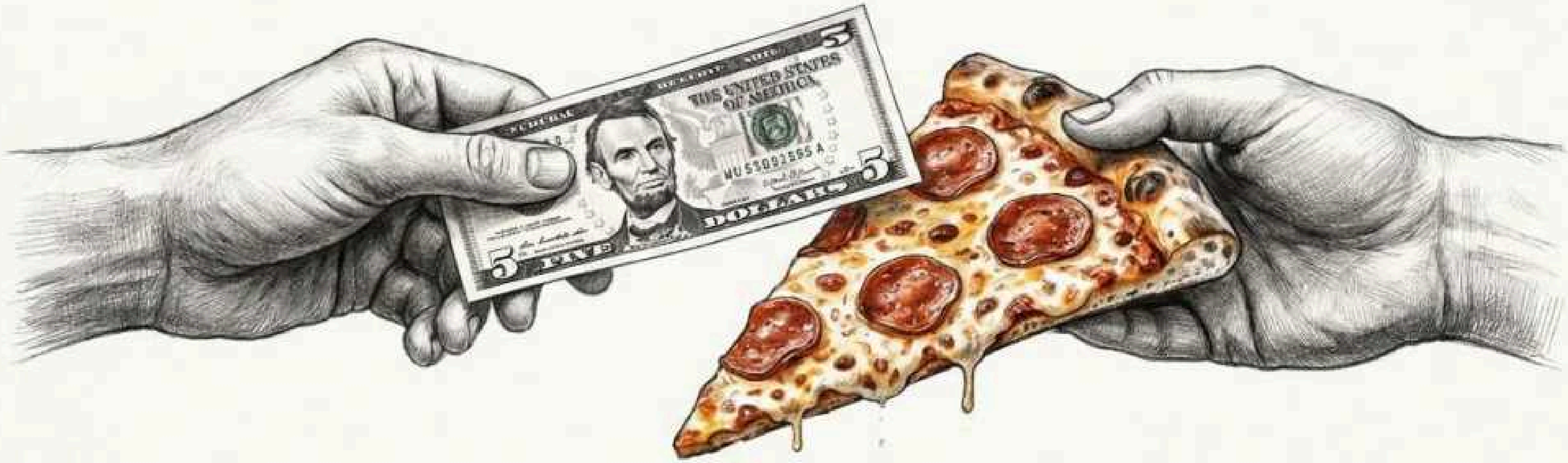
¶ 4.1

Gains From Trade: Surplus, Price Controls, and Taxes

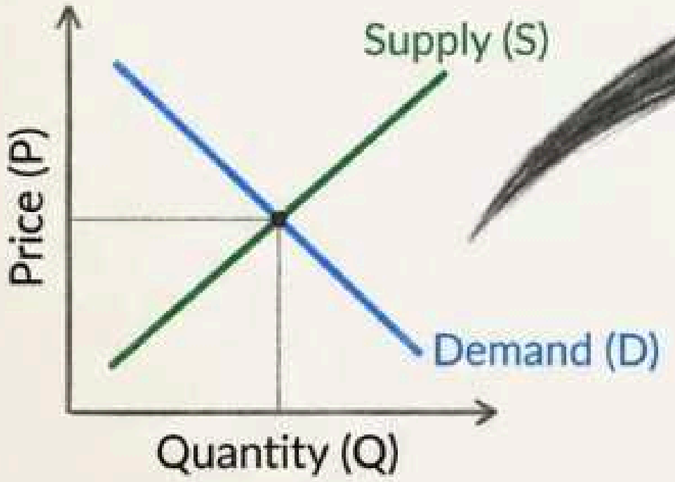
ECON 120 B — Lecture 4



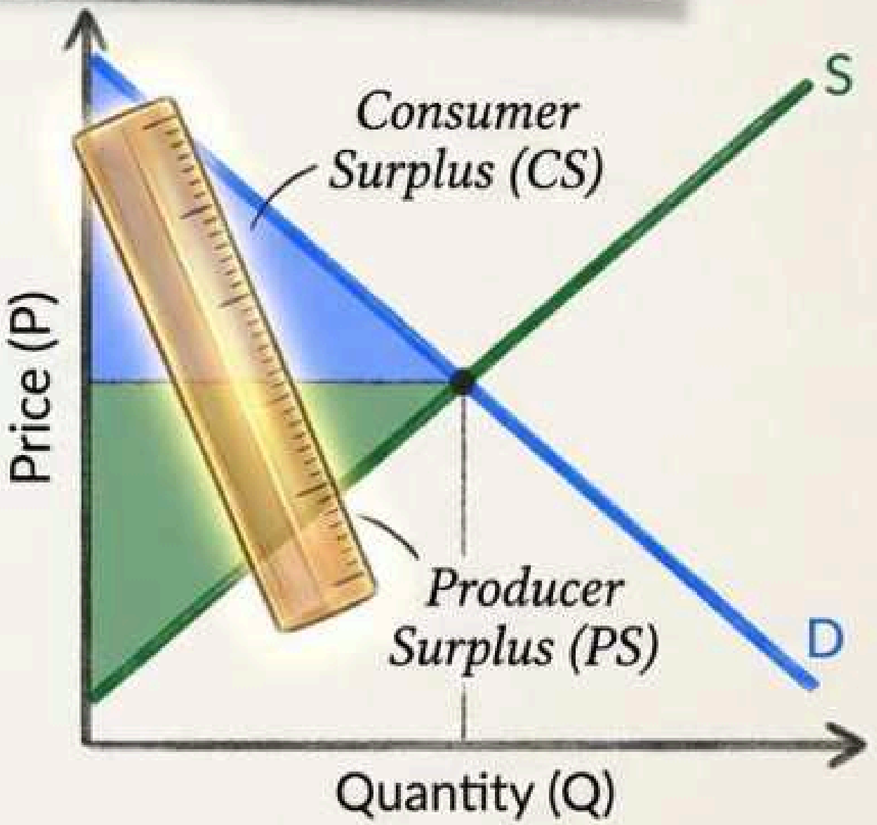
1. Surplus Geometry | 2. Market Distortions | 3. The Math of Deadweight Loss

Measuring the Gains from Trade

To judge price controls and taxes, we must first measure the gains buyers and sellers receive. That measure is called **Surplus**.

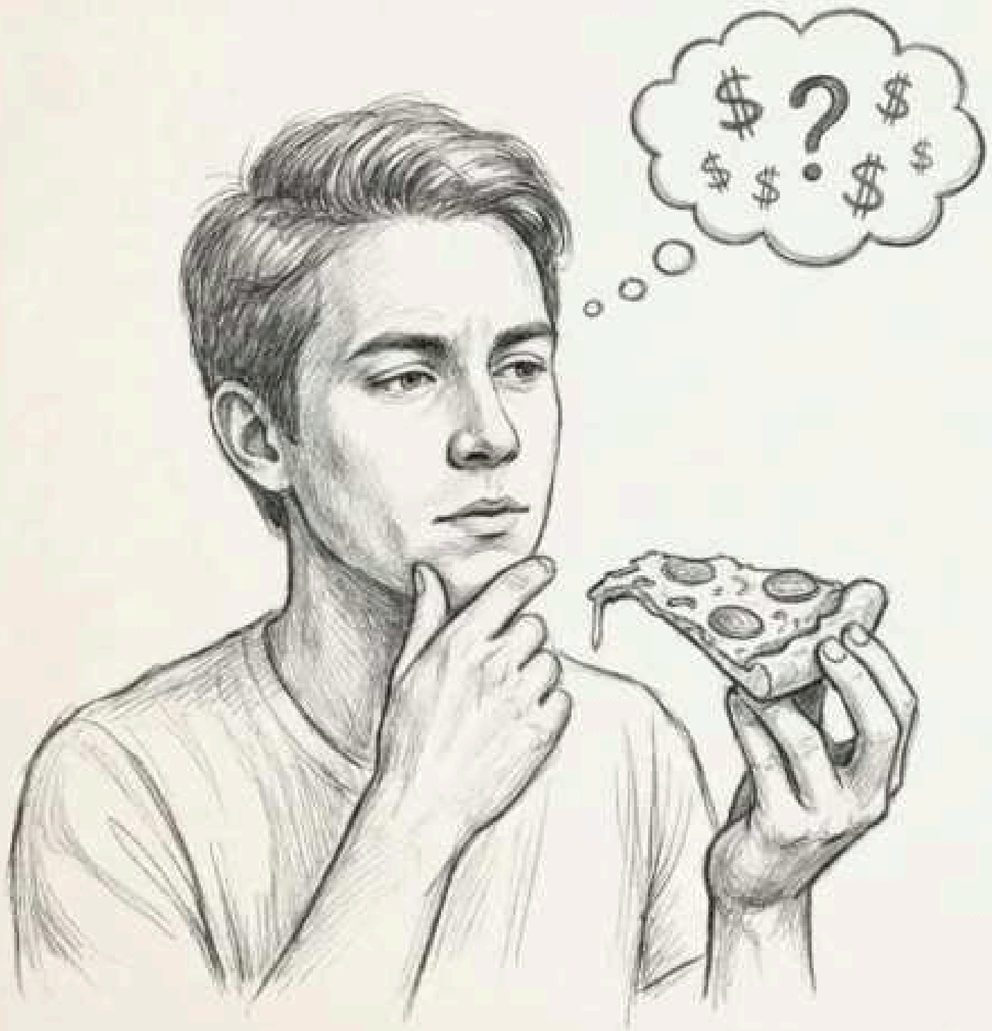


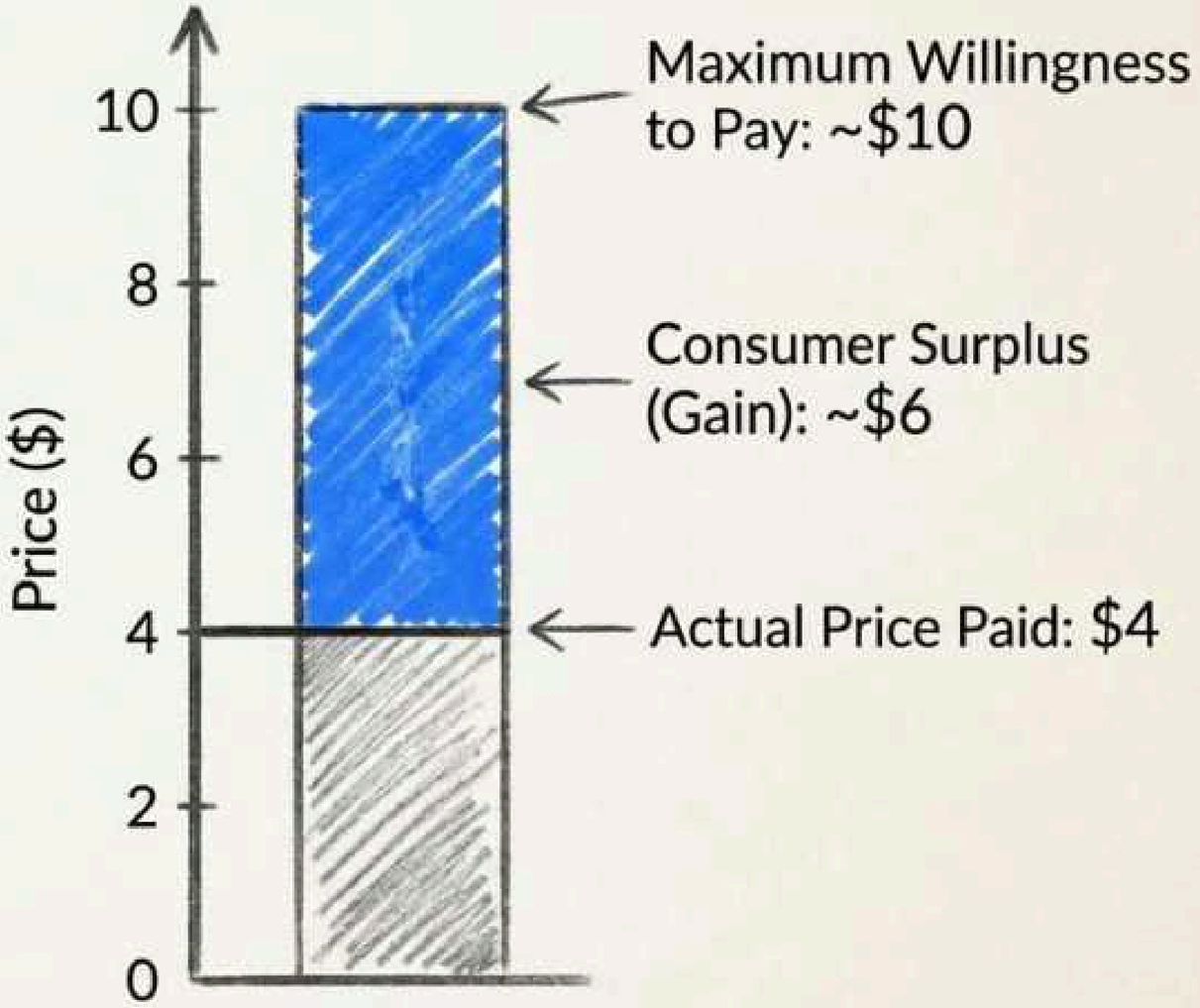
How Markets Work
(Mechanics)



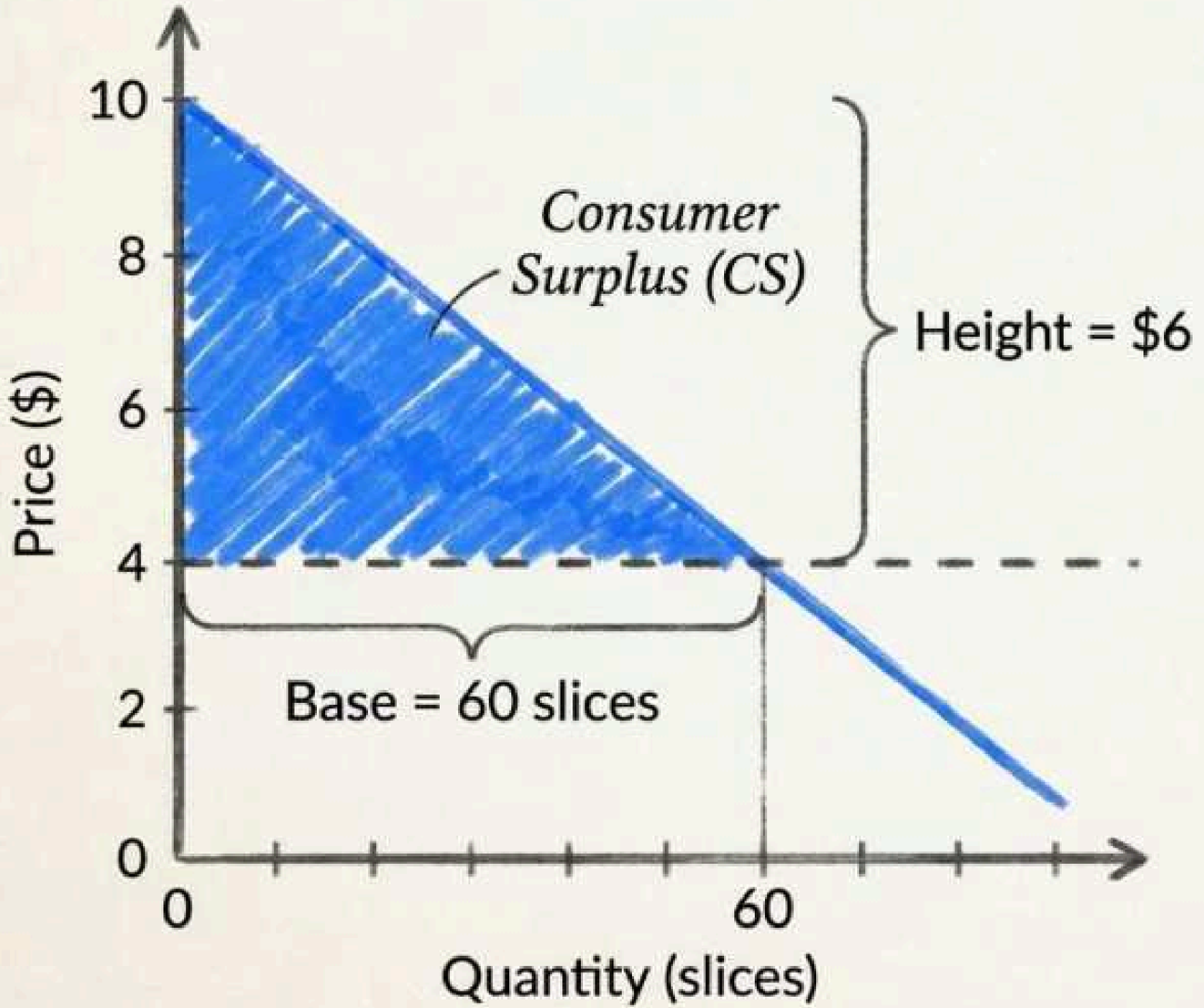
How Well They Work
(Evaluation)

The Individual Buyer: Willingness to Pay





Aggregating Buyers: Consumer Surplus



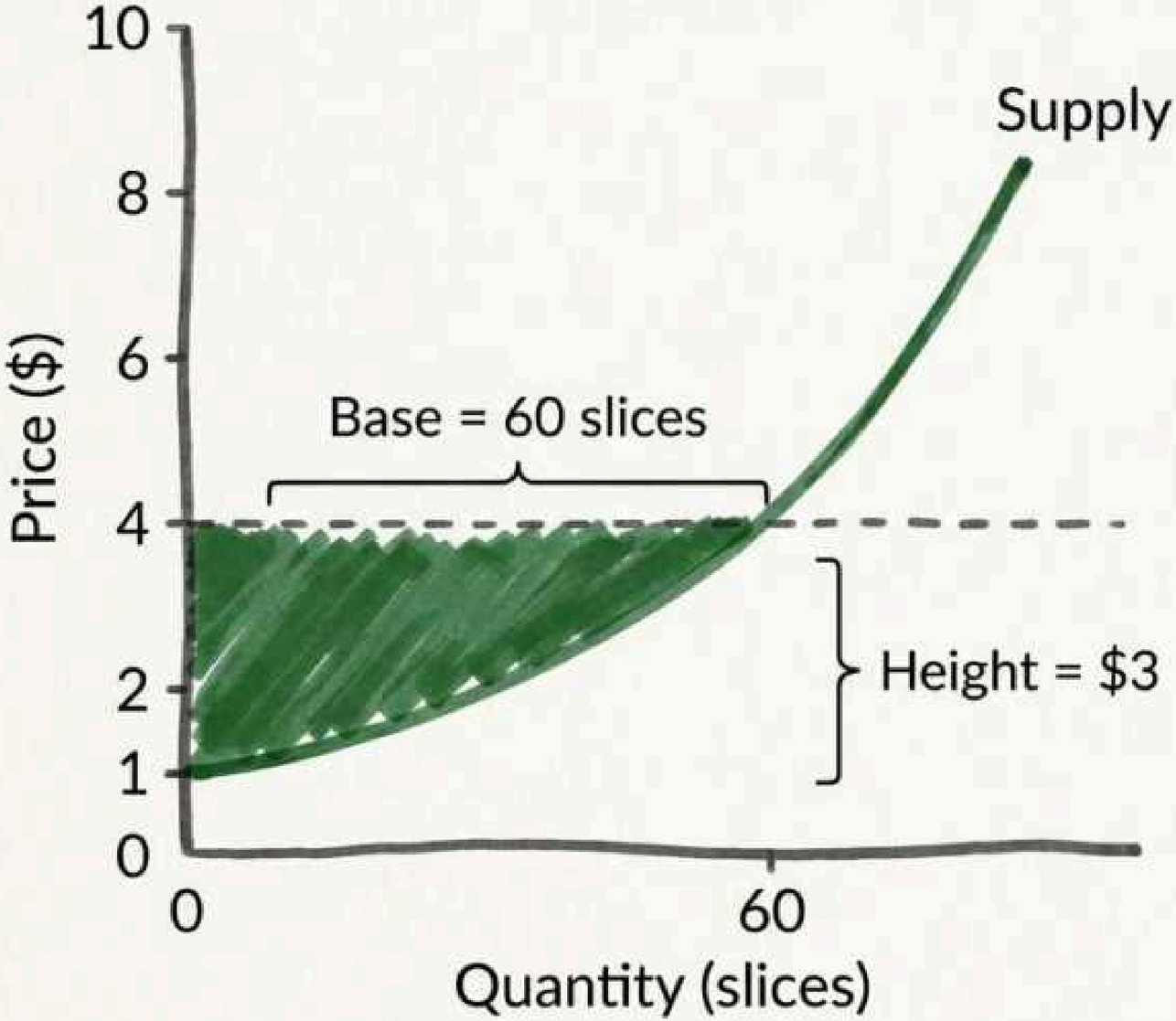
$$CS = \frac{1}{2} \times Base \times Height$$

$$CS = \frac{1}{2} \times 60 \text{ slices} \times \$6$$

$$CS = \$180 \text{ per hour}$$

Aggregating Sellers: Producer Surplus

¶ 4.5

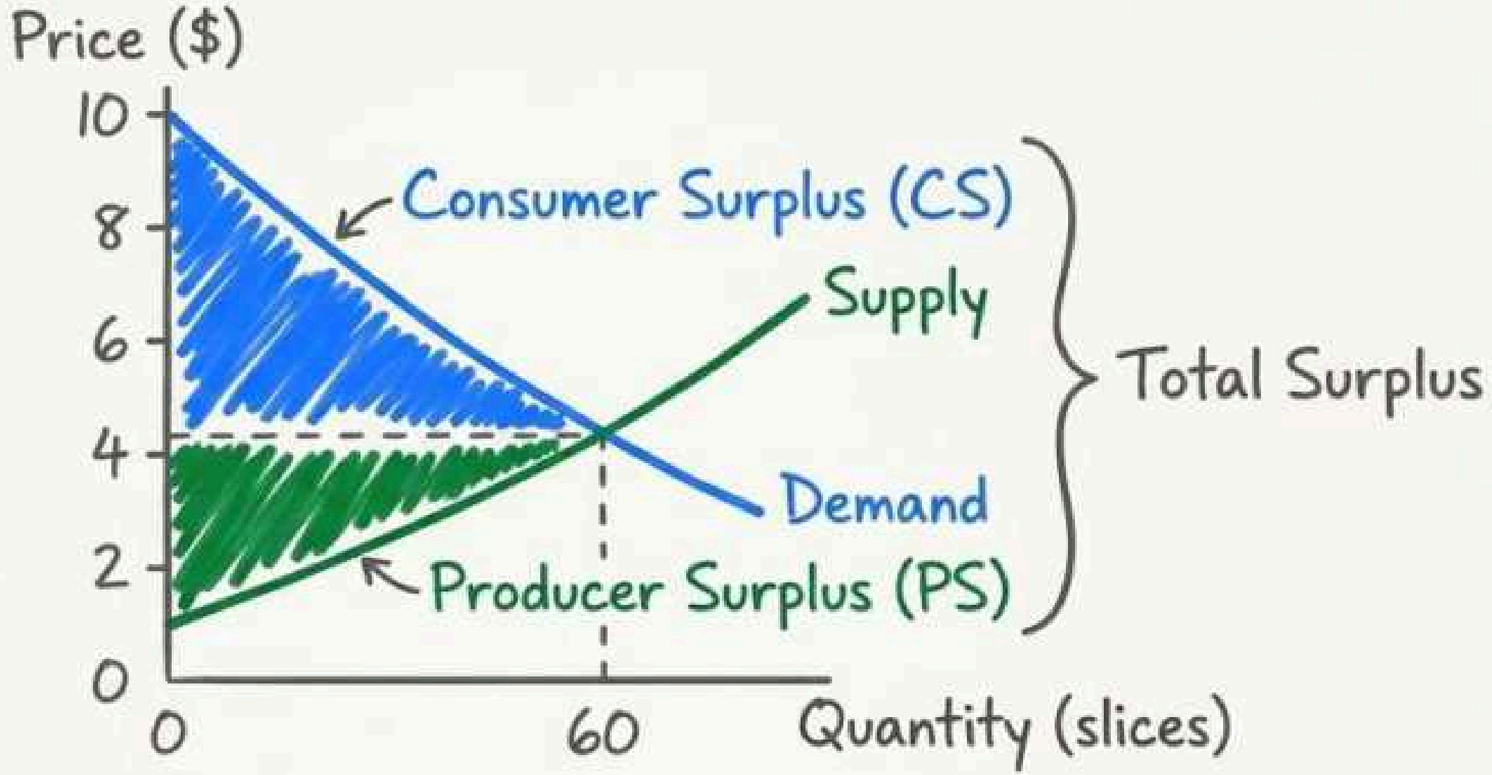


$$PS = \frac{1}{2} \times Base \times Height$$

$$PS = \frac{1}{2} \times 60 \text{ slices} \times \$3$$

$$PS = \$90 \text{ per hour}$$

Total Surplus and Market Efficiency



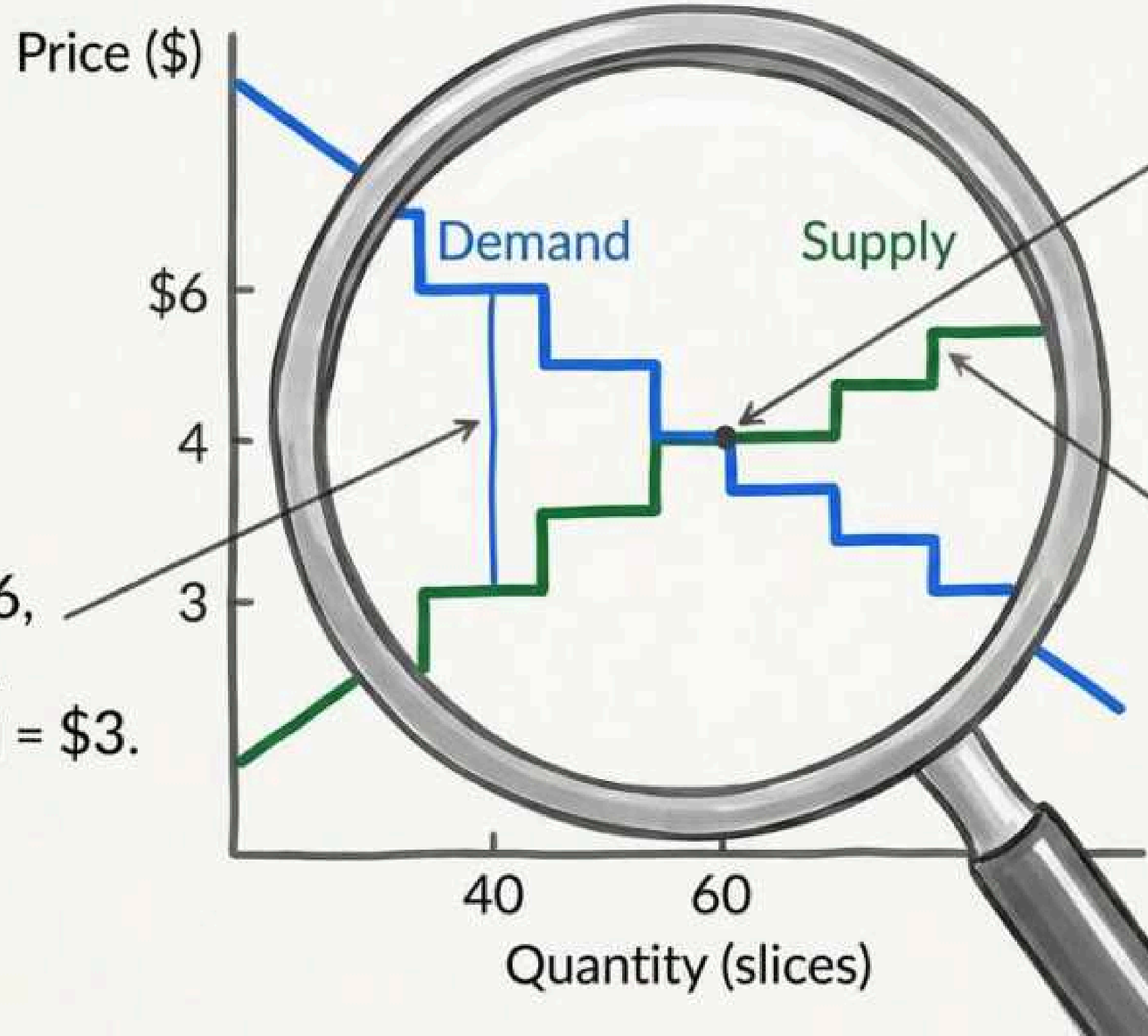
Total Surplus = CS + PS

$180 + $90 = $270 per hour

A market is efficient when it makes Total Surplus as large as possible.
Every slice worth more to a buyer than it costs a seller gets made.

Counting Trades One Slice at a Time

¶ 4.7



Buyer value $6,
Seller cost $3.
Surplus created = $3.

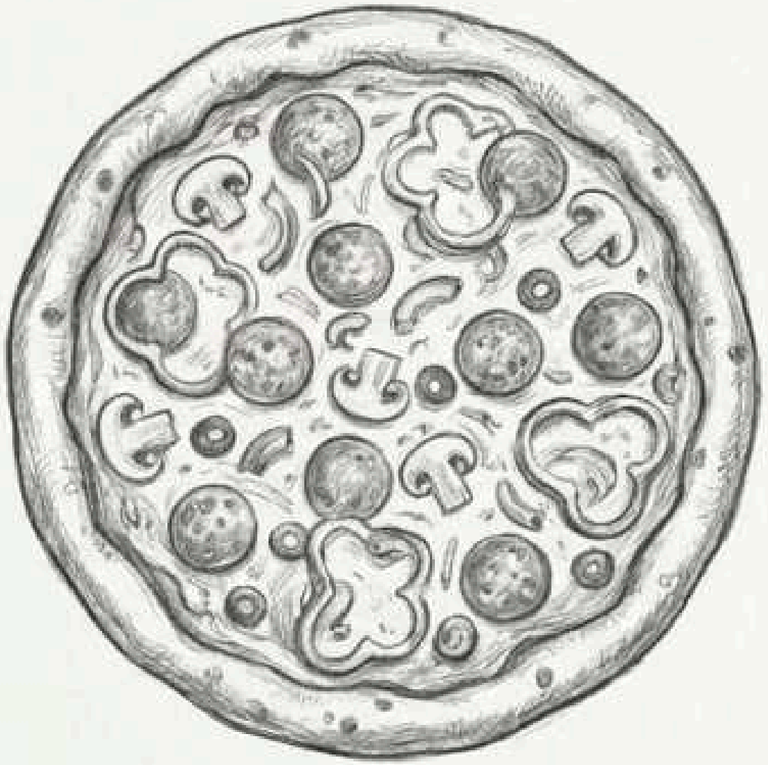
Buyer value $4,
Seller cost $4.
Steps touch.
Surplus = $0.

Beyond 60 slices, a slice costs more to make than it is worth.

Efficiency is Not Fairness

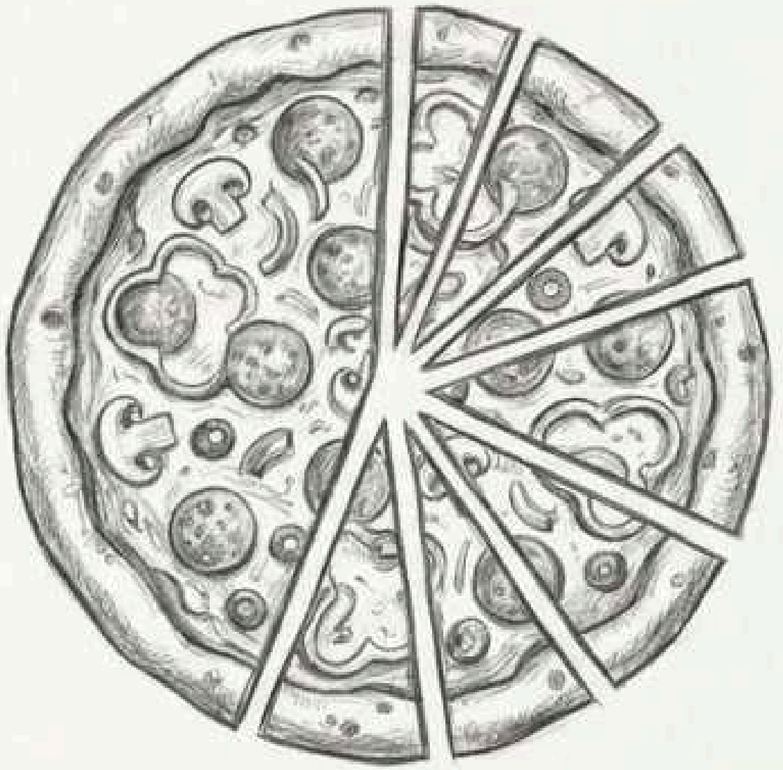
¶ 4.8

Size of the Pie



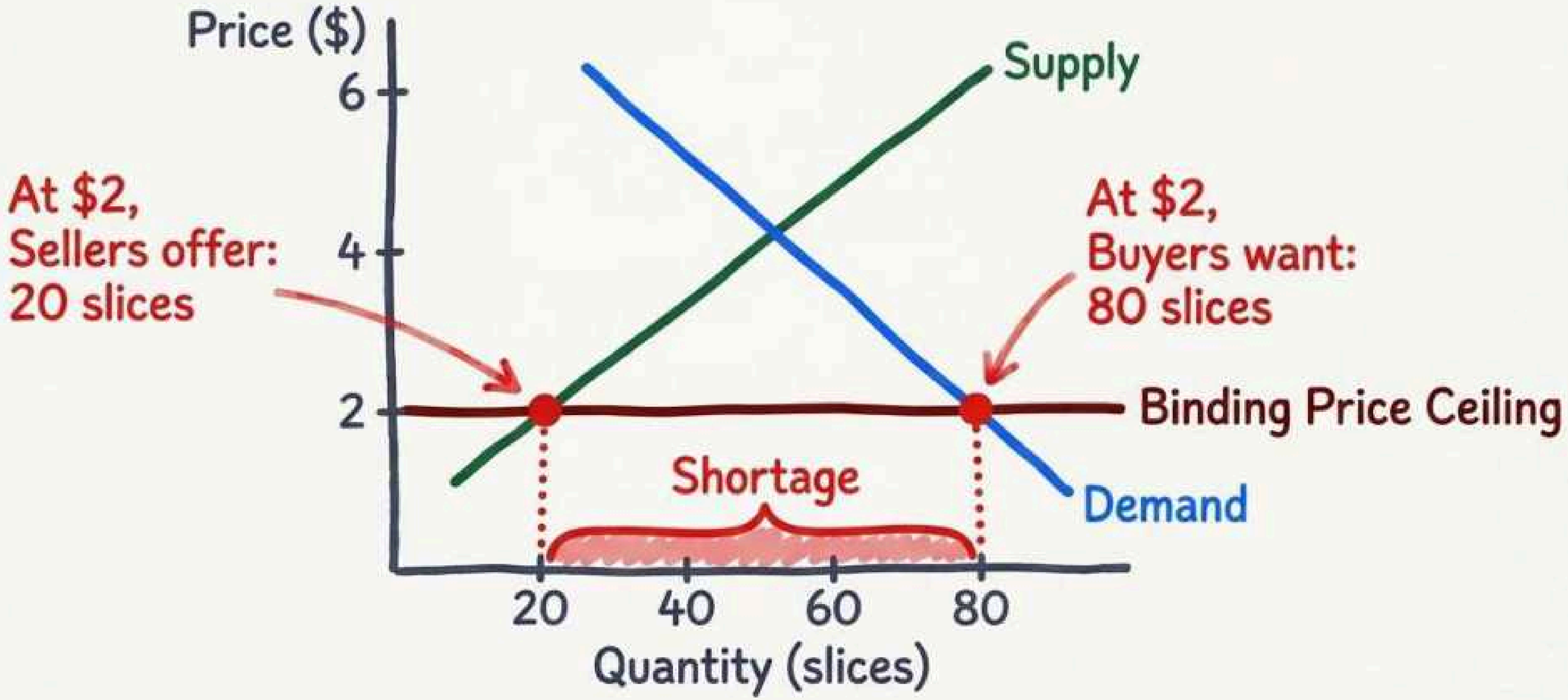
Efficiency maximizes total surplus. It does not guarantee everyone can afford what they need.

Slicing the Pie



Fairness addresses how the gain is shared—a question of values, not geometry.

Price Ceilings Create Shortages



Shortage = 60 slices an hour. Only 20 slices are actually sold.

The Real-World Fallout of a Ceiling

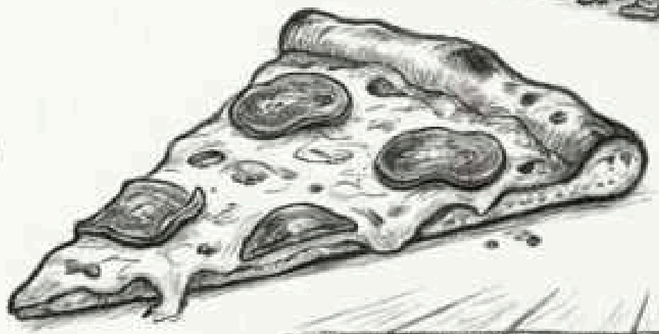
¶ 4.10

Binding Ceiling ($2)

- **Queues or Search**



- **Cut Quality**

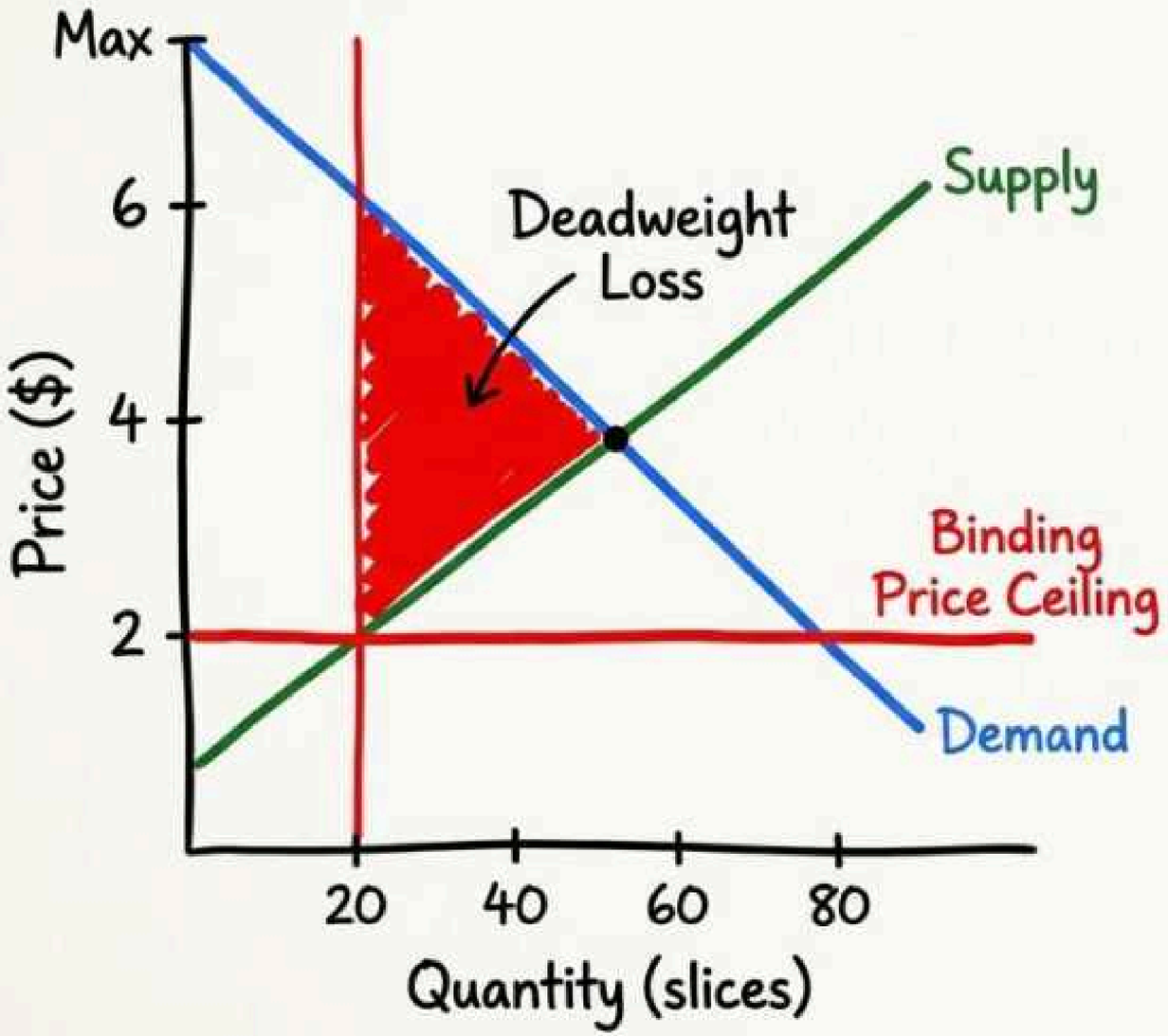


- **Black Markets**



Total surplus plummets from $270 to $150. $120 is lost completely.

Deadweight Loss: The Missing Triangle



Surplus that disappears when a market produces less than the efficient quantity (trades 20 through 60 are prevented).

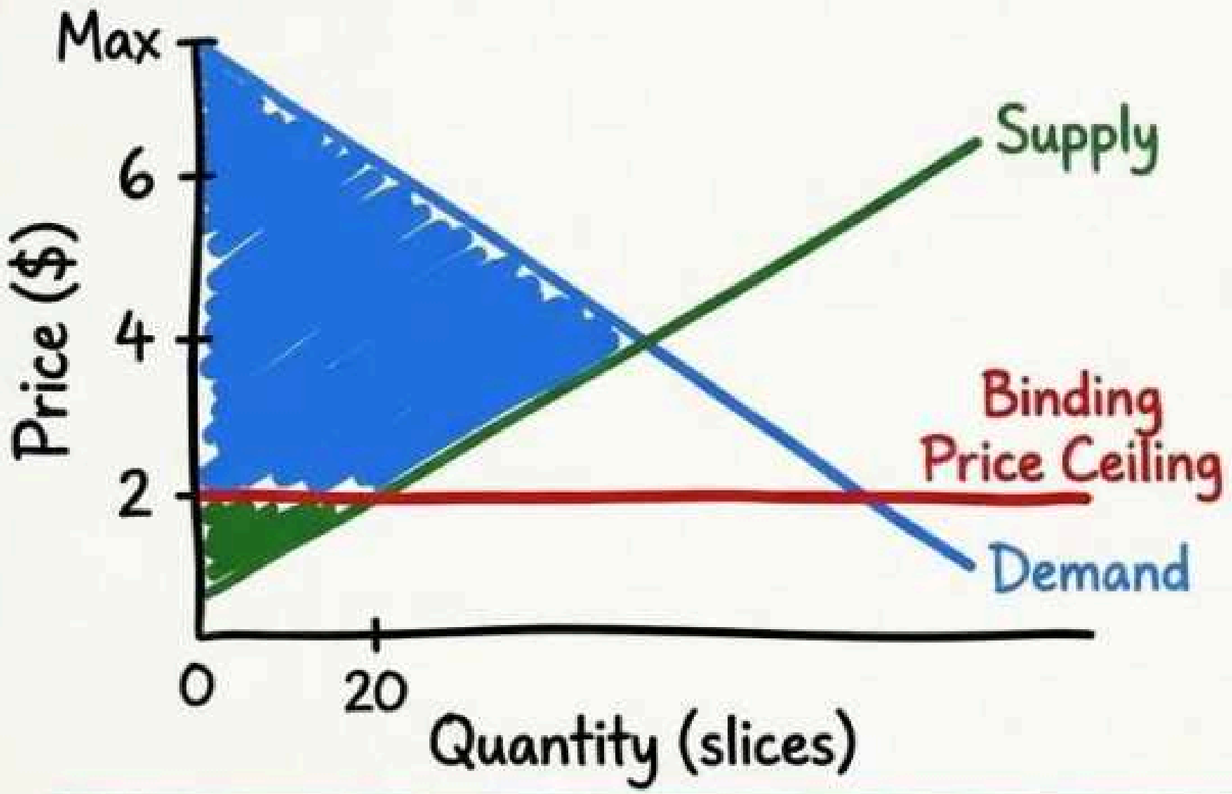
$$DWL = \frac{1}{2} \times \text{Lost Quantity} \times \text{Value Gap}$$

$$DWL = \frac{1}{2} \times 40 \text{ slices} \times \$6$$

$$DWL = \$120$$

Winners and Losers of the Ceiling

¶ 4.12



Takeaways:

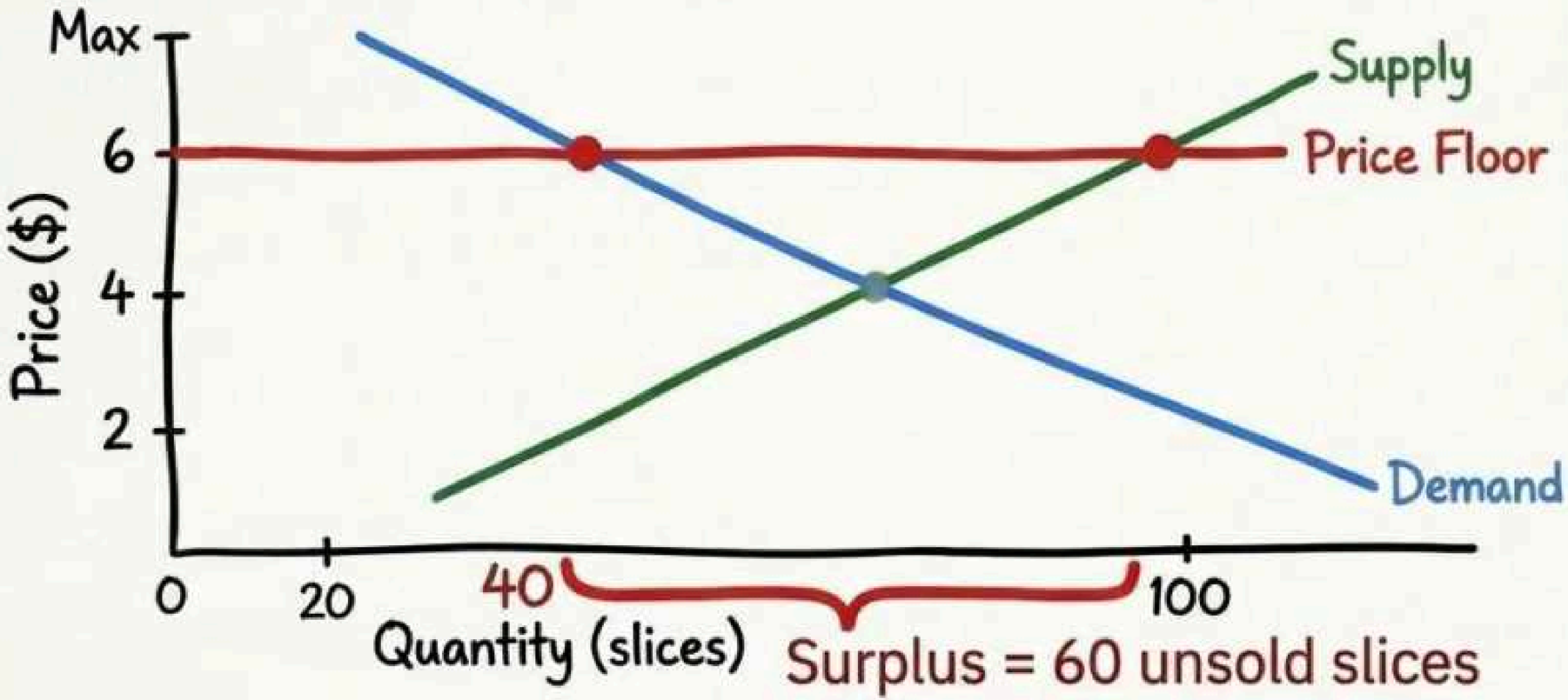
– Sellers lose the most.

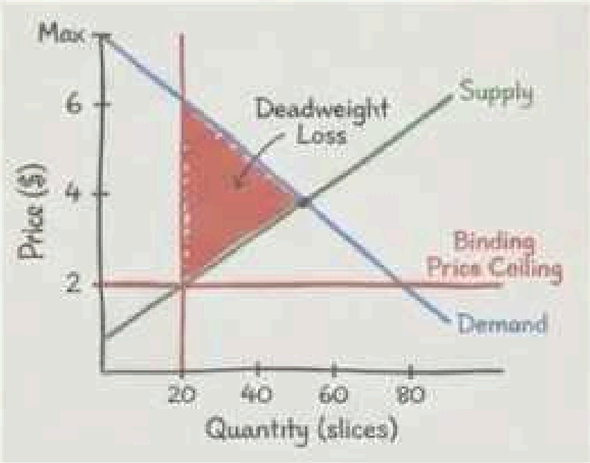
– 20 lucky buyers gain (paying $2 for high-value slices).

Crucial Caveat

This assumes perfect allocation. If allocation is by luck or queue, time wasted waiting makes the deadweight loss even larger.

Price Floors Create Surpluses



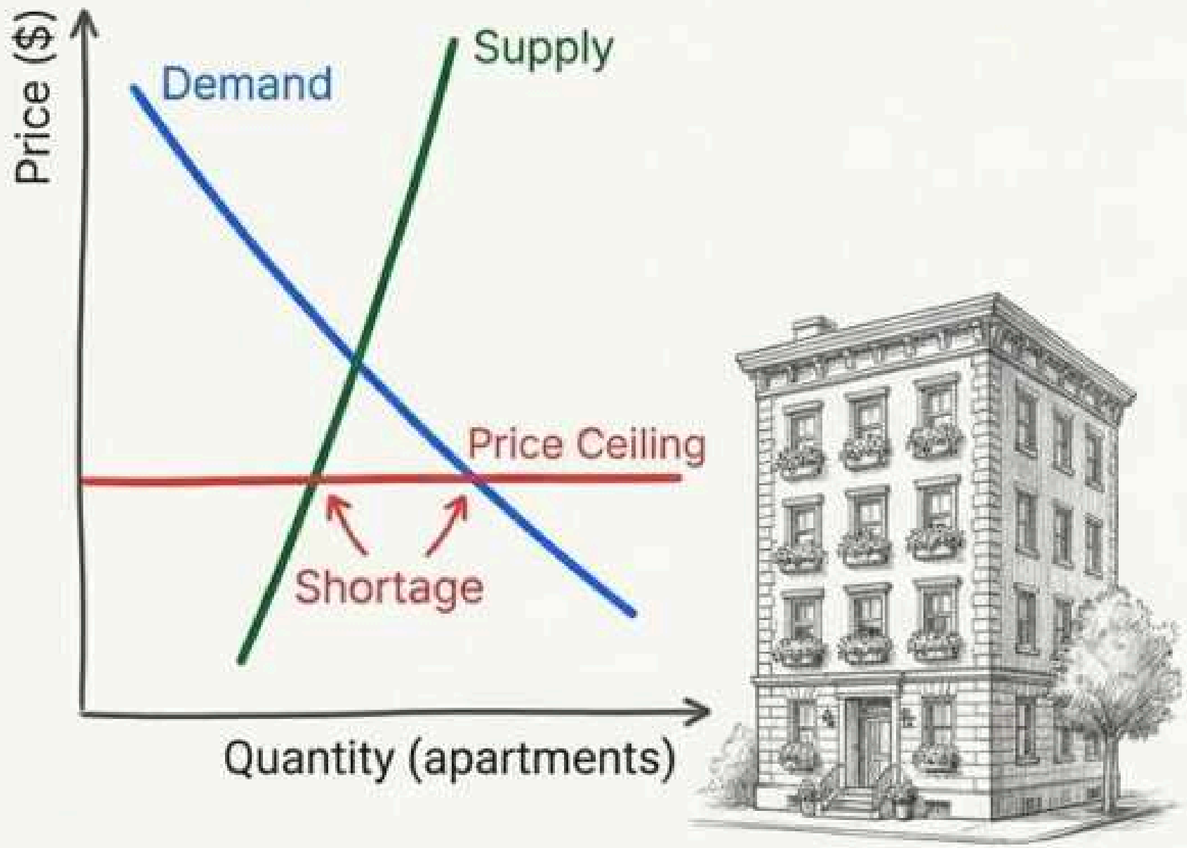


Example: Minimum wage in the labour market.

Contrast Callout: Ceilings (cap below equilibrium) cause Shortages. Floors (minimum above equilibrium) cause Surpluses.

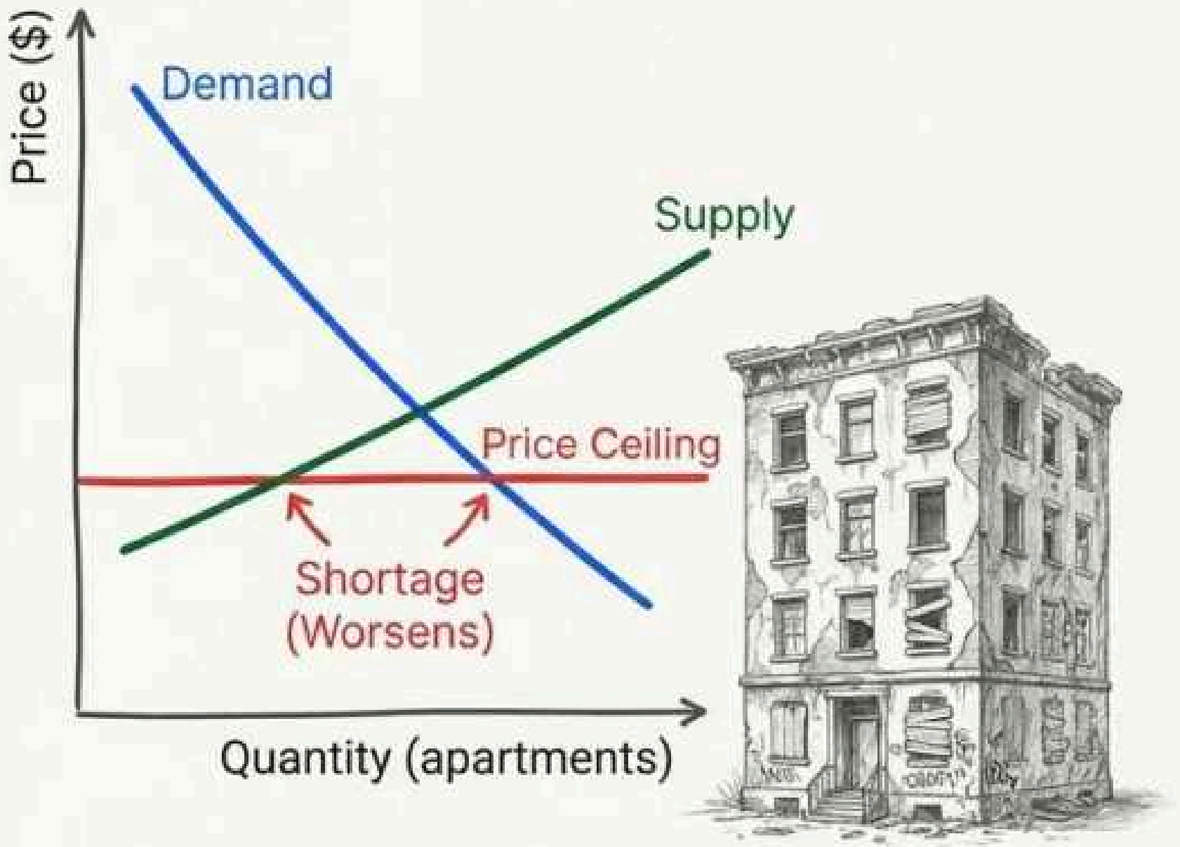
Rent Control Over Time

Short Run



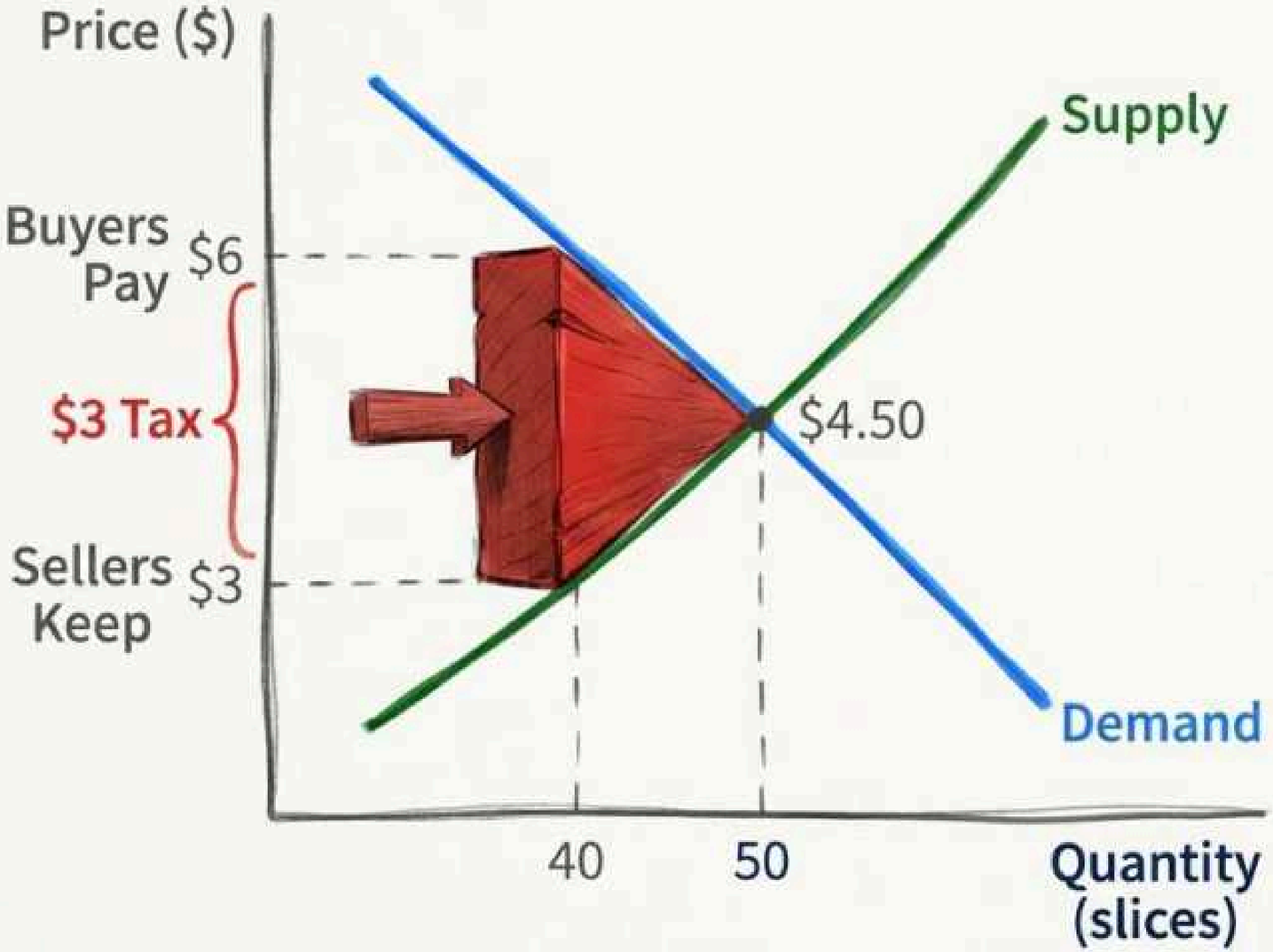
Tenants in controlled flats gain initially.

Long Run



Landlords build and maintain less.
Fewer flats offered. The shortage worsens.

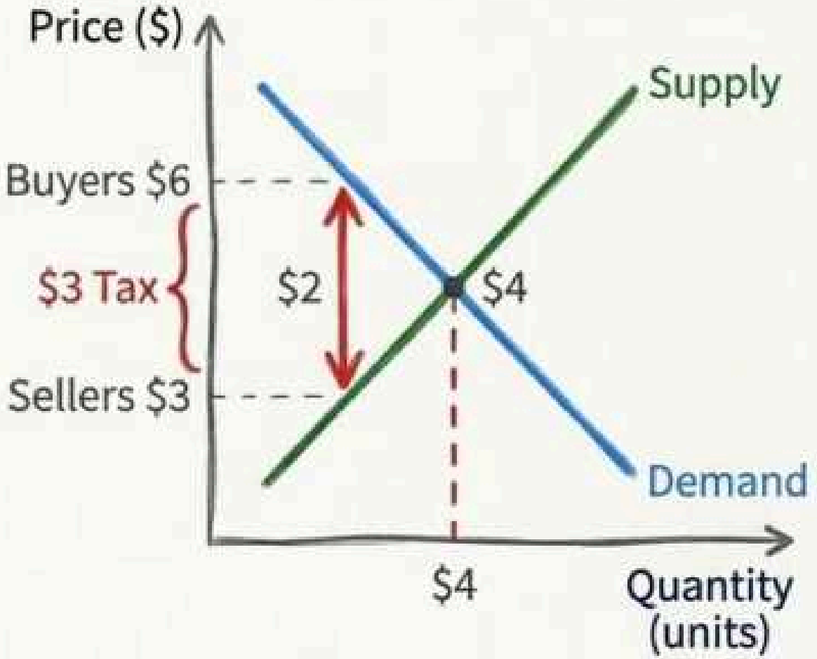
The Tax Wedge



A $3 tax collected from sellers forces a wedge between the price buyers pay and the price sellers keep, reducing the quantity to 40 slices.

Statutory vs. Economic Incidence

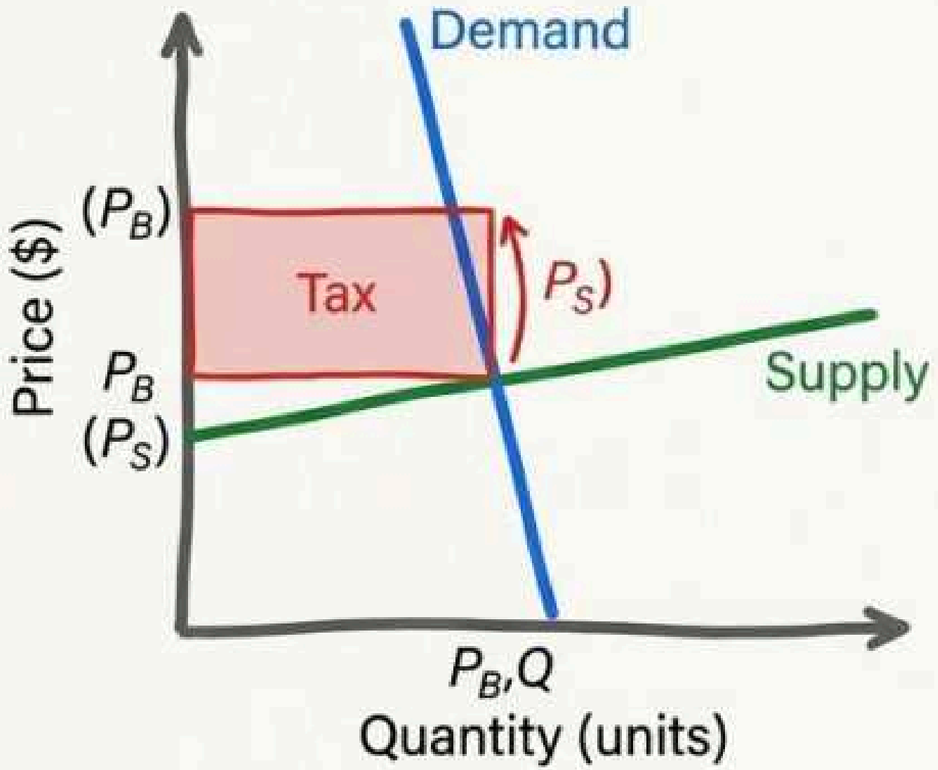




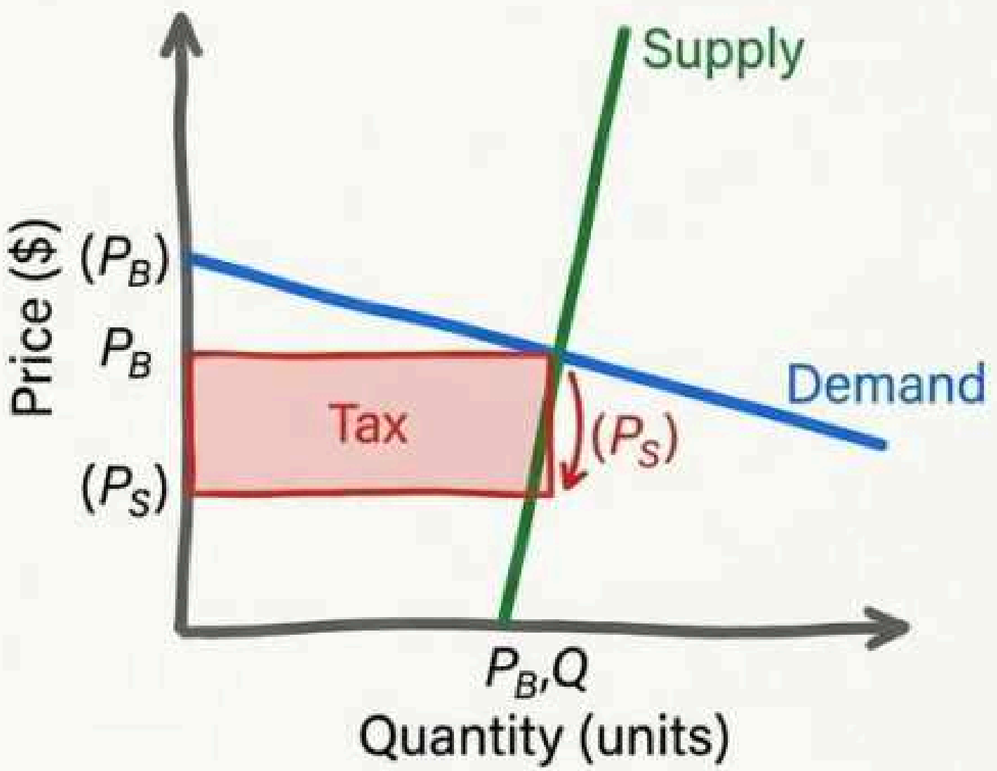
Key Principle: Tax incidence (who actually bears the burden) does not depend on who writes the cheque to the government.

Elasticity Determines the Burden

Inelastic Demand (Steep)

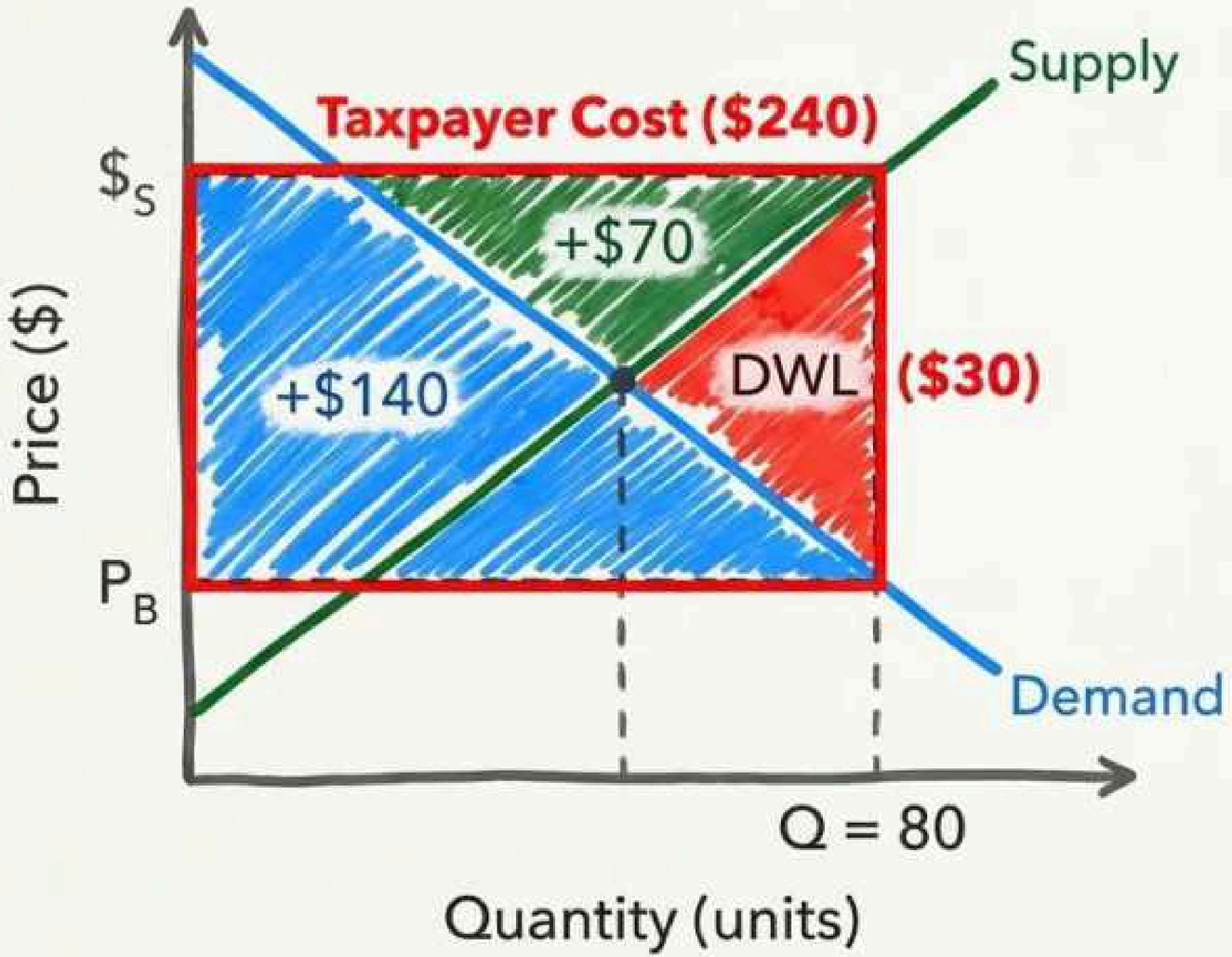


Inelastic Supply (Steep)



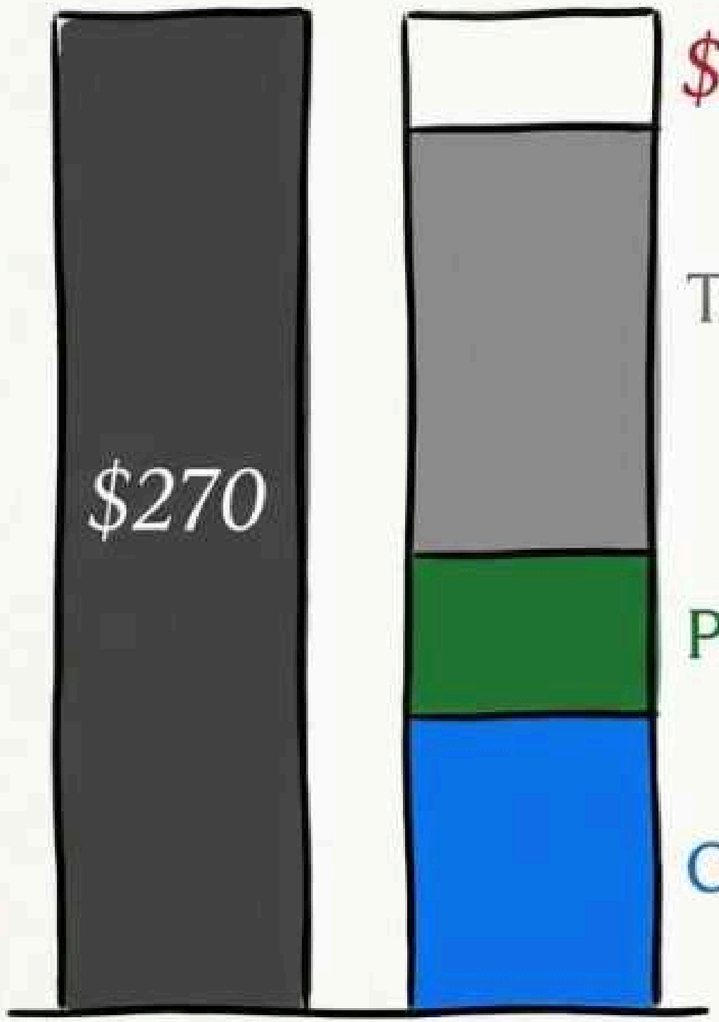
The side that is less elastic (steeper) bears more of the tax because it has fewer ways to escape. In our market, Demand is less elastic, so buyers bear most of the tax.

Subsidies: Taxes in Reverse



- Quantity rises to 80. Buyers pay $2, Sellers get $5.
- CS rises (+$140), PS rises (+$70).
- But Taxpayer Cost is $240.
- Net Result: Total surplus falls by $30 (Deadweight Loss) unless the subsidy corrects a missed market benefit.

Accounting for the Tax Effects

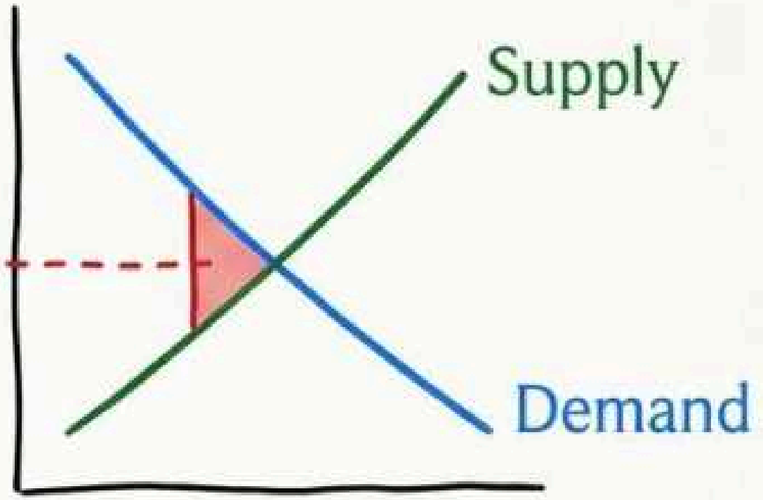


$30

Tax Revenue ($120)

PS ($40)

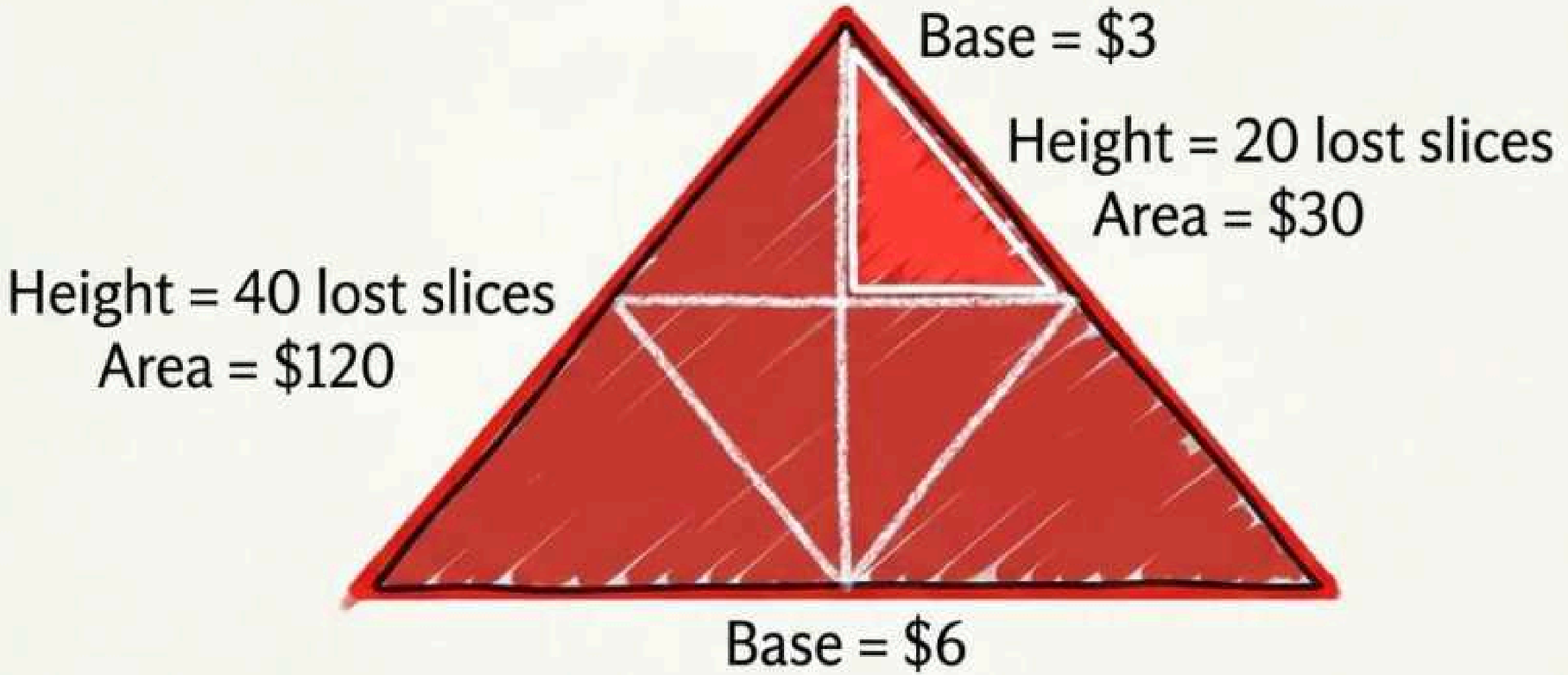
CS ($80)



- Govt collects $3 on 40 slices = $120 Revenue.
- CS ($80) + PS ($40) + Rev ($120) = $240.
- Original Surplus ($270) – New Total ($240) = $30 Deadweight Loss.

The Quadratic Growth of Deadweight Loss

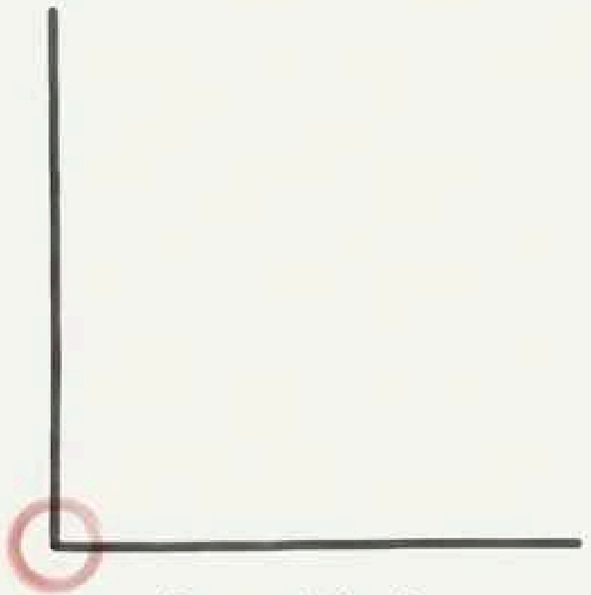
¶ 4.20



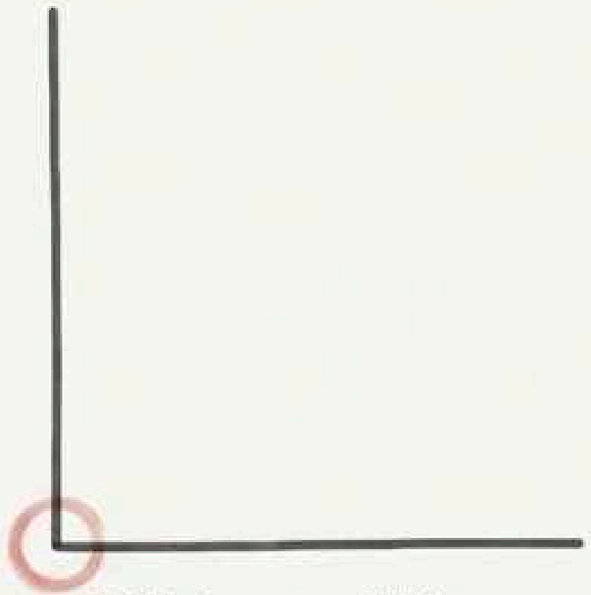
Core Insight: A tax raises money and distorts choices. The distortion (DWL) grows fast.

Proof: Doubling the tax to $6 cuts the quantity to 20. The DWL rises to $120. It is four times as large.

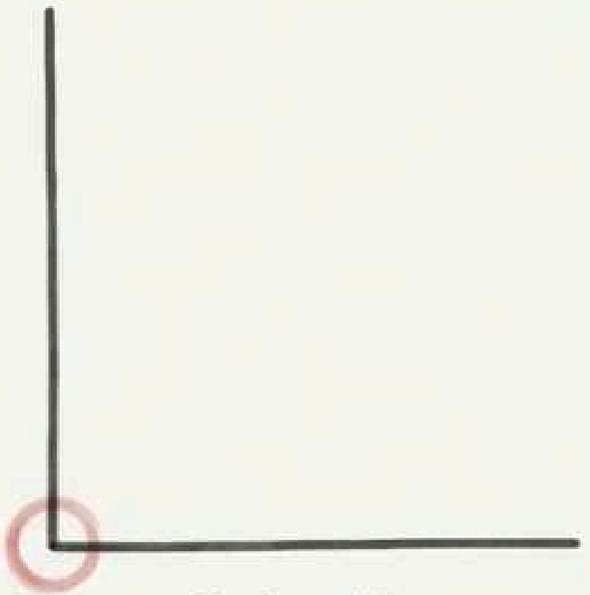
Application and Reflection



Rent Limits



Minimum Wage



Sales Tax

Think of a price control or tax you know about.
Before the next lecture, sketch the graph and answer:
- Who gains?
- Who loses?
- What trades no longer happen?