Discussion 8

1 Topics

- Short-Run Equilibrium
- Long-Run Average Cost Curve
- Economics of Scale
- Long-Run Equilibrium

2 Concept Review

2.1 Short-Run Equilibrium

A single firm under perfect competition takes the market price as given and sets its production accordingly.

- **Profit Maximization**
  - **Optimal output rule**: Firms maximize profit by producing at the quantity for which the marginal revenue is equal to the marginal cost, $MR = MC$.
  - Since for a price-taking firm $MR = P$, the optimal output rule is to produce the level of quantity such that $\boldsymbol{P = MC}$.
  - When is production economically profitable? Let π represent profits. We must compare total revenue (TR) to total cost (TC).
    * $TR > TC$ then $\pi > 0$ (the firm is profitable)
    * $TR = TC$ then $\pi = 0$ (the firm is at **break-even point**)
    * $TR < TC$ then $\pi < 0$ (the firm incurs losses)
- **Short-Run**

  In the short-run, a firm will produce a positive quantity as long as the market price is higher than the firm's minimum average variable cost:

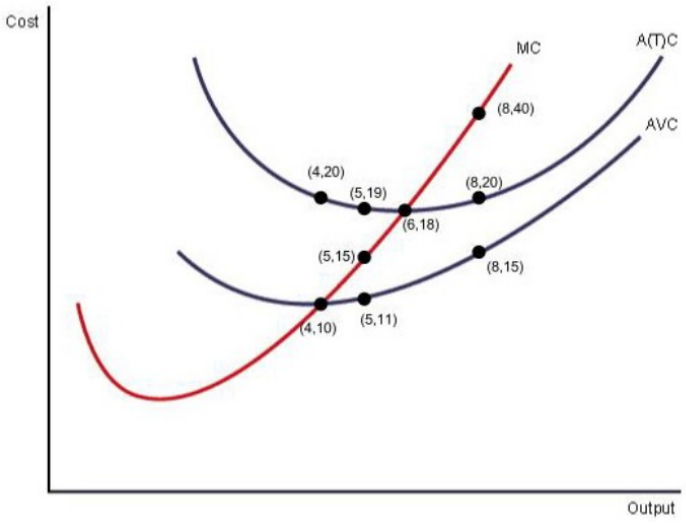
  $$P > \min AVC.$$

  When a firm's costs are such that $\min AVC < P < \min ATC$, the firm is incurring losses, *but it is still better off producing,* because doing so will generate revenue to cover some of its fixed costs (which must be paid regardless of whether it produces).

When $P = \min AVC$ we call this the **shutdown point**. When $P < \min AVC$, in the short-run the firm is better off shutting down production because producing just increases its losses.

3 Exercises

Exercise 1 (Cost Curves and Profit Maximization) Examine the following graph of cost curves for an individual firm in the market for widgets, which is perfectly competitive:



1. What are the fixed costs of this firm?

2. How many widgets will the firm produce if the price is \$10?

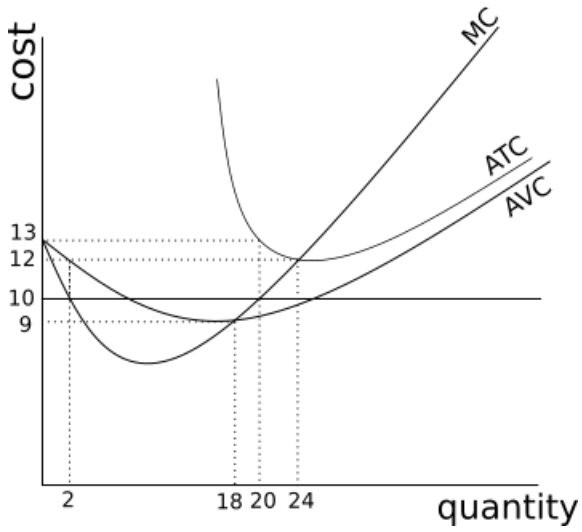
3. What will be this firm's profit if the price is \$10?

4. Find the profit and the total variable cost of the firm when the widget price is \$15. Give an argument why the firm should not produce a quantity of 0 at this price.

5. What is the firm's profit when the price is \$18?

6. What is the firm's profit when the price is \$40?

Exercise 2 (Firm Behavior in the Short-Run) The graph below represents the cost structure for a firm in a perfectly competitive industry:



1. Suppose the market price is \$10. Given the above information, what is the short-run profit-maximizing level of production for this firm?

2. In the short-run, what is the firm's profit?

3. What is the minimum price such that this firm will produce in the short-run?

Exercise 3 (Changes in Costs) Consider McKinsey & Company, a global consulting firm. Assume that McKinsey owns an office in NYC and produces strategic consulting papers by hiring Econ graduates. The market for consulting papers is perfectly competitive.

1. Suppose property taxes in NYC increase. Do total costs for McKinsey increase, decrease, or stay the same? What about variable costs?

2. Will McKinsey exit the market and shutdown production immediately? Why or why not?

3. Will the number of consulting papers produced by McKinsey increase, decrease, or stay the same?

Suppose that the rent prices are back to normal, and disregard any change that might have happened in the previous part. Now, the wage of Econ graduates employed in McKinsey has increased. After this change:

1. Do total costs for McKinsey increase, decrease, or stay the same? What about variable costs?

2. Do we have enough information to decide whether McKinsey will shutdown in the short-run? Why or why not?

Exercise 4 (Firm Short-Run Supply Curve) Find the short-run supply curve for a firm with

$$TC = 10 + 10\sqrt{q} + 5q^2$$

and

$$MC = 10q + \frac{5}{\sqrt{q}}.$$

1. What is the fixed cost for this firm? What is the variable cost?

2. What is the shutdown price for this firm?

3. If the market price is P, which is greater than the shutdown price, how much will the firm produce?

Exercise 5 (Derive Supply Curve) Consider a bakery with the following cost functions in a perfectly competitive bread market:

$$TC = q^2 + 4q + 5$$

$$MC = 2q + 4$$

where q denotes pounds of bread.

1. What is the shutdown price for this bakery?

2. Derive the short-run supply curve.

Now suppose that there are 10 bakeries with the same cost functions in the bread market and that the market demand curve is given by $P = -Q_d + 40$

3. Find the short-run equilibrium in the bread market.

4 Multiple Choice Questions

Exercise 6 Generally speaking, and without looking at the numbers, let us consider the relationship between total revenue (TR), total variable cost (TVC), and the total cost (TC; the sum of total variable and total fixed costs). At which point should a firm consider shutting down? Can you draw the relationship between these curves and explain your answer?

(a) When TR is higher than TVC, but lower than the TC.

(b) When TR is lower than TVC.

(c) Never; as long as the firm is selling positive quantities of a good, it should continue its operations.

(d) When TR is exactly equal to TC.

Exercise 7 Use the following information to answer the next two questions. Suppose that you start a business selling cases of lemonade for sporting events. Let the marginal cost curve for your lemonade business be given by the equation $MC = q^2 + 2$. The market price for a case of lemonade is \$27. You are a profit-maximizing firm.

1. How many cases of lemonade should you be selling?
   (a) 3
   (b) 5
   (c) 7
   (d) 9
2. If your average total cost at this quantity is \$20 per case, what is the profit you anticipate, if any?
   (a) 7
   (b) 35
   (c) 0
   (d) 12

Exercise 8 Cost Curves.

1. Average total cost equals average variable cost when:
   (a) The marginal cost is zero.
   (b) Marginal cost equals average variable cost.
   (c) Marginal cost equals average total cost.
   (d) Fixed costs are zero.
2. Which of the following must be always true as the quantity for output increases?
   (a) Marginal cost must rise.
   (b) Average total cost must rise.
   (c) Average variable cost must rise.
   (d) Average fixed cost must fall.