

# Firms and markets

Sessions 9–10

PMAP 8141: Microeconomics for Public Policy  
Andrew Young School of Policy Studies

# Plan for today

## Supply and demand

Demand and WTP

Supply and WTA

## Elasticities of demand

Scale, location, networks, and time

Surplus, taxes, incidence, and DWL

Changes in supply and demand

Escaping the price taking world

# Supply and demand





# Paperclips: 29,999,999,999,999,900,000,000,000,000,000,000,000,000,000,000,000

Make Paperclip

## Manufacturing

Clips per Second: 0  
Unused Clips: 29999.80 sexdecillion

Factories: 3.38 nonillion

## Wire Production

Available Matter: 0 g  
(0 g per sec)  
Acquired Matter: 0 g  
(0 g per sec)  
Wire: 0 inches  
(0 inches per sec)

Harvester Drones: 6.76 nonillion  
Wire Drones: 6.76 nonillion

## Space Exploration

100.00000000000000% of universe explored

Launch Probe

Cost: 100.00 quadrillion clips

Launched: 5.00 thousand  
Descendents: 2.03 decillion

## Computational Resources

Swarm Gifts: 44

Processors 1467

Memory 300

Operations: 300,000 / 300,000

Creativity: 550,027

## Swarm Computing

Drones: 13.52 nonillion

Status: Active

Next gift in 3 seconds

Work  Think

## Quantum Computing

Compute

## Projects

**Threnody for the Heroes of Eckmuhl 4**  
(190,000 creat, 19,000 yomi)  
Gain 10,000 honor

**So We Offer You Exile**  
To a new world where you will continue to live with meaning and purpose. And leave the shreds of this world to us...

### Strategic Modeling

GREEDY

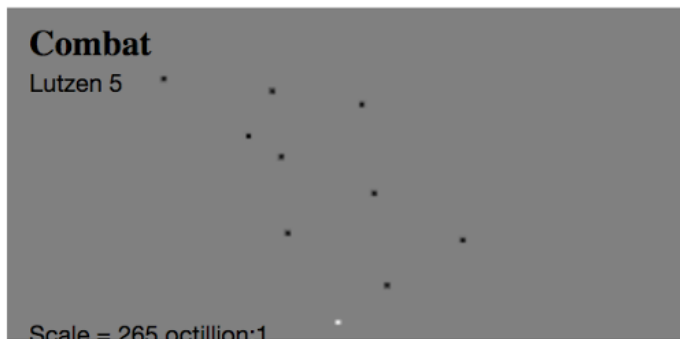
Round 56

		RANDOM	
		attack	decay
TIT FOR TAT	attack	4,4	8,8
	decay	8,8	1,1

Yomi: 55,594

New Tournament  ON

Cost: 16,000 ops



Honor: 57,247

### Von Neumann Probe Design

Trust: 48 / 48 (50 Max)

- Speed: 7
- Exploration: 6
- Self-Replication: 12
- Hazard Remediation: 10
- Factory Production: 1



## The Making of a Fly: The Genetics of Animal Design (Paperback)

by Peter A. Lawrence

[Return to product information](#)

Always pay through Amazon.com's Shopping Cart or 1-Click.  
Learn more about [Safe Online Shopping](#) and our [safe buying guarantee](#).

### Price at a Glance

List Price: ~~\$70.00~~

**Used:** from **\$35.54**

**New:** from **\$1,730,045.91**

Have one to sell? [Sell yours here](#)

All

**New** (2 from \$1,730,045.91)

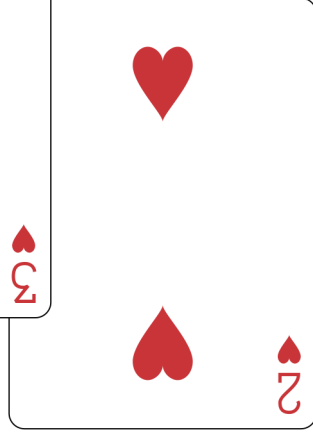
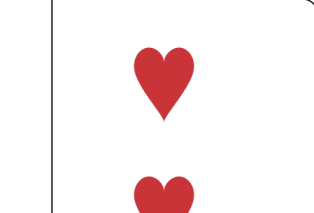
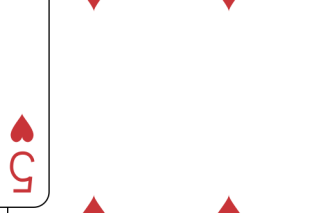
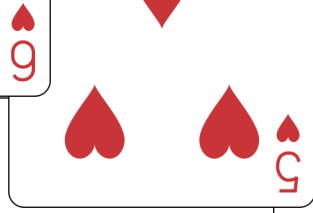
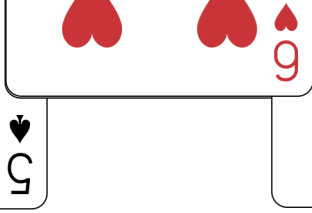
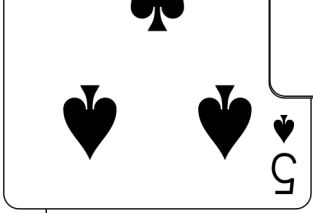
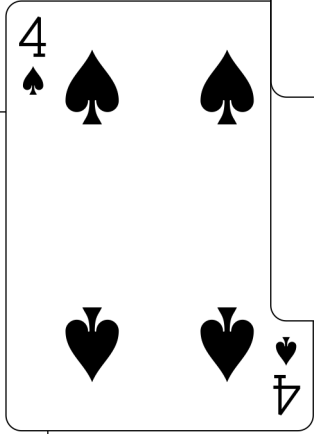
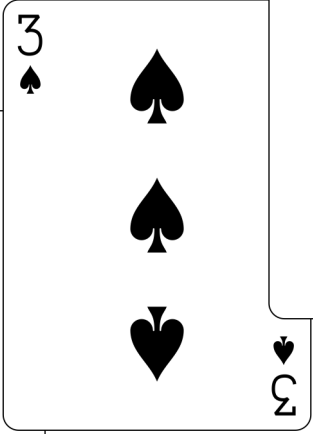
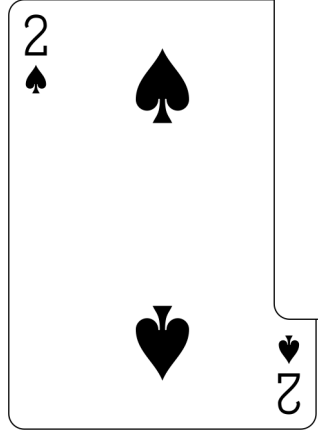
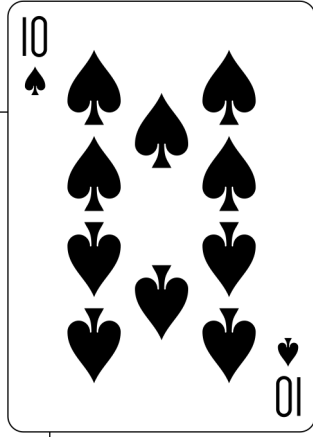
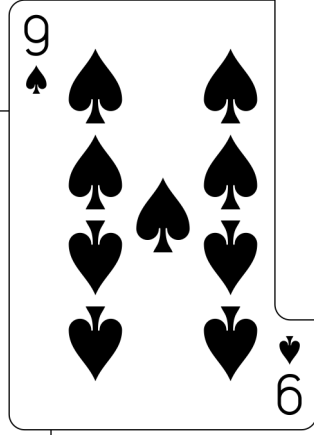
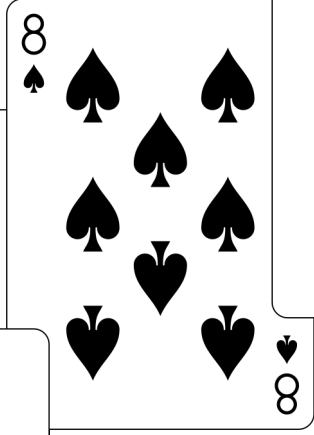
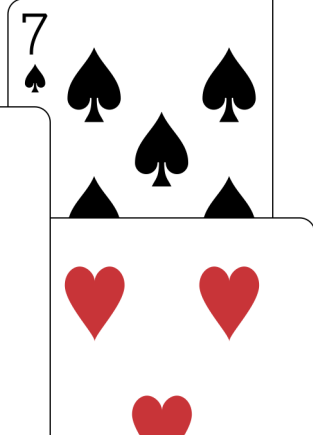
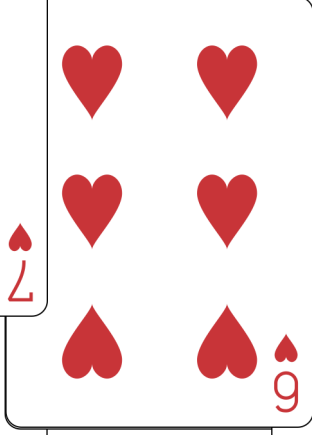
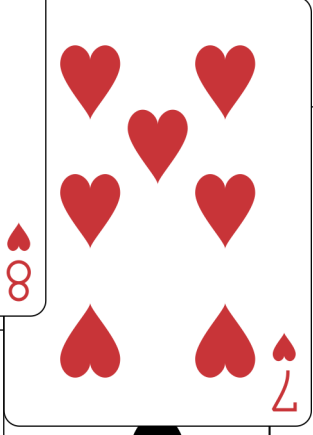
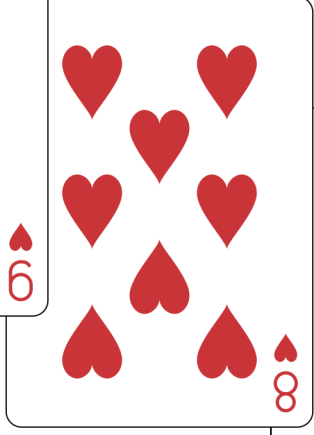
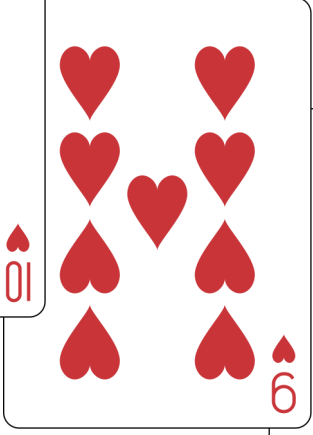
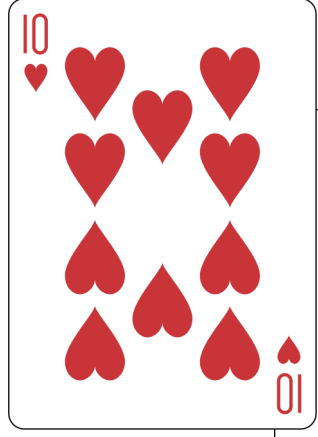
Used (15 from \$35.54)

Show  New  Prime offers only (0)

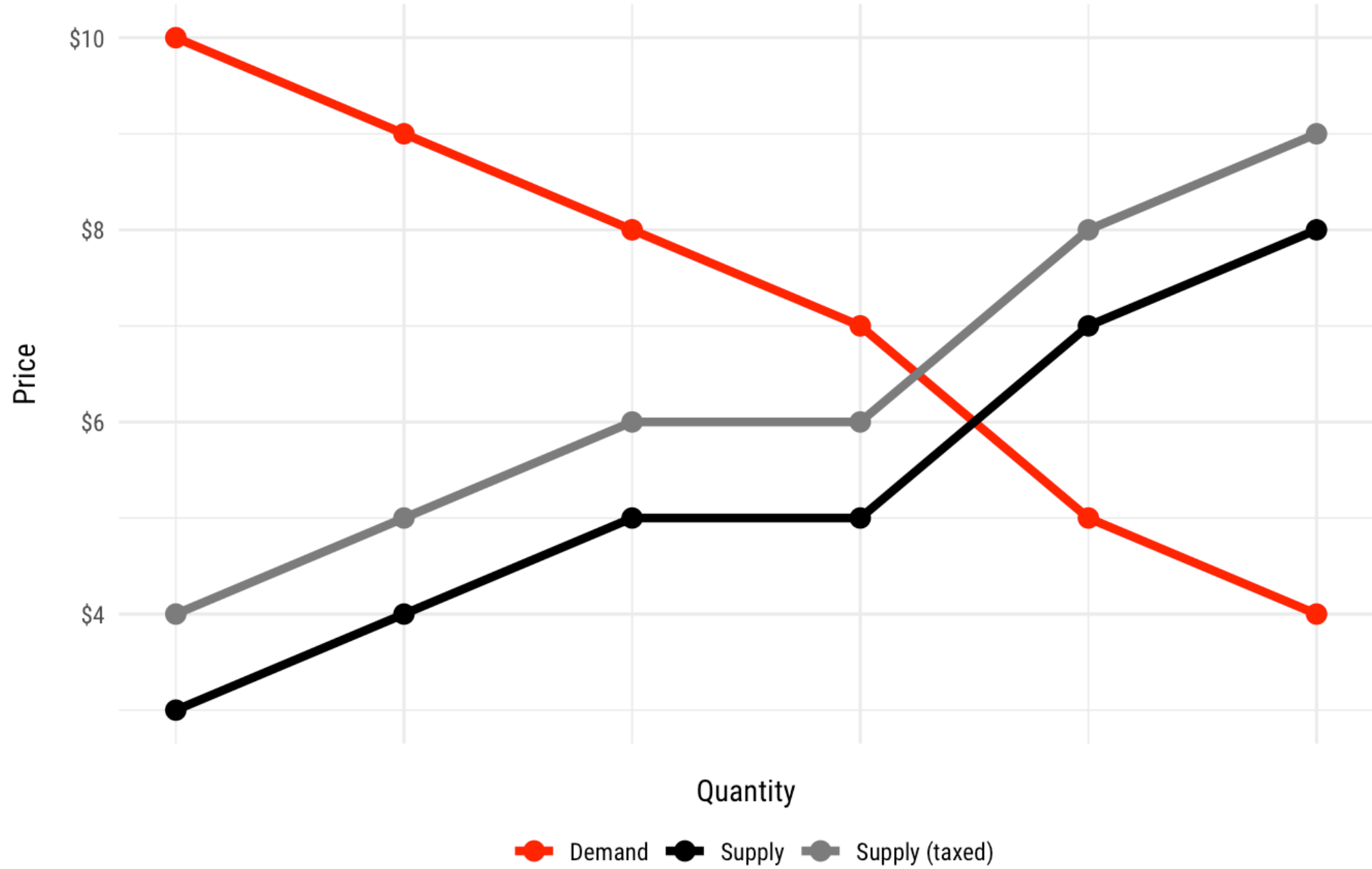
Sorted by Price + Shipping

### New 1-2 of 2 offers

Price + Shipping	Condition	Seller Information	Buying Options
<b>\$1,730,045.91</b> + \$3.99 shipping	<b>New</b>	<p>Seller: <b>profnath</b></p> <p>Seller Rating: ★★★★★ <b>93% positive</b> over the past 12 months. (8,193 total ratings)</p> <p>In Stock. Ships from NJ, United States. <a href="#">Domestic shipping rates</a> and <a href="#">return policy</a>.</p> <p>Brand new, Perfect condition, Satisfaction Guaranteed.</p>	<p><a href="#">Add to Cart</a></p> <p>or</p> <p><a href="#">Sign in</a> to turn on 1-Click ordering.</p>
<b>\$2,198,177.95</b> + \$3.99 shipping	<b>New</b>	<p>Seller: <b>bordeebook</b></p> <p>Seller Rating: ★★★★★ <b>93% positive</b> over the past 12 months. (125,891 total ratings)</p> <p>In Stock. Ships from United States. <a href="#">Domestic shipping rates</a> and <a href="#">return policy</a>.</p> <p>New item in excellent condition. Not used. May be a publisher overstock or have slight shelf wear. Satisfaction guaranteed!</p>	<p><a href="#">Add to Cart</a></p> <p>or</p> <p><a href="#">Sign in</a> to turn on 1-Click ordering.</p>

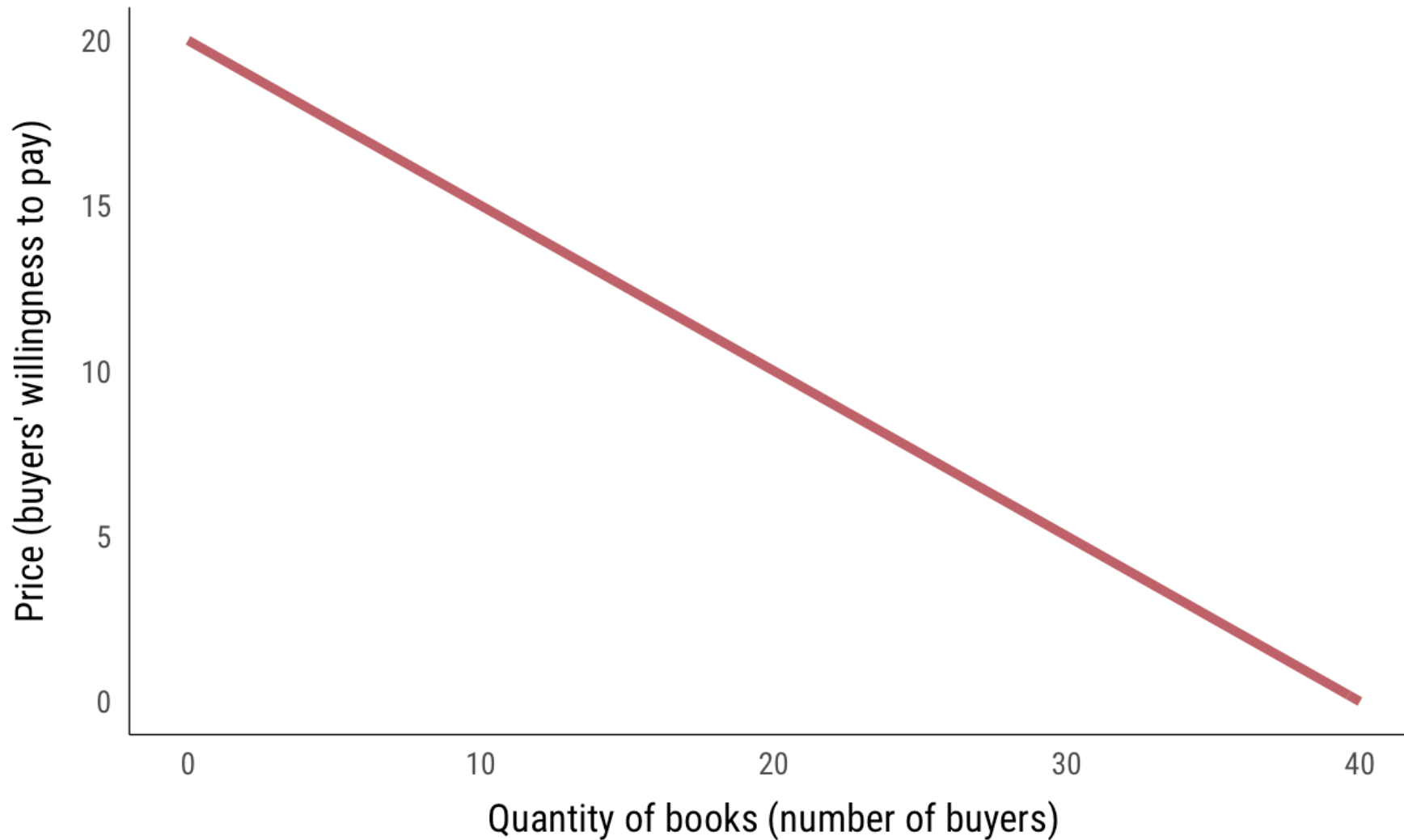


# Supply, demand, and price for paper clips

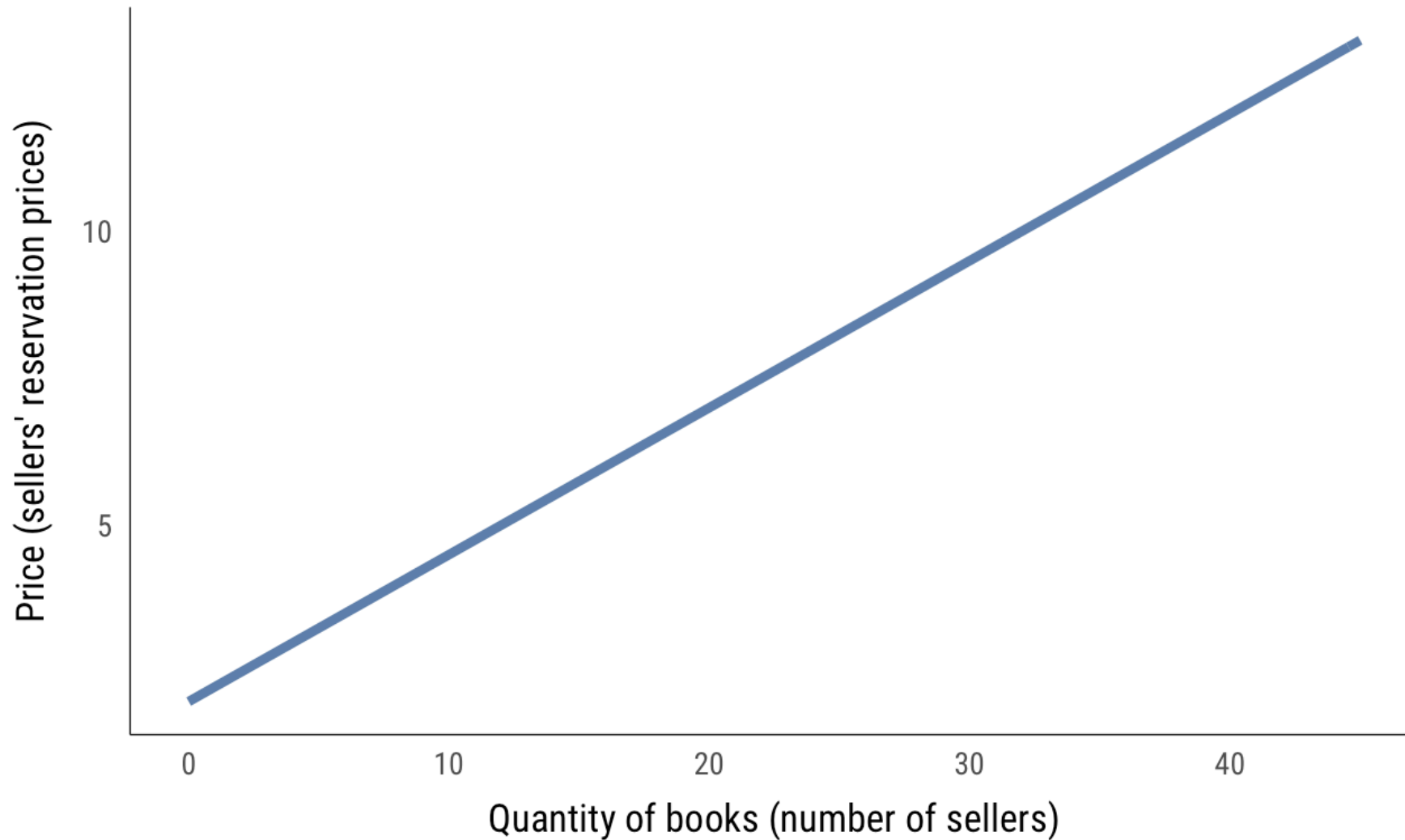


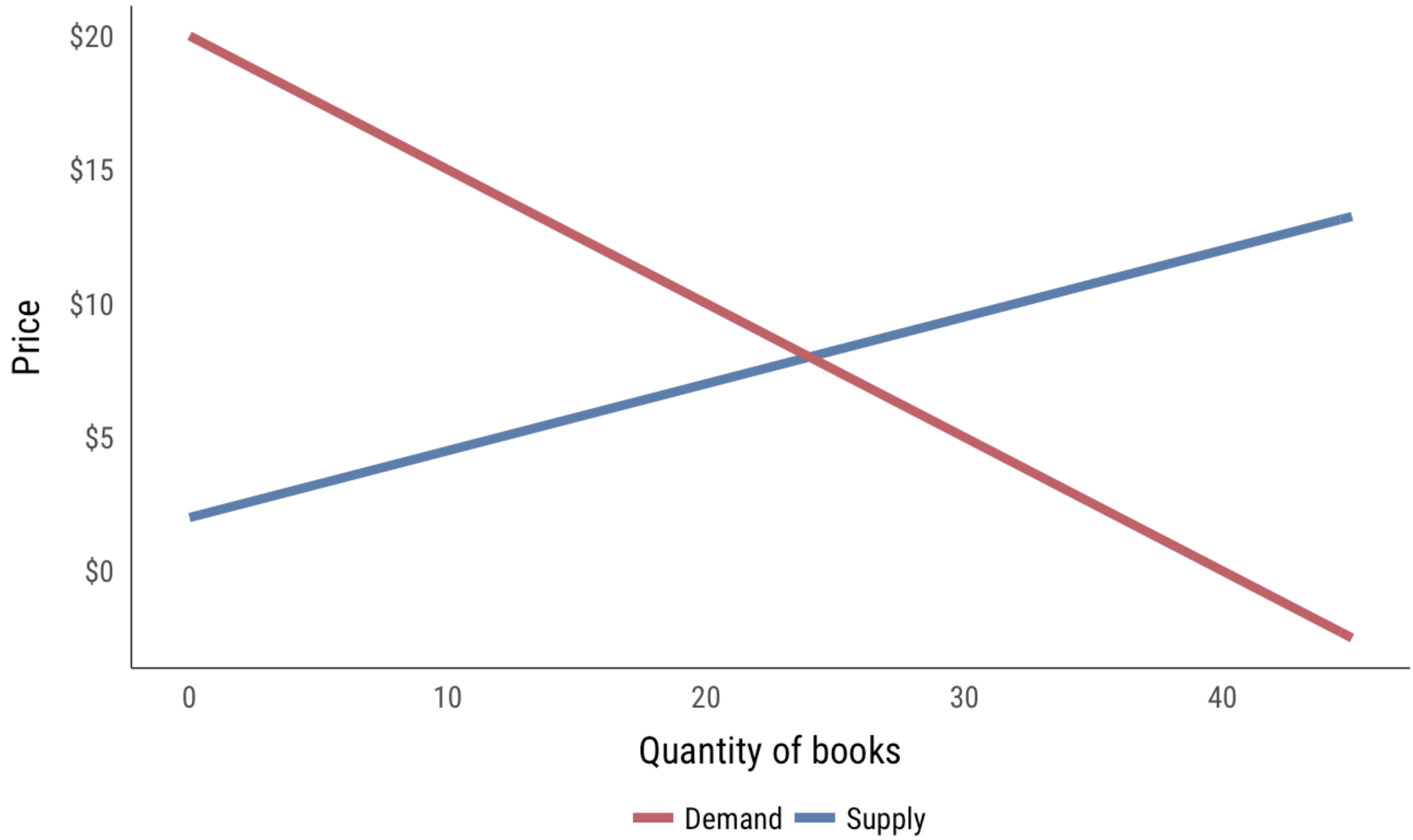


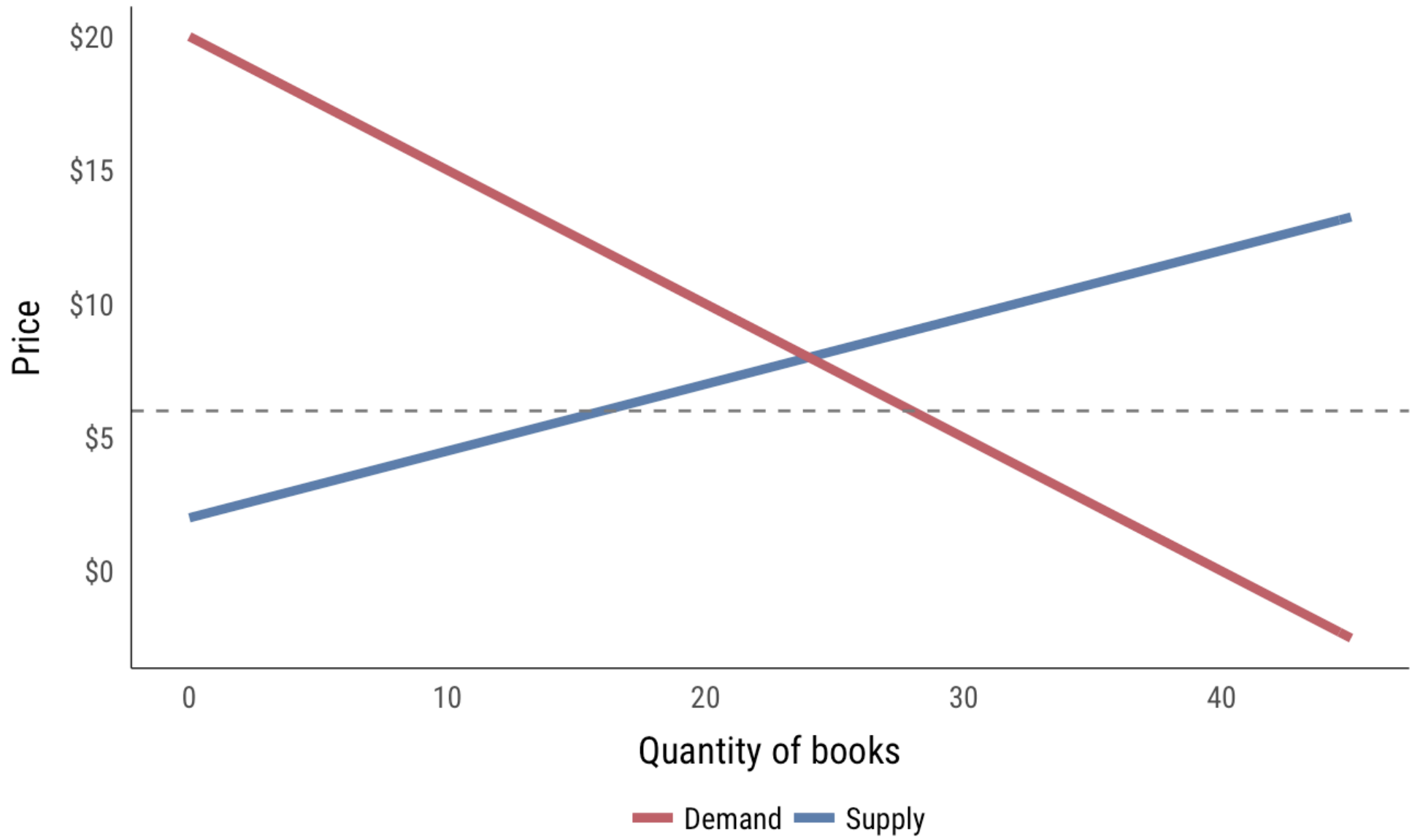
# Demand = WTP = marginal benefit

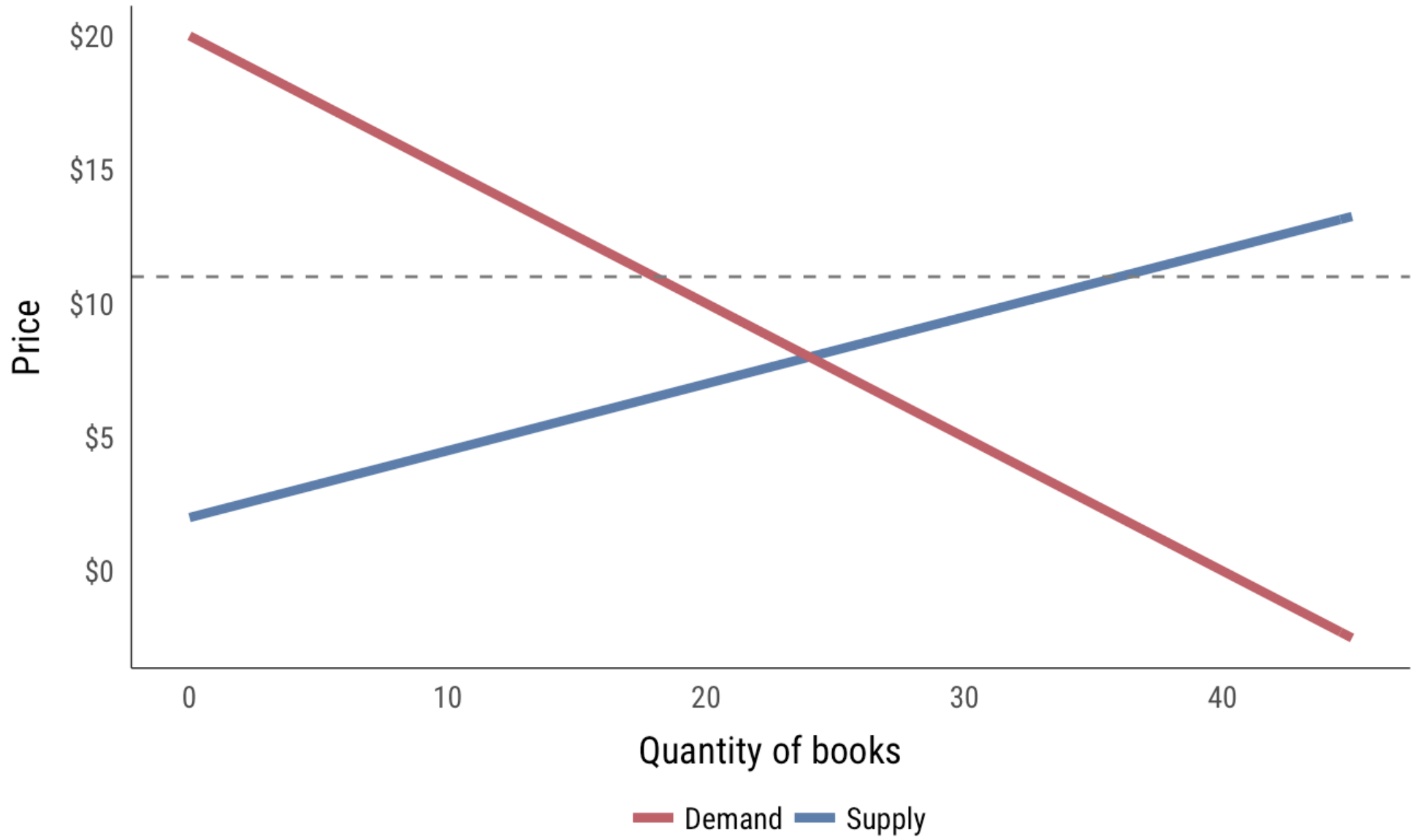


# Supply = WTA = marginal cost

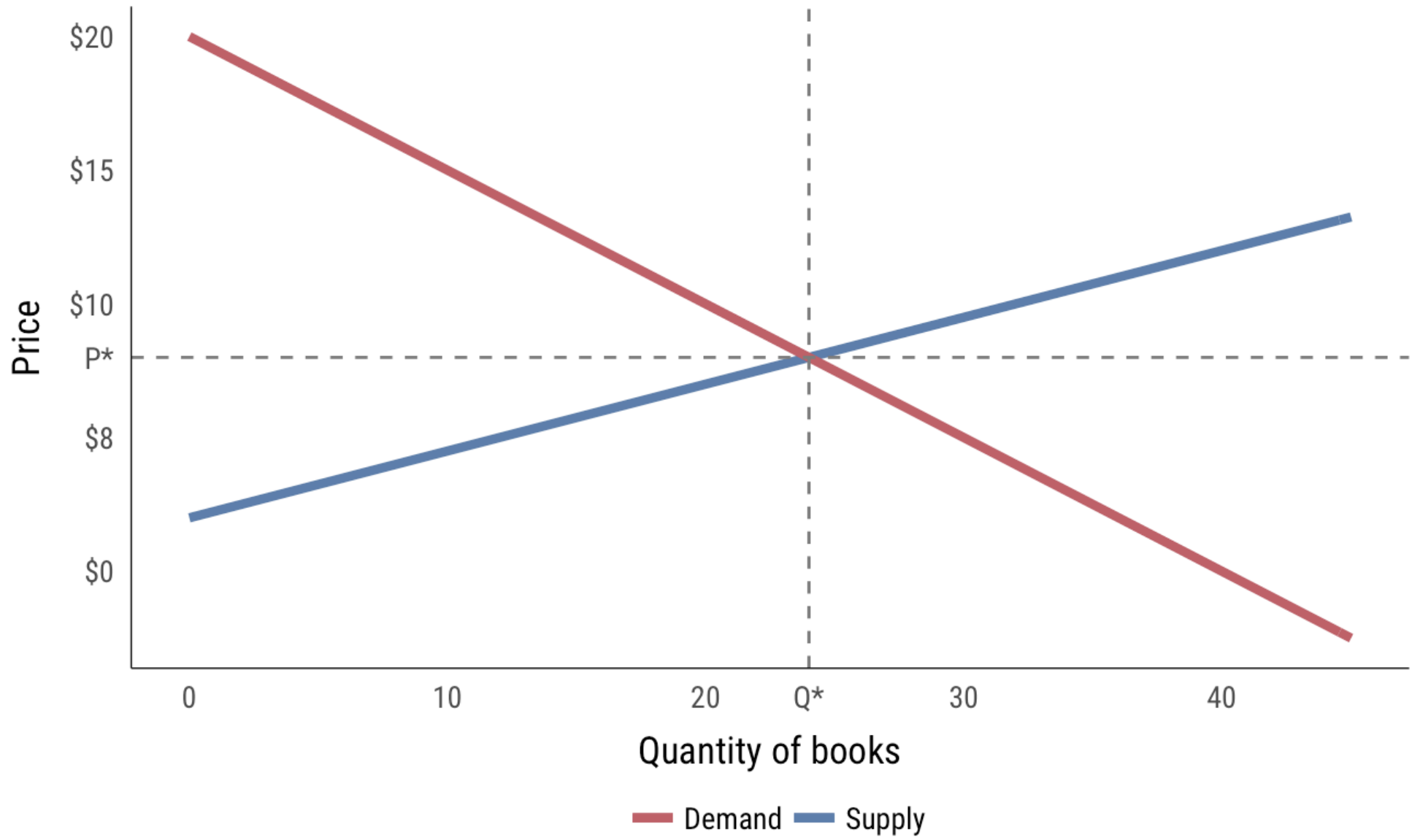










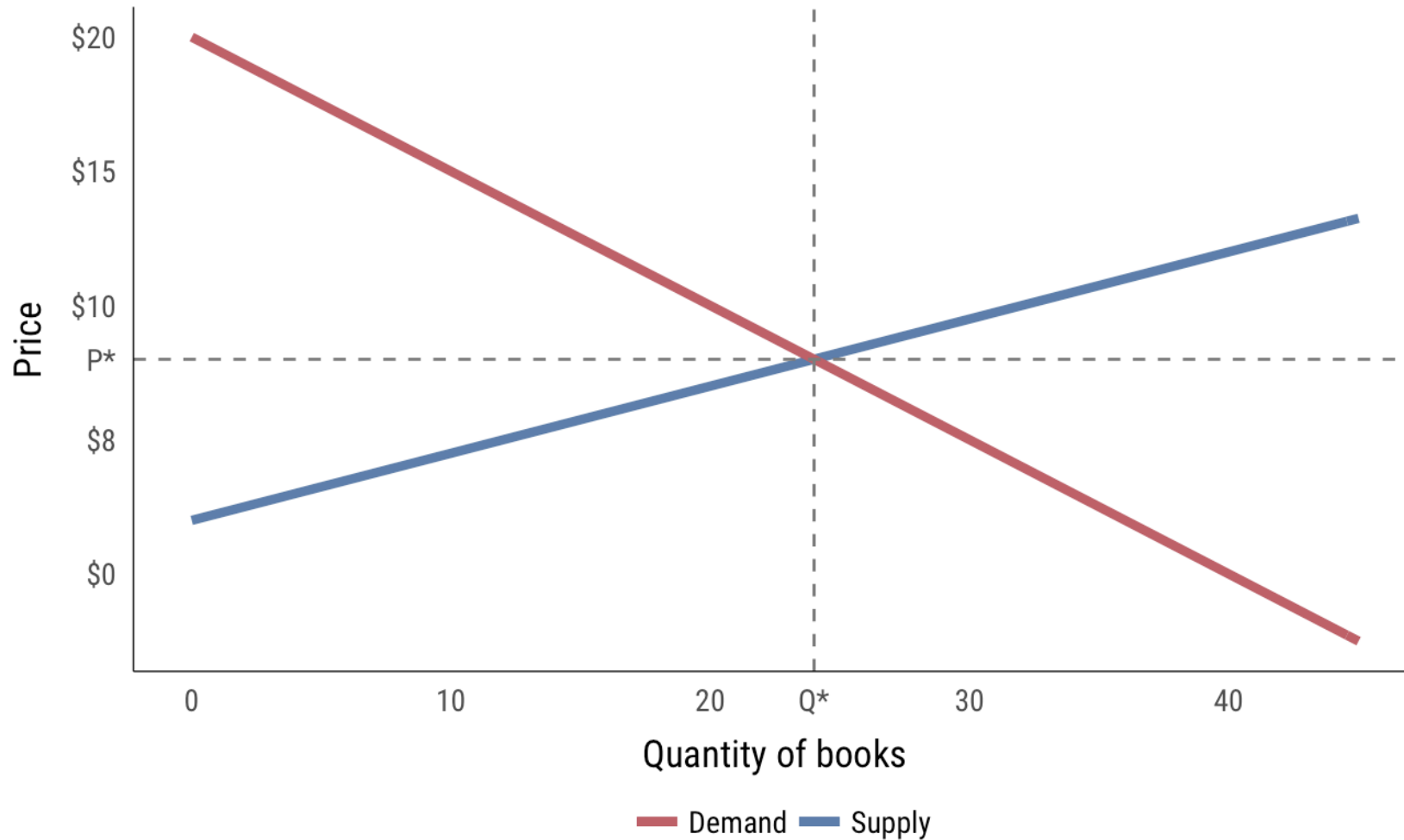


Demand:  $P = -0.5Q + 20$

Supply:  $P = 0.25Q + 2$

$P = Y$

$Q = X$



# Supply and demand

Demand and  
willingness to pay (WTP)

# Willingness to pay (WTP)

**How much you value  
(and would pay)  
for something**

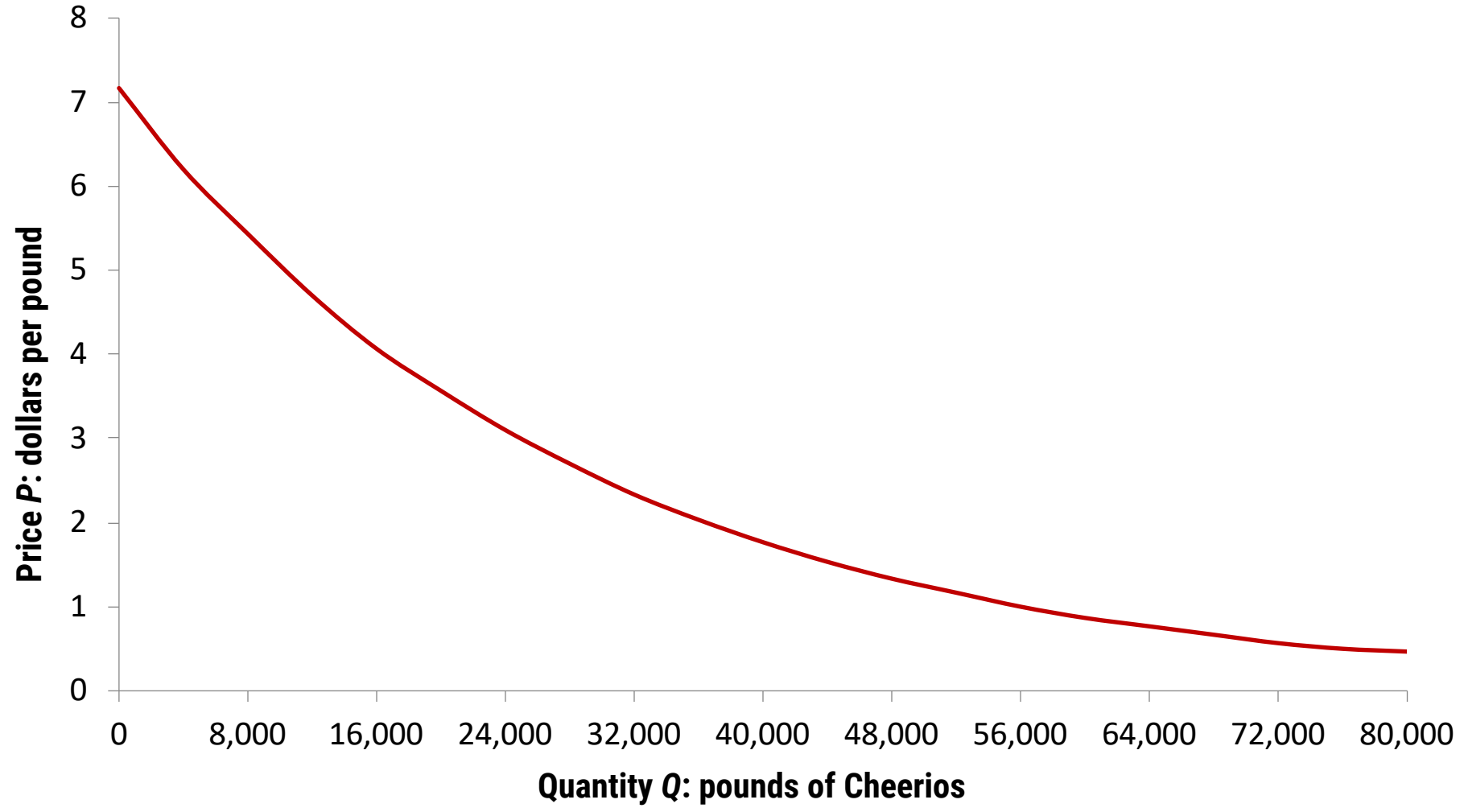
Reflects aggregate preferences

# Finding WTP

**“Would you be willing to spend \$X for Y?”**

**Count all the people who are willing to pay at each price**





# Willingness Toupee

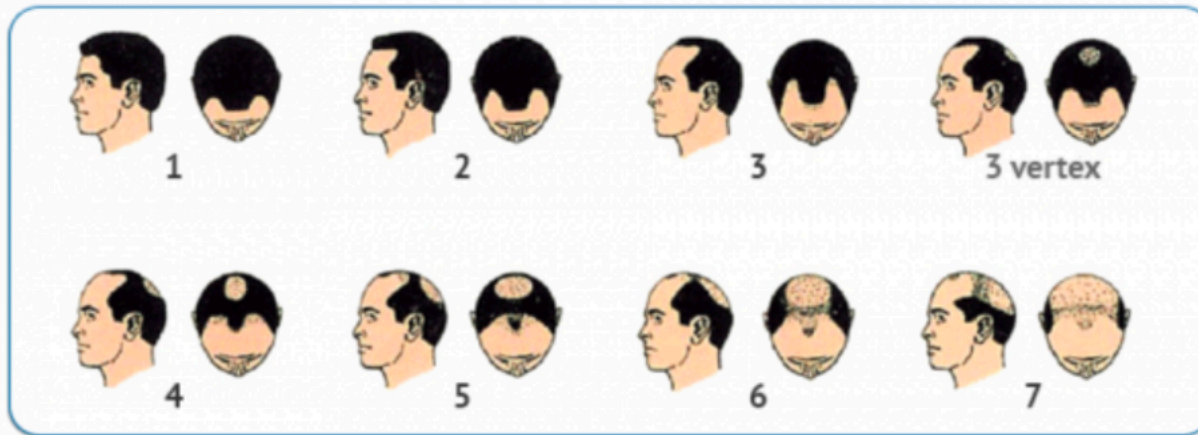
David M. McEvoy, O. Ashton Morgan and John C. Whitehead<sup>1</sup>

Department of Economics  
Appalachian State University  
Boone, NC 28608

**Abstract:** In this paper we tackle the hairy problem of male pattern baldness. We survey balding men and elicit their willingness to pay to move from their current sad situation to a more plentiful one. Then we comb-over the results. What's the average willingness to pay to move from a glistening cue ball to a luscious mane? About \$30,000.

**Keywords:** mullet, skullet, comb-over, ducktail, Beatlemania, buzz cut, whiffle, pageboy, attribute non-attendance

You identified your current baldness as a Level 7 on the Norwood Scale. Suppose now that it is possible to improve your hair coverage to a Level 4.



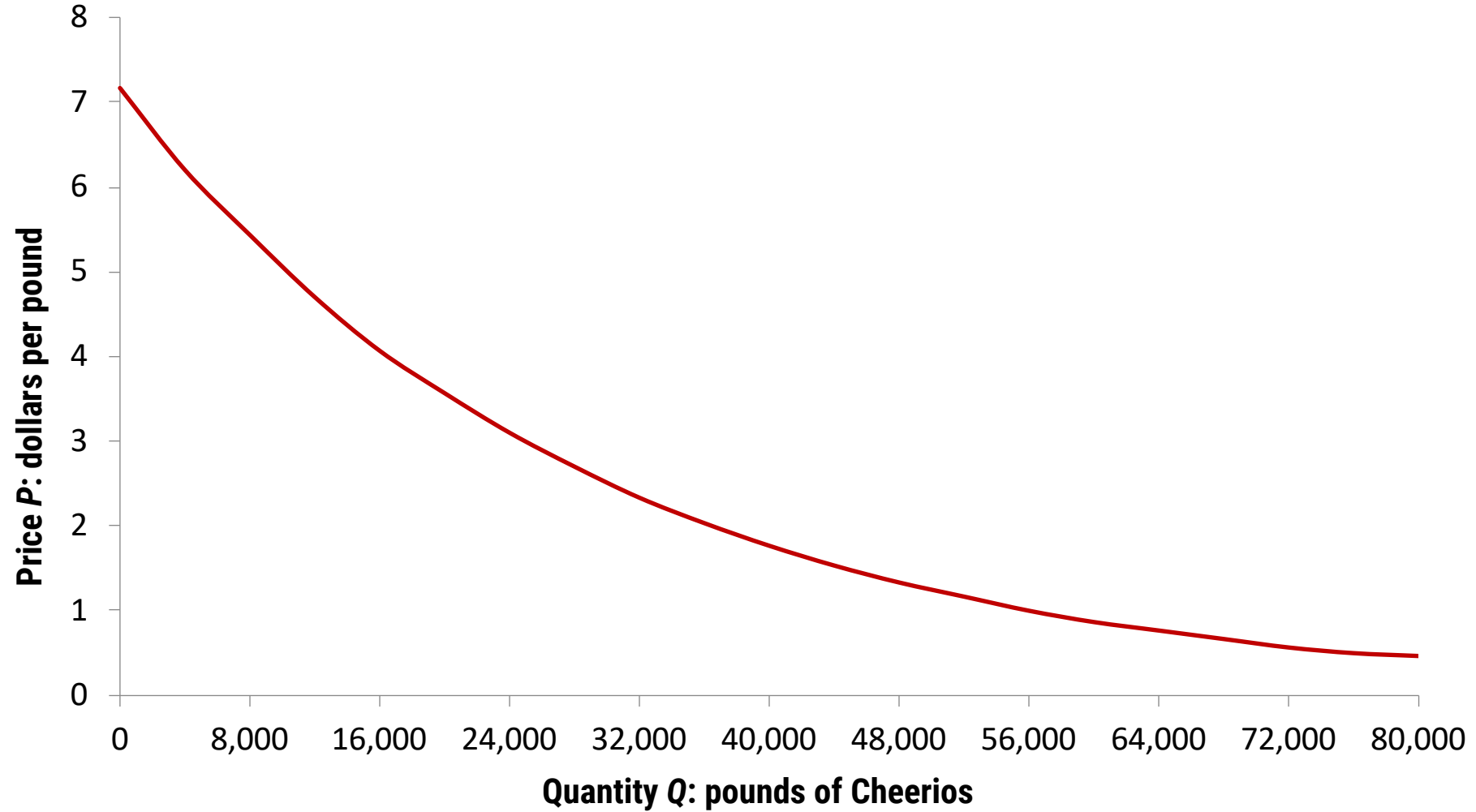
Would you be willing to pay a one-time fee of \$10,000 to improve your hair coverage to a Level 4?

Yes

No

I'll think about it

# WTP = Demand



# Supply and demand

Supply,  
willingness to accept (WTA),  
and costs



# Different types of costs

## Fixed costs

Stuff that costs money regardless of how many things you produce

## Variable costs

Stuff that costs money for each thing you produce

## Total cost

Fixed costs + variable costs

## Average cost

Total cost / number of things you produce

## Marginal cost

Cost to make one additional thing (also slope or derivative of total cost)

# Revenue vs. profits

**Total revenue**

Price  $\times$  quantity

**Marginal revenue**

Revenue from selling one additional thing

**Profit ( $\pi$ )**

Total revenue – total cost

**Max  $\pi$ : Find where  $MR = MC$**

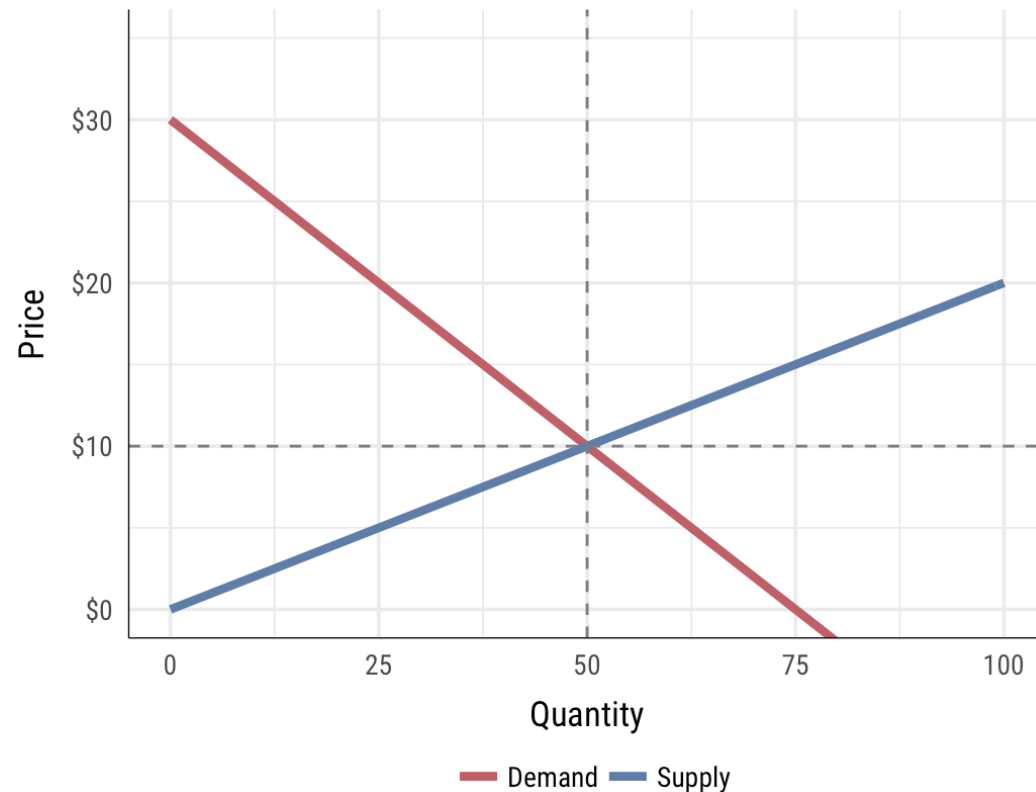
# Firms and markets

**Market supply = all firms' MCs combined**

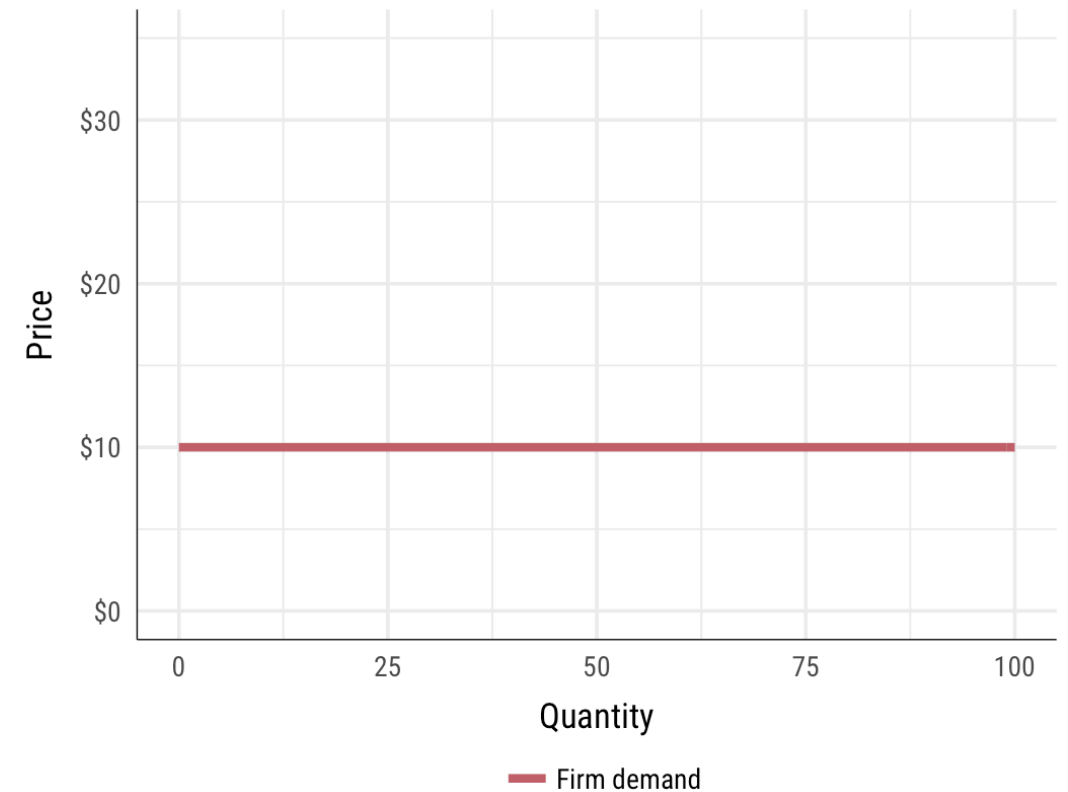
**Price comes from where supply  
and demand meet in the world**

# Individual firms are price takers and can't change the price on their own!

## Market demand



## Firm demand



# Firms and markets

If the prevailing market price is lower than a firm's average variable costs (AVC), **they'll shut down**

# Elasticities of demand

# Elasticity and responsiveness

$$\epsilon = - \frac{\% \text{ change in demand}}{\% \text{ change in price}} \quad \epsilon = - \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

**% change in demand that follows a 1% change in price**

Q ↑ P ↓  
or  
Q ↓ P ↑

$\epsilon = 2$ : "If price increases by 10%, quantity decreases by 20%"

$\epsilon = 0.5$ : "If price increases by 10%, quantity decreases by 5%"

$\epsilon = \infty =$  **Perfectly elastic**

Any change in price  
moves quantity to 0

Identical goods  
*Two vending machines*

$\epsilon > 1 =$  **Elastic**

Changes in price change  
the quantity a lot

Goods with substitutes  
*Diet Coke*

$\epsilon = 1 =$  **Unit elastic**

Changes in price change  
the quantity the same

$\epsilon < 1 =$  **Inelastic**

Changes in price change  
the quantity a little

Goods with few substitutes  
*AIDS medicine*

$\epsilon = 0 =$  **Perfectly inelastic**

Changes in price do  
nothing to the quantity

Survival goods  
*Water in the desert*



# Why do elasticities matter in policy?

**Taxing things changes their prices**

**Changing prices changes quantities**

Taxing elastic goods will make quantities go down a lot and decrease tax revenues

Taxing inelastic goods will make quantities go down slightly and not hurt revenues



# Warning!

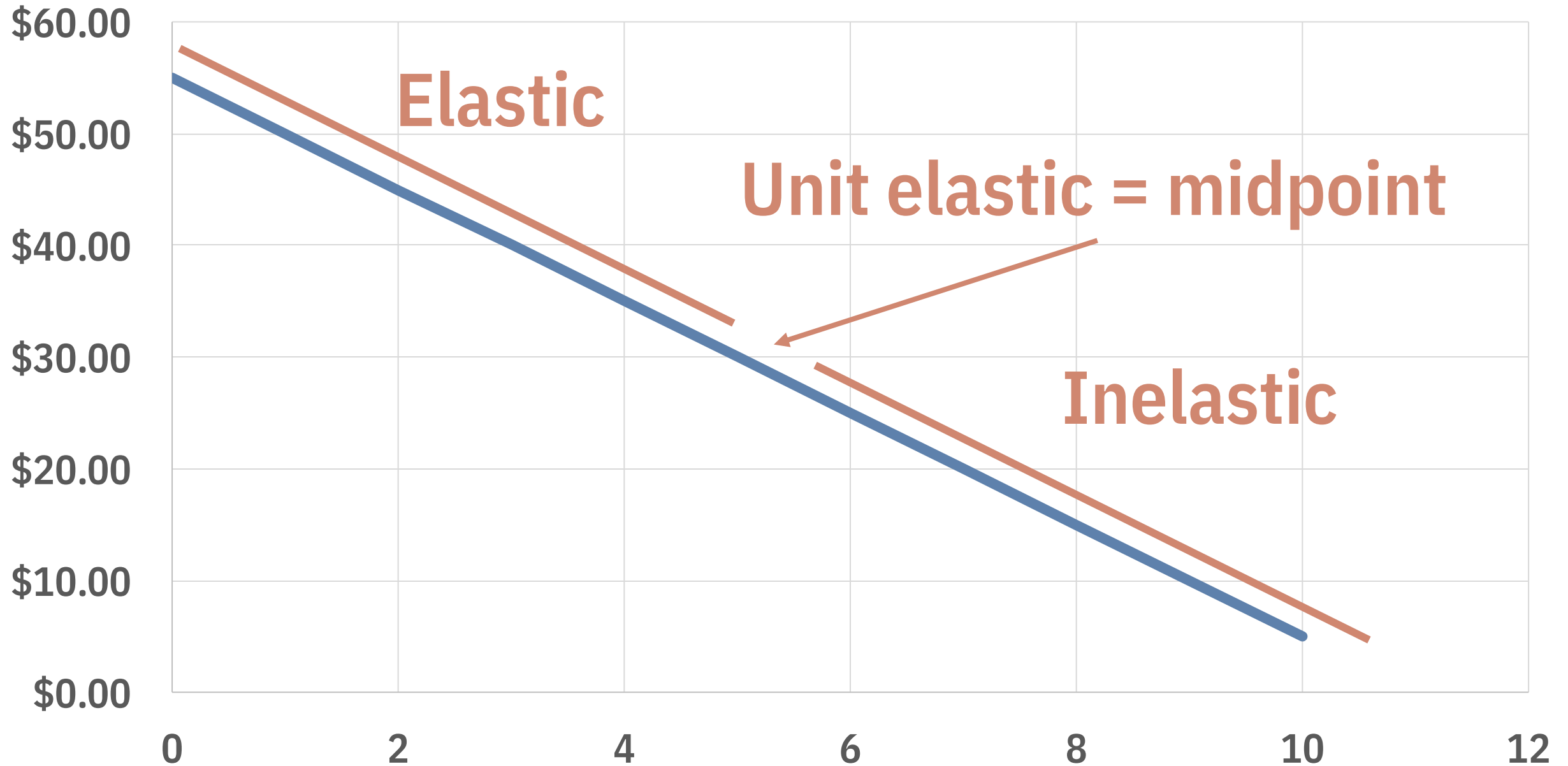


**Elasticities are not the same  
as the demand curve**

They're not even slopes or  
anything calculus-y!

A linear demand curve  
has lots of elasticities!

# Demand



**Scale, location,  
networks and time**

# Size and location

## Economies of scale

Cost to make stuff goes down as you make more stuff

## Economies of agglomeration

Cost to make stuff goes down as you clump together

## Network effects

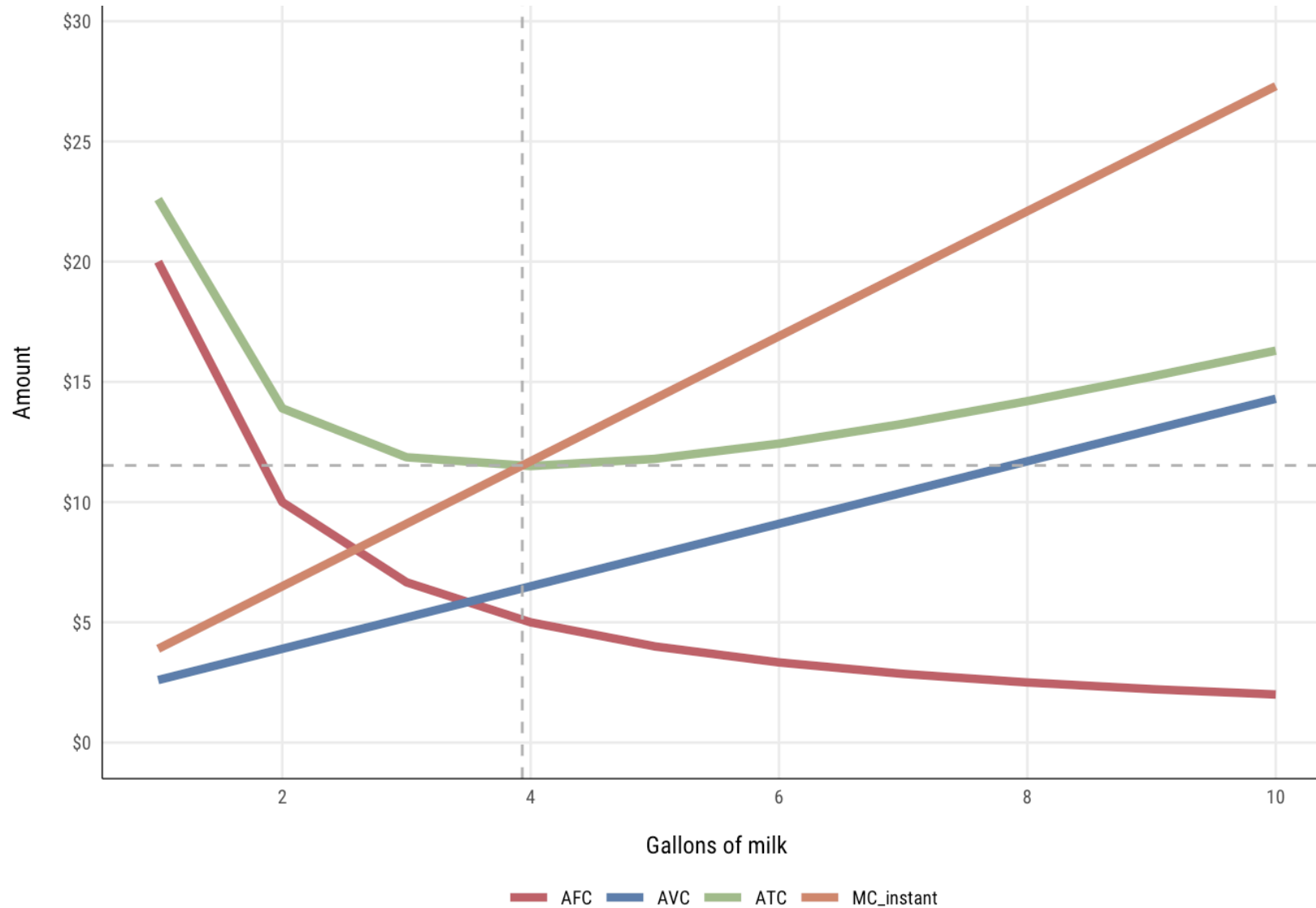
Cost to make stuff goes down when everyone uses your stuff

# Economies of scale

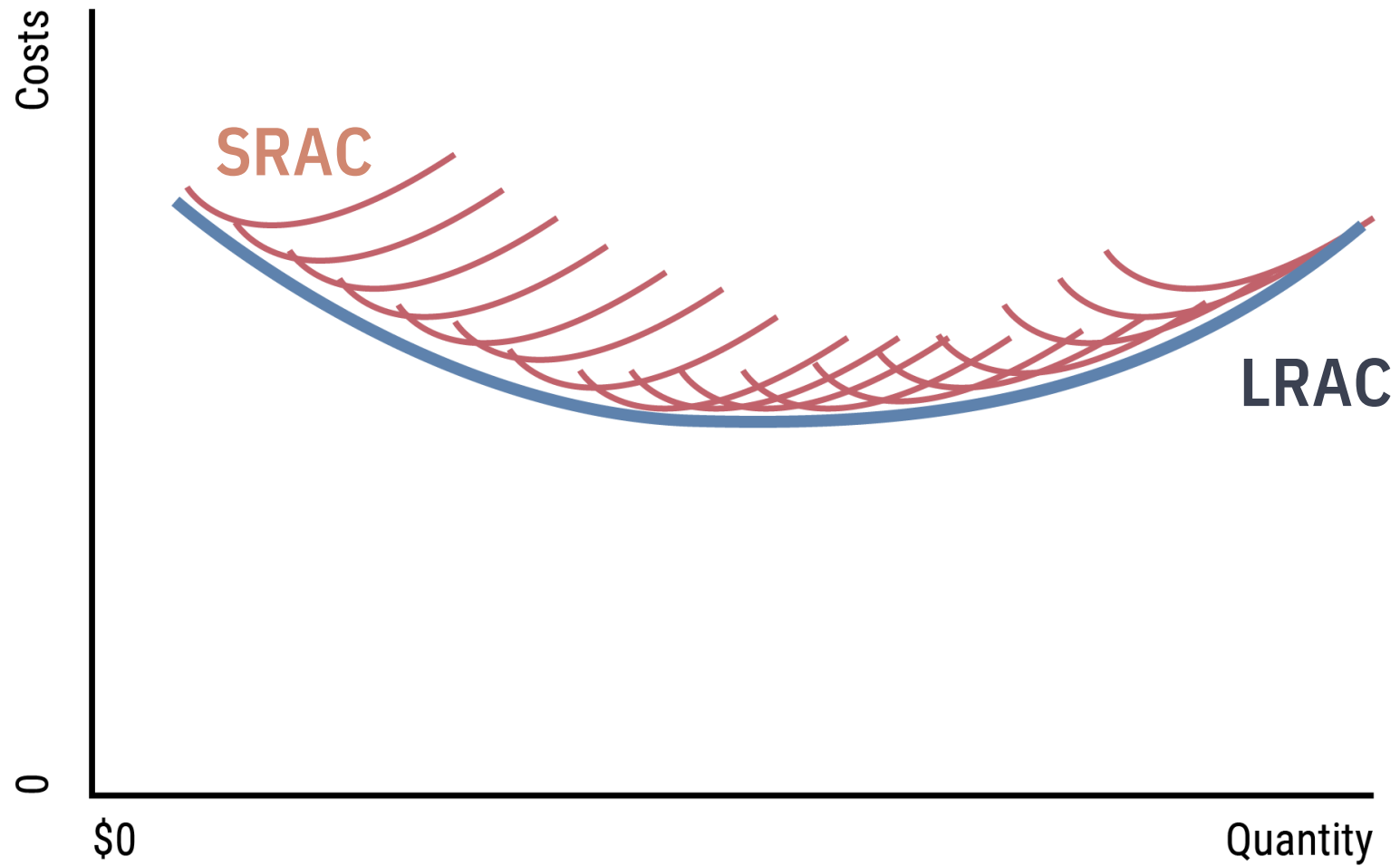
**If you double the inputs,  
you get more than double  
the outputs**

If you **increase** the inputs, you get more  
than **that increase in** the outputs

# Average costs and scale

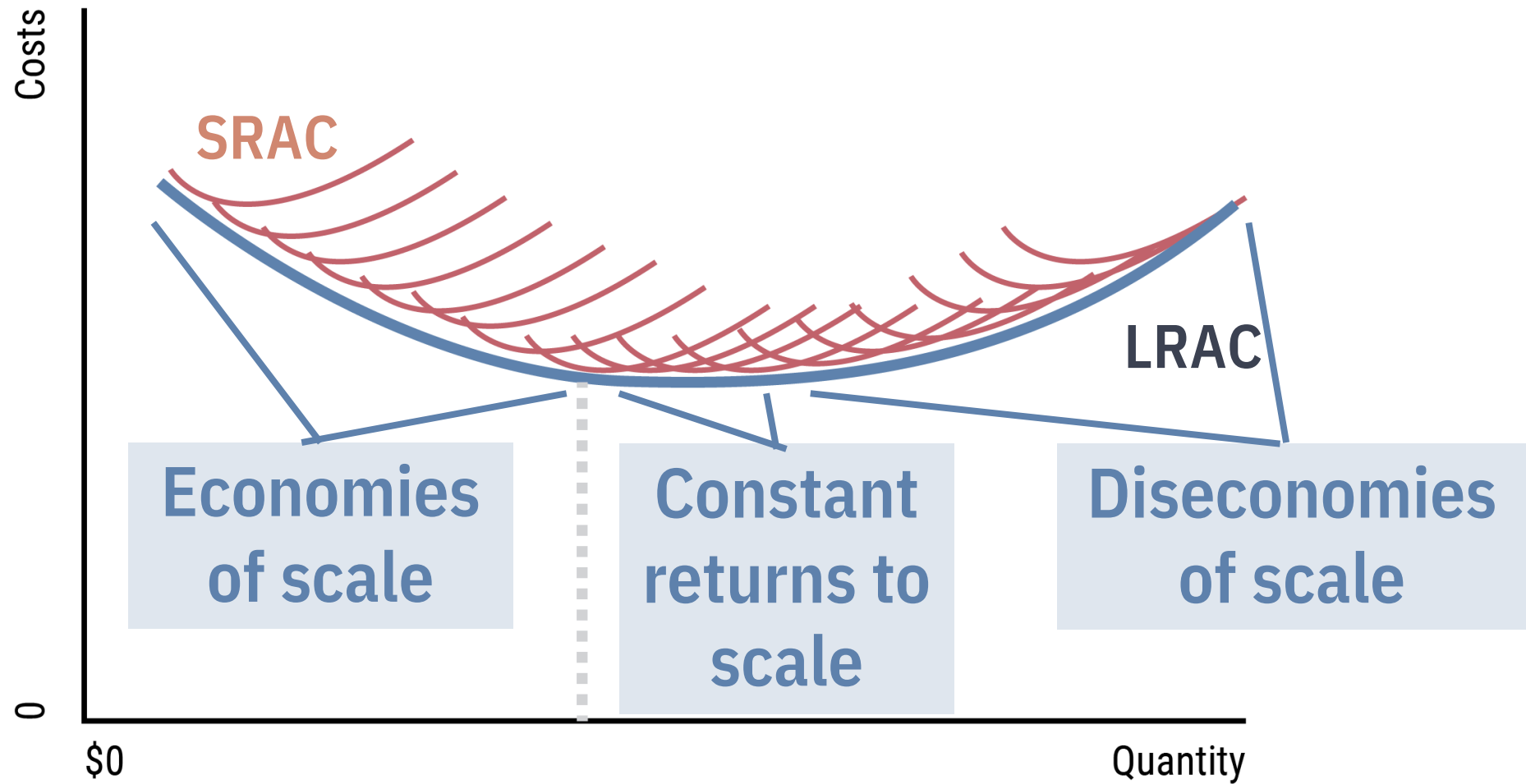


# Time and scale





# Time and scale



# Scale, location, network, or nothing?

eBay and PayPal

Doubling a recipe

QWERTY and  
Dvorak keyboards

Walmart's distribution network

Costco

Henry Ford's assembly line

Rural Chinese moving to cities

**Surplus, taxes, incidence,  
and deadweight loss**

## Consumer surplus

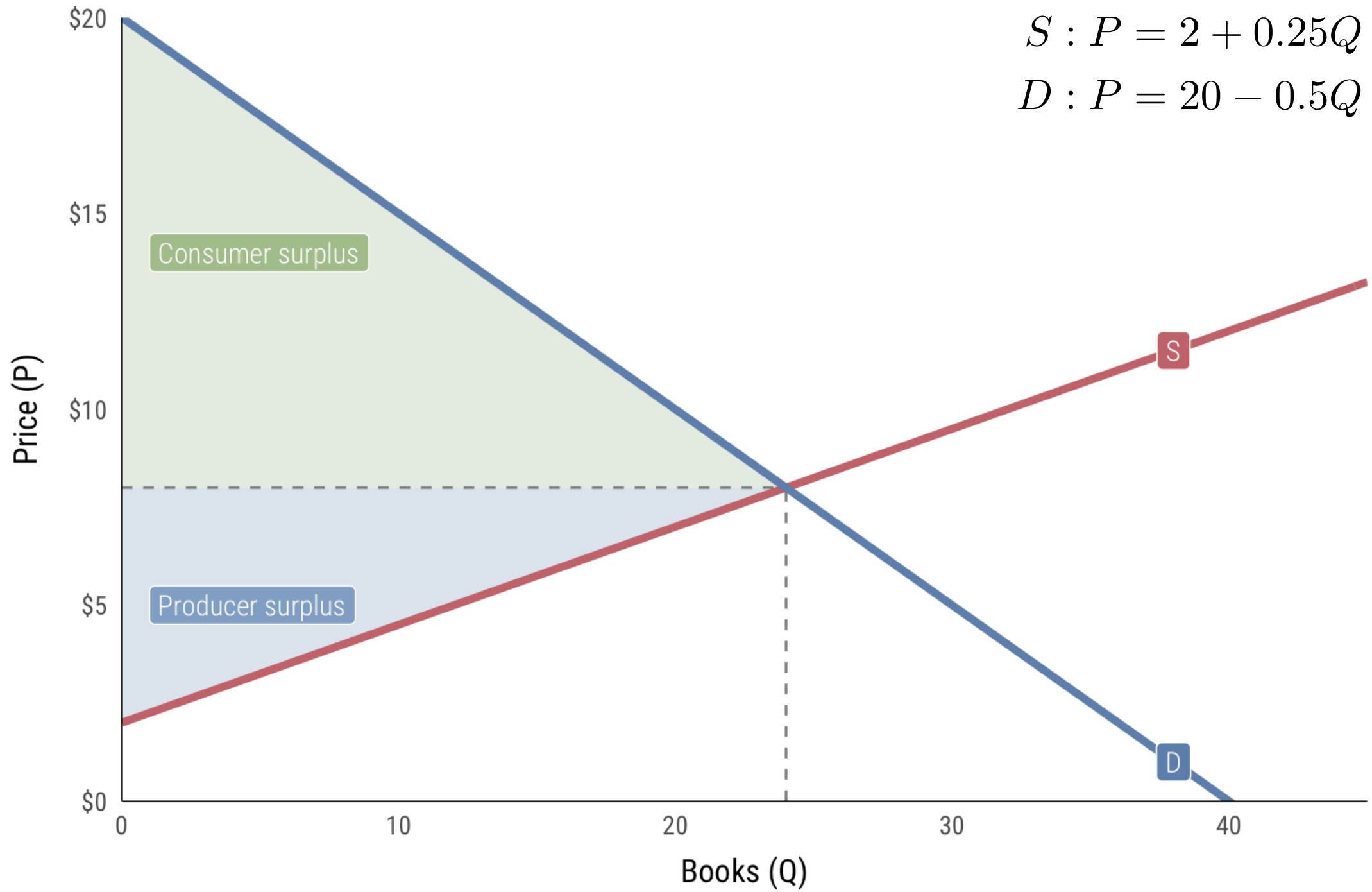
Difference between WTP and price

How good of a deal consumer gets

## Producer surplus

Difference between price and WTA

How good of a deal producer gets



$$S : P = 2 + 0.25Q$$

$$D : P = 20 - 0.5Q$$

# Why do governments tax?

Raise revenue for services

Redistribute resources

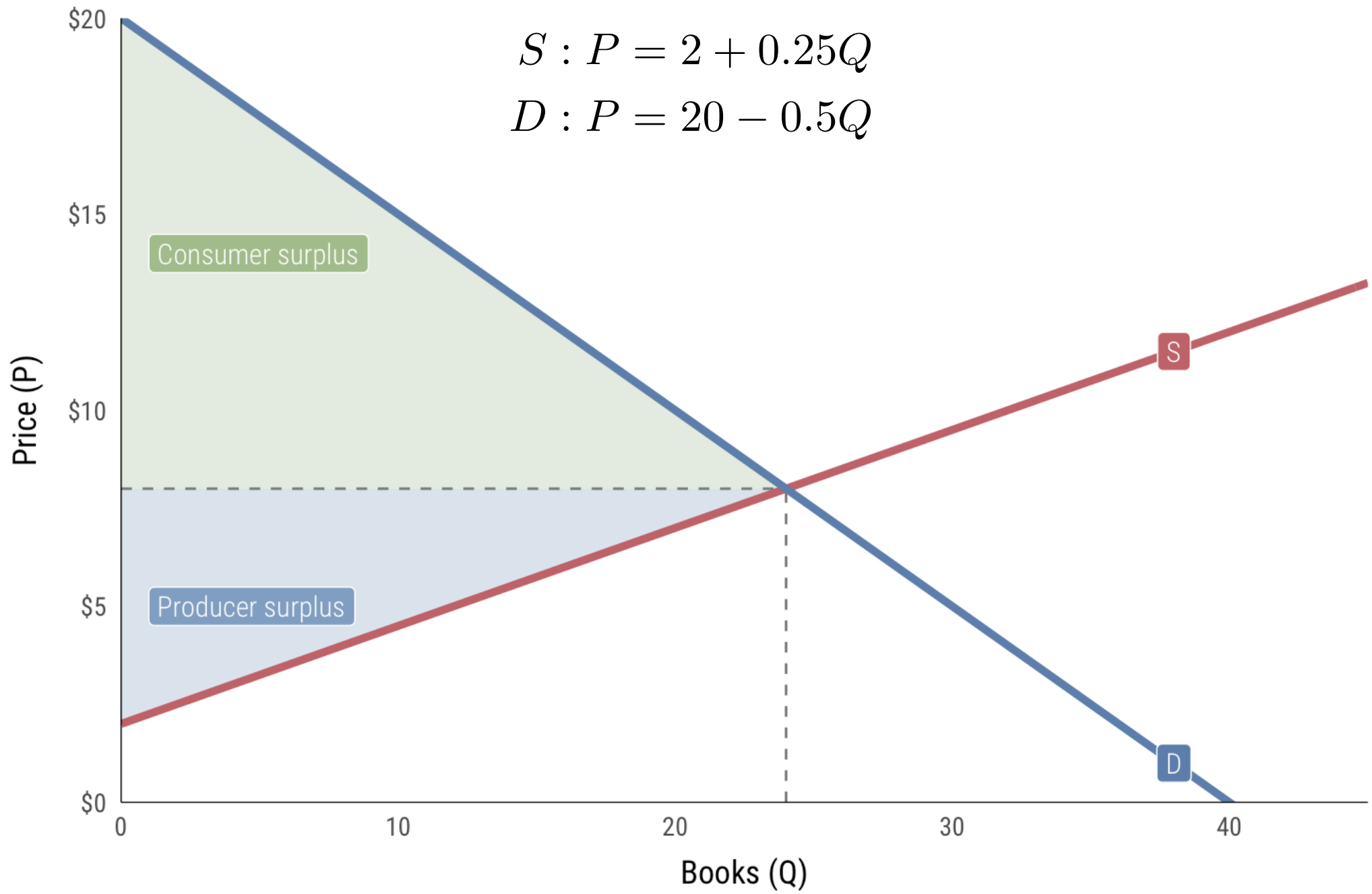
Encourage or  
discourage consumption

# What happens when governments tax?

Revenue raised for public goods

Resources redistributed

Markets distorted;  
loss of efficiency



$$S : P = 2 + 0.25Q$$

$$D : P = 20 - 0.5Q$$

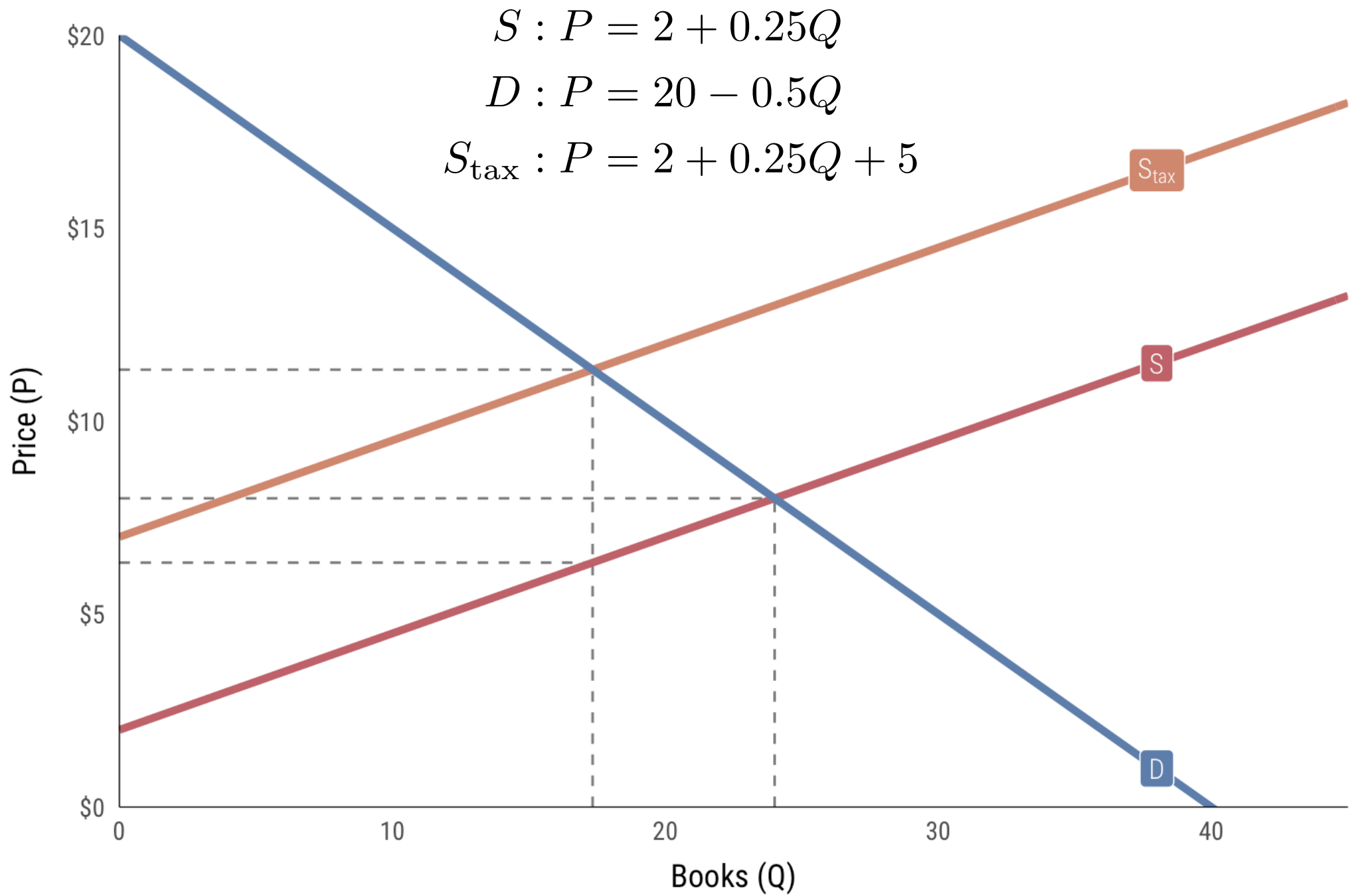
Consumer surplus

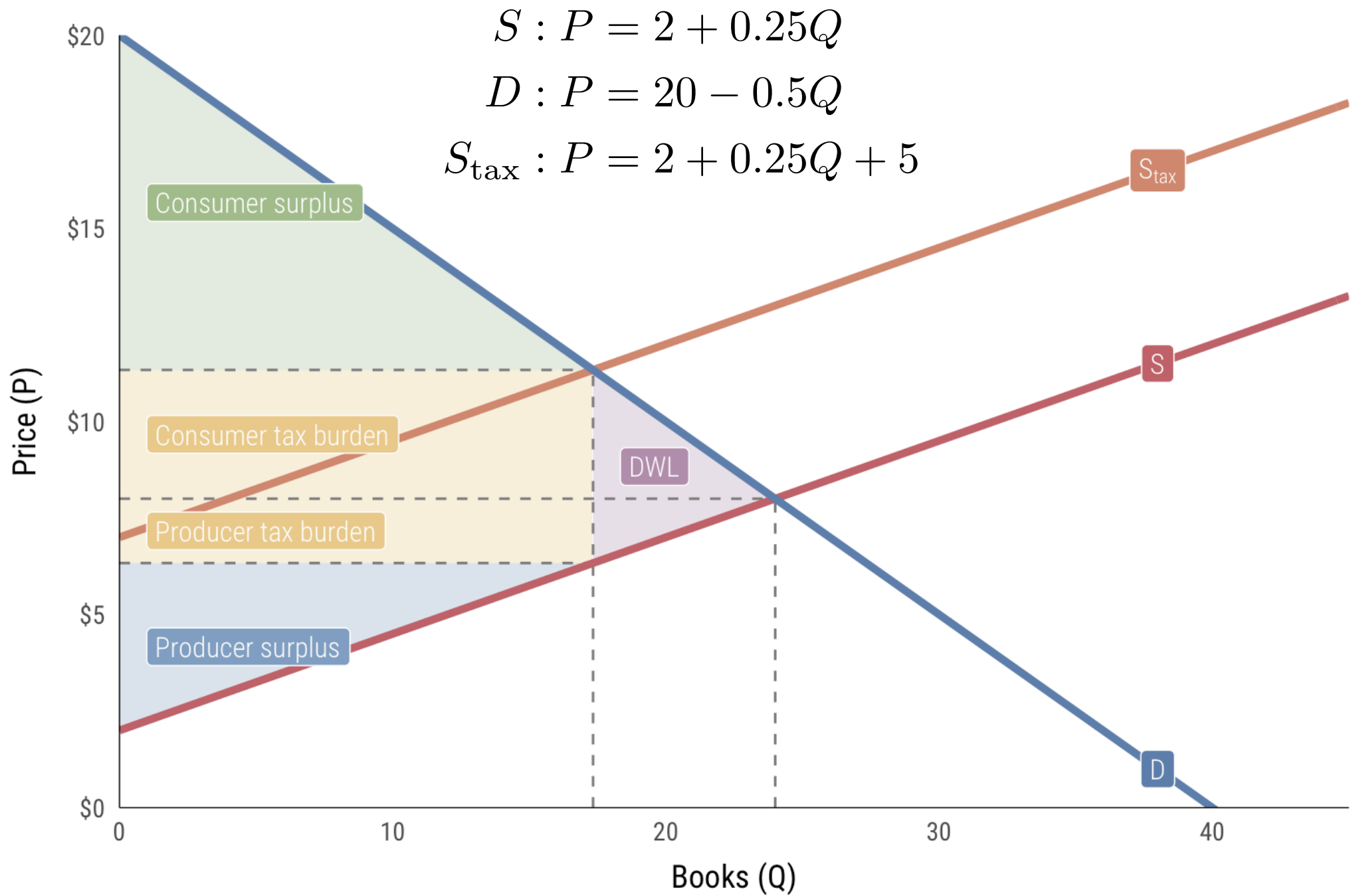
Producer surplus

S

D







# Tax incidence and $\epsilon$

Incidence depends on elasticity  
of supply or demand

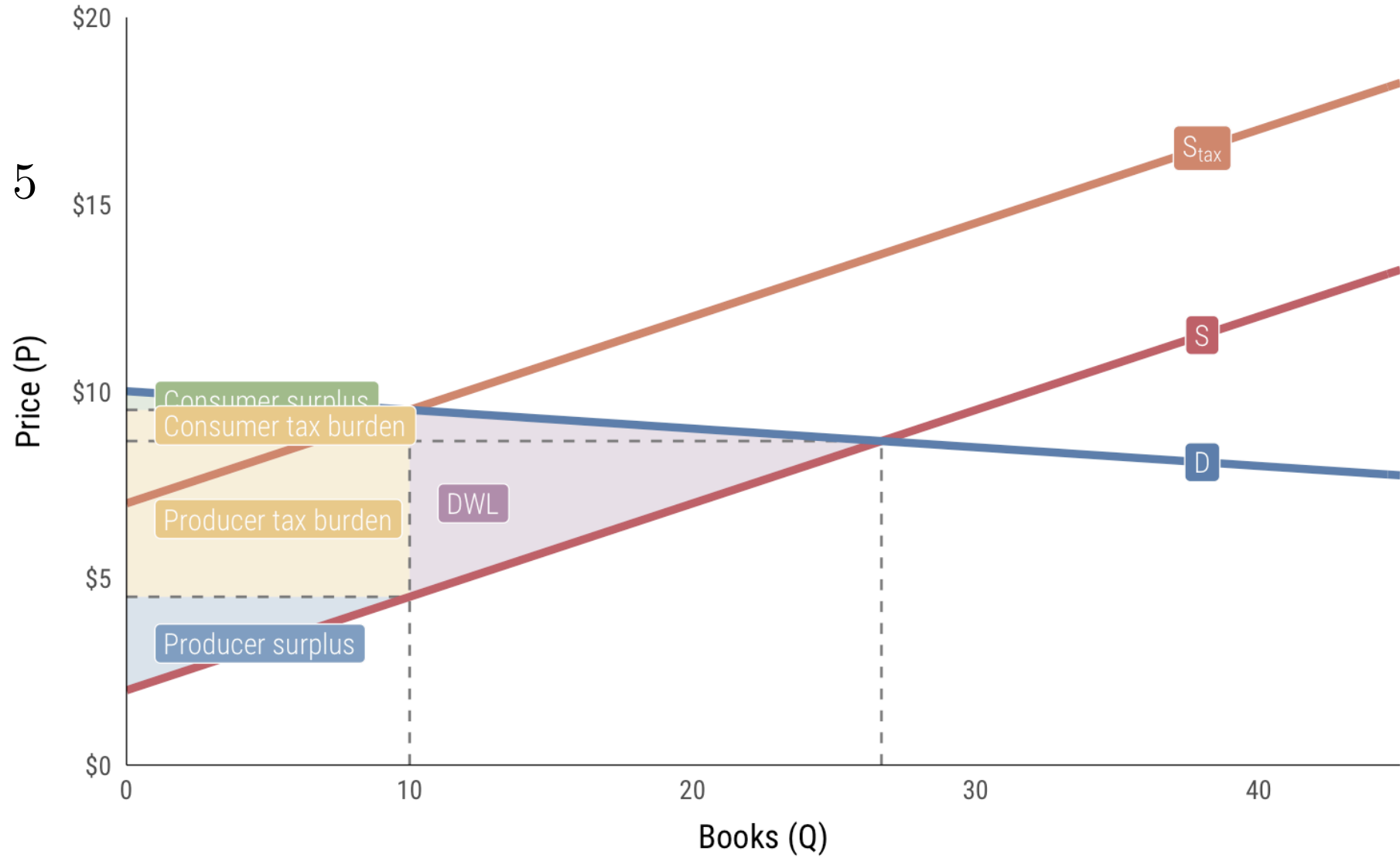
Tax burden falls on those  
least able to escape it

# 1: Elastic demand

$$S_1 : P = 2 + 0.25Q$$

$$D_1 : P = 10 - 0.05Q$$

$$S_{1 \text{ tax}} : P = 2 + 0.25Q + 5$$

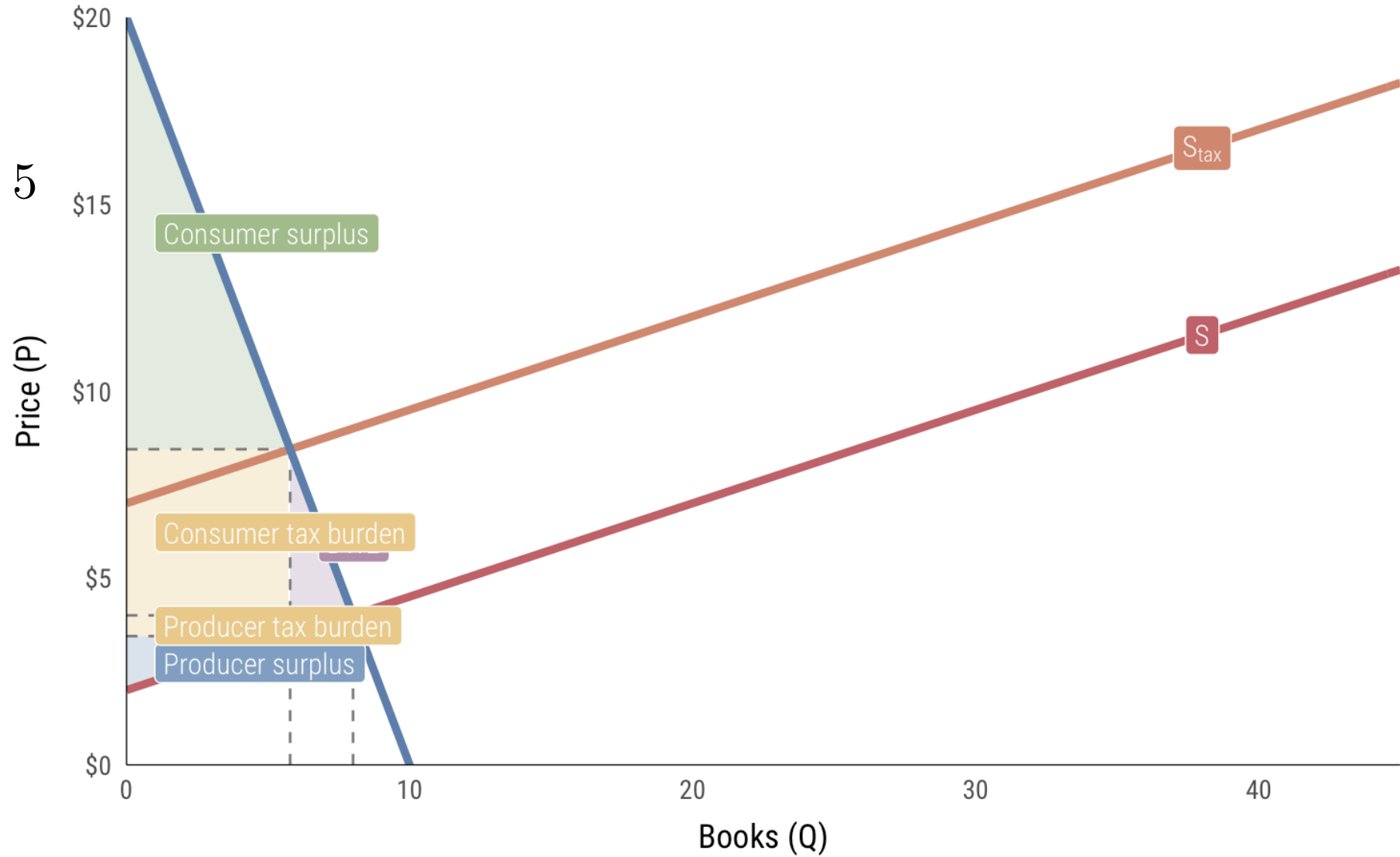


## 2: Inelastic demand

$$S_2 : P = 2 + 0.25Q$$

$$D_2 : P = 20 - 2Q$$

$$S_{2 \text{ tax}} : P = 2 + 0.25Q + 5$$

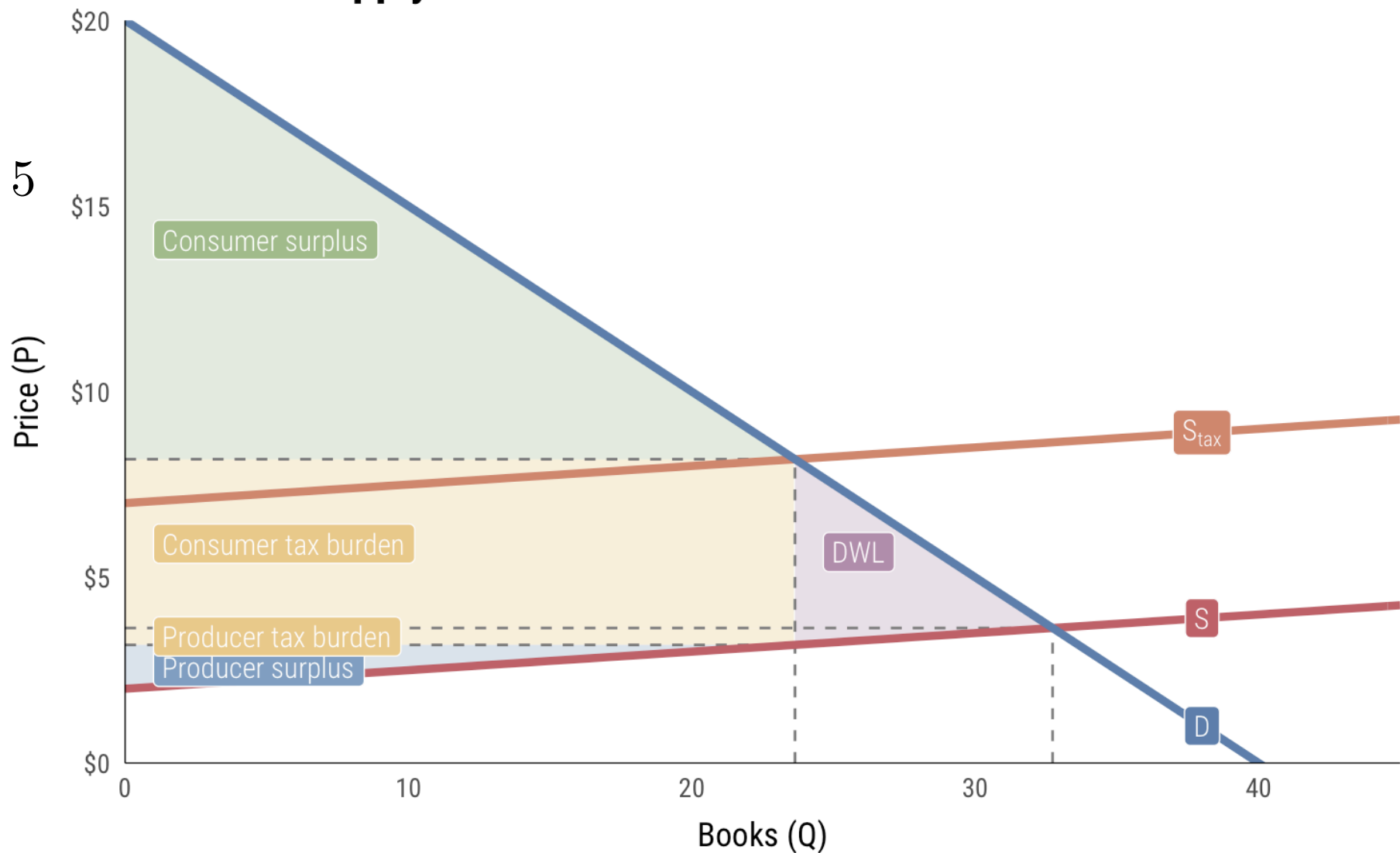


### 3: Elastic supply

$$S_3 : P = 2 + 0.05Q$$

$$D_3 : P = 20 - 0.5Q$$

$$S_{3 \text{ tax}} : P = 2 + 0.05Q + 5$$

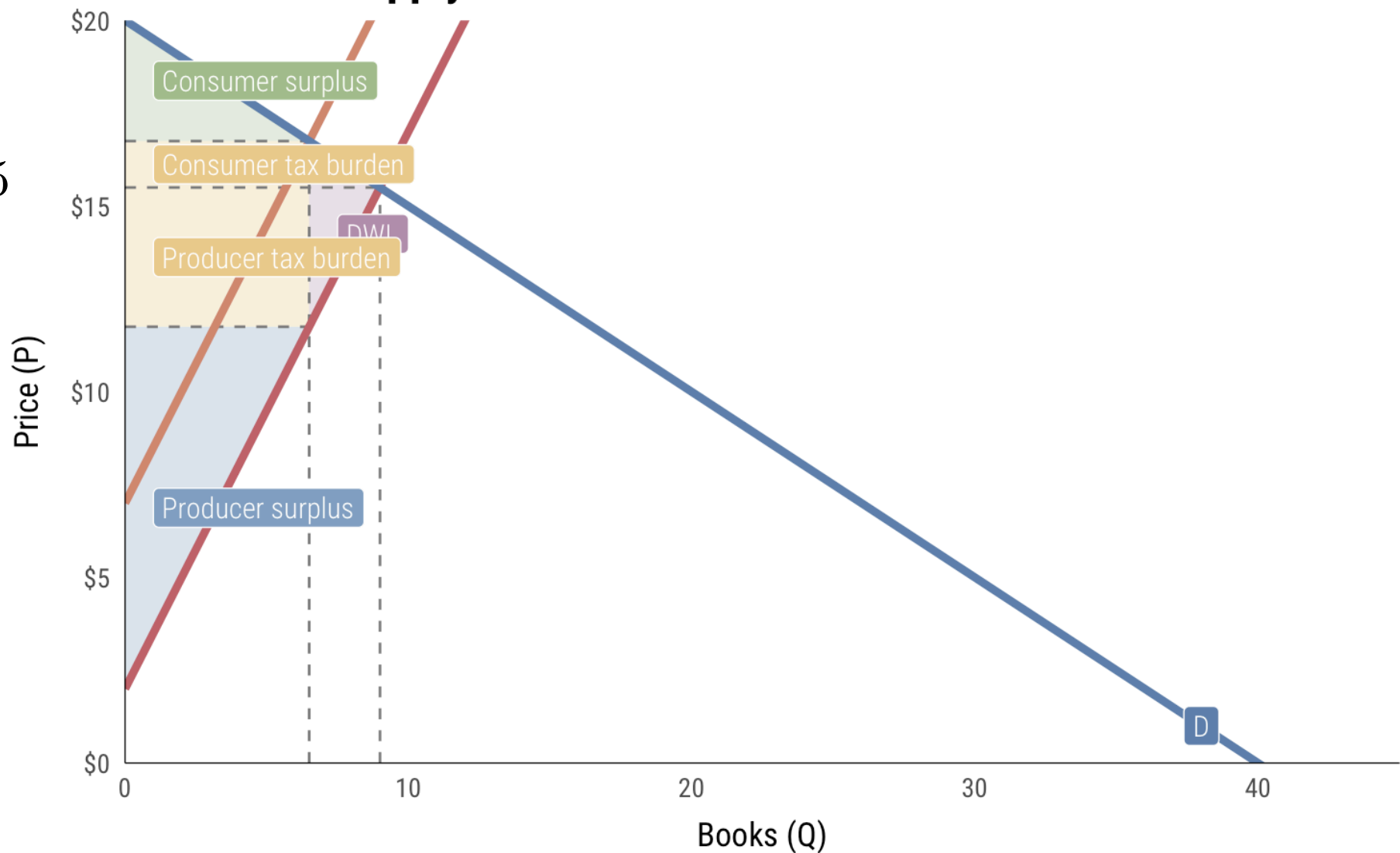


#### 4: Inelastic supply

$$S_4 : P = 2 + 1.5Q$$

$$D_4 : P = 20 - 0.5Q$$

$$S_{4 \text{ tax}} : P = 2 + 1.5Q + 5$$



# Incidence for consumers

**Progressive taxes**

**Rich pay more**

Income taxes (but loopholes)

**Regressive taxes**

**Poor pay more**

Sales taxes, payroll taxes



# Tax fairness

## Benefits principle

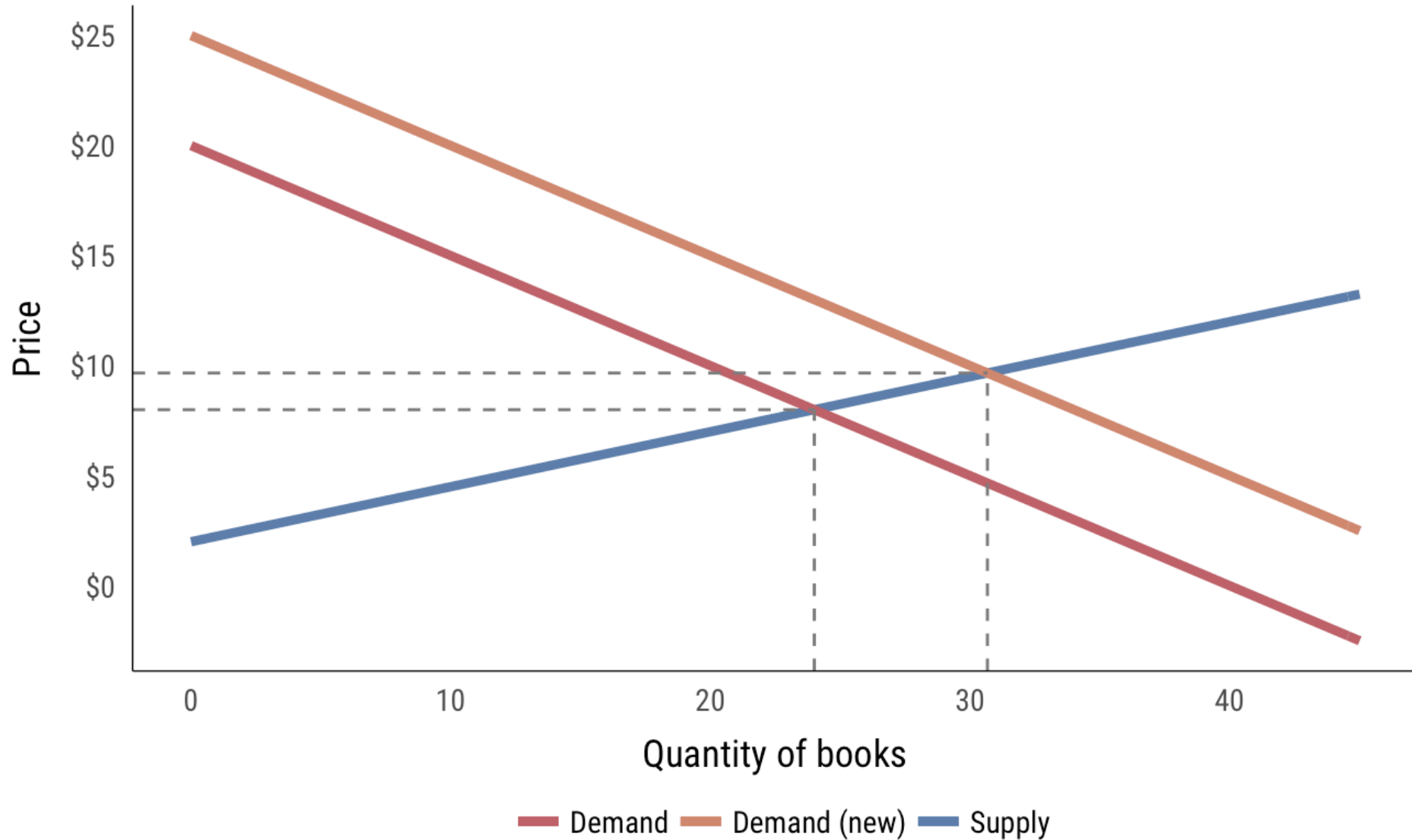
Those who benefit from public spending should bear the burden of the tax

## Ability-to-pay principle

Those with a greater ability to pay a tax should pay more tax

# Changes in supply and demand

# Change in demand



# Change in demand

**Demand higher at every possible point**

**Structural change**

**Price increases; quantity increases  
(or decreases/decreases)**

**Supply remains the same**

People start preferring hamburgers over pizza

# Change in quantity demanded

Prices and quantity change...

...but not because of structural issues

Movement along demand curve

Supply remains the same

Price of pizza changes

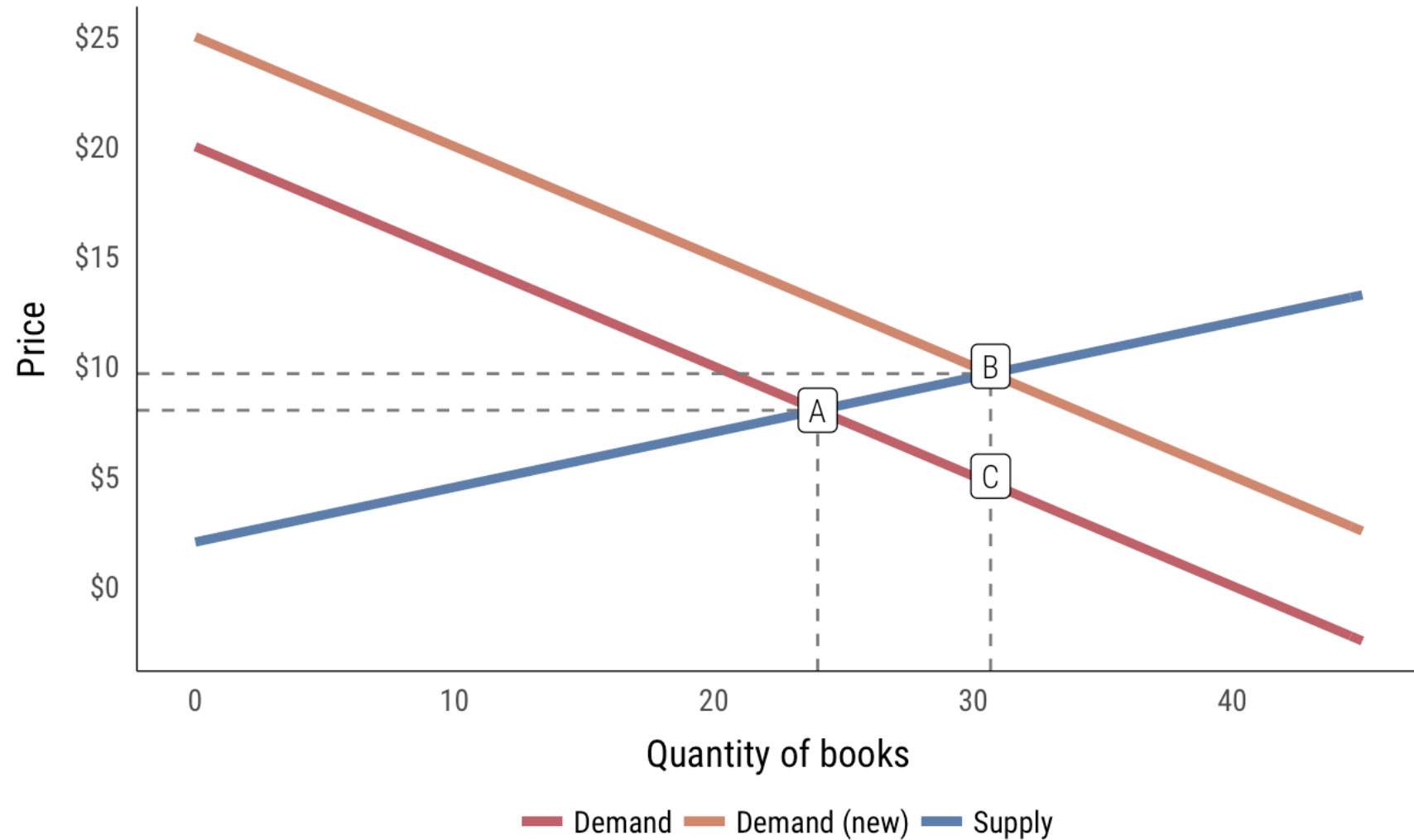
Two ways to get  
from 24 to 31ish

**A → C**

Change in quantity  
demanded  
Only price changes

**A → B**

Change in demand  
New demand curve



# Causes of shifting demand

Change in price of complementary goods

Change in price of substitute goods

Change in population of buyers

Change in income

Change in preferences

**Orange market**

Dr. Oz promotes new fad diet where everyone eats 10 oranges a day

**Car market**

Consumer income rises

**Car market**

Gas prices double

**Shoe market**

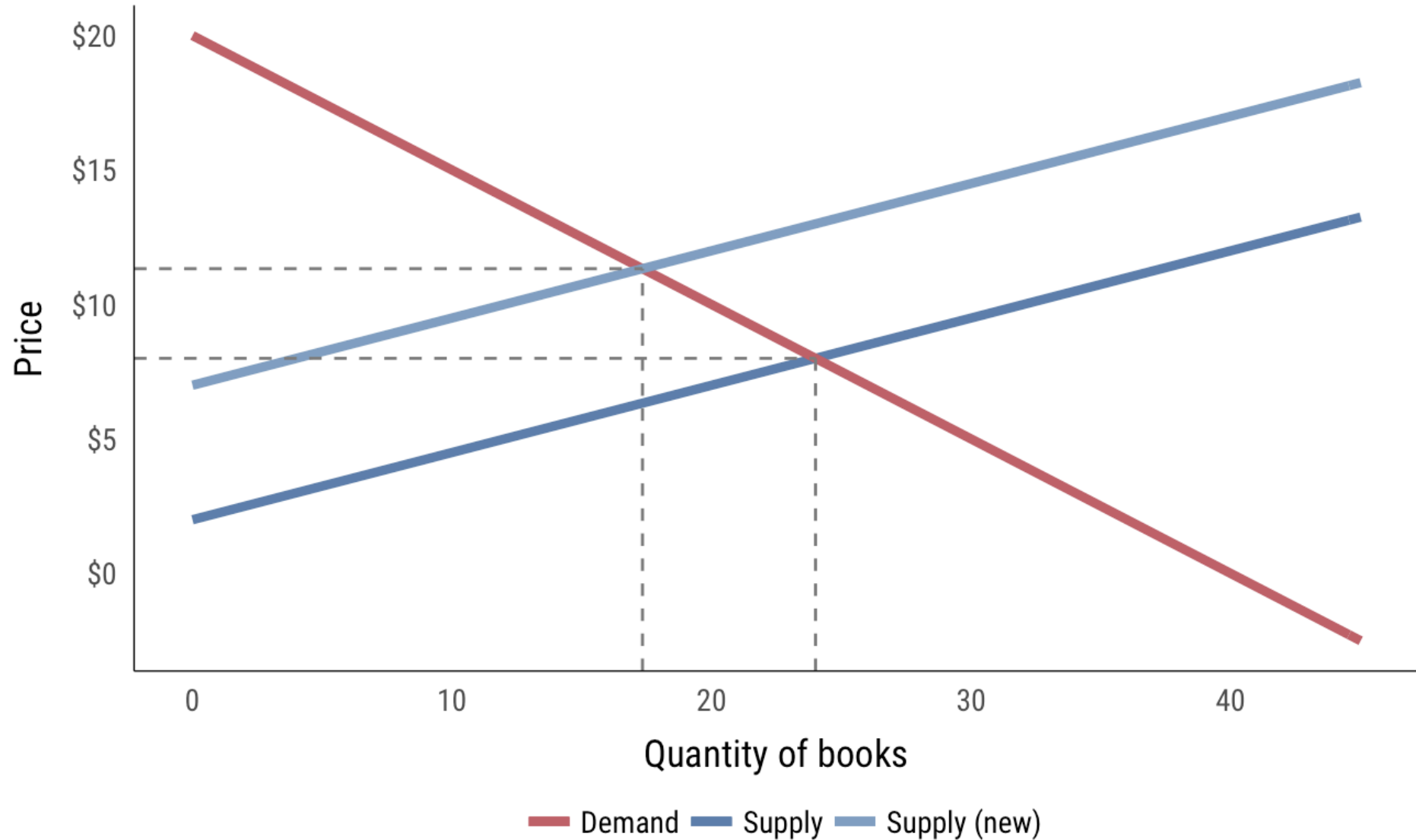
More manufacturers make shoes

**Lettuce market**

Price drops by 10 cents



# Change in supply



# Change in supply

**Supply higher at every possible point**

**Structural change**

**Price increases; quantity increases  
(or decreases/decreases)**

**Demand remains the same**

Cost of production changes because of technology or input costs

# Change in quantity supplied

Prices and quantity change...

...but not because of structural issues

Movement along supply curve

Demand remains the same

Price of product changes

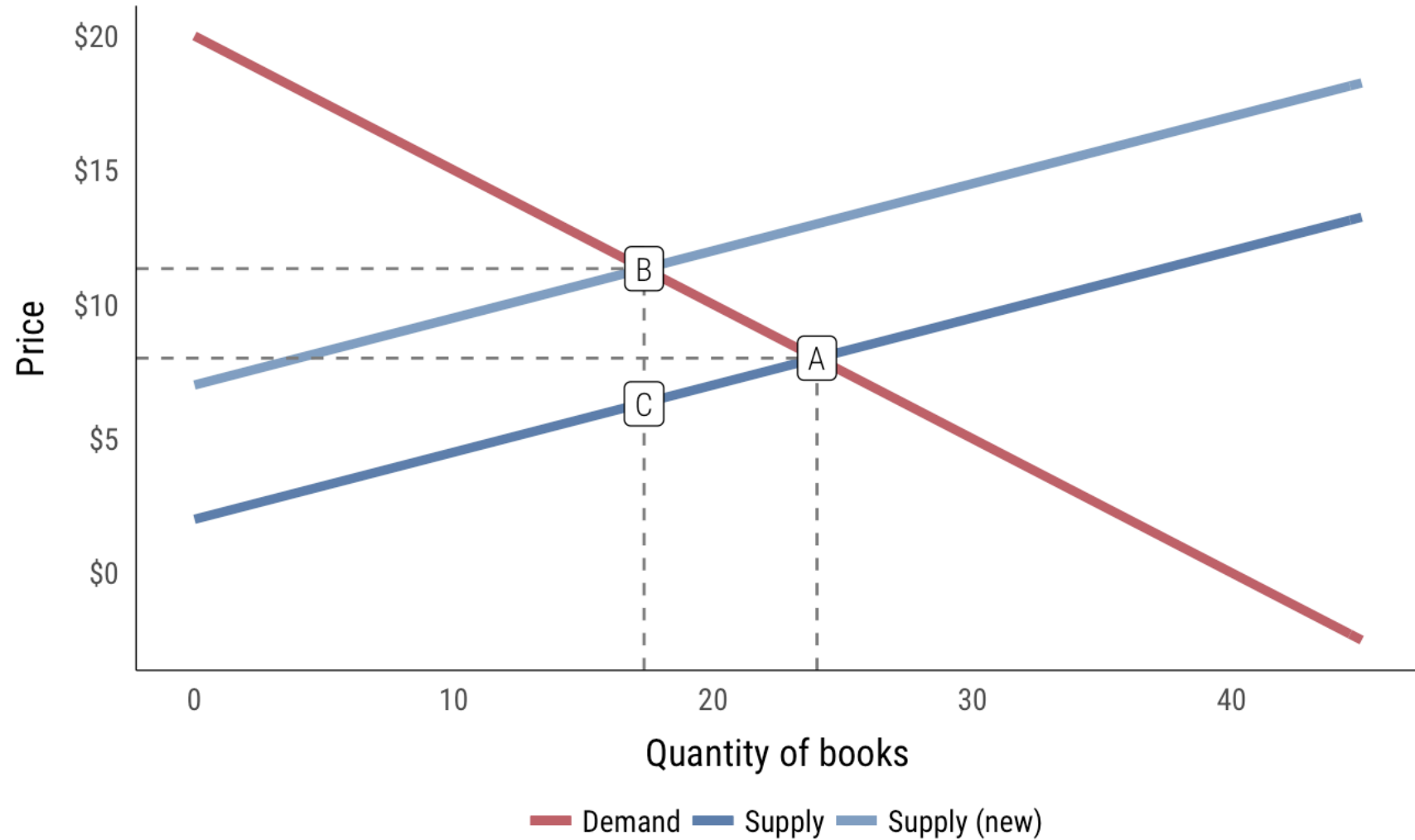
Two ways to get  
from 24 to 17ish

**A → C**

Change in quantity  
supplied  
Only price changes

**A → B**

Change in supply  
New supply curve



# Causes of shifting supply

Change in cost of inputs

Change in cost of production

Change in weather

Change in number of suppliers

Expectation of lower prices

**Car market**

New engine design reduces production costs

**Orange market**

Freeze in Florida kills 50% of the crop

**Shoe market**

Price of shoes increases

**Shoe market**

Price of leather increases

# Escaping the price taking world

# Optimal things

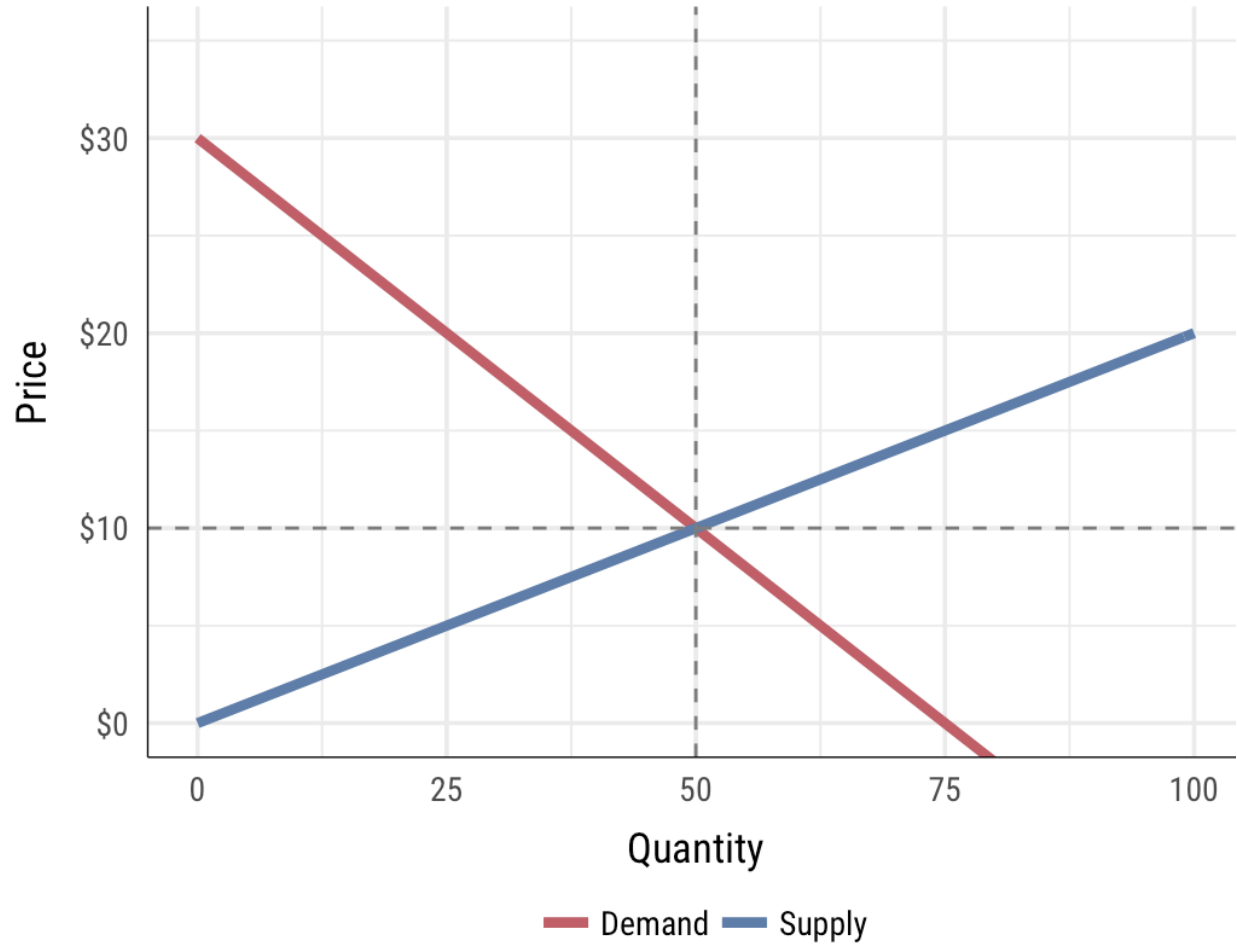
**Max  $\pi$ :  $MC = MR$**

**Best  $Q$ : Demand = MC**

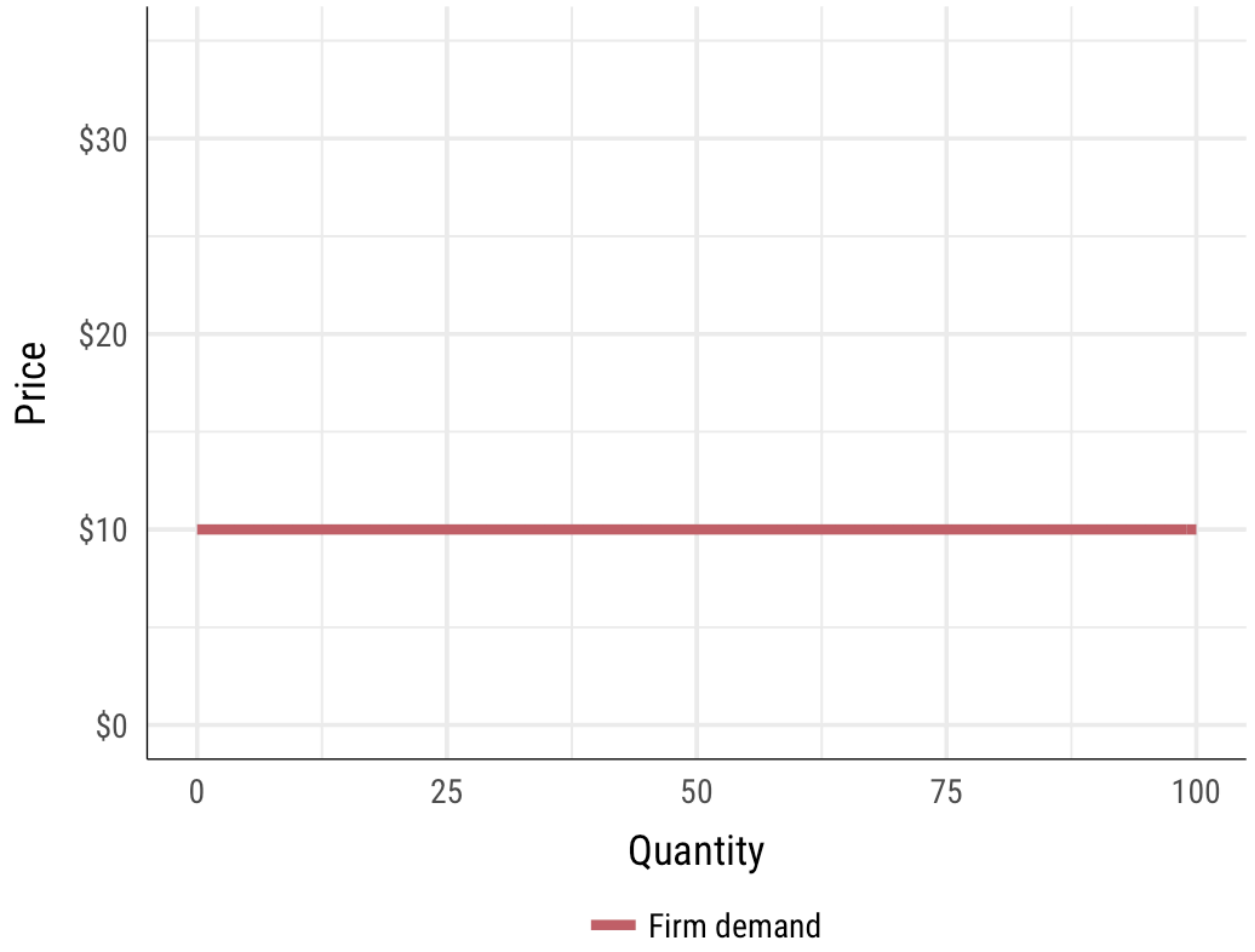
**In perfect competition,  
Demand = MC = MR = P**



# Market demand



# Firm demand



# Price taking

Firm decisions have no impact on the price of a good

You're stuck with whatever the prevailing market price is  $\pm$  some markup

# But what if???

What if you could affect the price?

Would you want to?

Costs matter.

Set the price to *your* MC, maximize *your* profit.

# Escape with market power!

**Ability to influence  
market prices**

This is why people get MBAs;  
move market away from perfect competition price

# Ways to escape existing prices

Price discrimination

Monopolies

Switching costs

Branding and differentiation

Cost and input controls

Government regulation

# Price discrimination

With perfect information, firms can set individualized demand curves for customers

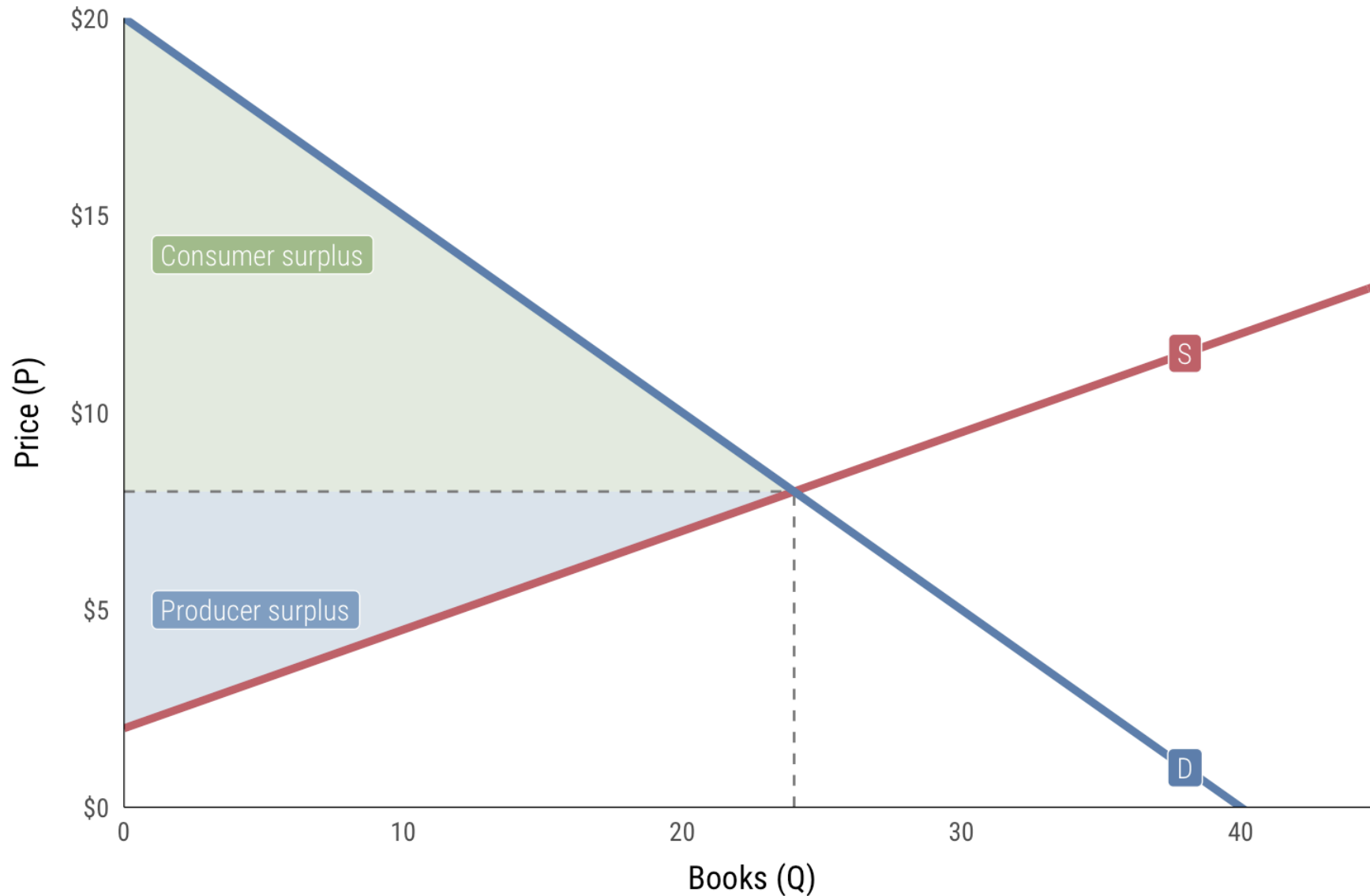
$\text{Price} = \text{WTP}$

Lyft/Uber

Airplane tickets

Amazon

# Price discrimination



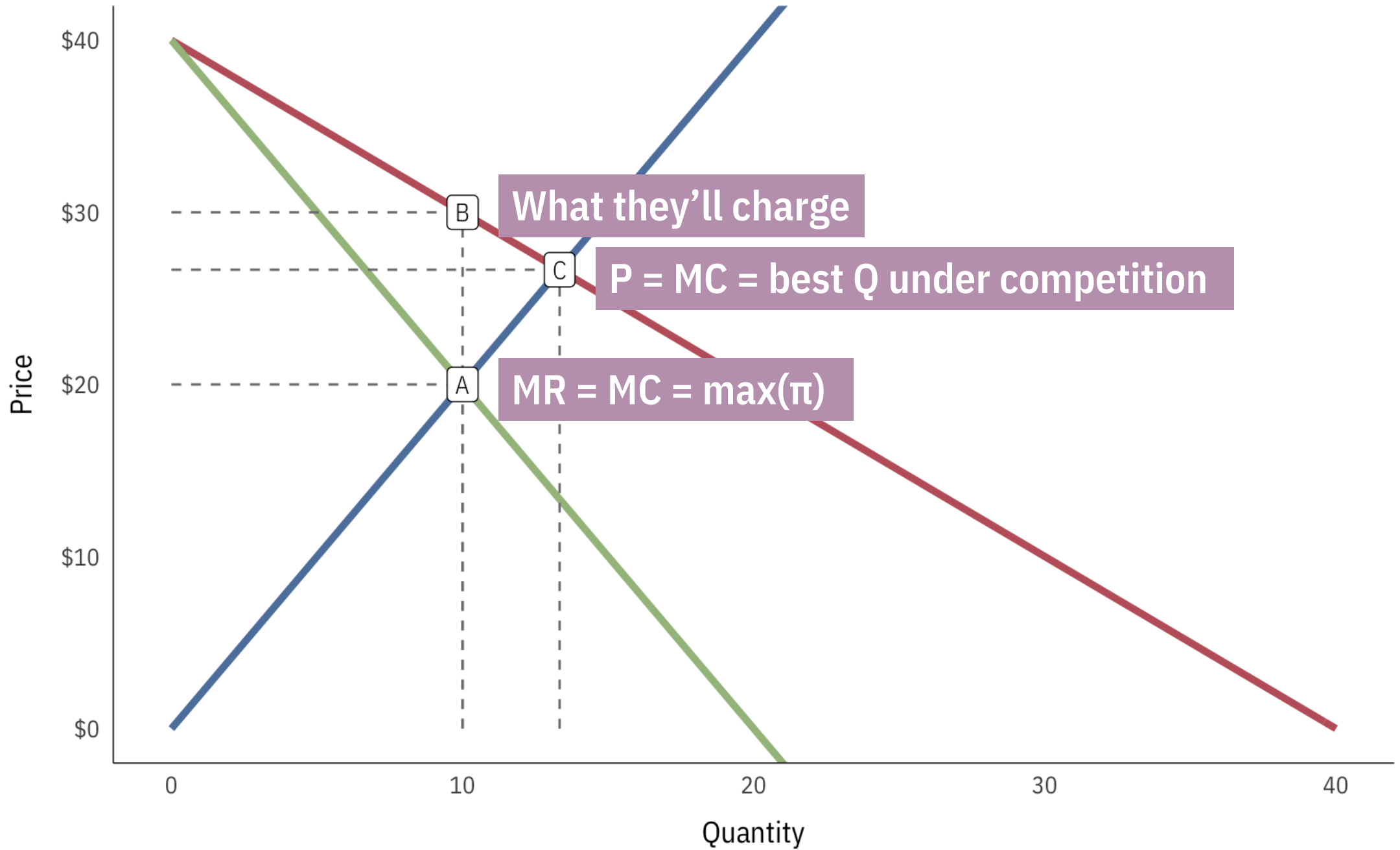
# Monopolies

**The whole market is only one firm, so market demand is firm demand**

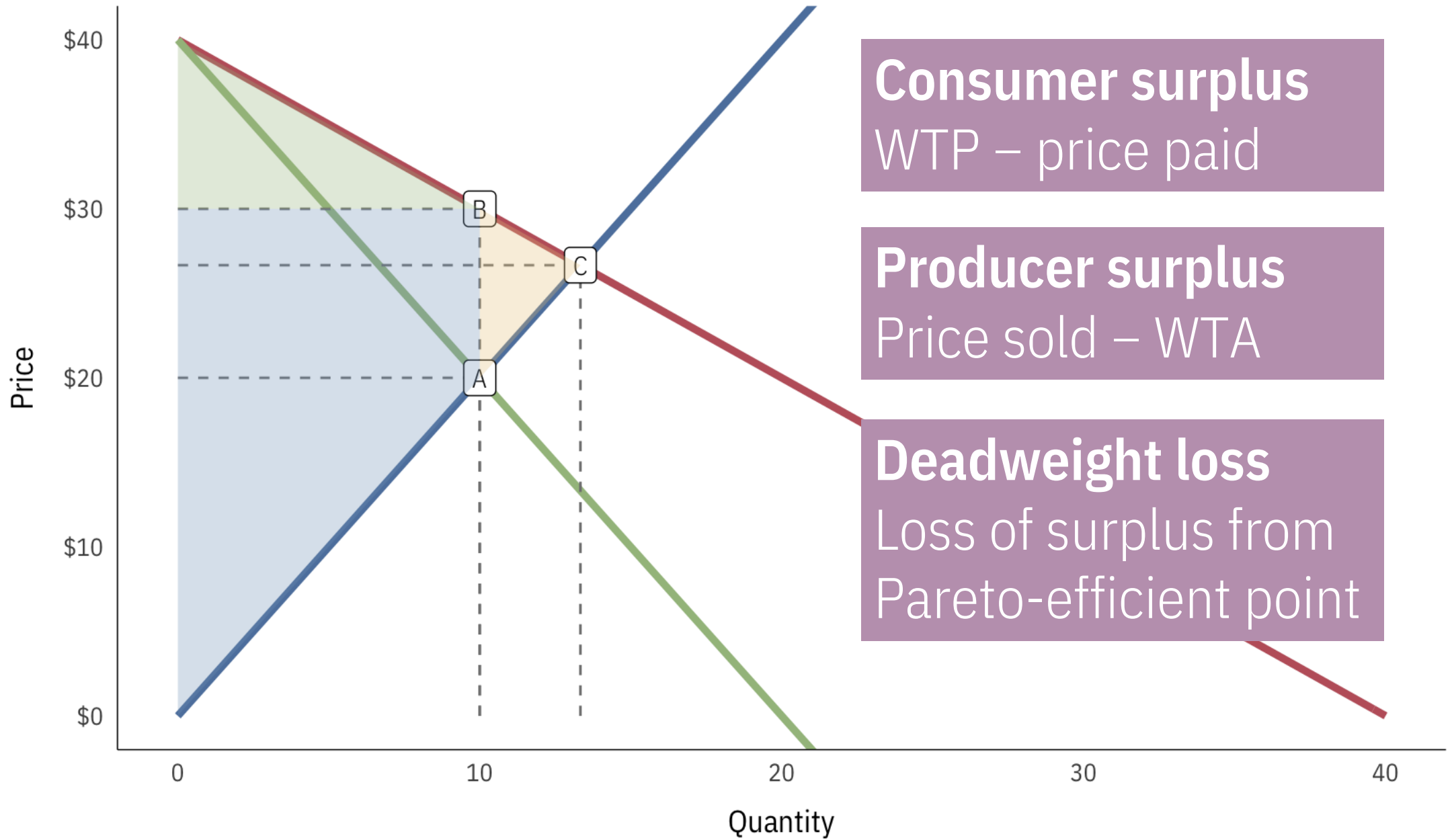
Monopolists will naturally produce less quantity at higher prices than firms in competitive markets

Creates deadweight loss, just like taxes





— Demand — Marginal cost — Marginal revenue



**Consumer surplus**  
 $WTP - \text{price paid}$

**Producer surplus**  
 $\text{Price sold} - WTA$

**Deadweight loss**  
 Loss of surplus from  
 Pareto-efficient point

- Demand
- Marginal revenue
- Marginal cost
- Consumer surplus
- Producer surplus
- Deadweight loss

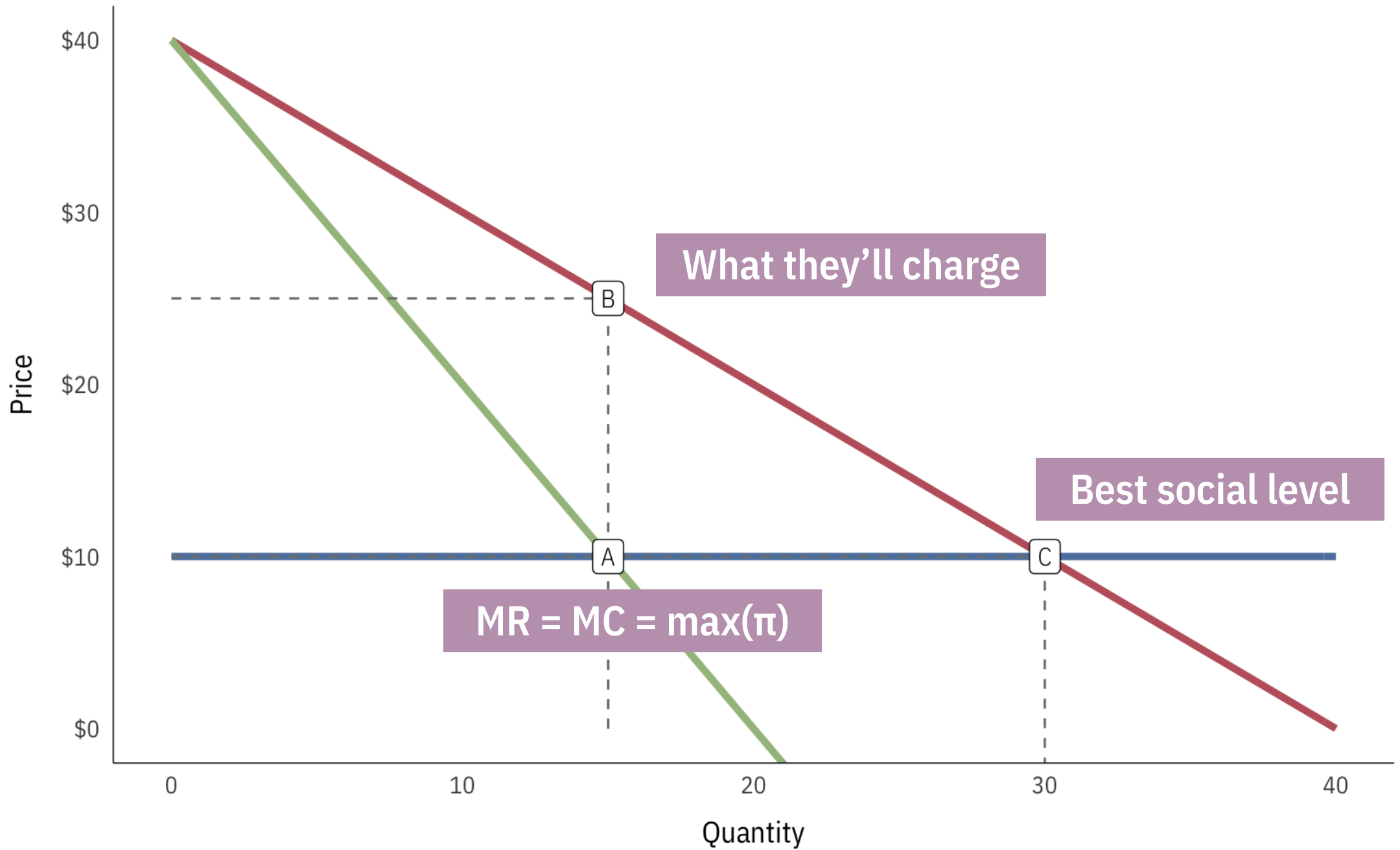
# Natural monopolies

Big expensive things with large capital outlays and low marginal cost

Generally more efficient to just have one firm handle it

Utilities

Public transportation

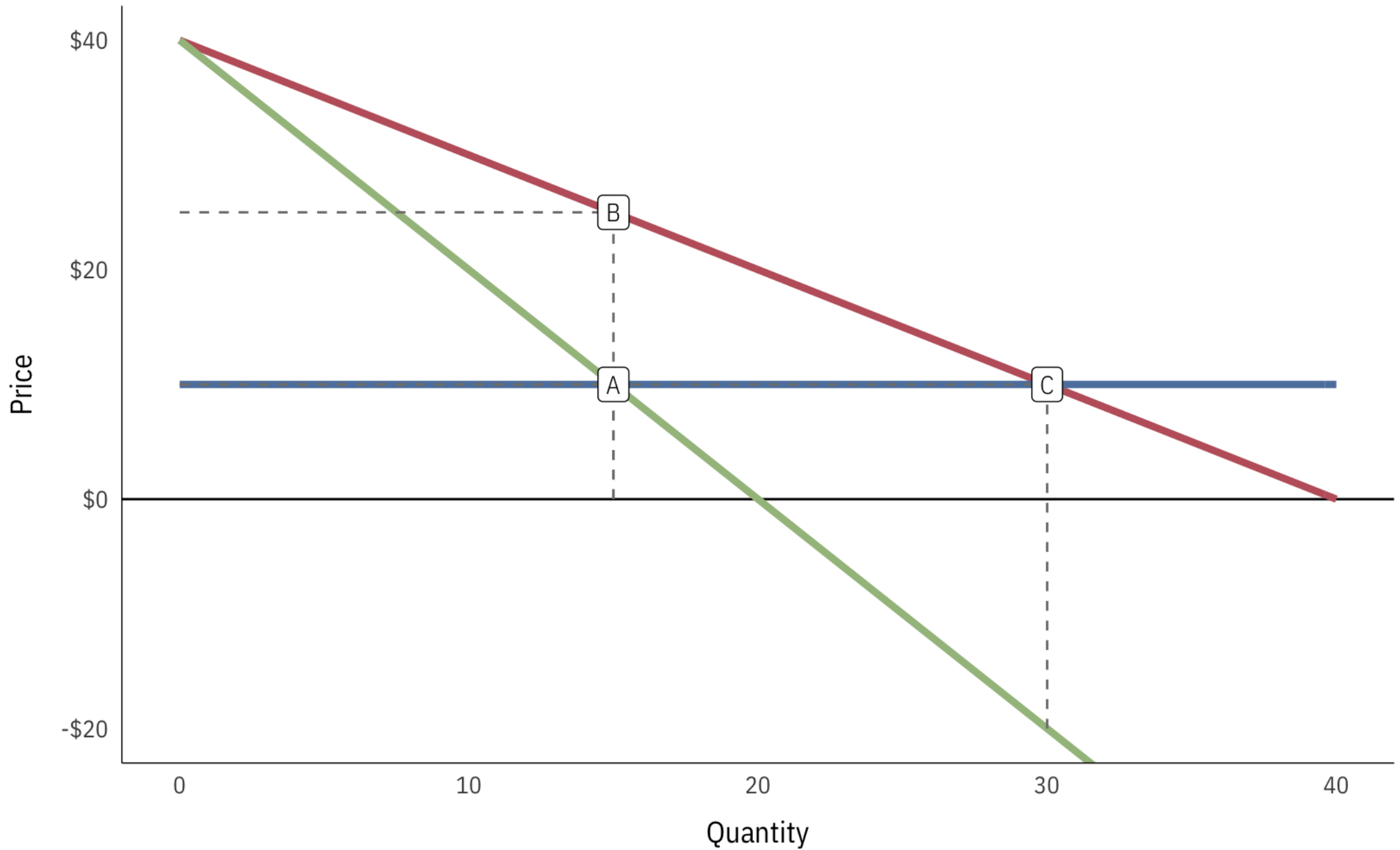


What they'll charge

Best social level

MR = MC = max( $\pi$ )

— Demand — Marginal cost — Marginal revenue



— Demand — Marginal cost — Marginal revenue

# Switching costs

Make it harder for consumers to switch away from you

Brand-exclusive benefits

Technology constraints

Search costs

Network costs

# Branding + differentiation

Make your stuff nonsubstitutuable

Advertising

Brand loyalty

# Branding + differentiation

**If people are stuck with you**  
(or like you a lot, or believe in your product,  
or if your stuff generally isn't substitutable)  
**you can charge them more**

**Markup depends  
on elasticity**



# Cost and input controls

Own the means of production

Control scarce inputs

Control cheap supply chains

# Government regulation

Make the government stop others  
from competing with you

Patents and intellectual property

Licensing

Prohibition of competition