1 Monopolies

Market Power The ability of a firm to charge a price above marginal cost and earn a positive profit.

Monopolists have market power, so they do not take prices as given. Instead, price is a function of the quantity they produce $\Rightarrow p = p(q)$.

$$R = p(q) \cdot q$$

$$MR = \frac{\partial R}{\partial q} = p(q) + \frac{\partial p(q)}{\partial q} \cdot q = p(q) \cdot \left(1 + \frac{1}{\varepsilon}\right)$$

	Positive if demand is elastic	$\Rightarrow \varepsilon < -1$
Marginal revenue is:	Equal to price if demand is perfectly elastic	$\Rightarrow \varepsilon = -\infty$
	Negative if demand is inelastic	$\Rightarrow -1 < \varepsilon \leq 0$

A monopolist still sets $MR = MC$, but they then set the price according to the *demand* curve, *not* according to the marginal revenue curve.

Lerner Index The ratio of the difference between price and marginal cost to the price.

$$\frac{p - MC}{p} = -\frac{1}{\varepsilon} \in [0, 1]$$

Natural Monopoly A situation in which one firm can produce the total output of the market at lower cost than several firms could.

$\Rightarrow$ Quantity demanded is such that long run average average cost is decreasing.

2 Exercises

1. You and some of your fellow economics students have noticed that no matter how many times a professor tells students to bring a scantron, there will always be some students who come to an exam without one. Using the tools from Dr. Bushnell's ECN 100 class, you start selling scantron forms before exams. Your cost of selling scantrons is $C(q) = 36 + 4q^2$ and demand for scantrons by forgetful students is $q(p) = 120 - 4p$.

   (a) Suppose that all of the economics students are competing to sell scantrons to the students who have forgotten a form. How many scantrons will be sold under perfect competition?
   Perfect competition will lead to minimized average cost.

   $$MC = AC \Leftrightarrow 8q = \frac{36}{q} + 4q \Leftrightarrow q^* = 3$$

   (b) What will the equilibrium price be?
   We know firms set price equal to marginal cost under perfect competition.

   $$p = MC(3) = 8 \cdot 3 = 24$$

   (c) How many students will be selling scantrons?
   We need to find the market demand at a price of \$24.

   $$q(24) = 120 - 4(24) = 24$$

   We know each student is supplying 3 scantrons, so the number of students selling scantrons is $\frac{24}{3} = 8$.

   (d) After learning about cartels, you want to apply this knowledge to the real world. You and your fellow students decide to collude and attempt to act as a monopoly. If there are the same number of students in the cartel as there were in part (c), what is your aggregate supply curve?

We know that each individual student has an inverse supply curve equal to $p(q) = 8q$, so their supply curve will be $q(p) = \frac{1}{8}p$. Since there are 8 students supplying scantrons, aggregate supply will be $8 \cdot q(p) = 8 \cdot [\frac{1}{8}p] = p$. Thus aggregate supply is $Q(p) = p$.

(e) How many scantrons will you sell as a cartel?

Since the students now have market power, marginal revenue is no longer equal to price.

$$MR = p'(q) \cdot q + p(q) = -\frac{1}{4}q + 30 - \frac{1}{4}q = 30 - \frac{q}{2}$$

And marginal cost is determined by the cartel's aggregate supply curve.

$$MC = q$$

We then set marginal revenue equal to marginal cost.

$$MR = MC \Leftrightarrow 30 - \frac{q}{2} = q \Leftrightarrow q = 20$$

(f) What is the price that you will sell scantrons at?

Here we go to the demand curve to see the price students will pay.

$$p(20) = 30 - \frac{20}{4} = 25$$

(g) What was your profit under perfect competition? If the cartel's production is split up amongst each student equally, what are your profits under collusion?

Under perfect competition, profit was equal to zero. Under the cartel we each sell $\frac{20}{8} = 2.5$ scantrons. So profit is

$$\pi = 25 \cdot 2.5 - [36 + 4(2.5)^2] = 1.5$$

(h) Are you better of worse off under collusion? Is society better or worse off under collusion? What is the change in welfare?

You are better off under collusion, because profits are now positive. Society will be worse off, because the cartel has created deadweight loss. The amount of deadweight loss is equal to the triangle between supply and demand to the right of the cartel quantity up to q^*.

$$DWL = \frac{1}{2}(25 - 20)(24 - 20) = 10$$

2. You have started a business for every Californian's new favorite drink, kombucha. Your brand (Kombooya) competes directly with a brand that markets to mothers (Mombucha). The total market demand for kombucha is given by $p(Q) = 840 - 5Q$, where $Q = q_1 + q_2$. Each firm has a cost function equal to $C(q) = 50 + 3q^2$.

(a) What is Kombooya's best response function to the quantity produced by Mombucha?

We set marginal revenue equal to marginal cost, taking Mombucha's quantity as given.

$$R = p(Q) \cdot q = 840q_1 - 5(q_1)^2 - 5q_1q_2$$

$$MR = 840 - 10q_1 - 5q_2$$

$$MC = 6q_1$$

$$MR = MC \Leftrightarrow 840 - 10q_1 - 5q_2 = 6q_1 \Leftrightarrow q_1(q_2) = \frac{840 - 5q_2}{16}$$

(b) What is Mombucha's best response function to the quantity produced by Kombooya?
We do the same for firm 2.

$$R = p(Q) \cdot q = 840q_2 - 5q_1q_2 - 5(q_2)^2$$

$$MR = 840 - 5q_1 - 10q_2$$

$$MC = 6q_2$$

$$MR = MC \Leftrightarrow 840 - 5q_1 - 10q_2 = 6q_2 \Leftrightarrow q_2(q_1) = \frac{840 - 5q_1}{16}$$

(c) How much will each firm produce in equilibrium?
By plugging in firm 2's best response function into q_2 for firm one, we can calculate how much each firm produces. After some algebra we get $q_1 = q_2 = 40$.

(d) What with the price of kombucha be in equilibrium?
Using the demand curve and the fact that $Q = q_1 + q_2 = 80$,

$$p(80) = 840 - 5(80) = 440$$