

Market structure 1: Perfect Competition

The perfectly competitive firm is a **price taker**: it cannot influence the price that is paid for its product.

This arises due to consumers' indifference between the products of competing firms \implies for example, buy from store with lowest price. Consumers' indifference arises from:

- Product homogeneity
- Consumers have perfect information
- No transactions cost
- Many firms

PC firm faces horizontal demand curve at market price p

PC firm's profit maximization problem

- $\max_q \pi(p) = pq - C(q)$
- First-order condition: $p = C'(q) = MC(q)$
- Second-order condition: $C''(q) > 0$, satisfied if $MC(q)$ is an increasing function
- If $p \uparrow$, production rises along $MC(q)$ curve: $MC(q)$ is the “supply curve” of the firm.

PC firm's shutdown decisions

- A firm produces only when its profits from producing exceed the costs it would avoid by not producing
- **In short-run:** avoidable costs do not include sunk costs. Shut down when revenues fall short of avoidable costs
 $\iff pq < \text{Avoidable costs}(q)$.

Consider two cases:

1. All fixed costs are sunk. Avoidable costs = $VC(q)$: shut down once $p < AVC(q)$ ($< AC(q)$).
 2. Proportion α of fixed costs not sunk. Avoidable costs = $VC(q) + \alpha F$: shut down once $p < AVC(q) + \frac{\alpha F}{q}$
- **In long-run:** avoidable costs include sunk cost. Shut down when $pq < C(q) \implies p < AC(q)$
 - Short-run supply curve? Long-run supply curve? Graph.

The perfectly-competitive industry: Short run

In the **short run**:

- Number of firms fixed
- Industry supply curve: sum of individual firms' short-run supply curves. Zero supply at prices below shutdown point. Graph.
- Industry demand curve: downward sloping. Graph.
- Price determined by intersection of industry demand and supply curves. Graph.
- In short-run equilibrium: positive profits for each firm as long as $p > AC(q)$.

The perfectly competitive industry: Long-run

- Number of firms can vary
- **Free entry and exit:**
Any short-run profits soaked up by new firms in long-run \implies
Price is driven down to the minimum of the AC curve
- Long-run industry supply curve: horizontal at minimum of the average cost curve
LR supply curve may be upward-sloping if min AC is rising in market demand Q (due, for example, to resource scarcity)

Elasticities and the residual demand curve

Contradiction between downward-sloping industry demand curve and horizontal demand curve faced by the individual firm?

- Price elasticity of demand:

$$\begin{aligned}\epsilon &\equiv \frac{\Delta q(p)}{\Delta p} \frac{p}{q} \\ &= \frac{\partial \log q(p)}{\partial \log p} \\ &= \frac{\partial q(p)}{\partial p} \frac{p}{q(p)}\end{aligned}$$

Steep demand curves are *inelastic*

Flat demand curves are *elastic*

- Residual demand: $D_r(p) = D(p) - S_o(p)$.

- At competitive equilibrium, firm i 's residual demand elasticity is:
 $\epsilon_i = \epsilon n - \eta_o(n - 1)$ where η_o is the “residual supply” elasticity:

$$\eta_o = \frac{\partial S_o(p)}{\partial p} \frac{p}{S_o(p)}$$

- Inelastic industry demand (low $|\epsilon|$) consistent with elastic residual demand curve (high $|\epsilon_i|$) as n increases
- Example
 - market demand $Q = 100 - p$
 - 50 firms, each with supply curve $q = p$

Desirability of PC outcome

$$p = MC(q) = \min_q AC(q)$$

- Production at $p = MC(q)$: firm produces an additional unit only if it can cover the production costs. *Producer surplus* is maximized.
- Value placed on marginal unit of the good p exactly equals the cost of producing that marginal unit (**consumption efficiency**). *Consumer surplus* is maximized.
- Production at minimum average cost: no better alternative use of resources is possible (**production efficiency**). In other words, each firm operating at minimum efficient scale.

Barriers to Entry

Nice outcome in perfect competitive world depends crucially on free-entry assumption. Fixed costs of entry are present in many markets: are they a barrier to entry??

- Fixed costs borne equally by all firms: accommodated by free entry assumption

Example: salt factory, advertising?

- Fixed costs which affect entrant firms disproportionately: barriers to entry

Example: First mover advantage.

$$C_1(q) = F + VC(q), C_2(q) = 2F + VC(q)$$

Microsoft: computer operating systems?

Next focus on extreme case where entry ruled out: monopoly

Market structure 2: Monopoly

- Industry has one firm, who faces downward-sloping industry demand curve
- **Market power:** ability of a firm to dictate market prices in an industry. Depends on the slope of the residual demand curve.
- Market power is “opposite” of price-taking behavior

Monopoly and profit maximization

Two equivalent formulations

1. Monopolist chooses quantity to maximize profits

- $\max_q p(q)q - C(q) = \text{Revenue}(q) - C(q)$
- Graph. Quantity can be increased only if price is lower.
Tradeoff between increased demand versus revenue lost on consumers who would have bought even under the higher price
- FOC: $R'(q) = p(q) + p'(q)q = C'(q) \leftrightarrow MR(q) = MC(q)$.
Graph.

2. Monopolist chooses price to maximize profits

- $\max_p pq(p) - C(q(p))$, where $q(p)$ is demand curve.
- FOC: $q(p) + pq'(p) = C'(q(p))q'(p)$
- At optimal price p^* , **Inverse Elasticity Property** holds:
$$(p^* - MC(q(p^*))) = -\frac{q(p^*)}{q'(p^*)} \text{ or } \frac{p^* - mc(q(p^*))}{p^*} = -\frac{1}{\epsilon(p^*)},$$

where $\epsilon(p^*)$ is $q'(p^*) \frac{p^*}{q(p^*)}$.
- Across monopolistic markets, should observe negative relationship between price and demand elasticity
- If $\epsilon \rightarrow +\infty$: $p = MC(q)$
- Example: $q(p) = 10 - q$
- What if $-1 < \epsilon(p^*) < 0$? Implies $p^* < 0$ so monopolist will never produce at this point. (See handout).

How monopolies arise

Crucial aspect of monopoly: price-setting ability (relatively inelastic demand curve)

- Product differentiation
- Superior production technology
- Government-granted monopolies

Is monopoly good or bad?

- Negative aspects of monopoly
 - At monopoly solution, $p > MC$. Graph. Deadweight loss from
 1. consumer surplus (consumers whose valuations lie between $p(q^M)$ and $p(q^{PC})$ do not buy the product
 2. producer surplus (units with marginal cost between $MC(q^M)$ and $MC(q^{PC})$ are not produced.
 - This deadweight loss is greater the more inelastic (“steeper”) demand is.

- Positive aspects of monopoly
 - Demsetz critique: monopolist is the firm with lowest-cost technology. Monopolist “deserves” its market leadership.
 - Schumpeter: monopoly profits provide an incentive for innovation and technological change (“process of creative destruction”)
 - Natural monopoly: industry characterized by increasing returns to scale.
- Government antitrust policy: balance these aspects
- Checks on a monopolist’s market power: threat of entry keeps price around average cost

Summary

1. Perfect competition

- Individual firm takes prices as given in making output decisions
- Shutdown decisions: long run vs. short run
- Industry equilibrium: in long-run $p = MC(q) = \min_q AC(q)$

2. Monopoly

- Firm has power to set both quantity and price
- Tradeoff between higher demand but lower per-unit prices
- $MR(q^*) = MC(q^*)$; inverse-elasticity pricing property

Next week, consider intermediate case of an industry with several firms: **Oligopoly**