Business Economics

Managerial Decisions in Competitive Markets
(Deriving the Supply Curve)

Thomas & Maurice, Chapter 11

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**Last chapter:** To explain firm behavior we separated the decision process (artificially) into two steps:

1. **Cost Minimization:** Firms try to produce a (given) output as cheap as possible

   **Result:** Factor demand functions and cost function \( C^* = C(w, r, Q) \)  
   ⇒ **Optimal factor allocation!**

2. **Profit Maximization:** Firms decide how much output they produce  
   ⇒ **Technological and market restrictions**
Firm Behavior

- **Technological restrictions**: Already incorporated in the cost function
  
  However: No assumptions about the market, just assumed that *factor prices* are exogenous

- **Market restrictions** indicate how the *output price* is determined
  
  ⇒ Different between market structures
  
  ⇒ Complete vs. incomplete markets
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Perfect Competition

Characteristics of perfect competition:

1. Firms are small relatively to the total market
2. Firms produce a **homogeneous** (perfectly standardized) good: Buyers are indifferent regarding the firm from which they purchase
3. Unrestricted **market entry** and **exit**
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⇒ (1) and (2) imply that firms cannot compete through pricing tactics → price takers!
⇒ (3) implies that economic profits are ‘competed away’ in the long-run.
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Perfect Competition: Demand

Example: Market for mineral water (homogenous good)
- A firm produces 100,000 units (e.g., bottles)
- Market price is EUR 1.50 per unit

Perfect competition:
- Firm is able to sell all 100,000 units at 1.50, because its output does not affect market price
- Changing market price induces a decrease in or a loss of revenue

⇒ Firm perceives horizontal (perfectly elastic) market demand curve!
Perfect Competition: Demand

Since firms are small relative to the market, managers ‘perceive’ relevant market demand as perfectly elastic!

$P$ is ‘perceived’ Market demand

Market demand

Market-supply

$P$
Revenue and Marginal Revenue

- Remember, total revenue \( R = P \times Q \).
- Average revenue: \( \text{AR} \equiv R/Q = (PQ)/Q = P \); 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

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\text{MR} = \frac{dR}{dQ} = \frac{d(PQ)}{dQ} \approx \frac{\Delta R}{\Delta Q} = \frac{\text{Change in Revenue}}{\text{Change in Output}}
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Perfect competition $\rightarrow$ firm can sell any output for market price! Therefore . . .

Marginal Revenue (MR) for a perfectly competitive firm is $P$

⇒ marginal revenue equals price:

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

⇒ Market demand is still downward-sloping!
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Profit Maximization and Firm Supply
**Assumption:**
Firms maximize *economic profits*, given as

\[ \pi = PQ - C(Q) \]

⇒ **Maximization under constraints**

- **Technological restrictions:** Incorporated in the cost function, \( C = C(Q) \)
- **Market restrictions:** Perfect competition
  \( P \) is exogenous
  \( w \) and \( r \) are given by the market (price-takers)
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Decision problem with exogeneous $P$:

$$\max_Q \pi = PQ - C(w, r, Q)$$
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**Profit Maximization**

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

$$\frac{\partial \pi}{\partial Q} = P - \frac{\partial C}{\partial Q} \Leftrightarrow 0$$

or "price equal marginal cost”

$$MR = P = \frac{\partial C}{\partial Q} \equiv MC$$
Profit Maximization

Why gives quantity where $P = MC$ highest possible profits?
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$MC < MR$: Firm should produce more!
Profit Maximization

Why gives quantity where $P = MC$ highest possible profits?

- **MC < MR**: Firm should produce more!
- **MC > MR**: Firm should produce less!

\[ P \ast = P = MR \]

Lost Profit
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:

\[ P = MR = MC \]
Profit Maximization

Profits:

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

Profits:

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

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

\[ MC(Q) = P \]
A profit maximizing firm should choose the output quantity where marginal cost is equal to the exogenous price:

\[ MC(Q) = P \]

Always?

No! This will not be the case when . . .

- . . . marginal cost decrease
- . . . $P < AC$
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What happens, when $P < AC$?

Remember

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\pi = PQ - C(Q)
= \left( P - \frac{C(Q)}{Q} \right) Q
= (P - AC) Q
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⇒ When $P < AC$ the firm would incur losses!

Still, losses would be minimized.
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2) If \( P < P_A \):
   Long-run market exit
   A: ‘Exit point’
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   Long-run market exit
   A: ‘Exit point’

3) If $P < P_B$:
   Stop production!
   B: ‘Shut-down point’
The short-run supply function \((S)\) of a firm on a perfect competitive market is the increasing part of the marginal cost curve, that lies above the minimum of the average (variable) cost curve.
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 \( \rightarrow \) **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 \( \rightarrow \) **exit point**.
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Short-Run Supply: Part of MC-curve lying above AVC-curve.

If $P_B < P < P_A$, the firm runs losses, but still can cover some of the fixed costs.
Long-Run Supply: Part of MC-curve lying above the minimum point of its AC-curve
If \( P > P_A \), the firm makes profits
Irrelevance of Fixed Costs

Fixed costs are irrelevant in the decision how much to produce ...

- Level of fixed cost has no effect on MC or minimum AVC and, therefore, no effect on optimal level of output

... but affects a firm’s long-run decision to leave the market!

- Fixed cost are included in ATC

Notice: Sunk cost should have no influence on any firm decision!
Managers on competitive markets have to watch market price and its development closely, and to organize and monitor production efficiently!
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Management on perfectly competitive markets

Two simple rules:

1. Shut down if AVC > \( P \), or exit the market if ATC > \( P \).
2. If AVC < \( P \) produce the quantity where MC = \( P \).
Market Supply
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).
- For a market with \( N \) firms:

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

Notice: Since quantities can never be negative only positive numbers may be added.
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Example: Short-run Market Supply

Assume three firms with identical technology, but different size, are on the market.

In the short run capital is fixed, but firms own different amounts of capital.

Since capital $K$ is fixed firms can only adjust their labor demand $L^*$. 
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Firm Entry & Market Supply
Perfect competition implies **free** market entry and exit.

If the market price is above the minimum of the AC-curve, some firms earn economic profits.

⇒ Incurs an incentive for new firms to enter the market!

⇒ Pushes prices in the long-run down to the minimum of the AC-curve!
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Example

Firm

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

Total Market

Shortrun market supply

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

\[ Q^D = 40 - 10P \]
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Example: long-run

Firm

\[ \pi = 0 \]
\[ \text{Market-entries!} \]

\[ \text{Reaction of Firms} \]

Total Market

**Shortrun market supply**
\[ S_k = \sum_{i=1}^{5} Q_i \]

**longrun market supply**
\[ S_l = \sum_{i=1}^{25} Q_i \]

\[ Q^D = 40 - 10P \]
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.
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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.

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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 $P = AC^{\text{min}}$: 
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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.
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Producer Surplus & Economic Rent
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).
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Short-Run Producer Surplus

Attn: Short-Run Producer Surplus is based on the AVC curve, not TAC!
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.
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Economic Rent

Producer Surplus = Economic Rent = $16,000
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.
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THANKS!