# Consumer & Producer Surplus

AP Microeconomics | Unit 2 | surplus as area, efficiency, and deadweight loss

*Running example.* Demand: $P = 6 - \frac{Q}{10}$. Supply: $P = \frac{Q}{10}$. Equilibrium: price \$3, quantity 30.

## 1. Consumer surplus

**Consumer surplus (CS)**

What buyers were willing to pay minus what they actually paid.
**Area below the demand curve and above the price**, out to the quantity sold.

$$CS = \tfrac{1}{2} \times 30 \times (6 - 3) = \$45$$

## 2. Producer surplus

**Producer surplus (PS)**

What sellers actually received minus the least they would accept (their marginal cost).
**Area above the supply curve and below the price**, out to the quantity sold.

$$PS = \tfrac{1}{2} \times 30 \times (3 - 0) = \$45$$

Both are triangles: $\frac{1}{2} \times$ base $\times$ height, with the height measured from the price to where the curve meets the price axis.

## 3. Total surplus and efficiency

$$\text{total surplus} = CS + PS = \$45 + \$45 = \$90$$

At the equilibrium quantity every unit that is worth more to a buyer than it costs a seller is traded, and none that is not. Total surplus is at its **maximum**: the market is *allocatively efficient*.

## 4. Deadweight loss

Suppose only 20 units are traded instead of 30 (a tax, a quota or a price control). Between 20 and 30 the demand curve is above the supply curve: each of those units is worth more to a buyer than it costs a seller, and it is not traded.

**Deadweight loss (DWL)**

The total surplus lost when the quantity traded is not the efficient quantity. **Nobody gets it**: not buyers, not sellers, not the government.

$$DWL = \tfrac{1}{2} \times (4 - 2) \times (30 - 20) = \$10$$


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The triangle lies between the quantity traded and the efficient quantity, and points at the efficient quantity. It appears when too little is traded *and* when too much is traded.

## 5. When the price changes

**Change in consumer surplus.** The price falls from \$3 to \$2 and quantity rises from 30 to 40. Old buyers save \$1 on each of 30 units (\$30); new buyers gain the triangle $\frac{1}{2} \times 10 \times \$1 = \$5$. So $\Delta CS = \$35 = \frac{1}{2}(30 + 40)(\$1)$, a trapezoid. When the price rises, the same trapezoid is lost.

**Who keeps the surplus.** Perfect price discrimination charges each buyer exactly their willingness to pay: consumer surplus is zero. A binding price floor raises the price and lowers the quantity, so consumer surplus falls; a quota that cuts output below equilibrium lowers CS and total surplus (producers may even gain). Deadweight loss is surplus lost to everyone; a transfer only moves surplus between buyers and sellers.

**Where students lose points**

1. Swapping the areas: consumers are above the price, producers below.
2. Forgetting the one-half: they are triangles, not rectangles.
3. Using the wrong height: measure from the price to the axis intercept.
4. Shading deadweight loss on the wrong side of the quantity traded.
5. Saying the lost surplus "goes to" someone: nobody gets it.

**Now practise it**

Theory sticks once you use it. On **sad-academy.com** you'll find practice questions for this exact subtopic in the AP format, and an AI that grades your free-response answers against the scoring guidelines, the way an AP reader would.

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