To explain firm behaviour we separated the decision process artificially into two steps:

- **Cost Minimization**: firms look for a way to produce any (given) output as cheap as possible. → optimal factor allocation!
  As a result we get **factor demand functions** and the **cost function** $C^* = C(w, r, Q)$.
  This happened in the last chapter.

- **Profit Maximization**: next firms have to decide what output to produce.
  They face technological and market restrictions.

**Technological restrictions** are already incorporated in the cost function (remember that the cost function was derived by cost minimization under constraint of the production function!). However, there were no assumptions for the output market necessary, we just assumed that factor prices are exogeneously given.

**Market restrictions** refer market conditions, that is, how output price is determined.

**Market restrictions** differ between market structures. Therefore, we have to examine the process profit maximization for different market structures separately.

In this chapter we’ll focus on **perfect competitive markets**, in the next chapter we’ll examine **imperfect competition**.
Perfect Competition

- Firms are **price-takers**! A firm cannot influence the price of its product, thus it can sell any amount of output at the market price. This is because...
  - A large number of firms in the market.
  - An undifferentiated product.
  - Complete information available to all market participants.
- In the long run competition between firms pushes economic profits (measured with opportunity cost) down to zero. This is because...
  - Free market entry and exit.

Free Entry and Exit:
- There is free entry and exit into and from an industry when new producers can easily enter into or leave that industry.
- Free entry and exit ensure:
  - that the number of producers in an industry can adjust to changing market conditions, and,
  - that producers in an industry cannot artificially keep other firms out.

Revenue and Marginal Revenue

- Remember, total revenue $R = P \times Q$.
- Average revenue: $AR \equiv R/Q = (PQ)/Q = P$; average revenue always equals the price!
- **Marginal Revenue (MR)** is the additional revenue that a firm takes in from selling one additional unit of output; or, the change in revenue divided by the change in output.
  $$\frac{dR}{dQ} = \frac{d(PQ)}{dQ} \approx \frac{\Delta R}{\Delta Q} = \frac{\text{Change in Revenue}}{\text{Change in Output}}$$
Revenue and Marginal Revenue

- Under perfect competition a firm can sell any output for the market price! Therefore...
- **Marginal Revenue (MR) for a perfectly competitive firm** is a horizontal line, because it can sell any further unit of output for the same price. Therefore, for a perfectly competitive firm *price equals marginal revenue*:

  \[ \text{MR} = \frac{d(PQ)}{dQ} = P \]

  (this is true only for perfect competition, this is not true for other market structures!)

Profit Maximization

Decision problem for exogeneous \( P \):

\[ \max_Q : \pi = PQ - C(w, r, Q) \]

A necessary condition for an optimum is (quantity \( Q \) is the only choice variable)

\[ \frac{\partial \pi}{\partial Q} = P - \frac{\partial C}{\partial Q} = 0 \]

or “price equal marginal cost”

\[ \text{MR} = P = \frac{\partial C}{\partial Q} \equiv \text{MC} \]
The firm can increase profits until revenue for the last unit sold equals cost of this last unit, i.e. until marginal revenue is equal marginal cost:

\[ P = MR = MC \]

Profits are highest, when the firm chooses the quantity \( Q \) at which

\[ MC(Q) = P \]

What happens, when \( P < AC \)?

- Remember

\[
\pi = PQ - C(Q) \\
= \left( P - \frac{C}{Q} \right) Q \\
= (P - AC) Q
\]

- When \( P < AC \) the firm would incur losses!

In this case profits are not maximized, but *losses minimized*. 
Supply Function of a Firm

1) When \( P = P_A \): 
   \( Q_A \rightarrow \text{Minimum Efficient Size} \)
2) When \( P < P_A \): 
   long-run \rightarrow \text{market exit} \rightarrow A: 'exit point' 
3) When \( P < P_B \): 
   stop production immediately \rightarrow B: 'shut-down point' 

Supply Function of a Firm

When the price falls below the minimum of the average variable cost curve (\( P_B \)) the firm will stop production immediately \( \rightarrow \text{shutdown point} \).

When the price falls only for a short time below the minimum of the average total cost curve, but the firm expects the price to increase again, the firm will continue production, since she still can cover at least a part of the fixed costs (price between \( P_A \) and \( P_B \)).

Only when the firm expects the price will remain permanently below the minimum of the average total cost curve she will decide to leave the market permanently \( \rightarrow \text{exit point} \).
**Long-Run Supply Curve**

*Long-Run Supply Curve of a Firm:*
The marginal cost curve (MC) above the minimum point of its average total cost curve. If market price is above $P_A$, the firm makes profits.

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**Irrelevance of Fixed Costs**

*Fixed costs are irrelevant in the decision how much to produce!*
- Level of fixed cost has no effect on marginal cost or minimum average variable cost.
- Thus no effect on optimal level of output.
- However, fixed cost are included in ATC, and therefore may indirectly influence the long-run decision of a firm to exit the market.
- *Sunk cost* should have no influence whatsoever for any decision of a firm!

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**Market Supply**

*Market supply equals the sum of the quantities supplied by the individual firms in the market.*
- The *market supply function* $(S)$ for a perfect competitive market is the horizontal sum of the individual supplies (aggregate quantities).
- Since quantities can never be negative only positive numbers may be added.
- for a market with $N$ firms:

\[ S = \sum_{i=1}^{N} Q_i \quad \text{for all } Q_i > 0 \]

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**Managerial decisionmaking**

- Managers on competitive markets have to watch market price and its development closely, and to organize and monitor production efficiently!

**Management on perfectly competitive markets**

Two simple rules:
- Shut down if $AVC > P$, or exit the market if $ATC > P$.
- If $AVC < P$ produce the quantity where $MC = P$. 
Profit Maximization and Competition

- Perfect competition implies free market entry and exit.
- If the market price is above the minimum of the average total cost curve some firms earn economic profits (opportunity cost!), therefore new firms will enter the market.
- This entry of new firms pushes prices in the long term down to the minimum of the minimum of the average total cost curve!

Example

Firm

\[ C_i = 0.75Q_i^2 + 0.75 \]

Total Market

Shortrun market supply

\[ S_k = \sum_{i=1}^{5} Q_i \]

Example: long-run

Firm

\[ \pi = 0 \]

Total Market

Longrun market supply

\[ S_l = \sum_{i=1}^{25} Q_i \]
Profit Maximization

- **Short-run:** Firms choose output quantity $Q$ where marginal cost equals the market price, because this gives them the highest possible profit
  \[ MC(Q) = P \]

- **Long-run:** However, in the long run competition and market entries force the market price down to the minimum of the average cost curve
  \[ MC(Q) = P = AC \]

Because of free market entry and exit the long run market supply curve is horizontal at the minimum of the average cost curve of a firm.

Long-run Market Supply Curve

- Market entries (exits) shift the market supply curve to the right (left).
- In the long run firms will enter or exit the market until market supply curve intersects the market demand curve at the 'smallest possible price', i.e. where market price is equal to the minimum of average cost.
- Therefore, markets entries and exits drive economic profits down to zero!

Long-run Market Supply

- In the long run firms will enter or exit the market until profit is driven to zero, therefore the number of firms in an industry is endogenous.
- In the long run, price equals the minimum of average total cost.
- The long-run market supply curve is horizontal (perfectly elastic) at price $P = AC_{\text{min}}$:
  \[ P \quad Q \]

- The long-run market supply curve can still be increasing if
  - it is an increasing cost industry (diseconomies of scale or decreasing returns to scale).
  - factors are scarce and become more expensive with increasing demand.
  - firms are differently efficient or own unique factors.
  In this case market price will reflect the minimum average cost of the *marginal firm*.
  - The marginal firm is the firm that would exit the market if the price were any lower.
**Short-Run Producer Surplus**

- **Short-Run Producer Surplus**: the area above the short-run supply curve that is below market price over the range of output supplied.
- Short-run producer surplus is the amount by which total revenue (TR) exceeds total *variable* cost (TVC).
- Short-run producer surplus exceeds economic profit by the amount of total fixed cost (TFC).

**Economic Rent**

- **Economic Rent**: Payment to the owner of a scarce, superior resource in excess of the resource’s opportunity cost.
- In long-run competitive equilibrium firms that employ such resources earn zero economic profit.
- Potential economic profit is paid to the resource as economic rent.
- In increasing cost industries, all long-run producer surplus is paid to resource suppliers as economic rent.
Managers on perfectly competitive markets have little or no control over product price. They compete on basis of lowering costs of production. One way of reducing cost is finding the 'Minimum Efficient Scale' for the industry. Perfectly competitive firms earn zero economic profit because entry of other firms compete away excess profit.

Managers in competitive industries are in a difficult situation, since they can only control cost. In the long run they can try to gain market power by . . .

- Differentiating products.
- Forming producer association to change consumer preferences and increase demand for output of the entire industry.
- Merging with other companies.

Any Questions?