Problem Set Four Solutions

Chapter 6

3. The Paducah Slugger Company makes baseball bats out of lumber and receives $10 for each finished bat. Paducah's only factors of production are lathe operators and a small building with a lathe. The number of bats per day it produces depends on the number of employee-hours per day as shown below. The wage is $15 per hour.

Number of bats per day	Number of employee-hours per day
0	0
5	1
10	2
15	4
20	7
25	11
30	16
35	22

a. Paducah's daily fixed cost for the lathe and building is $60. Construct a table showing total revenue, variable cost, total cost, and daily profit for various quantities of daily bat production. What is the profit maximizing quantity of bats? How much daily profit is made?

Answer: Total revenue is price of $10 times quantity. Variable cost is $15 times employee hours. Total cost is fixed cost of $60 plus variable cost. The profit-maximizing quantity of bats for Paducah is 20/day, which yields daily profit of $35.

Q (bats/day)	Total Revenue ($/day)	Variable cost ($/day)	Total cost ($/day)	Profit ($/day)
0	0	0	60	-60
5	50	15	75	-25
10	100	30	90	10
15	150	60	120	30
20	200	105	165	35
25	250	165	225	25
30	300	240	300	0
35	350	330	390	-40

b. What would be the profit-maximizing number of bats if the firm's fixed costs were not $60 per day but only $30?

Answer: The profit-maximizing number of bats is unchanged but profits rise $30 to $65. Fixed costs do not affect the profit-maximizing level of output.

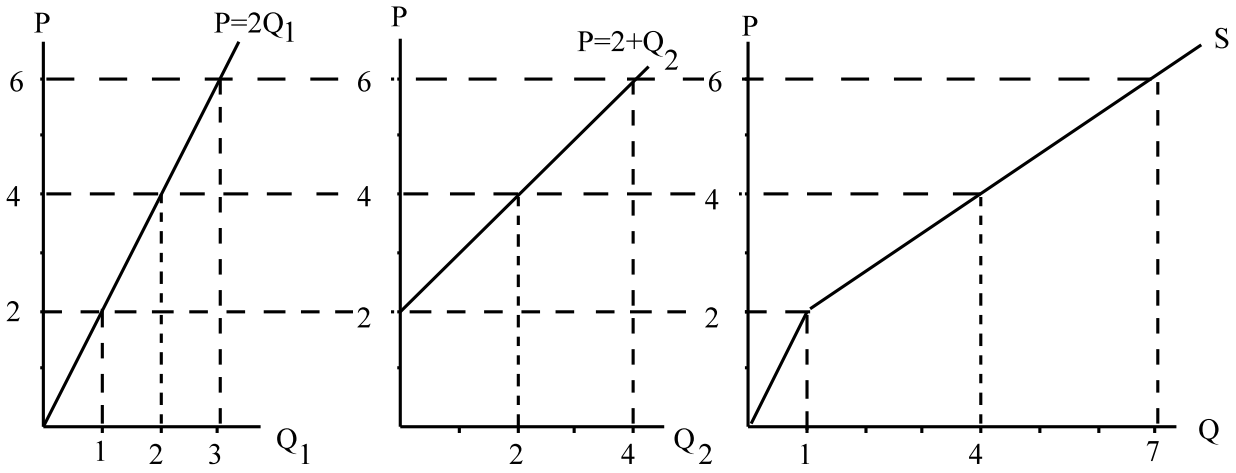
4. How would Paducah's profit-maximizing level of output be affected if the government imposed a tax of $10 per day on the company? What would Paducah's profit-maximizing level of output be if the government imposed a tax of $2 per bat instead? Why do these two taxes have such different effects?

Answer: A tax of $10 per day would decrease Paducah's profit by $10 per day at every level of output. But the company would still maximize its profit by producing 20 bats per day. A tax that is independent of output does not change marginal cost, and hence does not change the profit-maximizing level of output. But a tax of $2 per bat has exactly the same effect as any other $2 increase in the marginal cost of making each bat. As we see in the last column of the table below, the company's profit-maximizing level of output now falls to 15 bats per day. At that level it earns exactly 0 profit, but at any other level of output it would sustain a loss.

Q (bats/day)	**Total Revenue ($/day)**	**Variable cost ($/day)**	**Total cost ($/day)**	**Profit ($/day)**
0	0	0	60	-60
5	50	15	85	-35
10	100	30	110	-10
15	150	60	150	0
20	200	105	205	-5
25	250	165	275	-25
30	300	240	360	-60
35	350	330	460	-110

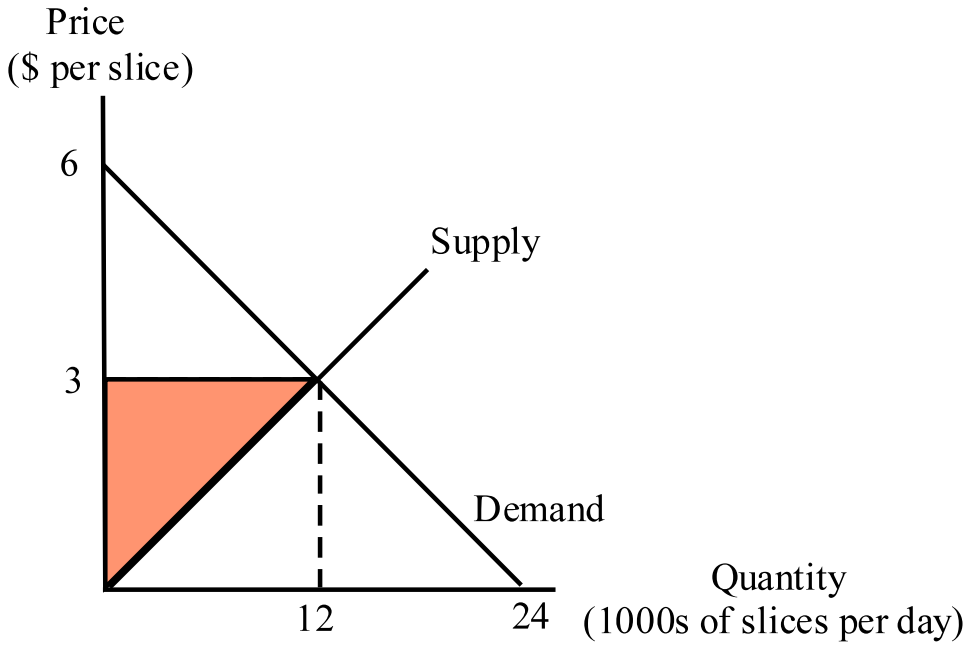
5. The supply curves for the only two firms in a competitive industry are $P = 2\ Q_1$ and $P = 2 + Q_2$, where Q_1 is the output of firm 1 and Q_2 is the output of firm 2. What is the market supply curve for this industry?

Answer: The market supply curve (right) is the horizontal summation of the supply curves of the individual market participants.

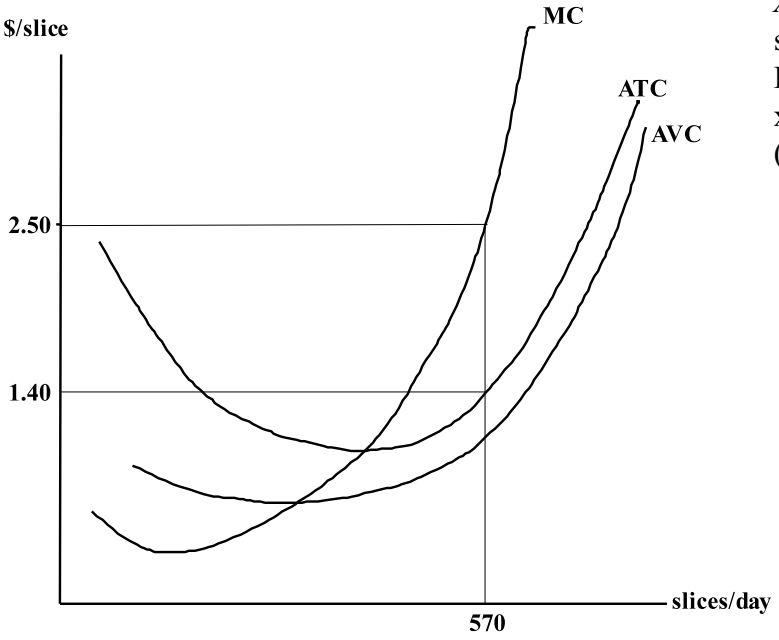


6. Calculate and graph daily producer surplus for the market for pizza whose demand curve is $Q_D = 24 - 4\ P$ and supply curve is $Q_S = 4\ P$.

Answer: Producer surplus is the area of the shaded triangle, (½) (3 - 0) (12) = $18/day.

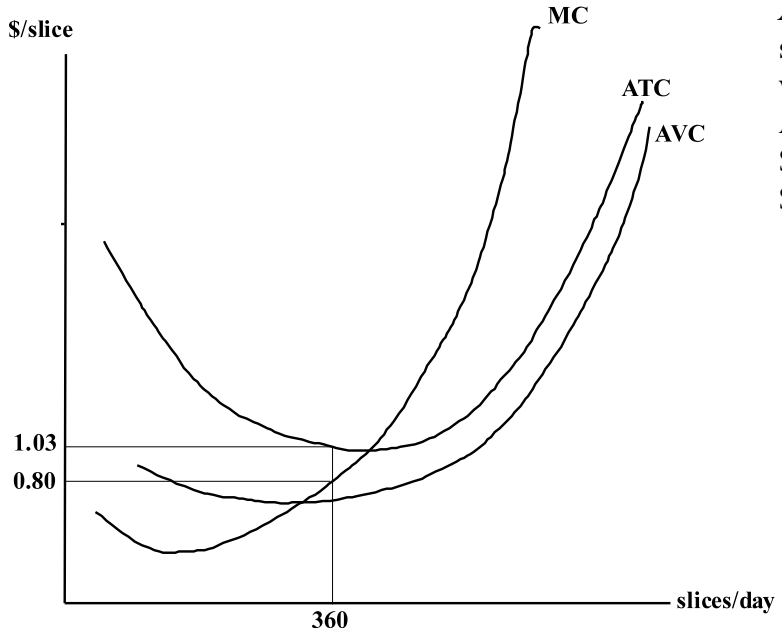


7. What is the profit-maximizing level of output and how much daily profit will the producer below earn if the price of pizza is $2.50/slice?



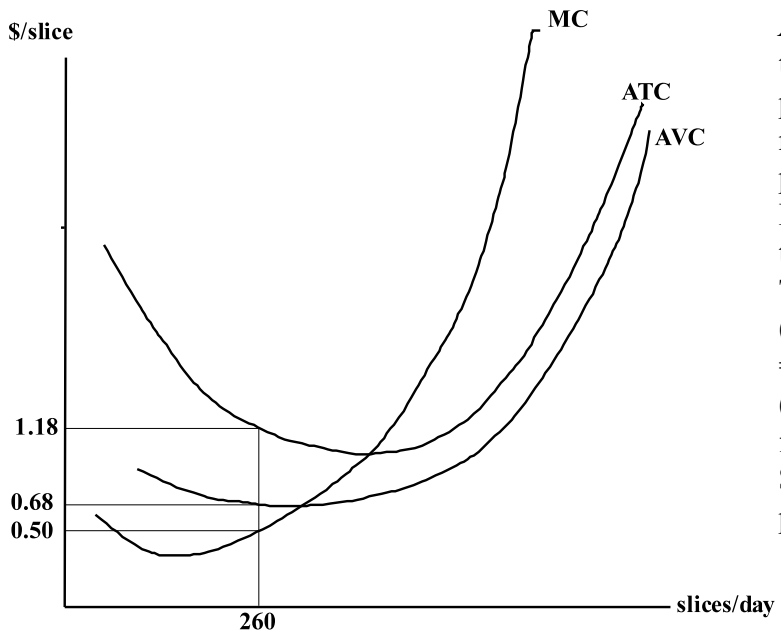
Answer: This firm will sell 570 slices per day, the quantity for which P = MC. Its profit will be (P-ATC) x Q = ($2.50/slice - $1.40/slice) x (570 slices/day) = $627/day.

8. What is the profit-maximizing level of output and how much daily profit will the producer below earn if the price of pizza is $0.80/slice?



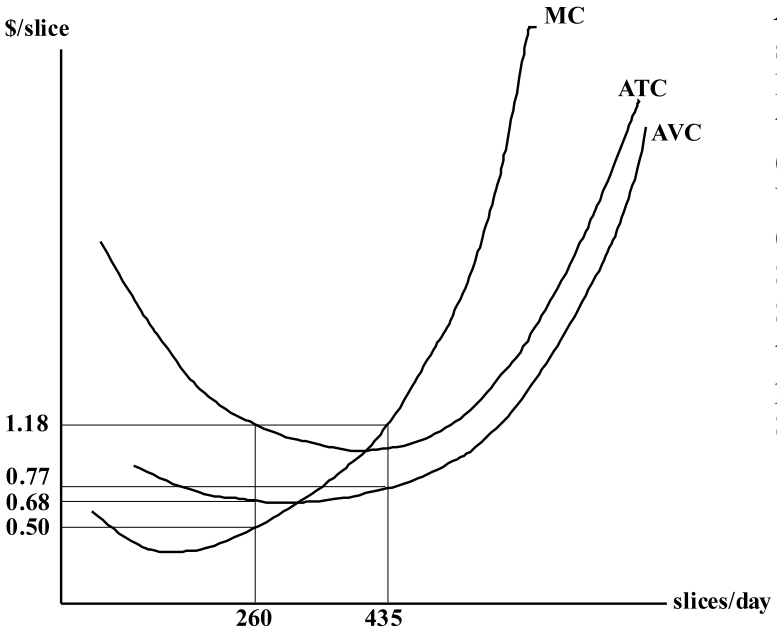
Answer: This firm will sell 360 slices per day, the quantity for which P = MC. Its profit will be (P-ATC) x Q = ($0.80/slice - $1.03/slice) x (360 slices/day) = -$82.80/day.

9. What is the profit-maximizing level of output and how much daily profit will the producer below earn if the price of pizza is $0.50/slice?



Answer: Because price is less than the minimum value of AVC, this producer will shut down in the short run: produce quantity zero. Daily profits are a loss equal to fixed cost. Fixed cost is the difference between total cost and total variable cost. TC = Q x ATC = (260 slices/day) ($1.18/slice) = $306.80/day and VC = Q x AVC = (260 slices/day) ($0.68/slice) = $176.80/day. So fixed cost = $306.80/day - $176.80/day = $130/day. This producer's profit is thus -$130/day.

10. What is the profit-maximizing level of output and how much daily profit will the producer below (who is the same producer as in #9) earn if the price of pizza is $1.18/slice?



Answer: This producer will sell 435 slices per day, the quantity for which P = MC. Total revenue will therefore be P x Q = ($1.18/slice) x (435 slices/day) = $513.30/day. Variable cost is AVC x Q = ($0.77/slice) (435 slices/day) = $334.95/day. Add fixed cost of $130/day to variable cost to obtain total cost = $464.95/day. So daily profit is TR - TC = $513.30/day - $464.95/day = $48.35/day.