prices and lower output than a purely competitive market.

In a competitive market firms produce where price is equal to marginal cost. For a competitive industry, the supply curve is the sum of the marginal cost curves and so the equilibrium quantity will be where demand and this aggregate marginal cost curve intersect.

Example

Consider an industry made up of 1,000 firms each with cost function C(q, w) = 100 + 10q + q^2 and marginal cost function MC(q, w) = 10 + 2q. Assume that the industry inverse demand is given by P = 70 - 0.04Q with demand given by Q = 1750 - 25P. Each firm will have a supply function obtained by solving the equation 10 + 2q = P. This will give q = ½ P - 5. If there are 100 firms then aggregate supply is given by multiplying this individual supply by 100. This will give Q = 50 P - 500. Setting supply equal to demand we obtain

$$\begin{aligned} Q^S = 50P - 500 &= 1750 - 25P = Q^D \\ \Rightarrow 75P &= 2250 \\ \Rightarrow P &= 30 \\ \Rightarrow Q &= 1{,}000 \end{aligned}$$

Each firm will then choose its output by setting price (30) equal to marginal cost. This will give

$$\begin{aligned} MC &= 10 + 2q = 30 \\ \Rightarrow 2q &= 20 \\ \Rightarrow q &= 10 \end{aligned}$$

Each firm has zero profits as can be seen by substituting $30 in the revenue and cost equations.

$$\begin{aligned} R &= (30)(10) = 300 \\ C &= 100 + (10)(10) + 10^2 = 300 \end{aligned}$$

Now consider a monopoly firm which buys up all 100 competitive firms and operates the 100 plants as before. The marginal cost curve for the monopolist will be the same as the supply curve for the 100 firms because the monopolist will produce such that each plant has the same marginal cost. Then the cost of producing one more unit of the good is the cost of producing one more unit at one of the plants. We get this aggregate marginal cost by inverting the supply curve

$$\begin{aligned} Q^S &= 50P - 500 \\ \Rightarrow 50P &= Q^S + 500 \\ \Rightarrow P &= \frac{1}{50}Q^S + 10 \\ \Rightarrow MC &= 0.02\,Q^S + 10 \end{aligned}$$

Revenue and marginal revenue are given by

$$\begin{aligned} P &= 70 - 0.04Q \\ \Rightarrow R &= (70 - 0.04Q)Q \\ &= 70Q - 0.04Q^2 \\ \Rightarrow MR &= 70 - 0.08Q \end{aligned}$$

We can now set marginal revenue equal to marginal cost to obtain the monopoly equilibrium

$$\begin{aligned} MC = 10 + 0.02Q &= 70 - 0.08Q = MR \\ \Rightarrow 0.1Q &= 60 \\ \Rightarrow Q &= 600 \\ \Rightarrow P &= 46 \end{aligned}$$

We can see this graphically as