

Principles of Economics

Discussion Session 4: Evaluating Welfare

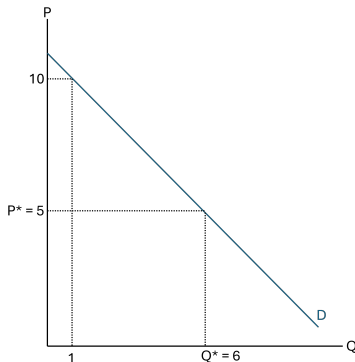
Joe Wilske

Boston College

September 26, 2025

Consumer Surplus

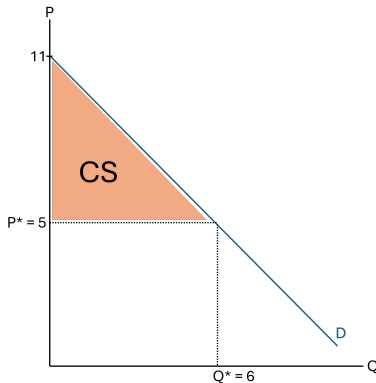
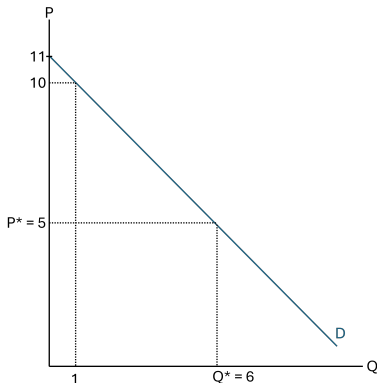
- **Consumer Surplus** is the difference between a consumer's willingness to pay and the actual price paid.
- The “surplus” value one gets from purchasing a good.



- This consumer is willing to pay \$10 for one unit.
- Since the market price is \$5, he gets $\$10 - \$5 = \$5$ of surplus value from that unit.

Consumer Surplus: Continued

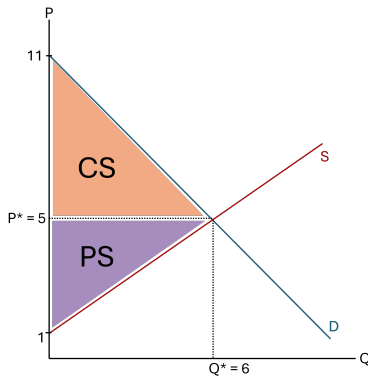
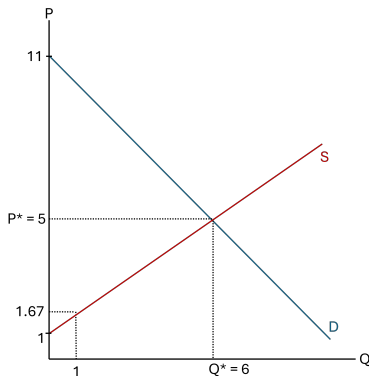
- Adding together the surplus from every unit purchased gives the total CS.
- Calculated by finding the area between the demand curve and price paid.



- $CS = \frac{1}{2}bh = \frac{1}{2}(6)(6) = 18$

Producer Surplus

- **Producer Surplus** is the difference between the actual price received and a producer's willingness to sell.
- Calculated by finding the area between the supply curve and price received.



- This producer is willing to sell one unit for \$1.67, so he receives $\$5 - \$1.67 = \$3.33$ of surplus from that unit.
- Summing across all units, $PS = \frac{1}{2}bh = \frac{1}{2}(6)(4) = 12$.

Exercise 1: Consumer & Producer Surplus

Consider the market for Boston College Doug Flutie jerseys:

- $Q^D = 250 - P$

- $Q^S = 2P - 50$

- 1 Find the market equilibrium.
- 2 Calculate the consumer surplus, producer surplus, and total surplus.

Exercise 1: Consumer & Producer Surplus

Solution:

① Market equilibrium price and quantity: $P^* = 100$, $Q^* = 150$

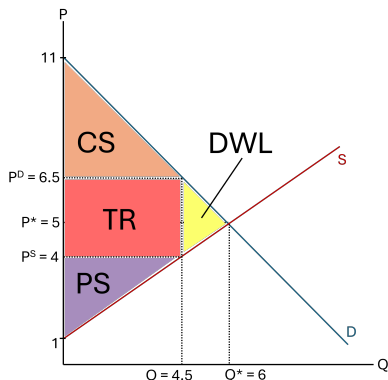
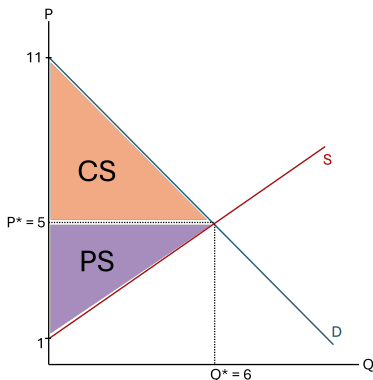
② $CS = \frac{1}{2}(150)(250 - 100) = \frac{1}{2}(150)(150) = 11,250$

$$PS = \frac{1}{2}(150)(100 - 25) = \frac{1}{2}(150)(75) = 5,625$$

$$TS = CS + PS = 16,875$$

Welfare Effect of a Tax

- We know a tax raises the buyer's price, lowers the seller's price, and reduces quantity.
⇒ Shrinks the CS and PS triangles



- Some CS and PS is converted to tax revenue: $TR = t \times Q$
- **Deadweight Loss** is the CS and PS that is simply lost due to the fall in quantity.

Exercise 2: Welfare Effect of a Tax

Suppose a market is described by the following supply and demand equations:

- $Q^D = 200 - P$
- $Q^S = 2P - 100$

- 1 Find the original equilibrium P^* and Q^* . Calculate Consumer Surplus and Producer Surplus.
- 2 Suppose the government imposes a tax of \$30 per unit.
 - a Find the new P^S , P^D and Q .
 - b Calculate CS, PS, Tax Revenue, and Deadweight Loss.

Exercise 2: Welfare Effect of a Tax

Solution:

$$\textcircled{1} \quad P^* = 100, Q^* = 100$$

$$CS = \frac{1}{2}(100)(100) = 5,000$$

$$PS = \frac{1}{2}(100)(50) = 2,500$$

$$\textcircled{2} \quad \textcircled{a} \quad P^S = 90, P^D = 120, Q = 80$$

$$\textcircled{b} \quad CS = \frac{1}{2}(80)(80) = 3,200$$

$$PS = \frac{1}{2}(80)(40) = 1,600$$

$$TR = (30)(80) = 2,400$$

$$DWL = \frac{1}{2}(20)(30) = 300$$

Optimal Taxation

- A reasonable goal when designing tax policy might be to minimize DWL.
⇒ Tax goods with inelastic demand or supply.

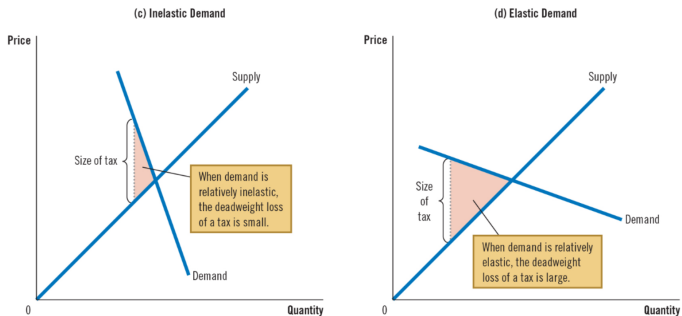
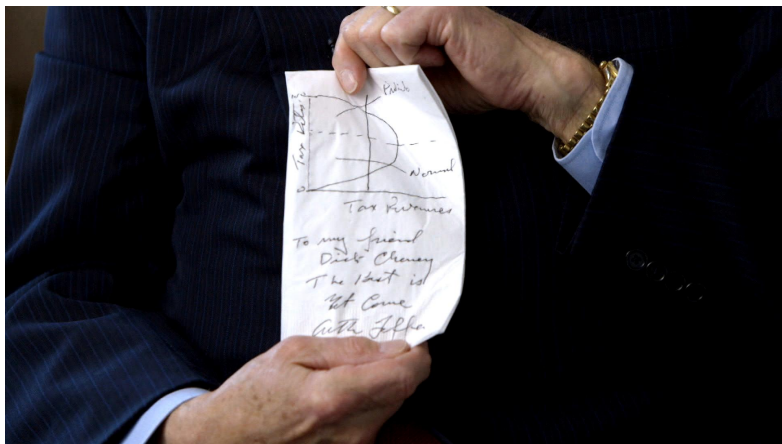


Figure: Mankiw, Principles of Economics 10th Edition, Chapter 8

- But what kinds of goods tend to be inelastic?
- How do we balance DWL minimization with other considerations?

Optimal Taxation: Continued

- Another goal of tax policy might be to maximize tax revenue.
- Economist Arthur Laffer famously brought the Tax Revenue curve to the public eye after sketching it on a napkin during a meeting with Dick Cheney and Donald Rumsfeld in 1974.



The “Laffer Curve”

- We can derive the Laffer Curve with our ‘Econ 101’ technique!
 - $Q^D = 200 - P$
 - $Q^S = 2P - 100$
- Just need to solve for tax revenue as usual, but leave t unspecified:
- $TR = -\frac{2}{3}t^2 + 100t$