In this chapter, look for the answers to these questions:

- What is a perfectly competitive market?
- What is marginal revenue? How is it related to total and average revenue?
- How does a competitive firm determine the quantity that maximizes profits?
- When might a competitive firm shut down in the short run? Exit the market in the long run?
- What does the market supply curve look like in the short run? In the long run?

Introduction: A Scenario

- Three years after graduating, you run your own business.
- You have to decide how much to produce, what price to charge, how many workers to hire, etc.
- What factors should affect these decisions?
  - Your costs (studied in preceding chapter)
  - How much competition you face
- We begin by studying the behavior of firms in perfectly competitive markets.

WHAT IS A COMPETITIVE MARKET?

- A perfectly competitive market has the following characteristics:
  - There are many buyers and sellers in the market.
  - The goods offered by the various sellers are largely the same.
  - Firms can freely enter or exit the market.

The Meaning of Competition

- As a result of its characteristics, the perfectly competitive market has the following outcomes:
  - The actions of any single buyer or seller in the market have a negligible impact on the market price.
  - Each buyer and seller takes the market price as given --- buyers and sellers are “price takers”.

The Revenue of a Competitive Firm

- Total revenue for a firm is the selling price times the quantity sold.
  \[ TR = (P \times Q) \]
- Total revenue is proportional to the amount of output.
- Average revenue tells us how much revenue a firm receives for the typical unit sold.
- Average revenue is total revenue divided by the quantity sold.
The Revenue of a Competitive Firm

• In perfect competition, average revenue equals the price of the good.

\[
\text{Average Revenue} = \frac{\text{Total revenue}}{\text{Quantity}} = \frac{\text{Price} \times \text{Quantity}}{\text{Quantity}} = \text{Price}
\]

Marginal revenue is the change in total revenue from an additional unit sold.

\[
\text{MR} = \frac{\Delta TR}{\Delta Q}
\]

For competitive firms, marginal revenue equals the price of the good.

Exercise
Fill in the empty spaces of the table.

<table>
<thead>
<tr>
<th>Q</th>
<th>P</th>
<th>TR</th>
<th>AR</th>
<th>MR</th>
</tr>
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<tbody>
<tr>
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<td>$10</td>
<td></td>
<td></td>
<td>n.a.</td>
</tr>
<tr>
<td>1</td>
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<td></td>
<td></td>
<td>$10</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$10</td>
<td>$40</td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>$10</td>
<td>$50</td>
<td></td>
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</table>

MR = P for a Competitive Firm

• A competitive firm can keep increasing its output without affecting the market price.
• So, each one-unit increase in Q causes revenue to rise by P, i.e., \( MR = P \).

MR = P is only true for firms in competitive markets.

PROFIT MAXIMIZATION AND THE COMPETITIVE FIRM’S SUPPLY CURVE

• The goal of a competitive firm is to maximize profit.
• This means that the firm will want to produce the quantity that maximizes the difference between total revenue and total cost.
• If increase Q by one unit, revenue rises by MR, cost rises by MC.
• Profit maximization occurs at the quantity where marginal revenue equals marginal cost.
  – When \( MR > MC \), increase Q
  – When \( MR < MC \), decrease Q
  – When \( MR = MC \), profit is maximized
Table 2 Profit Maximization: A Numerical Example

<table>
<thead>
<tr>
<th>Quantity (Q)</th>
<th>Total Revenue (TR)</th>
<th>Total Cost (TC)</th>
<th>Profit (TR – TC)</th>
<th>Marginal Revenue (Marginal Profit)</th>
<th>Marginal Cost (Marginal Loss)</th>
<th>Change in Profit (TR – TC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
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<td>5</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Q2</td>
<td>10</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Q3</td>
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<td>12</td>
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<td>4</td>
<td>2</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The firm maximizes profit by producing the quantity at which marginal cost equals marginal revenue. 

\[ P = MR \]

If the firm produces \( Q_1 \), marginal cost is \( MC_1 \).

If the firm produces \( Q_2 \), marginal cost is \( MC_2 \).

Figure 1 Profit Maximization for a Competitive Firm

Figure 2 Marginal Cost as the Competitive Firm’s Supply Curve

As \( P \) increases, the firm will select its level of output along the MC curve.

Figure 3 The Competitive Firm’s Short-Run Supply Curve

The firm’s short-run decision to shut down:

- A shutdown refers to a short-run decision not to produce anything during a specific period of time because of current market conditions.
- Exit refers to a long-run decision to leave the market.
- The firm shuts down if the revenue it gets from producing is less than the variable cost of production.
  - Shut down if \( TR < VC \)
  - Shut down if \( TR/Q < VC/Q \)
  - Shut down if \( P < AVC \)

Shut down vs. Exit

- **Shutdown:** A short-run decision not to produce anything because of market conditions.
- **Exit:** A long-run decision to leave the market.
  - A firm that shuts down temporarily must still pay its fixed costs. A firm that exits the market does not have to pay any costs at all, fixed or variable.
**Split Milk and Other Sunk Costs**

- The firm considers its sunk costs when deciding to exit, but ignores them when deciding whether to shut down.
  - *Sunk costs* are costs that have already been committed and cannot be recovered.
  - Sunk costs should be irrelevant to decisions; you must pay them regardless of your choice.
  - \( FC \) is a sunk cost: The firm must pay its fixed costs whether it produces or shuts down.
  - So, \( FC \) should not matter in the decision to shut down.

**The Firm’s Short-Run Decision to Shut Down**

- The portion of the marginal-cost curve that lies above average variable cost is the competitive firm’s short-run supply curve.

**The Firm’s Long-Run Decision to Exit or Enter a Market**

- In the long run, the firm exits if the revenue it would get from producing is less than its total cost.
  - Exit if \( TR < TC \)
  - Exit if \( TR/Q < TC/Q \)
  - Exit if \( P < ATC \)
- A firm will enter the industry if such an action would be profitable.
  - Enter if \( TR > TC \)
  - Enter if \( TR/Q > TC/Q \)
  - Enter if \( P > ATC \)

**Measuring Profit in Our Graph for the Competitive Firm**

- Profit = \( TR - TC \)
- Profit = \( (TR/Q - TC/Q) \times Q \)
- Profit = \( (P - ATC) \times Q \)
THE SUPPLY CURVE IN A COMPETITIVE MARKET

- The competitive firm’s long-run supply curve is the portion of its marginal-cost curve that lies above average total cost.
- Short-Run Supply Curve
  - The portion of its marginal cost curve that lies above average variable cost.
- Long-Run Supply Curve
  - The marginal cost curve above the minimum point of its average total cost curve.

THE SUPPLY CURVE IN A COMPETITIVE MARKET

- Market supply equals the sum of the quantities supplied by the individual firms in the market.
- For any given price, each firm supplies a quantity of output so that its marginal cost equals price.
- The market supply curve reflects the individual firms’ marginal cost curves.

The Long Run: Market Supply with Entry and Exit

- Firms will enter or exit the market until profit is driven to zero.
- In the long run, price equals the minimum of average total cost.
- The long-run market supply curve is horizontal at this price.
The Long Run: Market Supply with Entry and Exit

- At the end of the process of entry and exit, firms that remain must be making zero economic profit.
- The process of entry and exit ends only when price and average total cost are driven to equality.
- Long-run equilibrium must have firms operating at their efficient scale.

Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit.
- If existing firms earn positive economic profit,
  - New firms enter.
  - SR market supply curve shifts right.
  - \( P \) falls, reducing firms’ profits.
  - Entry stops when firms’ economic profits have been driven to zero.

Entry & Exit in the Long Run

- In the LR, the number of firms can change due to entry & exit.
- If existing firms incur losses,
  - Some will exit the market.
  - SR market supply curve shifts left.
  - \( P \) rises, reducing remaining firms’ losses.
  - Exit stops when firms’ economic losses have been driven to zero.

Why Do Competitive Firms Stay in Business If They Make Zero Profit?

- Profit equals total revenue minus total cost.
- Total cost includes all the opportunity costs of the firm.
- In the zero-profit equilibrium, the firm’s revenue compensates the owners for the time and money they expend to keep the business going.
- Recall, economic profit is revenue minus all costs – including implicit costs, like the opportunity cost of the owner’s time and money.
- In the zero-profit equilibrium, firms earn enough revenue to cover these costs.

A Shift in Demand in the Short Run and Long Run

- An increase in demand raises price and quantity in the short run.
- Firms earn profits because price now exceeds average total cost.
Figure 8 An Increase in Demand in the Short Run and Long Run

(b) Short-Run Response

An increase in market demand... raises price and output.

The higher P encourages firms to produce more... and generates short-run profit.

(c) Long-Run Response

Profits induce entry and market supply increases.

The increase in supply lowers market price. In the long run market price is restored, but market supply is greater.

Why the Long-Run Supply Curve Might Slope Upward

• Some resources used in production may be available only in limited quantities.
• Firms may have different costs.
• Marginal Firm
  • The marginal firm is the firm that would exit the market if the price were any lower.