

Name Belasco - KEY

1. **(35 points, 5 points each)** You run a company called Dawg Tags, which prints dog tags and resides in a perfectly competitive industry. The table below contains the relationship between firm-level quantity and average total costs (ATC).

Dawg Tags					
quantity	TVC	MC	TFC	TC	ATC
1	\$5	\$5	6	11	11
2	13	8	6	18	9
3	25	12	6	31	10.3333
4	43	18	6	49	12.25
5	79	36	6	85	17

The industry demand for dog tags is characterized by

$$P = 42 - (Q_d/10)$$

While the industry supply curve includes 100 firms with identical cost structures. Assume each company must incur a fixed cost of \$6 for use of machinery. The market price for dog tags is currently \$12.

- a. What is the short-run profit-maximizing quantity for Dawg Tags?

Where $P=MC$ or $\$12 = MC$. This occurs at $q=3$.

- b. What is the short-run **market** equilibrium quantity?

With 100 identical firms, market quantity will be $Q = 300$ [$=3*100$]. You could also solve this problem by plugging in \$12 into the demand equation to find the market equilibrium. $P = 12 = 42 - (Q_d/10)$, which leads to $(Q_d/10)=30$, implying $Q_d = 300$.

- c. What are the short-run profits for Dawg Tags associated with the profit-maximizing quantity?

$$\text{Profits} = TR - TC = P \cdot Q - (TFC + TVC) = (3 \cdot 12) - (6 + 25) = 36 - 31 = 5$$

or

$$\text{Profits} = (P - ATC) \cdot Q = (12 - 10.333) \cdot 3 = 5$$

- d. Fill in the missing values below associated with the industry supply curve. (Hint: 100 identical firms are in this industry)

Dog Tag Industry Supply	
Quantity	Price
100	\$5
200	8
300	12
400	18
500	36

- e. Given the supply curve above, approximate the supply elasticity near the equilibrium price of \$12. Interpret the elasticity figure.

$$E_s = \frac{\% \Delta Q_s}{\% \Delta P} = \frac{(Q_1 - Q_0)/Q_0}{(P_1 - P_0)/P_0} = \frac{(400 - 300)/300}{(18 - 12)/12} = 0.667$$

This implies that a one-percent increase in price will correspond with a 0.667 percent increase in quantity supplied.

- f. What is the long-run equilibrium price in this industry? What is the new profit-maximizing firm-level of output?

Long-run equilibrium price occurs where ATC is at a minimum, P=\$9. This occurs at q=2.

- g. How many firms exist in this market in the long run? Explain whether your response is consistent with your answer in part (c).

To determine this, we plug the long run price into the demand curve to obtain the equilibrium quantity.

$$9 = 42 - Q_d/10$$

$$Q_d = (42 - 9) * 10 = 330$$

Each firm is producing at $q=2$, so this implies there are 165 firms. This is an increase in firms, which is consistent with an industry that experiences positive profits in the short run.

2. **(15 points, 5 points each)** Consider the following production function

$$Q = 5K + 10L$$

Assume that production occurs with 5 units of capital and 5 units of labor where $P_L = 10$ and $P_K = 2$.

- a. Compute the approximate MRTS. Carefully interpret this figure.

When $K=L=5$, $Q=75$. We can rewrite the equation above as

$$5K = 75 - 10L$$

$$K = 15 - 2L$$

We can then increase L by one unit so that

$$K = 15 - 2(6) = 15 - 12 = 3$$

Thus, the MRTS is equal to 2, since an additional unit of labor needs to be met with a 2 unit reduction to capital in order to maintain the same level of output.

This can also be found as

$$MRTS = \frac{MPL}{MPK} = \frac{10}{5} = 2$$

- b. Compute the approximate MPL and MPK. Carefully interpret these figures.

$MPL = 10$ -> one additional unit of labor increase output by 10 units.

$MPK = 5$ -> one additional unit of capital increases output by 5 units.

- c. Does this production function exhibit decreasing, constant, or increasing returns to scale? Clearly explain what this means.

Constant returns to scale since a doubling of both inputs leads to a doubling of outputs.

3. **(20 points, 5 points each)** Assume Russ operates a taxi cab in New York City and that the taxi cab business is a perfectly competitive industry. Initially, assume that all taxi cab drivers have identical costs and earn exactly zero economic profits.
- a. Describe characteristics of the taxi cab business that is consistent with a perfectly competitive industry.

Homogeneous products

Relatively small firms

Firms are Price takers

Free entry/exit

- b. An increase in fuel cost impacts the entire taxi cab industry in New York City (including Russ). Explain and show the short run impact on Russ's business and market equilibrium price and quantity for taxi cabs in NYC.

An increase in fuel costs causes an increase to MC, AVC, and ATC curves. This causes a reduction to supply, which increases the price and lowers the quantity supplied. The impact on Russ's business is ambiguous since costs are higher but so is the price.

- c. Show and describe the impact of higher fuel cost in the long run on Russ's business and market equilibrium price and quantity for taxi cabs in NYC (assuming a constant cost industry).

The long run supply curve is horizontal at the point where ATC is at a minimum. Since that has increases, the long run price increases, leading to a lower quantity supplied.

- d. Does the assumption of a constant cost industry seem like a reasonable assumption in this industry? Justify your answer.

The assumption of a constant cost industry seems reasonable if additional taxi drivers do not cause higher fuel costs, are just as productive as existing driving, or do not cause the price of labor to increase.

ESSAY. Select three of the questions below to answer. Write your answer in the space provided. Clearly indicate which question you are answering with each response. When necessary, clearly draw supply and demand curves with clearly labeled axis and curves. Be as specific as possible with your response. Also, if you provide more than three responses, only the first three will be graded. (10 points each)

1. Is the following statement true or false when we consider both short and long run decisions? Support your answer. "A profit maximizing producer will continue to produce a product as long as the price received for that product is at least equal to the average total cost of producing that product.

Partially true. A profit-maximizing producer will produce as long as $P > AVC$ in the short run. When $P < AVC$, then the firm will shut down. In the long run, the producer will exit the industry if $P < ATC$.

2. Carefully explain the difference between "fixed costs" and "variable costs." Also, describe the different impacts they have on output decisions and profitability in the short run.

Fixed costs do not change for varying levels of production. These costs include annual fees, rental rates, etc. Changes to fixed costs can impact profitability but do not impact output decisions in the short run.

Variable costs change with production. These costs include fuel, labor, etc. Changes to variable costs impact both profitability and output decisions in the short run since producers set $MR = MC$. Variable costs impact MC , and thus influence output decisions.

3. Some industries, such as manufacturing and agriculture among others, have experienced significant movements toward more capital-intensive production practices. Using isoquant and iso-cost curves to support your statements, illustrate the main factors driving these movements.

There are a few justifications that could be used here. (1) The price of capital has decreased relative to labor. (2) The productivity of capital has increased relative to labor.

4. Downtown hot dog vendors in New York City operate within the confines of a perfectly competitive industry that is in long-run equilibrium. A recent increase in tourism to Downtown NYC has resulted in an increased demand for hot dogs in the city. In the long run, would you expect prices to increase? What do you expect to happen to the number of hot dog vendors in NYC? Justify your answers.

An increase to demand, leads to higher prices in the short run. This also entices more vendors to enter the market, which occurs until economic profits are back to zero. In the long run, prices do not change since long run price is equal to the break-even price (which hasn't changed).

