A firm’s management has control over functions like finance, marketing and production.

It has no direct control over profits or market share.

Economic relationships determine if the firm’s decisions translate into markers of business success.
Microeconomic Principles

- The cost functions
- Demand, price and revenue
- Price and output for a profit maximizing firm
- The theory of perfectly competitive markets
- Game theoretic models of market competition

Cost functions

- The total cost function is the relationship between output and the lowest possible cost of producing a given output
- Total cost = Fixed cost + Variable cost
- Average cost = Total cost ÷ Quantity
- Marginal cost = Rate of change in total cost with respect to output
Total Cost

- If the firm is producing efficiently, the total cost will have to increase with output.
- Costs can be classified into fixed and variable costs.
- Some costs may be semi-fixed and they are constant over a range of output.
- When a firm increases its capacity, fixed costs will not remain fixed.

Total Cost Function

$TC(Q)$

![Graph of Total Cost Function](image)
Average Cost

- Average cost (AC) can vary with output. If it does not, we have constant returns to scale.
- When AC decreases (increases) with output, there are economies (diseconomies) of scale.
- A given process may have economies of scale over one range of output and diseconomies in another.

U-shaped Cost Curve
Minimum Efficient Scale

- Output is initially $Q$ and it changes by $\Delta Q$
- $MC(Q) = \frac{TC(Q + \Delta Q) - TC(Q)}{\Delta Q}$
- When AC is decreasing as output increases, $MC < AC$
- When AC is increasing as output increases, $MC > AC$
- If AC is independent of output, $MC = AC$
Marginal Cost and Average Cost

Marginal Cost and Average Cost

Marginal Cost and Average Cost

Marginal Cost and Average Cost
Short-Run and Long-Run Cost Functions

- In the short run as output varies all inputs except plant size vary
- For each plant size there is a short run average cost function (SAC)
- Long run cost curve (LAC) is the lower envelope of the SACs
Short-Run Average Cost

- Short run average cost has two components
  - Average fixed cost (AFC)
  - Average variable cost (AVC)
- As output increases AFC falls
- AVC increases with output
- The result is a U shaped SAC

Sunk Cost

- Costs that are unaffected by the decision at hand are sunk costs
- Avoidable costs are the opposite of sunk costs
- Fixed costs are not necessarily sunk costs
- It is important to ignore the sunk costs when making decisions
Accounting and Economic Costs

- Accounting costs are based on the accrual principles and rely on historical costs
- Economic cost of a resource is its value in the best foregone use (opportunity cost)
- Good economic decisions consider opportunity costs
- Accounting costs become useful in measuring the past performance of firms.

Accounting and Economic Profits

- Accounting profit = Sales – Accounting cost
- Economic profit = Sales – Economic cost
- Economic profit = Accounting profit – (Economic cost – Accounting cost)
- Ignoring opportunity costs may overstate the profitability of a firm
The Demand Curve

- The quantity of a product a firm is able to sell depends on
  - The price of the product
  - The prices of related products
  - Income and taste of the consumers and so on
- When all other variables are held constant the price the firms charges and the quantity the firm can sell are inversely related.

The Demand Curve

![Diagram of the demand curve](image)
The Demand Curve

- The downward sloping demand curve exists for most products.
- The exceptions are when:
  - Price signals quality
  - Price implies prestige
- The demand curve reports:
  - The quantity bought at various prices and
  - The highest price the market will bear for given output

Price Elasticity of Demand

- Elasticity is the sensitivity of the demand to changes in price.
- \[ \eta = \frac{\Delta Q / Q_o}{\Delta P / P_o} \]
- The demand is elastic if \( \eta > 1 \)
- The demand is inelastic if \( \eta < 1 \)
Price Elasticity of Demand

Demand is elastic when

- The product is undifferentiated
- Expenditure on the product is a smaller fraction of the total expenditure
- The product is an input in the production of a final good
Price Elasticity of Demand

Demand is inelastic when
- Complexity of the product makes comparison difficult
- Information about substitutes is scarce
- Cost is not fully borne
- Switching to other products is costly
- Product is used jointly with other products to which the customer is committed

Price Elasticity of Demand

- Demand is elastic in the brand level even when it may be inelastic at the industry level
- If rivals match price changes by a firm industry level elasticity is relevant
- If rivals do not match price changes the firm’s demand elasticity will be relevant.
Total Revenue and Marginal Revenue

- Total Revenue (TR) = P(Q) Q
- Marginal Revenue (MR) = rate of change in TR

\[ MR(Q) = \frac{TR(Q + \Delta Q) - TR(Q)}{\Delta Q} \]

\[ MR = P\left(1 - \frac{1}{\eta}\right) \]

Marginal Revenue

- Since \[ MR = P\left(1 - \frac{1}{\eta}\right) \]
  - MR > 0 when \( \eta > 0 \)
  - MR < 0 when \( \eta < 0 \)
The Marginal Revenue

Pricing and Output Decisions

- Profits are maximized when MR = MC
- If MR > MC the firm can increase profits by increasing output
- If MR < MC the firm can increase profits by decreasing output

\[ P \left( 1 - \frac{1}{\eta} \right) = MC \]
Pricing and Output Decisions

- Price Cost Margin (PCM) = \( P - C \)  
  \( P \)

- If MC is constant, MC = C

- If MR > MC then \( \eta > \frac{1}{PCM} \)
  - The firm should lower its price

- If MR < MC then \( \eta < \frac{1}{PCM} \)
  - The firm should raise its price

- At the optimal output the price elasticity is the inverse of the price cost margin
Perfect Competition

- Perfect competition is a special case in the theory of the firm
- Industry has many firms that produce an identical product
- Firms can enter and exit at will
- Each firm must charge the same price
- Firm level elasticity of demand is infinite
- Firm level demand curve is flat
Industry Supply and Demand

- Industry supply is the horizontal sum of the individual firms’ supply functions
- Industry supply is more elastic than the individual firms’
- The industry demand and industry supply determine the price
- If price exceeds average cost, more firms enter and shift the industry supply to the right.

Perfect Competition

[Graph showing price, marginal cost (MC), and supply (SS)]
Industry Supply and Demand

- If industry demand were to fall price falls below average cost
- Some firms exit and the industry supply shifts to the left
- Industry shakeout continues until price equals average cost and profits are zero

Perfectly Competitive Industry Prior to New Entry

![Diagram showing MC, AC, and SS curves with Price and Quantity axes.](Diagram)
Industry Supply and Demand

Perfectly Competitive Industry at Long-Run Equilibrium

Effect of a Reduction in Demand on the Long-Run Perfectly Competitive Equilibrium
Game Theory

- When there are fewer firms in the industry firms will have to consider the reaction of the rivals
- Game theory is useful in these “small numbers” contexts
- In game theoretic models each player anticipates the actions and reactions of its competitors.

Game in Matrix Form

|       | Beta
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Game in Matrix Form

- Two firms Alpha and Beta need to decide whether or not to expand
- The pairs of numbers represent the profits to Alpha and Beta for each set of choices
- Each firm maximizes profits given the rival’s strategy

Game in Matrix Form

- The Nash equilibrium is \{Expand, Expand\}
- Neither firm has the incentive to switch its strategy though if both switch they are both better off.
- Expand is also the dominant strategy for each firm (best for each choice by the opponent)
- Not all games have dominant strategies
Modified game has no dominant strategy. The Nash equilibrium is Small, Small.
Game Tree for Sequential Game

- Alpha makes the move first and then Beta makes the move to maximize its profits
- The optimal responses by Beta are

<table>
<thead>
<tr>
<th>Alpha</th>
<th>Beta</th>
<th>Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not expand</td>
<td>Small</td>
<td>15, 20</td>
</tr>
<tr>
<td>Small</td>
<td>Small</td>
<td>16, 16</td>
</tr>
<tr>
<td>Large</td>
<td>Do not expand</td>
<td>18, 9</td>
</tr>
</tbody>
</table>

- Alpha chooses Large to maximize its profits (Subgame Perfect Nash Equilibrium)

Sequential Move Games and Simultaneous Move Games

- In a sequential move game Alpha’s capacity choice has commitment value
- Outcome for Alpha is better compared with simultaneous move game
- In the simultaneous move game Beta cannot observe Alpha’s decision before making its own decision.