Microeconomics for Public Policy I
Fall 2023

Problem Set 10

On what and how to submit

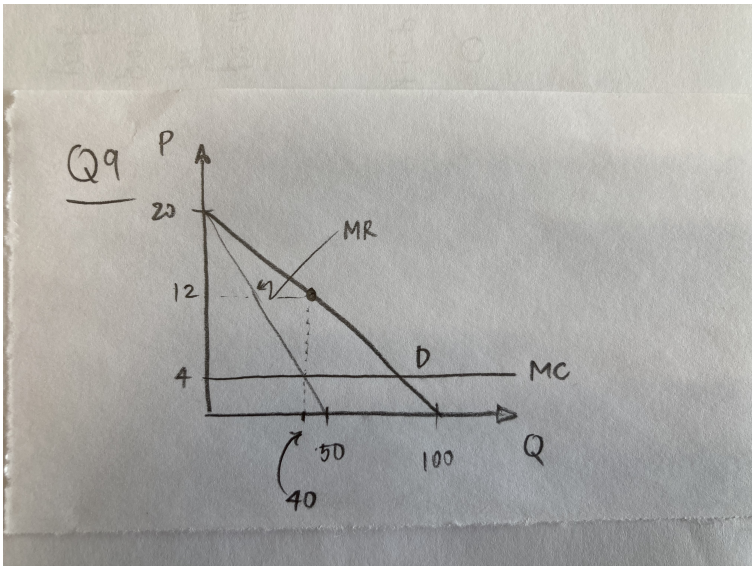
- For this and all future problem sets, questions are from the "Problems" section of the questions at the end of the chapter.
- Due before Lecture 11 to your Box folder
- Name the file "ps10_[lastname].[extension]". For example, my file would be "ps10_brooks.pdf".
- You do not need to type your submission. Any **legible** submission is ok. For example, you can write the problem set with hand-drawn graphs, take a picture, and submit the picture.

1. GLS Chapter 9, Question 9. Hint: find the demand curve using the points on the graph.

   (a) Draw the marginal revenue curve

   There are two points from the graph: (0,20), and (100,0). The slope is rise over run, or $\frac{-20}{100}$. Therefore, we can write the demand curve as $P = -0.2Q + 20$.

   Using the formula from class, $MR = -0.4Q + 20$.



   (b) Find profit maximizing P and Q

Set $MR = MC$

$$\begin{aligned} MR &= MC \\ -0.4Q^* + 20 &= 4 \\ 16 &= 0.4Q^* \\ Q^* &= 40 \end{aligned}$$

Then find the profit maximizing price, P^*, by plugging the profit maximizing quantity into the **demand** curve:

$$\begin{aligned} P^* &= -0.2Q^* + 20 \\ &= -0.2(40) + 20 \\ &= 12 \end{aligned}$$

(c) Calculate profit

Profit is total revenue minus total cost:

$$\begin{aligned} \pi &= TR - TC \\ &= P^*Q^* - ATC(Q^*) \\ &= 12(40) - 4(40) \\ &= 320 \end{aligned}$$

(d) Can the seller increase profit by reducing price and selling more?

Suppose we lower the price to \$11. How many units can you sell at this price? Plug 11 into the demand curve:

$$\begin{aligned} P &= -\frac{2}{10}Q + 20 \\ 11 &= -\frac{2}{10}Q + 20 \\ \frac{1}{5}Q &= 9 \\ Q &= 45 \end{aligned}$$

Given this price and quantity,

$$\begin{aligned}\pi &= TR - TC \\ &= P^*Q^* - ATC(Q^*) \\ &= 11(45) - 4(45) \\ &= 315\end{aligned}$$

Since $315 < 320$, lowering the price does not increase profit.

(e) Can we increase profit by increasing price?

Suppose we increase the price to \$13. How many units sell? Plug 13 into the demand curve:

$$\begin{aligned}P &= -\frac{2}{10}Q + 20 \\ 13 &= -\frac{2}{10}Q + 20 \\ \frac{1}{5}Q &= 5 \\ Q &= 35\end{aligned}$$

Given this price and quantity,

$$\begin{aligned}\pi &= TR - TC \\ &= P^*Q^* - ATC(Q^*) \\ &= 13(35) - 4(35) \\ &= 315\end{aligned}$$

Again, since $315 < 320$, increasing the price does not increase profit.

2. GLS Chapter 8, Question 15. Hint: Harley-Davidson is a firm with market power.

(a) Solve for profit maximizing P and Q

A profit-maximizing firm with market power finds Q by setting $MR = MC$:

$$\begin{aligned} MR &= MC \\ 40,0000 - 20Q^* &= 16,000 \\ 24,000 &= 20Q^* \\ Q^* &= 1,200 \end{aligned}$$

Put this Q into the demand curve to find price:

$$\begin{aligned} P^* &= 40,000 - 10Q^* \\ &= 40,000 - 10(1,200) \\ &= 28,000 \end{aligned}$$

(b) Suppose tariffs increase costs by \$2,000. What are the new profit maximizing price and quantity?

This means that instead of a cost of \$16,000, there is a cost of \$18,000.

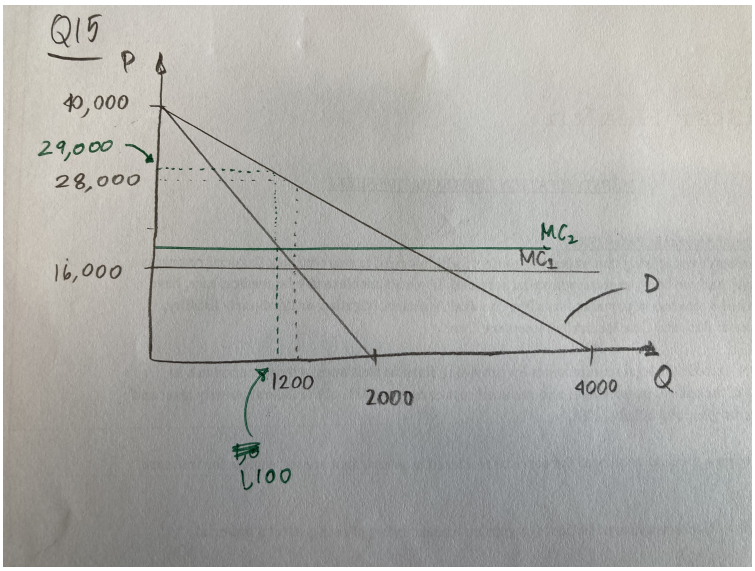
A profit-maximizing firm with market power finds Q by setting $MR = MC$:

$$\begin{aligned} MR &= MC \\ 40,0000 - 20Q^* &= 18,000 \\ 22,000 &= 20Q^* \\ Q^* &= 1,100 \end{aligned}$$

Put this Q into the demand curve to find price:

$$\begin{aligned} P^* &= 40,000 - 10Q^* \\ &= 40,000 - 10(1,100) \\ &= 29,000 \end{aligned}$$

I drew this figure to help me with the problem (it helped me recognize an error in calculation!).



3. GLS Chapter 9, Question 17

(a) If competitive, what would P and Q be?

In a perfectly competitive market, the supply curve is the marginal cost curve. This means that for the industry as a whole, we would find the competitive equilibrium price by setting $MC =$ demand. To do this, we need to find the demand curve.

The picture shows us that the demand curve has two points: (0.1), and (100,0). I also know from the figure that the slope is $\frac{-1}{100}$. This is enough to write the demand curve as

$$P = \frac{-1}{100}Q + 1$$

.

Given that, I can set MC equal to demand:

$$\begin{aligned} \frac{-1}{100}Q + 1 &= \frac{10}{100} \\ 1 - \frac{10}{100} &= \frac{1}{100}Q \\ \frac{90}{100} &= \frac{1}{100}Q \\ Q &= 90 \end{aligned}$$

And we know that $P = MC$, so $P = 0.10$.

(b) consumer and producer surplus in the competitive market?

Producer surplus is zero. If the supply curve is the marginal cost curve, there is no space between the supply curve and the market equilibrium price.

Consumer surplus is the area below the demand curve and above the market price. In this case, this is

$$\begin{aligned} CS &= \frac{1}{2}(90)(0.90) \\ &= \frac{1}{2}(81) \\ &= 40.5 \end{aligned}$$

(c) profit maximizing P and Q with a monopoly?

First we need marginal revenue. Using the formula from class, $MR = 1 - \frac{2}{100}Q$.

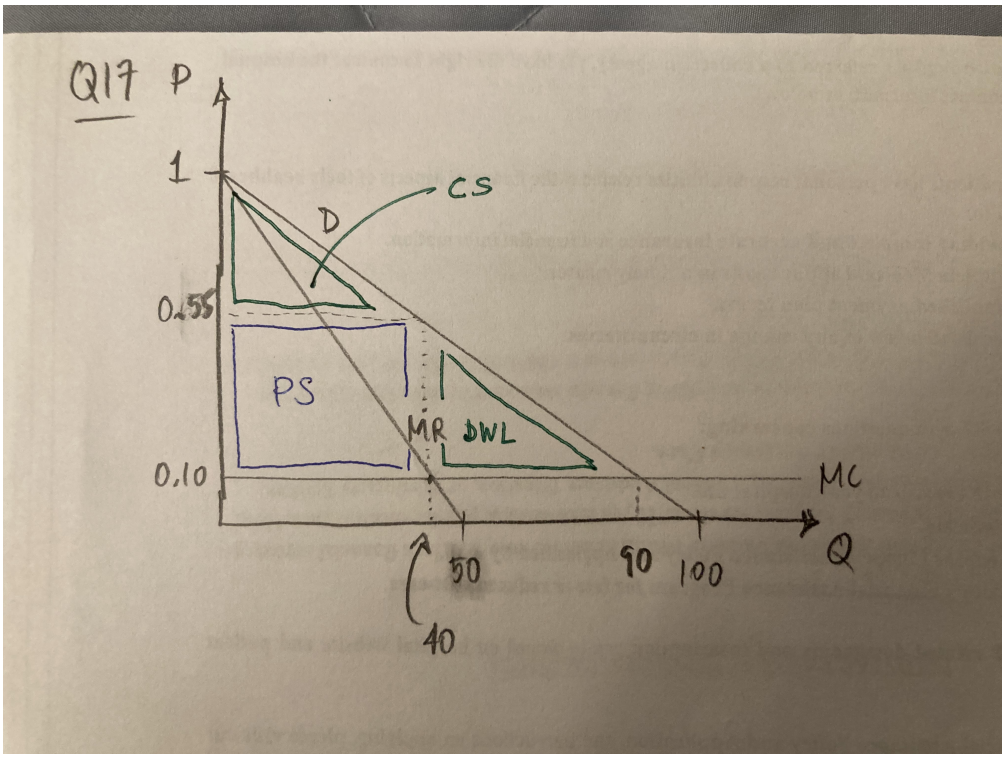
To find profit maximizing Q, set $MR = MC$:

$$\begin{aligned} 1 - \frac{1}{50}Q &= \frac{1}{10} \\ \frac{9}{10} &= \frac{1}{50}Q \\ Q &= \frac{450}{10} \\ Q &= 45 \end{aligned}$$

Find the price by plugging the profit maximizing Q into the demand curve: $P = -\frac{1}{100}Q + 1 = -\frac{1}{100}(45) + 1 = 0.55$.

(d) consumer and producer surplus with a monopoly?

See figure for location of consumer and producer surplus:



Relying on the figure,

$$\begin{aligned} CS &= \frac{1}{2}(1-0.55)(45) \\ &= \frac{1}{2}(\frac{45}{100})(45) \\ &= 10.125 \end{aligned}$$

And

$$\begin{aligned} PS &= (0.55-0.10)(45) \\ &= (0.45)(45) \\ &= 20.25 \end{aligned}$$

(e) Deadweight loss of monopoly?

This is the remaining area under the demand curve and above the marginal cost curve. You can calculate that area directly ($= \frac{1}{2}(100-40)(0.55-0.10)$), or you can say

$$\begin{aligned} DWL &= CS_{\text{original}} + PS_{\text{original}} - (CS_{\text{new}} + PS_{\text{new}}) \\ &= (40.5+0) - (10.125+20.25) \\ &= 40.5 - 30.375 \\ &= 10.125 \end{aligned}$$

4. Monopolies and the Long Run

Use a few paragraphs to describe an industry that used to have market power and that now does not; explain why.

Any reasonably argued example is acceptable here.