Supply and Demand

Demand: how much consumers will buy at a particular price; describes consumers' willingness to pay (WTP). $\boxed{Q_d = a - b \cdot P}$

Supply: how much producers will provide at a particular price; describes producers' willingness to accept (WTA) / the industry's aggregate marginal cost curve (i.e. Market supply is the sum of the individual firm supply curves). $\boxed{Q_s = c + d \cdot P}$

Remember to always check whether we need to invert a given function! **Competitive Markets**: Individual firms and consumers don't affect prices (i.e. they have no market power and are price takers)

Competitive Market Equilibrium:

$\boxed{Q^* = Q_s(P^*) = Q_d(P^*)}$ In these markets, prices are determined by:

- the **"marginal buyer"** $P^* = WTP$: who would leave the market if the price were any higher, and
- the **"marginal seller"** $P^* = WTA$: who would leave the market if the price were any lower

Producer Surplus (PS): = Revenue - Total WTA = Revenue - Total Variable Cost (area below price and above supply.)

Without market power, firm-level inverse demand curve is perfectly elastic (i.e. horizontal) at the market price. Market sets $\boxed{MR(Q) = P}$. Firm's supply curve is its MC curve. Firm profit **maximized** when:

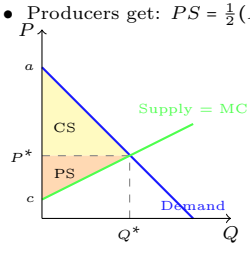
Market $\boxed{P = MR(Q^*) = MC(Q^*)}$, provided the firm is operating at all. *Not to be confused with the MR discussed in H1 Monopoly Pricing!*

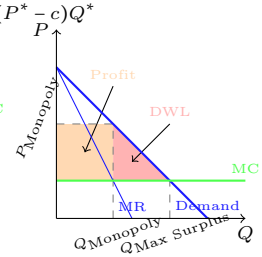
First Welfare Theorem: Competitive markets are **efficient** (i.e. they maximize total surplus = CS + PS).

- Assumes no distortions such as market power, info frictions, or *externalities*.
- Under perfect competition, all trades involving consumers who value the good more than the marginal cost associated with producing an additional unit of the good are realized.

Welfare is maximized: by the perfectly competitive outcome when there are not externalities. To maximize total welfare, we want

- Consumers get: $CS = \frac{1}{2}(a - P^*)Q^*$
- Producers get: $PS = \frac{1}{2}(P^* - c)Q^*$





Competitive markets maximize total surplus.

Distortion e.g.: Pricing with market power

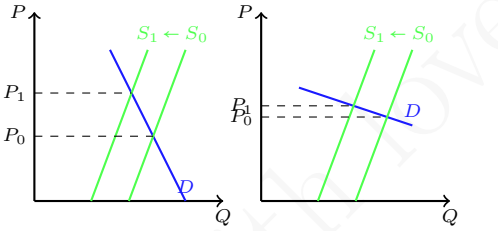
Deadweight Loss (DWL): Lost surplus due to a distortion away from perfect competition.

$\boxed{\text{DWL} = \text{CS} + \text{PS} - \text{TS}}$ i.e. Maximum surplus - Achieved surplus. DWL offers an opportunity to "grow the pie", represents the value proposition for many firms.

In the left graph: DWL will be generated

- if $Q < Q^*$ because there will be consumers that value the product at above the marginal cost
- if $Q > Q^*$ because there will be consumers consuming the product even though their $WTP < MC$

Cost Shock: if one side of the market is highly elastic, then they can avoid shocks (and pass on any taxes / transation fees).

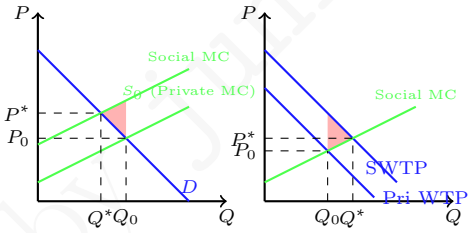


Externalities

Externality: an activity generates it when it imposes a cost or benefit on a third party not involved in the activity. An externality is a **market failure** because the market does not account for the full cost or benefit of the activity – left alone the perfectly competitive market will not maximize welfare.

- **Negative ext.**: costs born by society; e.g. pollution, congestion, noise, contagion. External costs (negative ext.) ⇒ firms produce too much. **Sol.**: tax the product by the externaltiy amount (to shift **up the supply curve**); taxes "internalize" the externality and reduce quantity.
- **Positive ext.**: benefits born by society; e.g. education, vaccines, R&D (ideas). External benefits (positive ext.) ⇒ firms produce too little. **Sol.**: subsidize customers the externaltiy amount (to shift **up the demand curve**)

Without solutions (e.g. regulation, taxes, subsidies, property rights), externalities create DWL.



Tragedy of the Commons: When a resource is held in common, individuals have no incentive to conserve it. This is an example of a negative externality since others' access impairs everyone's use of the resource. Individual will overuse.

Solution: assign property rights, regulate, or tax; joint ventures also allow for collaboration that "internalizes" the externality.

Coase Theorem: If property rights are well-defined and transaction costs are low (or none), the efficient solution occurs regardless of who holds the property rights. Cap and Trade policies set up a market to make this bargaining easier.

Distributional Consequences:

1. the distribution of the burden of the externality,
2. distribution of the costs to correct the externality, and
3. distribution of the burden of externality after policy intervention.

E.g. the R&D market: think of the demand curve originating from the profits that firms here would get from innovating, and thus representing the **private** demand for R&D. The MC curve (supply) represents the private MC of research and development. We will assume that the private MC of R&D equals the social MC. Demand: $Q_{\text{private},d} = 100 - 2P$; supply: $Q_s = \frac{P}{2}$.

1. **Competitive market equilibrium**:
   $$Q_{\text{private},d} = Q_s \Rightarrow 100 - 2P = \frac{P}{2} \Rightarrow \begin{cases} P^* = 40 \\ Q_s^* = 20 \end{cases}$$
2. **Total amount spent on R&D**:
   $P^* \cdot Q_s^* = 40 \cdot 20 = 800$
3. Now suppose that not only does the firm paying for the research and development benefit from the R&D, but some of these benefits spillover to other firms. In particular, economists have calculated that every unit of R&D done by a firm benefits other firms by \$30. **What is the society demand curve for R&D**: Inverse demand curve: $P = 50 - \frac{Q}{2}$. The positive externality implies that the willingness to pay for R&D increases by \$30 everywhere. So the social inverse demand curve (SWTP) is
   $$P = 80 - \tfrac{Q}{2} \xrightarrow{\text{inverse}} Q_{\text{society},d} = 160 - 2P$$
4. **Ways to overcome this positive externality**:
   (a) Implementing patent system to allow the innovating firm to capture more of the benefits from their R&D.
   (b) Subsidizing R&D; esp. for hard, basic science.