Chapter 17 Practice Problems

Elements of Microeconomics (discussion section 4)

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Question 1

In Baltimore there are two main internet providers, Xfinity and Verizon. Suppose the marginal cost of supplying internet is constant at $40 per customer, and the demand for internet service is described by the following demand schedule:

Price	Quantity
$180	5,000 customers
$160	6,000
$140	7,000
$120	8,000
$100	9,000
$80	10,000
$60	11,000
$40	12,000

(a) If there were many suppliers of internet service in Baltimore, what kind of market would this be? What would be the price and quantity?

(b) If there were only one supplier of internet service, what kind of market would this be? What would the price and quantity?

(c) If Xfinity and Verizon form a cartel, what would be the price and quantity?

  (i) If Xfinity and Verizon split the market evenly in this case, what would be Verizon's production and profit?

  (ii) What would happen to Verizon's profit if it increased it's production by 1,000 while Xfinity stuck with the cartel agreement?

(d) Why are cartel agreements often unsuccessful?

Answer:

(a) When there are many sellers and many buyers we are in a perfectly competitive market. In this type of market, equilibrium occurs where $P = MR = MC$ since firms are price takers. In this case, $MC = \$40$, so the equilibrium price will be $P^* = \$40$. And, at this price, the quantity demanded will be $Q^* = 12,000$.

(b) When there is only one seller we are in a monopoly market. In this type of market, equilibrium occurs where the firm maximizes profit. We can compute the profit for each price/quantity pair and determine the pair which yields the greatest profit:

Price	Quantity	π
\$180	5,000	\$700,000
\$160	6,000	\$720,000
\$140	7,000	\$700,000
\$120	8,000	\$640,000
\$100	9,000	\$540,000
\$80	10,000	\$400,000
\$60	11,000	\$220,000
\$40	12,000	\$0

So the greatest profit for a single seller occurs when $P = 160$ and $Q = 6,000$, so these will be the price and quantity in this market.

(c) If they act as a cartel, they collude and behave like a single monopolist, so the cartel price is $P = \$160$ and the cartel quantity is $6,000$.

(i) If Xfinity and Verizon split the market equally, Verizon will serve 3,000 customers (half of the monopoly quantity) and will earn $\pi = (160 - 40) * 3,000 = \$360,000$

(ii) If Verizon increases production by 1,000 to 4,000 while Xfinity remains at the production of 3,000, the new market quantity will be 7,000. At this market quantity, the market price will be \$140. This will cause Verizon to now have $\pi = (140 - 40) * 4,000 = \$400,000$, so their profit increases by \$40,000. BUT, Xfinity;'s profit decreases to \$300,000, so they've lost profit because Verizon did not adhere to the cartel agreement.

(d) Cartel agreements are often unsuccessful because each firm has an incentive to cheat and increase their production, because it would increase their profit. If when Verizon increases their production by 1,000, Xfinity did the same, they each would earn \$320,000 in profit. SO Xfinity is better off by also increasing their profit. This continues to happen, so there is an incentive not to adhere to the cartel agreement.

Question 2

Sandy's Brew is a small coffee company that is considering entering the local coffee market which is dominated by Common Ground Coffee. Each company's profit depends on whether Sandy's Brew enters the market and whether Common Ground Coffee sets a hgih price or a low price:

		Common Ground Coffee	
		High Price	Low Price
Sandy's Brew	Enter	$(\$500, \$750)$	$(-\$250, \$250)$
	Don't Enter	$(\$0, \$1600)$	$(\$0, \$500)$

Where the row player earns the first value in the parentheses in each situation, and the column player earns the second value in the parentheses in each situation.

(a) Does either player have a dominant strategy?

(b) What is a nash equilibrium?

(c) Is there a nash equilibrium in this game? If so what is it?

  (i) How does your answer to (a) help you determine the nash equilibrium

(d) Common Ground Coffee threatens to set a low price if Sandy's Brew enters the market. Is this a credible threat? Why or why not?

Answer:

(a) Yes! Common Ground Coffee's dominant strategy is to set a High Price and Sandy's Brew's does not have a dominant strategy.

(b) A nash equilibrium is a pair of strategies such that each player's strategy is a best response to the other's.

(c) Yes! There is a nash equilibrium where Common Ground Coffee chooses their dominant strategy, High Price, and Sandy's Brew chooses to Enter. This yields payoffs $(\$500, \$750)$.

  (i) By eliminating Common Ground Coffee's dominated strategy (Low Price), we can tell that since Common Ground will certainly play the strategy High Price, Sandy's Brew's best response is to Enter the market. This is how we get our nash equilibrium.

(d) This is not a credible threat. If Common Ground Coffee chooses to set a Low Price, they will earn \$250 or \$500 which are both less than they will earn if they set a High Price, regardless of what Sandy's Brew does.

Question 3

Consider the market for cigarettes, which has a demand and supply curve given by:

$$Q_D = 75 - 3P$$

$$Q_S = 5 + P$$

(a) What is the equilibrium price and quantity in this market?

(b) Cigarettes have a negative externality on bystanders due to second hand smoke, causing the socially optimal quantity of cigarettes to be less than the equilibrium quantity in this market. Through what intervention can the government bring the market equilibrium closer to the socially optimal level?

(c) If the socially optimal quantity of cigarettes is 20, a tax of what amount per pack of cigarettes must be levied by the government to bring the market equilibrium to equal the the socially optimal quantity.

Answer:

(a) First solve for inverse supply and demand:

$$P = 25 - \frac{1}{3}Q_D$$

$$P = Q_S - 5$$

Then set them equal to each other to find the equilibrium price and quantity:

$$25 - \frac{1}{3}Q = Q - 5$$

$$30 = \frac{4}{3}Q$$

$$Q = \frac{45}{2}$$

And thus the equilibrium price is $P = \frac{45-10}{2} = \frac{35}{2}$

(b) The government can intervene and introduce a pigouvian tax.

(c) We need to find the tax which causes the quantity where supply equals demand to be equal to 20. The government can levy a tax on the sellers to achieve this, which affects only the intercept iof the supply curve. So, we can consider the supply curve post tax as:

$$P = Q_S - 5 + T$$

Where T is the size of the tax. SO we can set this new supply curve equal to the existing demand curve and plug in 20 (the socially optimal level) for Q:

$$\begin{aligned} Q_S - 5 + T &= 25 - \frac{1}{3}Q_D \\ 20 - 5 + T &= 25 - \frac{20}{3} \\ T &= \frac{30 - 20}{3} \\ T &= \frac{20}{3} \end{aligned}$$

So the government can levy a tax of $T = \frac{20}{3}$ on sellers for each pack of cigarettes to bring the market equilibrium quantity to the socially optimal quantity. The new market price will be higher than before.