

Homework 7
Econ 361
Intermediate Microeconomic Analysis
30 points

1. (3 points) Under what real-world conditions (tell a story with a concrete example) might a competitive industry be an increasing cost industry? A decreasing cost industry?

An increasing cost industry is associated with an upward sloping long-run supply curve. When a new firm enters the industry, the resource prices increase so the long run cost curve increases as well. The entire ATC curve for a firm shifts upwards. For example, a resource intensive industry such as the copper industry or production that depends on other scarce resources such as lithium or tough to extract ores. Some countries face labor shortages. An increase in output will increase costs.

An example of decreasing cost industry is the personal computer industry, in which the supply of personal computers increases by more than demand, causing price of personal computers to decline. This decline in price is because the component producers (the suppliers of inputs) can achieve economies of scale when the computer industry expands.

2. (3 points) Under what condition or conditions will a firm (any firm) experience positive producer surplus in the long run? Explain by presenting a specific example.

In a competitive industry, entry and exit in the long run will always push economic profit to zero. Economic profit accounts for all opportunity costs, so zero economic profit essentially means firms have no incentive to exit (no better opportunities exist elsewhere) or enter.

Producer surplus is the difference between price and variable cost, or average cost in the long run. However, while this cost includes the cost of labor and capital, it does not include the opportunity cost of scarce inputs that generate economic rent. Thus, *in the presence of economic rent, producer surplus can be positive* as scarce inputs generate revenue above the cost of labor and capital, but economic profit is still zero because of the opportunity cost (the firm could sell the scarce inputs).

You discussed several examples in class.

3. (4 points) Suppose the firms or firm in an industry are characterized as follows:

$$TC = 100 + 2q^2$$

$$\text{Demand: } P = 90 - 2Q$$

a. If there is one firm in this industry, find the monopoly price, quantity, and profit.

First, because this firm is a monopoly, the firm output (q) = market supply (Q)

$$\text{Profit } (\pi) = \text{Total Revenue} - \text{Total Cost}$$

To maximize profit, set $MR = MC$

$$\text{Total revenue} = \text{Average Revenue} * Q$$

$$TR = Q * (90 - 2Q)$$

$$TR = 90Q - 2Q^2$$

$$MR = 90 - 4Q$$

$$TC = 100 + 2Q^2$$

$$MC = 4Q$$

$$MR = MC$$

$$90 - 4Q = 4Q$$

$$90 = 8Q$$

$$Q = 11.25$$

$$P = 90 - 2(11.25) = 67.5$$

$$\text{Profit } (\pi) = TR - TC = 67.5 * 11.25 - (100 + 2 * (11.25)^2)$$

$$\pi = 406.25$$

b. Now find the price, quantity, and profit if the industry is competitive.

With competition, $P = MR = AR =$ The demand curve.

$$P = 90 - 2Q = MC = 4Q$$

$$90 = 6Q$$

$$Q = 15$$

$$P = 60$$

$$\text{Profit } (\pi) = TR - TC = 60 * 15 - (100 + 2(15)^2)$$

$$\pi = 350$$

4. (4 points) A monopoly faces a demand curve given by $P = 4000 - 4Q$, where P is price and Q is quantity. Its total costs are given by $TC = 200 + 2Q^2$.

a. Calculate the deadweight loss due to monopoly power in this market. Provide the number and show all of your work.

$$\text{Revenue} = (4000 - 4Q) * Q$$

$$\text{MR} = 4000 - 8Q$$

$$\text{MC} = 4Q$$

$$\text{MR} = \text{MC}$$

$$\text{Thus, } Q = 1000/3 \text{ and } P = 4000 - 4 * 1000/3 = 8000/3$$

In competitive market, however, $P = 4000/3$, $Q = 2000/3$

$$\text{Thus, } \text{DWL} = 0.5 * 4000/3 * 1000/3 = 222,222$$

b. Provide an intuitive explanation for why the area of deadweight loss represents the quantification of efficiency losses (the social costs) in this market.

The deadweight loss from the monopoly is the difference between the marginal benefit and the marginal cost of each additional unit above the monopoly quantity up until the competitive quantity. Those units benefit society more than they cost, and this net benefits lost because of the monopoly is deadweight loss.

5. (6 points) A monopolist hires you to help him determine the profit-maximizing price for his product.

a. Provide the monopolist with the derivation of a simple pricing rule. Writing down the rule does not count—you must derive it.

We need to use marginal revenue to find price as a function of elasticity of demand and marginal cost.

$$\text{TR} = P(Q) * Q$$

$$\text{MR} = P(Q) + Q * dP/dQ$$

Multiply by P/P

$$\text{MR} = P(Q) + Q * dP/dQ * (P/P)$$

$$\text{MR} = P + (Q/P) * dP/dQ * P$$

$$\text{MR} = P + P(1/E_d) \text{ because we know that } (Q/P) * dP/dQ = E_d$$

$$\text{MR} = \text{MC}$$

$$\text{MC} = P + P(1/E_d)$$

$$(P - \text{MC})/P = -1/E_d$$

$$P = \text{MC}/(1 + 1/E_d)$$

Now we have a pricing rule with price as a function of MC and E_d .

b. Now explain to the monopolist how he should use the rule, for the full range of demand elasticities that he might face. Be sure you not only explain how to use the rule, but also why the rule works in the way it does.

Mathematically, we can see that this rule will not work if $0 > E_d > -1$ or if $E_d = -1$.

Luckily, we know that if $0 > E_d > -1$ and thus demand is inelastic, the monopoly can simply cut production and raise prices to increase profit.

If the monopoly increases its price, the quantity it sells falls. The total cost of producing goods will be no higher and probably will be lower if quantity falls. In the inelastic part of the demand curve, when price increases, quantity falls less than in proportion. Therefore, revenue = $P \cdot Q$ must rise (try it numerically). If we know that revenue rises and cost falls, profit by definition must rise. Therefore, in the inelastic section of the demand curve, raising prices or cutting production always increases profit. Another way to look at this is that a monopoly will not choose P and Q where demand is inelastic, because this is not profit maximizing.

c. An unregulated monopoly has a cost function given by $TC = 400 + 5q$ and faces a demand curve with a price elasticity equal to -1.5 . If the monopoly can only charge one price, what is that price?

$$P = MC / (1 + 1/E_d)$$

$$MC = dTC/dQ = 5$$

$$P = 5 / (1 + 1/-1.5)$$

$$P = 15$$

According to our pricing rule, the optimal price is \$15.

6. (3 points) True, false, or uncertain? The greater the wage elasticity of supply, the greater will be the monopsony power of a sole employer. Explain.

False. The opposite is correct. The more inelastic the supply curve, the greater the difference between marginal expenditure and average expenditure, and thus the greater the difference between marginal value and wage.

7. (3 points) Under what conditions will consumers benefit from price discrimination?

In comparison to charging only one price, firms with market power that price discriminate generally increase total welfare, often at the expense of consumer surplus; however, sometimes both consumer surplus and producer surplus increase.

With first degree price discrimination, all consumers are charged their reservation prices, and consumer surplus is zero.

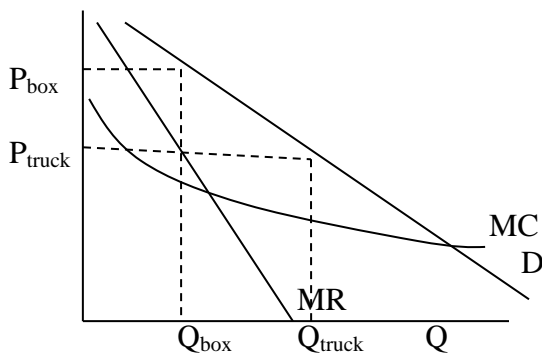
When price discrimination is imperfect, consumers retain some surplus. Because output is increased and more consumers are able to purchase the product in question, it is possible that the surplus retained by the additional consumers is greater than the surplus lost by consumers with higher reservation prices, and overall consumer surplus increases. Other variations of price discrimination are similar, in that output and the number of consumers who have access to a product generally increase.

However, it is possible, say via third degree price discrimination, that a firm can identify a group of consumers willing to pay more than the monopoly price and capture their surplus. The rest of the consumers are charged the monopoly price. In this case, all that happens is that consumer surplus is converted into producer surplus and consumers do not benefit from price discrimination. As a general rule, if the lowest price that a price discriminating firm charges is equal to the monopoly price in the absence of price discrimination, then consumers are not benefitted and surplus is shifted to producers but total surplus is unchanged.

8. (4 points) For each scenario below, identify the profit-maximizing pricing strategy, provide the graph that characterizes the strategy and explain the graph using appropriate equations. All of the sellers have the ability to price discriminate.

a. Shipping costs for a food distributor are lower by the truckload than by the box.

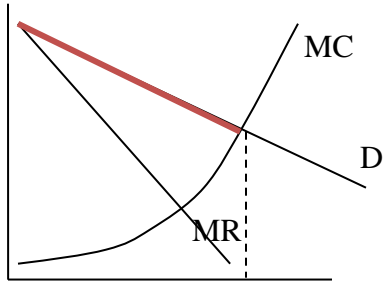
This is a scenario where second-degree price discrimination makes sense. Because this firm has economies of scale, this firm can charge a higher price for the box and a lower price for the truckloads.



As long as they are producing above average cost, second-degree price discrimination by selling in truckloads will increase their profit.

b. Carpet salesmen negotiate prices with tourists in the bazaar.

They are using first degree price discrimination to sell the tickets at each individual fans reservation price by negotiating with each one individually.



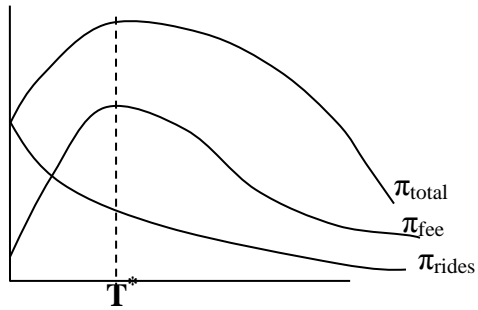
Each price charged will lie on the red portion of the demand curve. The quantity (q) is the competitive quantity where $D = AR = MC$. All surplus is captured by the carpet salesman, as represented by the area between the demand curve and the MC curve.

c. An amusement park charges an entry fee and a price per ride.

The amusement park is utilizing a two-part tariff. The entry charge and price per drink should be set so as to capture the maximum amount of consumer surplus without losing too many customers. That is, ideally the entry fee would vary across consumers; with each consumer paying his consumer surplus to enter the park and a price per ride equal to marginal cost of the ride. In practice one might be able to approximate this by having a “kids day” or some equivalent. The profit maximizing combination can only be discovered through trial and error, but in general terms, maximizing profit occurs when the following equation is maximized:

$$\pi = n(T)*T + (P-MC)*Q(n)$$

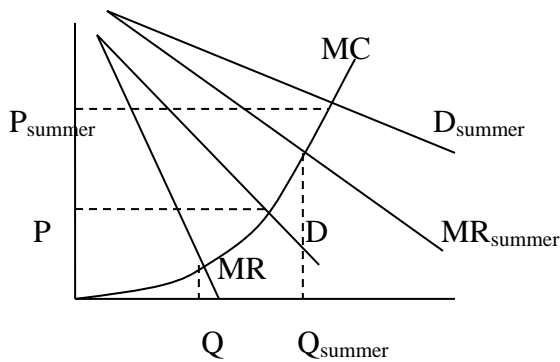
Where $n(T)$ is the number of customers (it depends on the entry fee) and $Q(n)$ is the quantity of rides sold, which is a function of the number of entrants.



T^* represents the optimal combination of prices where profit is maximized.

d. Owners of rental cabins know that more families vacation along the North Shore of Lake Superior during summer months than during winter months.

This could be an example of peak load pricing, as peak season requires staffing up to meet demand. Because of diminishing MPL and capacity constraints, MC is higher, so owners of rental cabins should charge a higher price during summer months.



During the winter months, owners should charge P where $MR = MC$. During summer he should charge P_{summer} where $MC = MR_{summer}$.