Box 1: The Household and Consumer Welfare

- The final basket of goods that is chosen are determined by three factors:
  a. Income
  b. Price
  c. Preferences

- **Substitution Effect:** change in consumption due to a change in price; whenever the price of a good increases, you purchase less of the good. The substitution effect is negative because an increase in price reduces your consumption. A reduction in price increases your consumption.

- **Income Effect:** the *additional* change in consumption of good 1 that is due to the fact that the price increase reduces the real income of the consumer.

**Shifts in the Demand Curve:**

- If income rises, then this a shift in the demand curve because a higher income is going to cause you to demand a higher quantity of all goods.
- Changes in the prices of other goods
- Changes in tastes/preferences
- If there is a change in price, then it is a change along the demand curve **NOT** a shift in the curve. This is a change due to the income and substitutions effects

**Labor and Wages in Microeconomics**

*Wage:* the cost of labor. When you work, you forego leisure which is a normal good; the wage is your compensation for foregoing leisure.

*Substitution effect of an increase in wage:* an increase in your wage is an increase in the cost of leisure. When wage increases, you work more because the cost of leisure has increased.

*Income effect of an increase in wage:* when your wage increases, you feel richer and so you consume more of all goods, including leisure.

**Economic Efficiency and Policy**

For policy, we want to be able to answer the following questions:

1. What is the impact of the policy on government revenues?
2. What is the impact of the policy on the well-being of individuals?
3. Is the policy efficient?
4. Is the policy equitable?

**Relative Efficiency:** benefits to those who gain exceed the losses to those who lose.
Box 2: The Firm

Short Run Costs:

- **Total Costs** = Fixed Costs + Variable Costs—in the short run, the only costs which are variable are labor costs because capital is fixed in the long run.

- **Marginal revenue**: increase in revenue associated with a small increase in the output level; As output increases, total revenue increases but at a declining rate, since the price falls as output increases, i.e. the extra unit that you sell at a lower prices brings in less revenue. Since marginal revenue is the slope of the total revenue curve, as total revenue increases, marginal revenue falls.

- **Marginal costs**: increase in cost associated with a small increase in output.

Profit Maximization for Price Taking Firms

- \( \pi = pQ – TC(Q) \)
- Firms will increase output until marginal revenue equals marginal costs
- If increasing output by one unit results in additional revenue that exceeds the extra cost of producing that unit, then producing that unit will increase profits. \( MR = MC \)
- Marginal revenue is equal to price because price is constant in the short run and is the same for all customers since firms are price takers. (This is also true from Keynesian macro policy which says that prices are sticky in the short run) \( MR = P \)
- The equilibrium \( Q \) will be found where marginal revenue is equal to price and where it intersects with the marginal cost curve. \( P = MR = MC \) (\( MC = P \))
- **Shut Down rule**: if the price is less than short run average variable costs, the firm will shut down.

Properties of the Supply Curve

1. Supply curve shows how much it will produce at different price levels
2. The short run supply curve is the short-run marginal cost curve **above the short-run average variable cost curve**.

Shifts in the Supply Curve:

- Change in price off any of the variable inputs will lower the marginal cost at any output level, shifting the short-run supply
- Technological change
- Change in cost of fixed inputs will NOT change the firm’s short-run supply curve, but will cause profits to rise.
- Change in price of output will NOT cause shifts in the supply curve, but will cause output to change due to movements along the supply curve.

Returns to Scale

**Decreasing Returns to scale**: a production function displays decreasing returns to scale if increasing all inputs by the same proportion increase output by less than that proportion
  - e.g. Doubling all inputs will less than double all outputs.

**Constant Returns to Scale**: increasing all inputs by the same proportion increases output by the same proportion. In a Cobb-Douglas production function, with constant returns to scale, the sum of the coefficients are equal to 1.
  - e.g. doubling all inputs will double output.

**Increasing Returns to Scale**: increasing all inputs by the same proportion increase output by more than that proportion.
  - e.g. doubling all inputs will more than double all outputs.
Box 3: Elasticity

**Price elasticity of demand:** the percentage change in quantity demanded that results from a percentage change in price.

- If the price elasticity of demand for salmon is 2.5, then a one percent increase in the price of salmon leads to a 2.5 percent decrease in the demand for salmon.

**Price elasticity of supply:** the percentage change in quantity supply that results from a percentage change in price

- If the price elasticity of supply of tofu is 0.34, then a one percent increase in the price of tofu will cause suppliers to increase the supply of tofu by 0.34 percent.

**Cross-price elasticity of demand:** the percentage change in the quantity of X demanded that is induced by a percentage change in the price of Y.

- *Substitutes:* The cross-price elasticity of demand for salmon with respect to the price of tuna is 7.01. A 1 percent increase in the price of tuna will cause a 7.01 percent increase in the demand for salmon.
- *Compliments:* The cross-price elasticity of demand for winnies with respect to the price of buns is –2.5. A 1 percent increase in the price of buns leads to a 2.5 percent decrease in the demand for winnies.

**Income elasticity of demand:** the percentage change in the quantity of the good consumed that results from a one percentage change in income.

- *Normal goods:* The income elasticity of demand for symphony tickets is 0.9. A one percent increase in income leads to a 0.9 percent increase in the demand for symphony tickets.
- *Inferior goods:* The income elasticity of demand for winnies is –0.2. A one percent increase in income leads to a 1.2 percent decrease in the demand for winnies.
- *Luxury goods:* The income elasticity of demand for British Airways Tickets is 3.4. A one percent increase in income leads to a 3.4 percentage increase in the demand for British Airways Tickets

**Inelastic goods:** E is less than 1. An increase in P leads to an increase in total expenditures. A decrease in P leads to a decrease in total expenditures.

**Unitarily elastic good:** E is equal to 1. There is not change in total expenditures stay the same when price increases or decreases.

**Elastic goods:** E is greater than 1. An increase in P leads to a decrease in total expenditures. A decrease in P leads to an increase in total expenditures.

**Taxes and Elasticities:** the most inelastic party bears the highest burden of the tax, e.g. if the elasticity of demand is 0.8 and the elasticity of supply is 1.2, then the economic incidence of the tax is going to be borne by the demander.
Box 4: Using elasticities to calculate the effects of a tax

In this problem we are trying to solve for two variables:
- \( Q_1 \) = the after tax quantity
- \( P_1 \) = the after tax price

Percentage reduction in demand caused by a sales tax: \((\% \text{ change in price}) \times (\text{elasticity of demand})\)

Given the elasticity of demand for a good, \((\varepsilon^D)\) the following equation can be used to find the before and after tax price for consumers and quantity demanded of a good:

\[
\frac{(Q_1^D - Q^0)}{Q^0} = \left(\frac{(P_1^D - P^0)}{P^0}\right) \varepsilon^D
\]

\( \varepsilon^D \) = elasticity of demand
\( Q^0 \) = before tax quantity
\( Q_1^D \) = after tax quantity demanded
\( P^0 \) = before tax price
\( P_1^D \) = price consumers pay after the tax

To find the quantity demand after the tax, we manipulate the bolded equation to get the following equation:

(1) \[ Q_1^D = Q^0 + Q^0 \left[\frac{(P_1^D + t - P^0)}{P^0}\right] \varepsilon^D \]

Percentage reduction in supply caused by a sales tax: \((\% \text{ change in price}) \times (\text{elasticity of supply})\)

Given the elasticity of supply for a good, \((\varepsilon^S)\) the following equation can be used to find the before and after tax price paid to firms and quantity supplied of a good:

\[
\frac{(Q_1^S - Q^0)}{Q^0} = \left(\frac{(P_1^S - P^0)}{P^0}\right) \varepsilon^S
\]

\( \varepsilon^S \) = elasticity of supply
\( Q^0 \) = before tax quantity
\( Q_1^S \) = after tax quantity supplied
\( P^0 \) = before tax price
\( P_1^S \) = price firms receive after the tax

To find the quantity supplied after the tax, we manipulate the bolded equation to get the following equation.

(2) \[ Q_1^S = Q^0 + Q^0 \left[\frac{(P_1^S + t - P^0)}{P^0}\right] \varepsilon^S \]

When we set equations (1) and (2) equal to one another, we can find the after tax price. This is given by the following equation:

(3) \[ P_1 = P_0 - t \left[\frac{\varepsilon^D}{(\varepsilon^D - \varepsilon^S)}\right] \]

To get the final quantity demanded, you put equation (3) into either equation (1) or (2). This will yield \( Q_1 \) which is the final quantity demanded in equilibrium.

**Incidence of the tax:** The most inelastic party bears the highest burden of the tax, e.g. if the elasticity of demand is 0.8 and the elasticity of supply is 1.2, then the economic incidence of the tax is going to be borne by the demander.
Box 5: Monopoly and Oligopoly
A firm might be a monopoly for the following reasons: Legal and technical barriers to entry

Characteristics of a Monopoly
1. **Produce (Q)** where marginal revenue equals marginal costs; \( MR = MC \)
2. **Demand** is equal to average revenue; \( AR = D \)
3. **Price** is the point on the demand curve where \( MC = MR \).
4. **Marginal Costs and Marginal Revenue** can be expressed as a function of the price of the good, and the demand elasticity for the good:
   \[ MR = MC = P \left(1 + \frac{1}{\varepsilon_D}\right) \]
   *(The less price-elastic the demand for a commodity, the greater the gap between the equilibrium price and marginal costs.)*
5. **Rule**: No monopoly will produce where the demand for a good is inelastic
6. Monopolies will price discriminate if they know the elasticity of demand for their customers.

**Cournot Model**: each firm takes the other firm’s output as fixed.

**Bertrand Model**: each firm takes the other firms prices as fixed.
Box 6: Externalities and Public Goods

Externalities
1. Externalities are inefficient because externality producing agents do not take into account the costs/benefits they impose on others (through non-market means) when making decisions.
2. Private Costs and Benefits: cost and benefits that accrue to individual firms and consumers as a result of their own decisions
3. External Costs and Benefits: those that accrue to other firms/consumers because of externalities
4. Social Costs and Benefits: the sum of private and social costs
5. With no restrictions, producers will sell until the private marginal costs of producing will equal the private marginal benefits of production; PMC = PMB
6. Marginal Damage: the sum of marginal external costs over all people in the economy that are incurred as more of the good is produced. For a negative externality, this is sloping upward because as more of the good gets produced, marginal damage to society increases.
7. Social Marginal Costs and Social Marginal Benefits: the cost/benefits that accrue to everyone in society as a result of an extra unit of the good being produced. SMC = SMB—this conditions must hold for greatest efficiency. SMC=PMC + MD
8. A tax to reduce a negative externality will make the private actor internalize the damage that it inflicts on society.

Public Goods
1. Nonexclusive: once produced, no one can be excluded from consuming
2. Nonrival: can be consumed by additional consumers at zero marginal social cost, e.g. a radio station
3. Efficiency requires that a good be produced until the cost of producing an extra unit of the good is equated with the social benefit of having an extra unit of good. MC = \sum MB_i = SMB; please note that each individual demand curve is equal to their marginal benefit: MB_i = D_i
4. Leaving production of the good to the free market will result in an output level of less than the efficient quantity.
5. Because a good is nonexclusive (can’t really “sell” it to anyone once produced) there are no incentives for it to be produced; people don’t get together to produce it because of free riding; government provides public goods in this case.