Principles of Economics
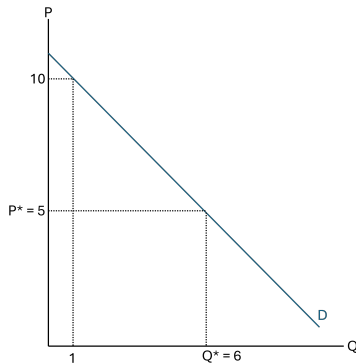## Discussion Session 4: Evaluating Welfare

Joe Wilske

Boston College

September 27, 2025

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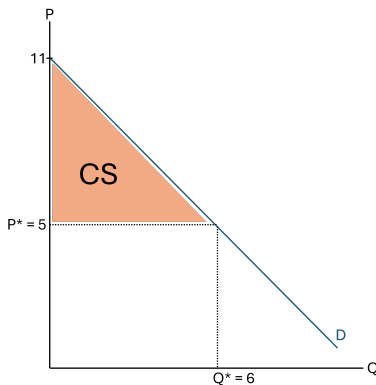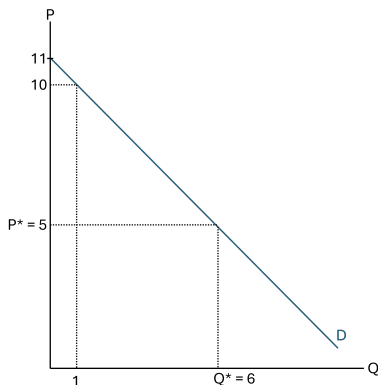
- **Consumer Surplus** is the difference between a consumer's willingness to pay and the actual price paid.
- The "surplus" value one gets from purchasing a good.

- 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.
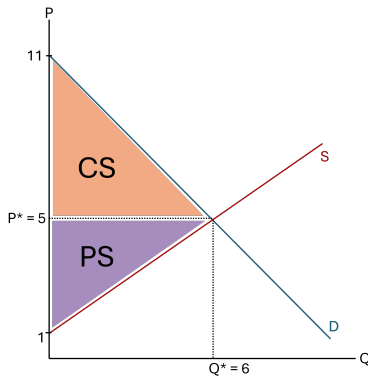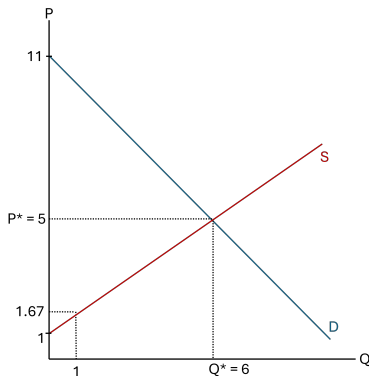
Consumer Surplus: Continued

- 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.

Solution:

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

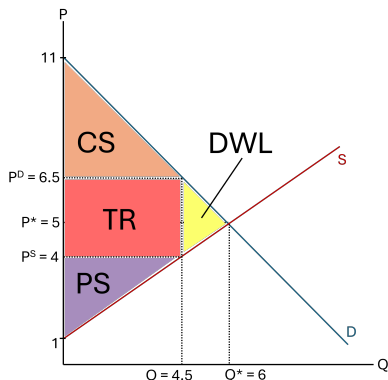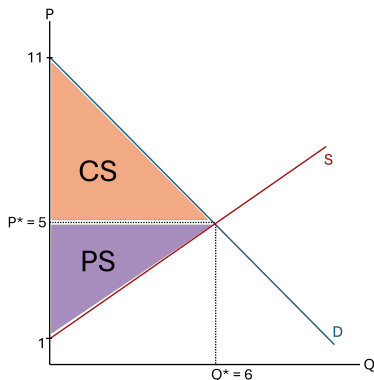2. $CS = \frac{1}{2}(150)(250 - 100) = \frac{1}{2}(150)(150) = 11{,}250$

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

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

Welfare Effect of a Tax

- We know a tax raises the buyer's price, lowers the seller's price, and reduces quantity.
  $\implies$ 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.

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:

1. $P^* = 100, \ Q^* = 100$

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

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

2. a. $P^S = 90, \ P^D = 120, \ Q = 80$

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

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

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

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

Optimal Taxation

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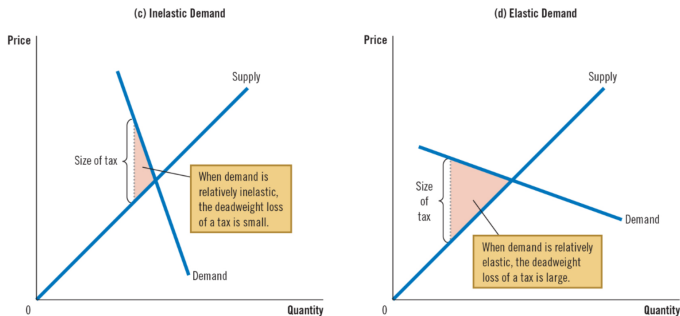 $\implies$ Tax goods with inelastic demand or supply.

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.
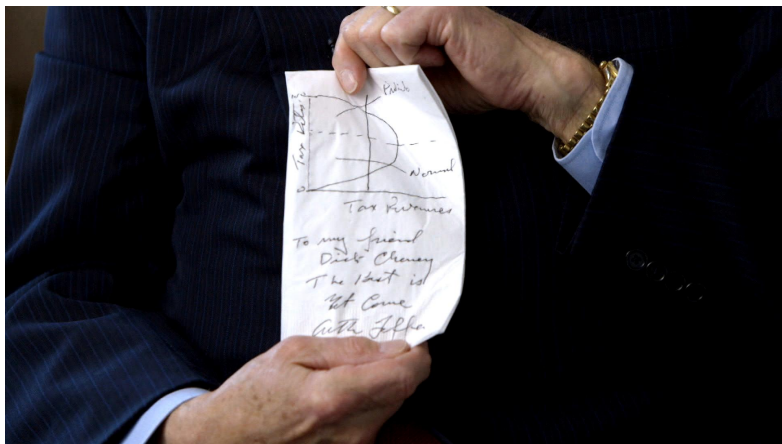
The "Laffer Curve"

- 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:

- $TR = -\frac{2}{3}t^2 + 100t$