Principles of Economics

Chapter 4: Perfect Competition

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Agenda

Reading:

- Mankiw/Taylor (2020), Chapters 3, 6, 7
- Varian (2014), Chapter 16

Model

Perfect Competition: A market is perfectly competitive if all producers and all consumers are price takers.

Framework: Consider a perfectly competitive market where an ordinary good is supplied by $n \in \mathbb{N}$ identical firms producing at increasing marginal costs.

- Open Market: Producers and consumers are free to enter or exit the market.
- Homogeneous Good: Consumers consider every unit of the good as identical, i.e. they regard the products of different producers in the market as perfect substitutes.
- Market Transparency: Producers and consumers are well informed about prices in the market.

Competitive Equilibrium

Market Equilibrium: The market is in equilibrium if for a given price p, market demand Q^D equals market supply Q^S.

- Let p^* and Q^* denote price and quantity, respectively, in the competitive equilibrium, i.e. in equilibrium under perfect competition.
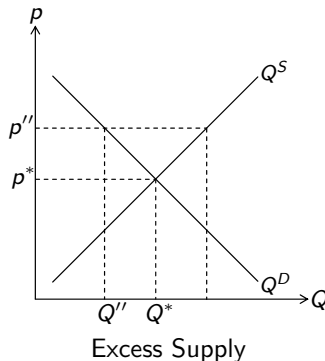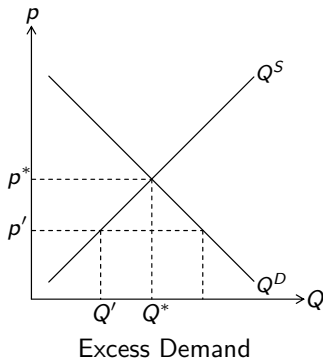
$$Q^D(p^*) = Q^S(p^*) = Q^*$$
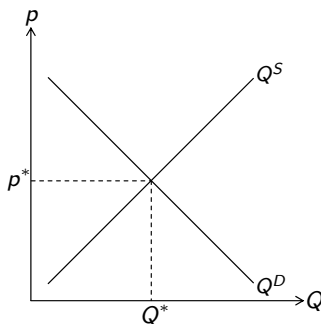
Imbalances

Market Imbalance: A market is imbalanced if for a given price p, market demand Q^D differs from market supply Q^S.

- Excess Demand: If $p' < p^*$, then $Q^D > Q^S$ and $Q' < Q^*$.
- Excess Supply: If $p'' > p^*$, then $Q^D < Q^S$ and $Q'' < Q^*$.

Excess Demand   Excess Supply

Comparative Statics

Change in Market Demand: Ceteris paribus, if market demand

- increases, both equilibrium price and equilibrium quantity increase.
- decreases, both equilibrium price and equilibrium quantity decrease.

Change in Market Supply: Ceteris paribus, if market supply

- increases, equilibrium price decreases, while equilibrium quantity increases.
- decreases, equilibrium price increases, while equilibrium quantity decreases.

Number of Firms

**Short Run:** The number of firms in the market is fixed.

Long Run: The number of firms in the market may change because of entry and exit of firms.

- Additional firms enter the market if this yields non-negative profits.
- Incumbent firms exit the market if they make losses.
- The equilibrium number of firms in the market is the maximum number of firms that can make non-negative profits.

Equilibrium in the Long Run

Example: Consider a perfectly competitive market with market demand $Q^D(p) = 240 - p$ served by $n \in \mathbb{N}$ identical firms. Each firm has total costs of $C(q) = 3{,}200 + \frac{1}{2}q^2$ so that long-run market supply is

$$Q^S(p) = \begin{cases} np, & p \geq 80 \\ 0, & p < 80. \end{cases}$$
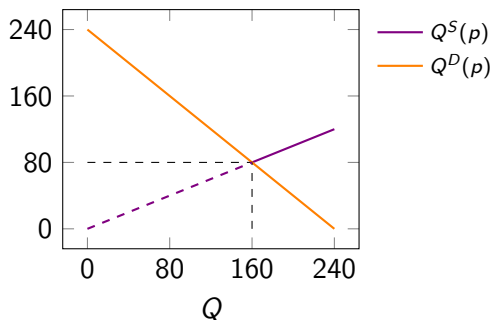
Competitive Equilibrium

Individual Maximization: Given the equilibrium price p^*,

- utility maximization implies that consumers' reservation price, i.e. inverse market demand, must equal equilibrium price

$$p(Q^*) = p^*,$$

- profit maximization implies that producers' reservation price, i.e. marginal costs, must equal equilibrium price

$$MC(Q^*) = p^*.$$

Competitive Equilibrium: At the equilibrium quantity Q^*, the reservation prices of consumers and producers must be equal.

$$p(Q^*) = MC(Q^*).$$

Consumer and Producer Surplus

Total Surplus: Sum of consumer and producer surplus; $TS = CS + PS$

- Consumer Surplus: Aggregated differences between consumers' reservation price and market price;
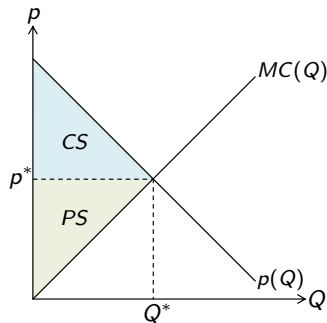
$$CS = \int_0^{Q(\tilde{p})} (p(Q) - \tilde{p}) \, dQ$$

- Producer Surplus: Aggregated differences between market price and producers' reservation price;

$$PS = \int_0^{Q(\tilde{p})} (\tilde{p} - MC(Q)) \, dQ$$

Consumer and Producer Surplus

Welfare Maximum: In the competitive equilibrium, total surplus is maximal.

- The competitive equilibrium is Pareto efficient as all potential gains from trade are realized.
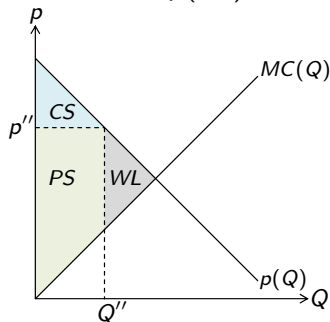
Welfare Loss in the Short Run

Welfare Loss: Whenever reservation prices of consumers and producers differ in equilibrium, total surplus is not maximal. The shortfall compared to the welfare maximum is a welfare loss WL.

- A price ceiling at $p' < p^*$ implies $Q' < Q^*$ and $p(Q') > MC(Q')$.
- A price floor at $p'' > p^*$ implies $Q'' < Q^*$ and $p(Q'') > MC(Q'')$.
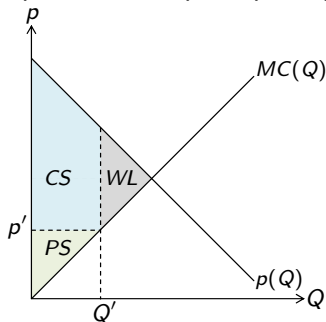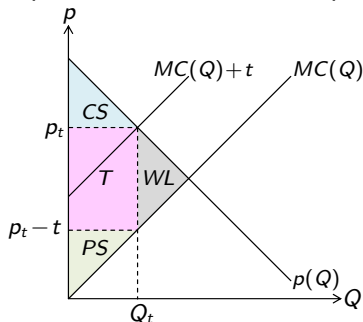

Price Ceiling   Price Floor

Welfare Loss in the Short Run

Taxation: Consider a tax per unit of output, where $t > 0$ denotes the tax rate, and $T = tQ$ denotes tax revenue. The welfare effects of the tax are equal, whether it is levied on producers or consumers.

- In equilibrium, the tax drives a wedge between the reservation prices of consumers and producers; $t = p(Q_t) - MC(Q_t)$.
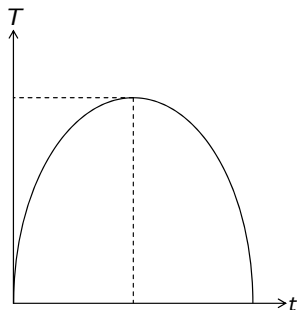

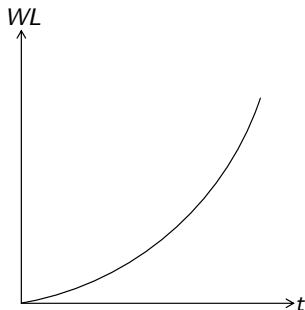Tax Levied on Producers
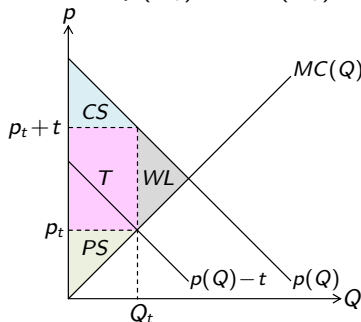
Tax Levied on Consumers

Comparative Statics

Change in the Tax Rate: If an increase in the tax rate causes a decrease in the tax base (equilibrium quantity), it will result in

- an increase (decrease) in tax revenue if the tax rate is sufficiently small (large),
- a higher welfare loss of taxation.

Tax Revenue   Welfare Loss