1.7 — Price Elasticity

ECON 306 • Microeconomic Analysis • Fall 2021

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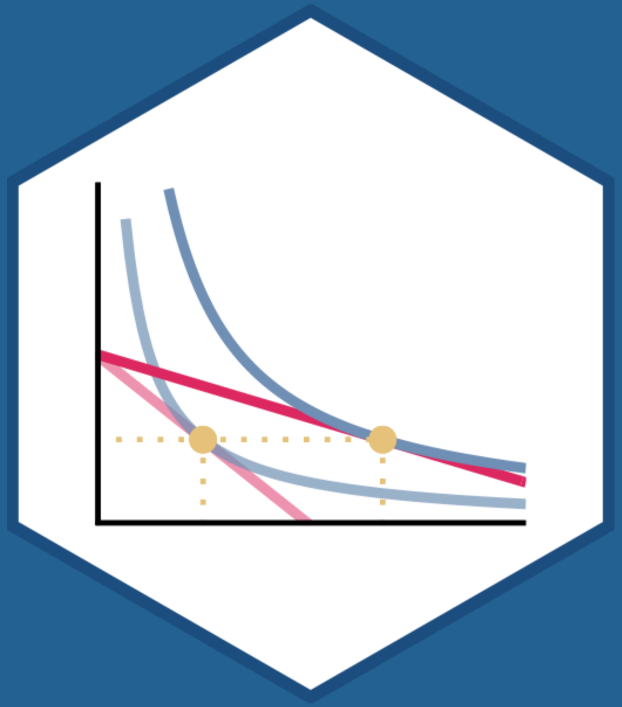

Outline

Price Elasticity of Demand

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- **Price elasticity of demand** measures *how much* (in %) quantity demanded changes in response to a (1%) change in price

$$\epsilon_{q_D,p} = \frac{\%\Delta q_D}{\%\Delta p}$$

Price Elasticity of Demand: Elastic vs. Inelastic

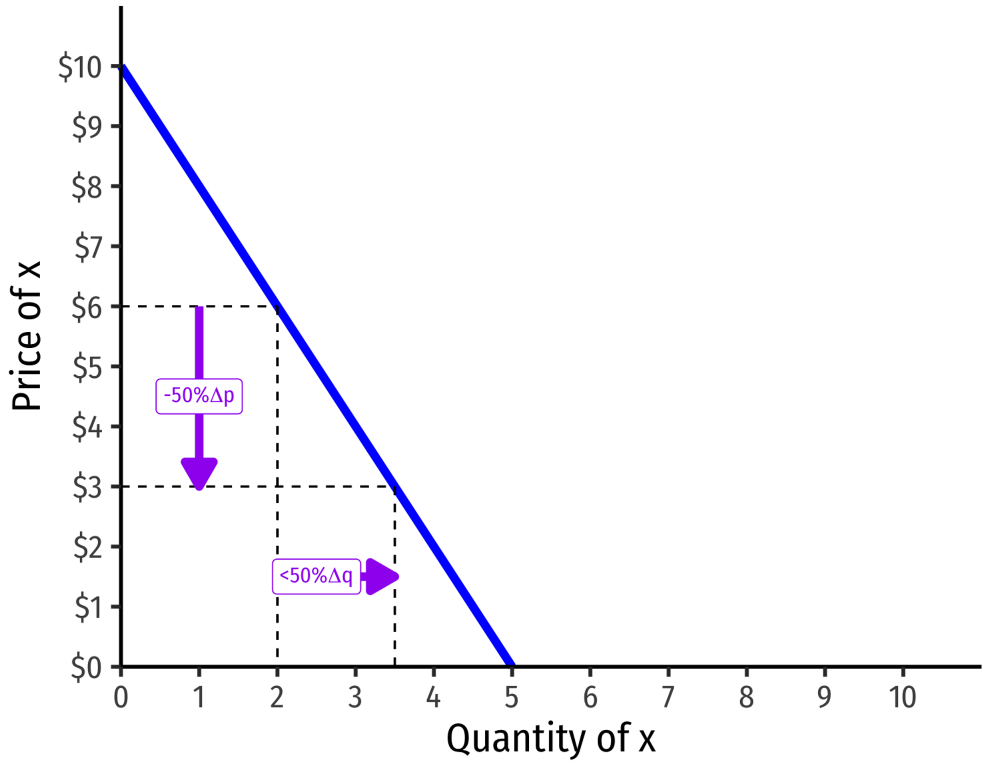
$$\epsilon_{q_D,p} = \frac{\%\Delta q_D}{\%\Delta p}$$

	"Elastic"	"Unit Elastic"	"Inelastic"
Intuitively:	**Large** response	Proportionate response	**Little** response
Mathematically:	$\lvert\epsilon_{q_D,p}\rvert > 1$	$\lvert\epsilon_{q_D,p}\rvert = 1$	$\lvert\epsilon_{q_D,p}\rvert < 1$
	Numerator $>$ Denominator	Numerator $=$ Denominator	Numerator $<$ Denominator
A 1% p-change	**More than 1%** change in q_D	**1%** change in q_D	**Less than 1%** change in q_D

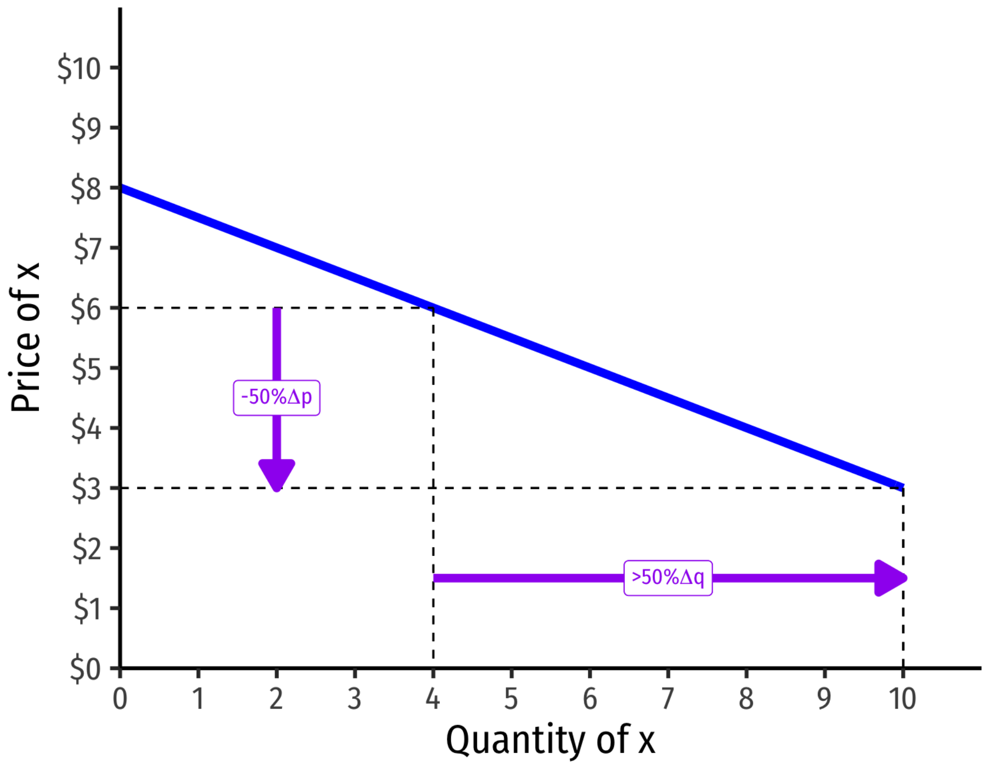
Visualizing Price Elasticity of Demand

An identical 50% price cut on an:

"Inelastic" Demand Curve



"Elastic" Demand Curve



Price Elasticity of Demand Formula

$$\epsilon_{q_D,p} = \frac{\%\Delta q_D}{\%\Delta p}$$

Price Elasticity of Demand Formula

$$\epsilon_{q,p} = \frac{\%\Delta q}{\%\Delta p} = \frac{\left(\frac{\Delta q}{q}\right)}{\left(\frac{\Delta p}{p}\right)}$$

Price Elasticity of Demand Formula

$$\epsilon_{q,p} = \frac{\%\Delta q}{\%\Delta p} = \frac{\left(\frac{\Delta q}{q}\right)}{\left(\frac{\Delta p}{p}\right)} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

Price Elasticity of Demand Formula

$$\epsilon_{q,p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

- First term: *direction* of the effect
  - This is the **price effect**!
  - Always *negative*!
- Second term: *magnitude* of the effect
  - Will change depending on p and q

Price Elasticity of Demand Formula

$$\epsilon_{q,p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

- You've learned **"arc"**-price elasticity using the **"midpoint formula"** between 2 points

- This is a more general formula, we can find the **elasticity at any *one* point**!

- We can actually simplify this even more...does the first term remind you of anything?

Price Elasticity of Demand Formula

$$\epsilon_{\mathbf{q,p}} = \frac{\mathbf{1}}{\mathbf{slope}} \times \frac{\mathbf{p}}{\mathbf{q}}$$

- First term is actually the inverse of the slope of the inverse demand curve (that we graph)!

- To find the elasticity at any point, we need 3 things:

  1. The price
  2. The associated quantity demanded
  3. The slope of (inverse) demand

Example

Example: The demand for movie tickets in a small town is given by:

$$q = 1000 - 50p$$

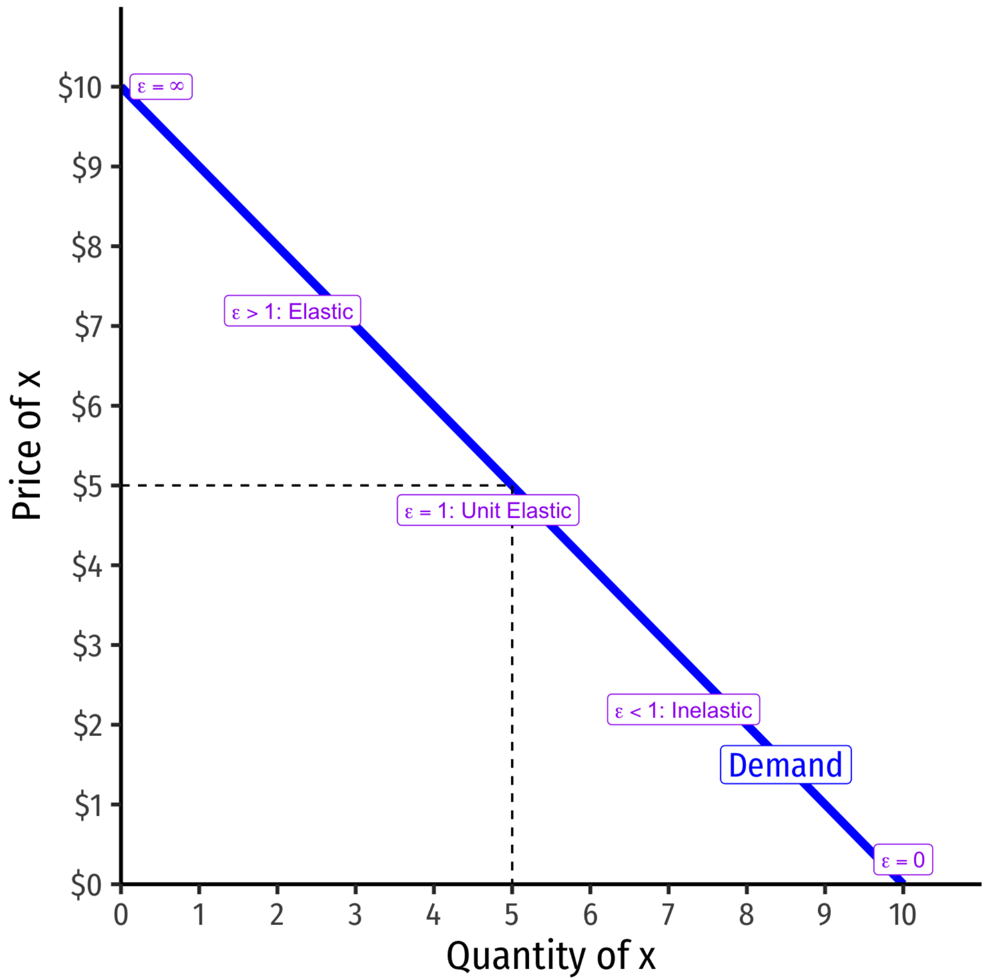
1. Find the inverse demand function.

2. What is the price elasticity of demand at a price of $5.00?

3. What is the price elasticity of demand at a price of $12.00?

4. At what price is demand unit elastic (i.e. $\epsilon q, p = -1$)?

Price Elasticity Changes Along the Demand Curve



$$\epsilon_{q,p} = \frac{\mathbf{1}}{\mathbf{slope}} \times \frac{\mathbf{p}}{\mathbf{q}}$$

- **Elasticity** $\neq$ **slope** (but they are related)!
- **Price elasticity changes along the demand curve**
- Gets *less* elastic as $\downarrow$ price ($\uparrow$ quantity)
  - $\frac{1}{slope}$ is constant
  - $\frac{p}{q}$ gets smaller as $\downarrow p$ and $\uparrow q$

Determinants of Price Elasticity of Demand

What determines how responsive your buying behavior is to a price change?

- More (fewer) **substitutes** $\implies$ more (less) elastic
  - Larger categories of products (less elastic) vs. specific brand (more elastic)
  - **Necessities** (less elastic) vs. **luxuries** (more elastic)
  - Large (more elastic) vs. small (less elastic) **portion of budget**
- More (less) **time to adjust** $\implies$ more (less) elastic

Price Elasticity of Demand and Revenues

Price Elasticity of Demand and Revenues

- Price elasticity of demand is closely related to **Revenues** $(R)^{\dagger}$

$$R(q) = pq$$

† From the buyer's side, this is **total expenditures**.

Price Elasticity of Demand and Revenues

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Demand is	ΔR and Δp
Elastic $\|\epsilon\| > 1$	p & R change **opposite**
Unit Elastic $\|\epsilon\| = 1$	R **maximized**
Inelastic $\|\epsilon\| < 1$	p & R change **together**

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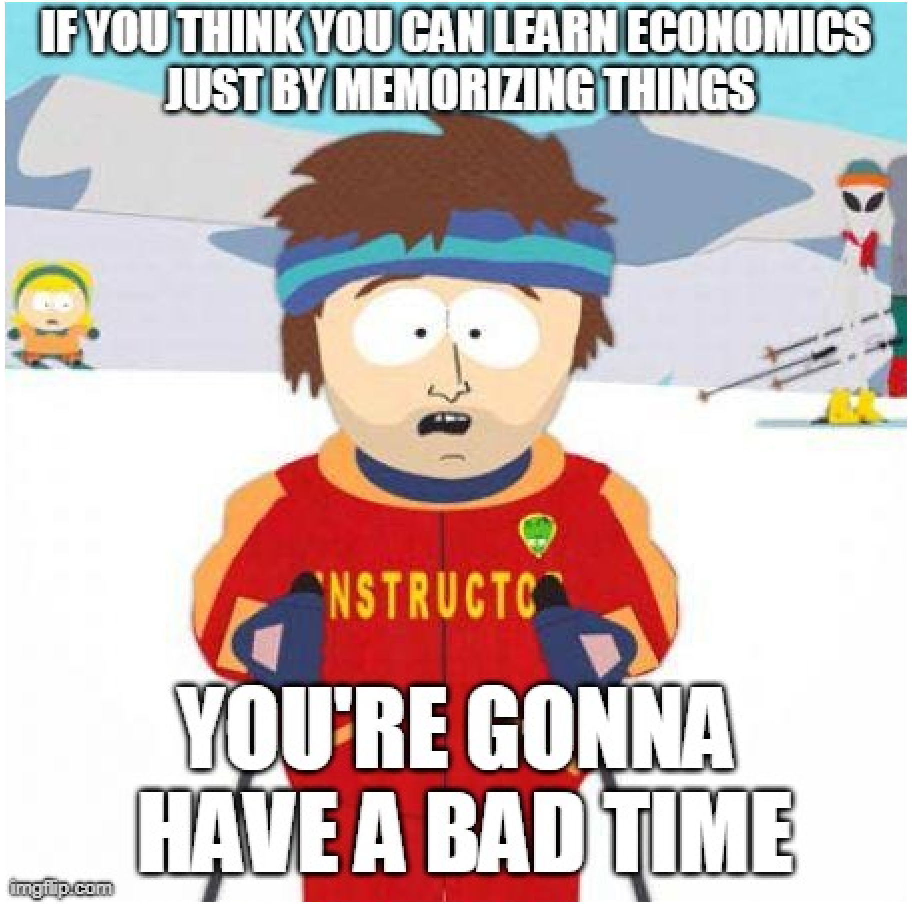
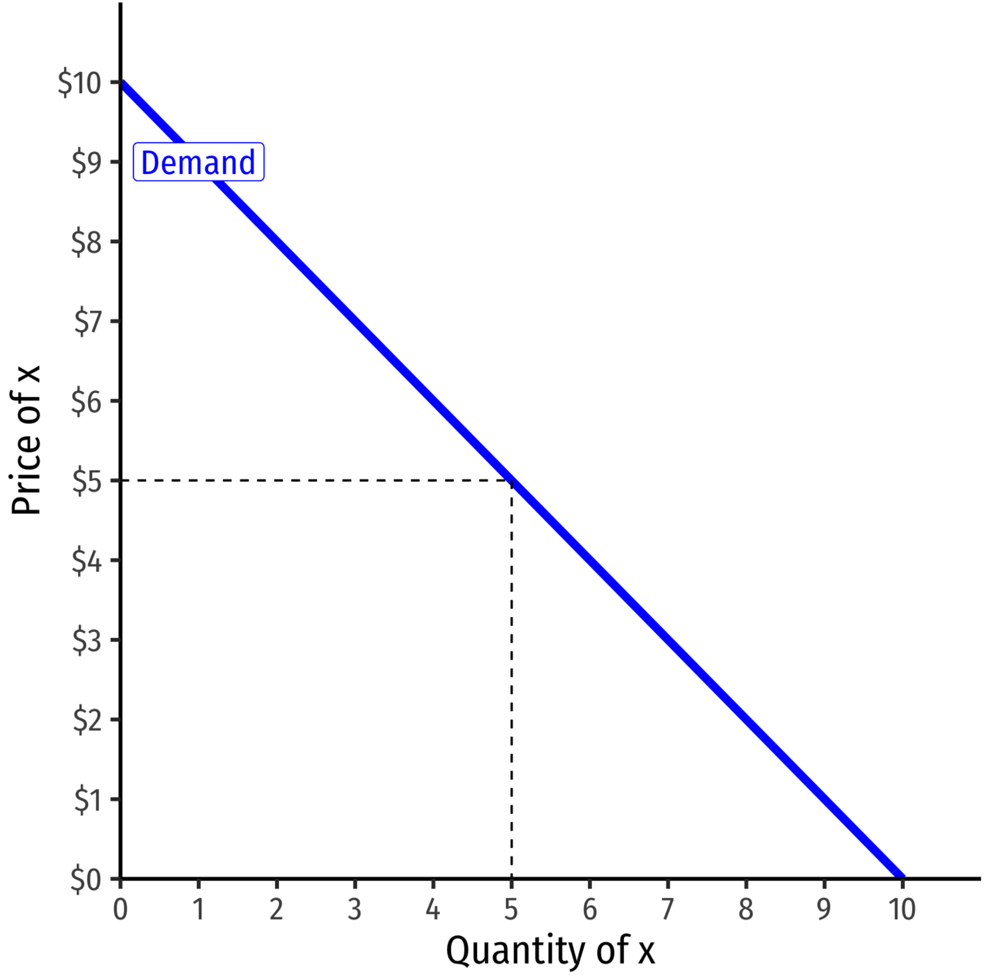
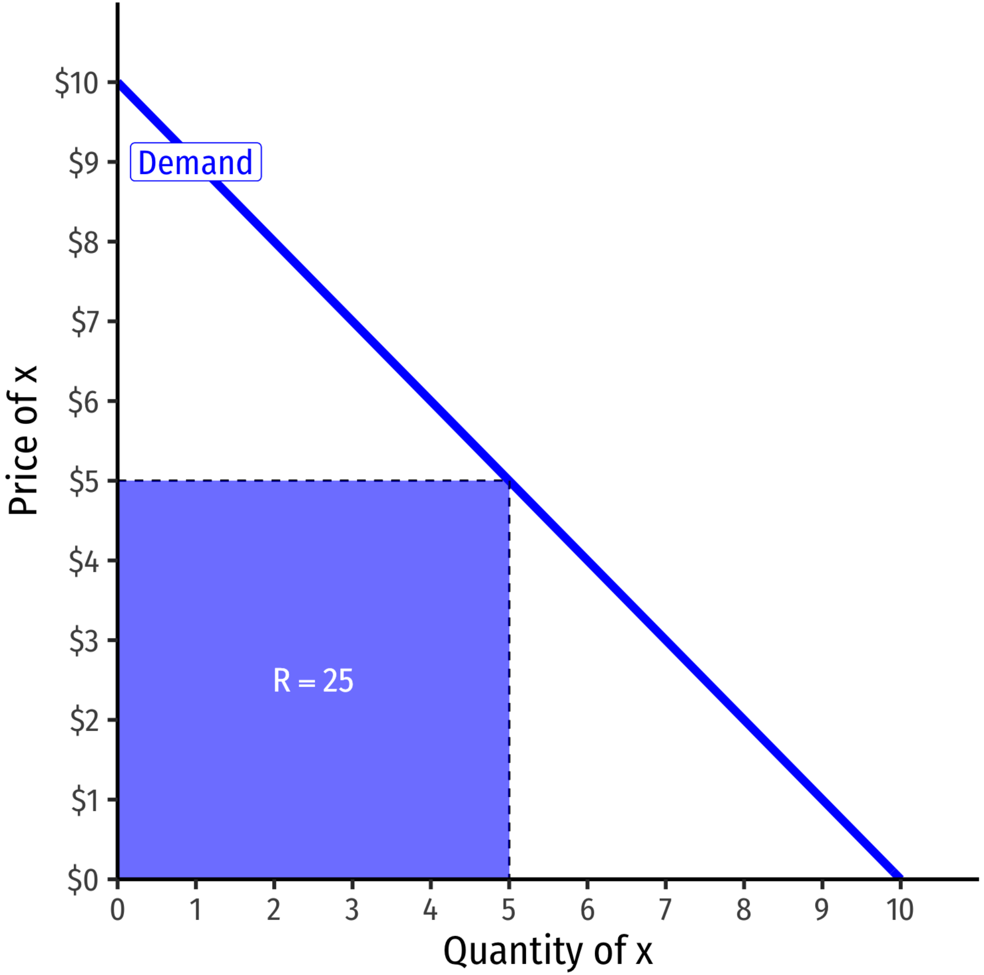


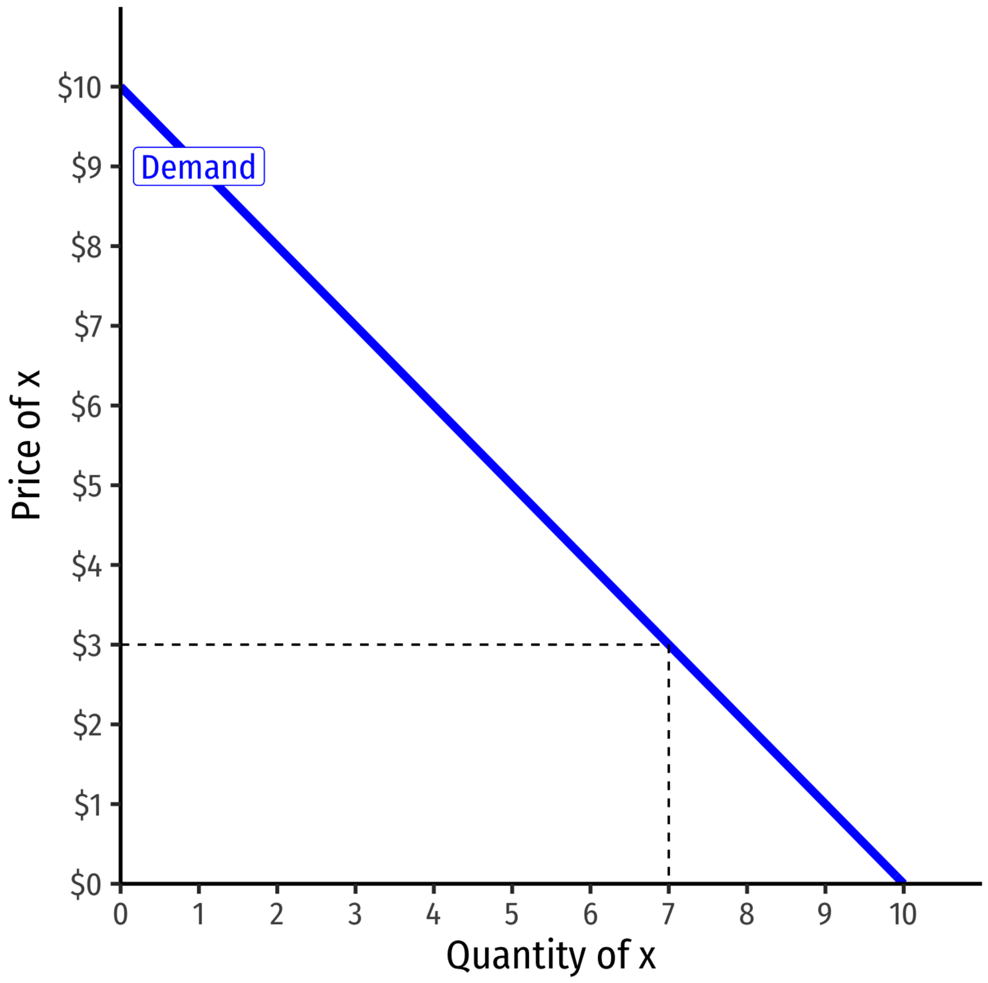
Revenues: Example I



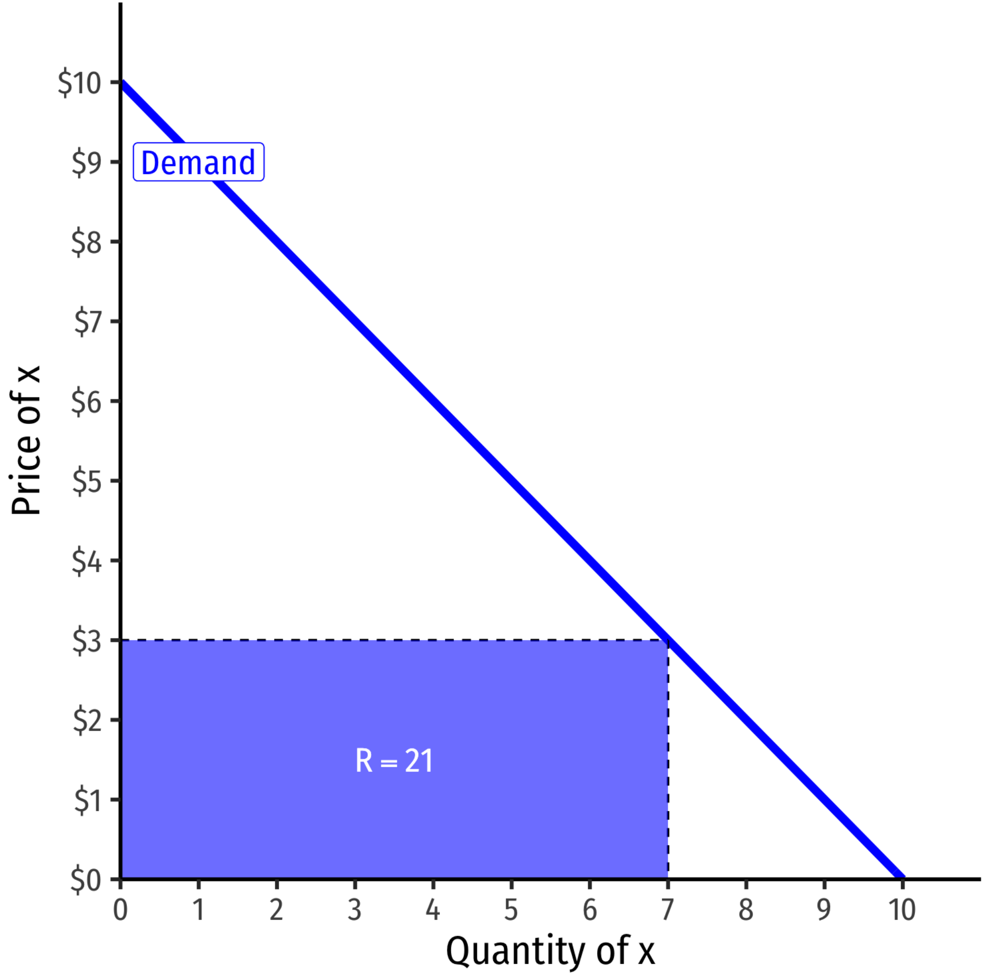
Revenues: Example I



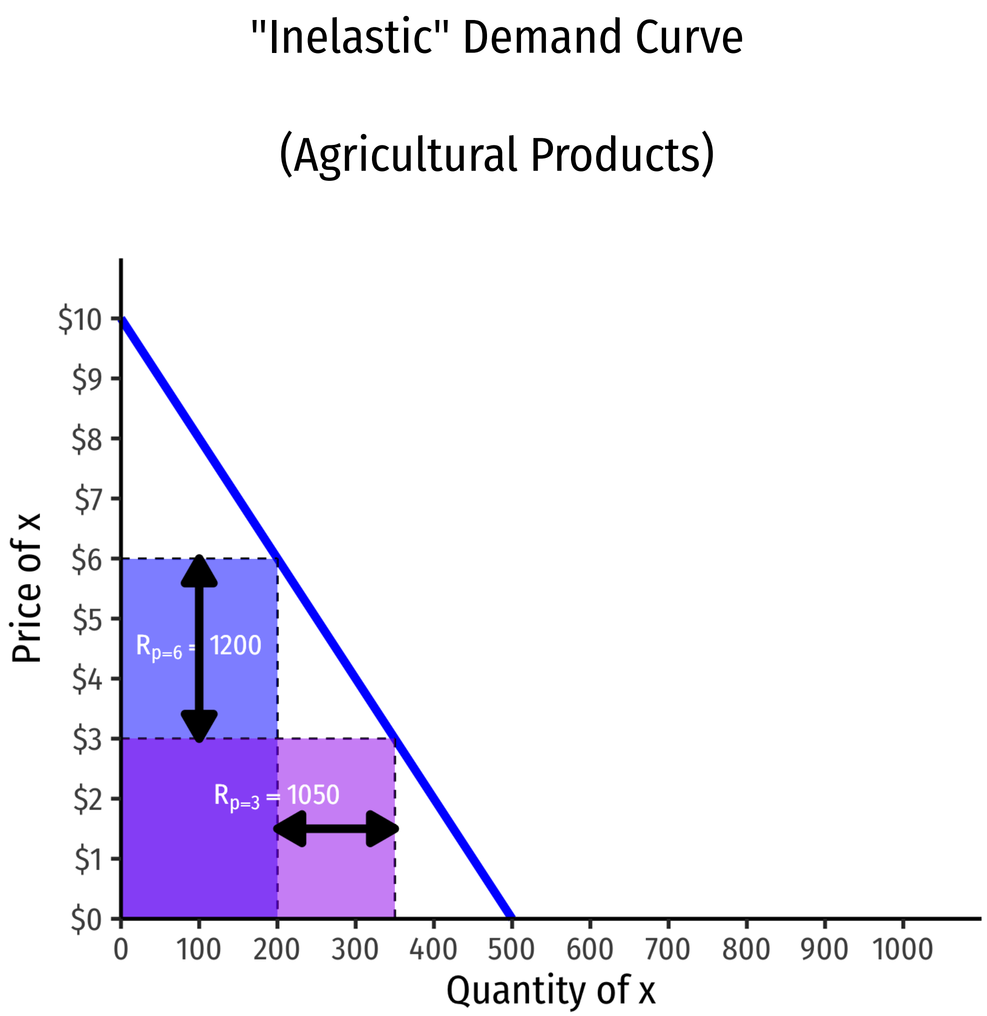
Revenues: Example II

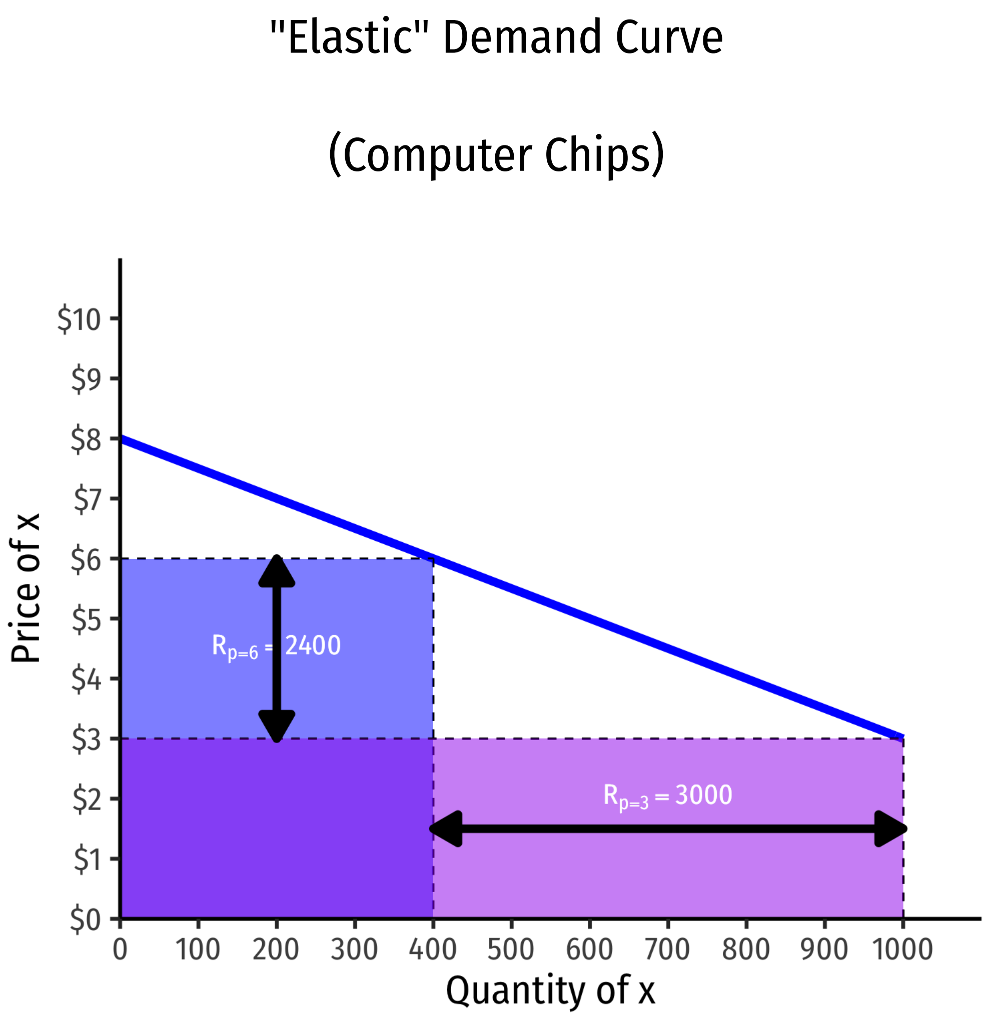


Revenues: Example II



Visualizing Price Elasticity of Demand and Revenues

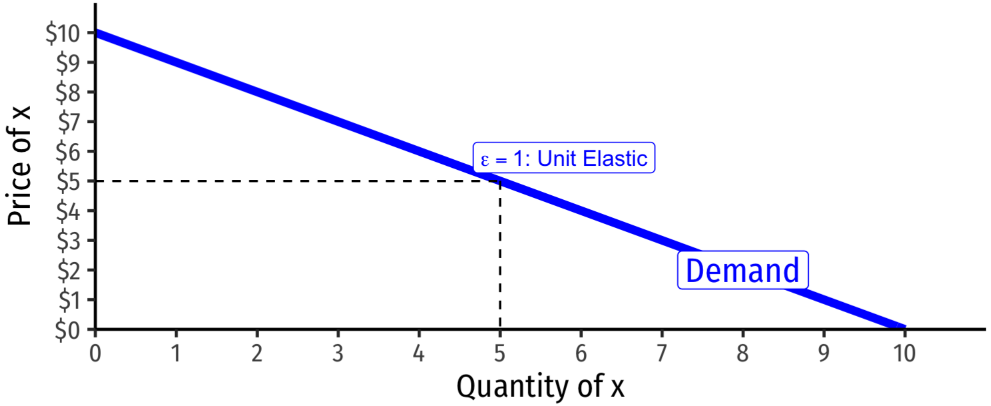


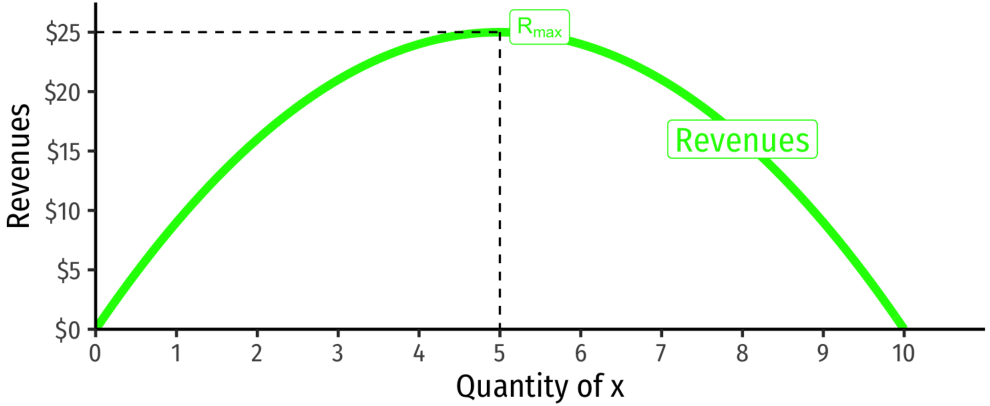


Price Elasticity and Revenues

$$R(q) = pq$$

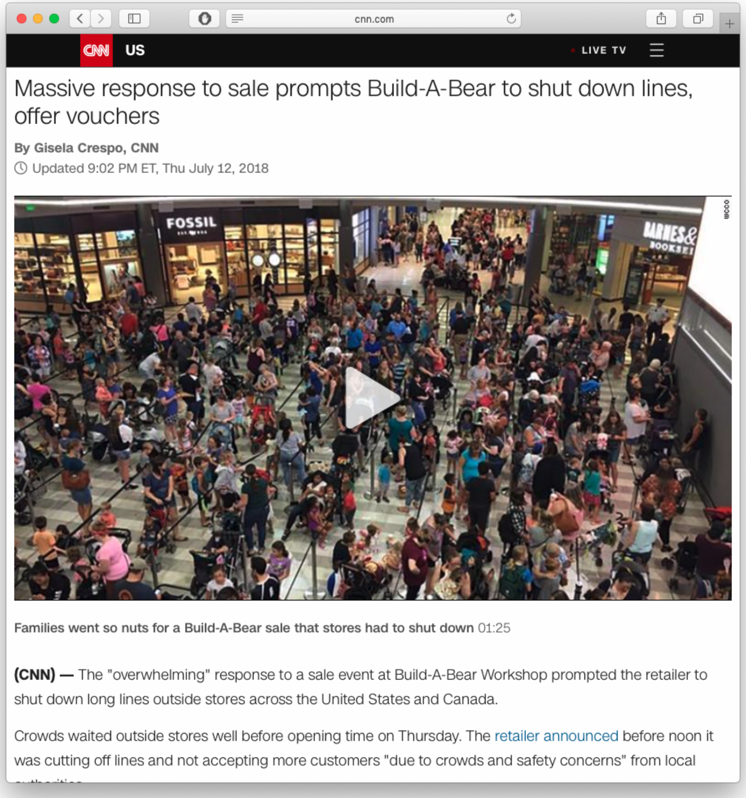
q	p	$R(q)$
0	10	0
1	9	9
2	8	16
3	7	21
4	6	24
5	**5**	**25**
6	4	24
7	3	21
8	2	16
9	1	9
10	0	0





Revenue max'ed at price where $\epsilon = -1$

Price Elasticity and Revenues: Example I


cnn.com
CNN US LIVE TV

Massive response to sale prompts Build-A-Bear to shut down lines, offer vouchers

By Gisela Crespo, CNN
Updated 9:02 PM ET, Thu July 12, 2018

Families went so nuts for a Build-A-Bear sale that stores had to shut down 01:25

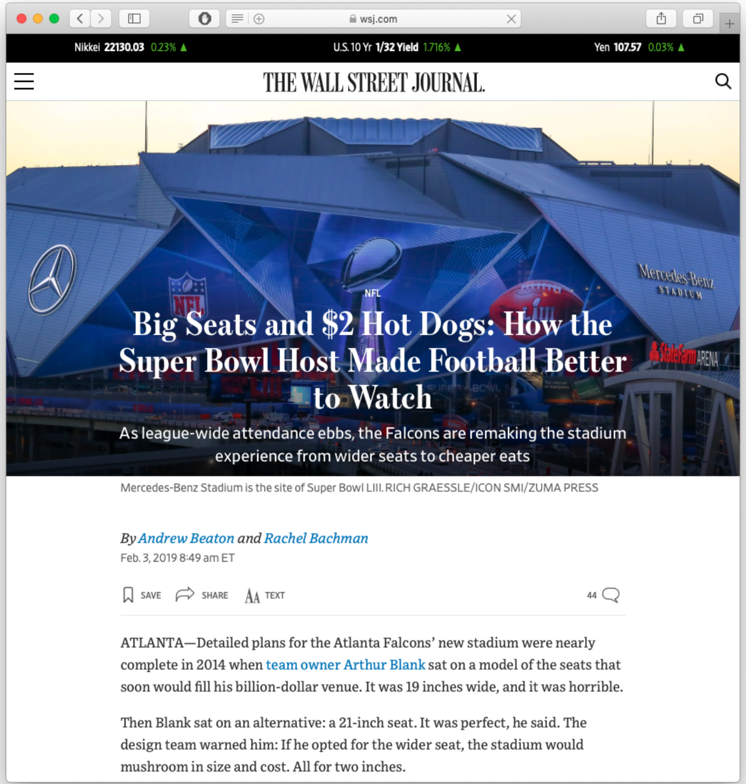
(CNN) — The "overwhelming" response to a sale event at Build-A-Bear Workshop prompted the retailer to shut down long lines outside stores across the United States and Canada.

Crowds waited outside stores well before opening time on Thursday. The retailer announced before noon it was cutting off lines and not accepting more customers "due to crowds and safety concerns" from local

> "Build-A-Bear announced its Pay Your Age event earlier this week. Customers who show up to the stores can pay their current age for the popular stuffed animals. On Wednesday, the retailer wrote on its Facebook page that it was 'anticipating potential of long lines and wait times.'"

Source: CNN (July 2, 2018)

Price Elasticity and Revenues: Example II



Nikkei 22130.03 0.23% ▲ U.S. 10 Yr 1/32 Yield 1.716% ▲ Yen 107.57 0.03% ▲

THE WALL STREET JOURNAL.

Big Seats and $2 Hot Dogs: How the Super Bowl Host Made Football Better to Watch

As league-wide attendance ebbs, the Falcons are remaking the stadium experience from wider seats to cheaper eats

Mercedes-Benz Stadium is the site of Super Bowl LIII. RICH GRAESSLE/ICON SMI/ZUMA PRESS

By *Andrew Beaton* and *Rachel Bachman*
Feb. 3, 2019 8:49 am ET

SAVE SHARE TEXT 44

ATLANTA—Detailed plans for the Atlanta Falcons' new stadium were nearly complete in 2014 when team owner Arthur Blank sat on a model of the seats that soon would fill his billion-dollar venue. It was 19 inches wide, and it was horrible.

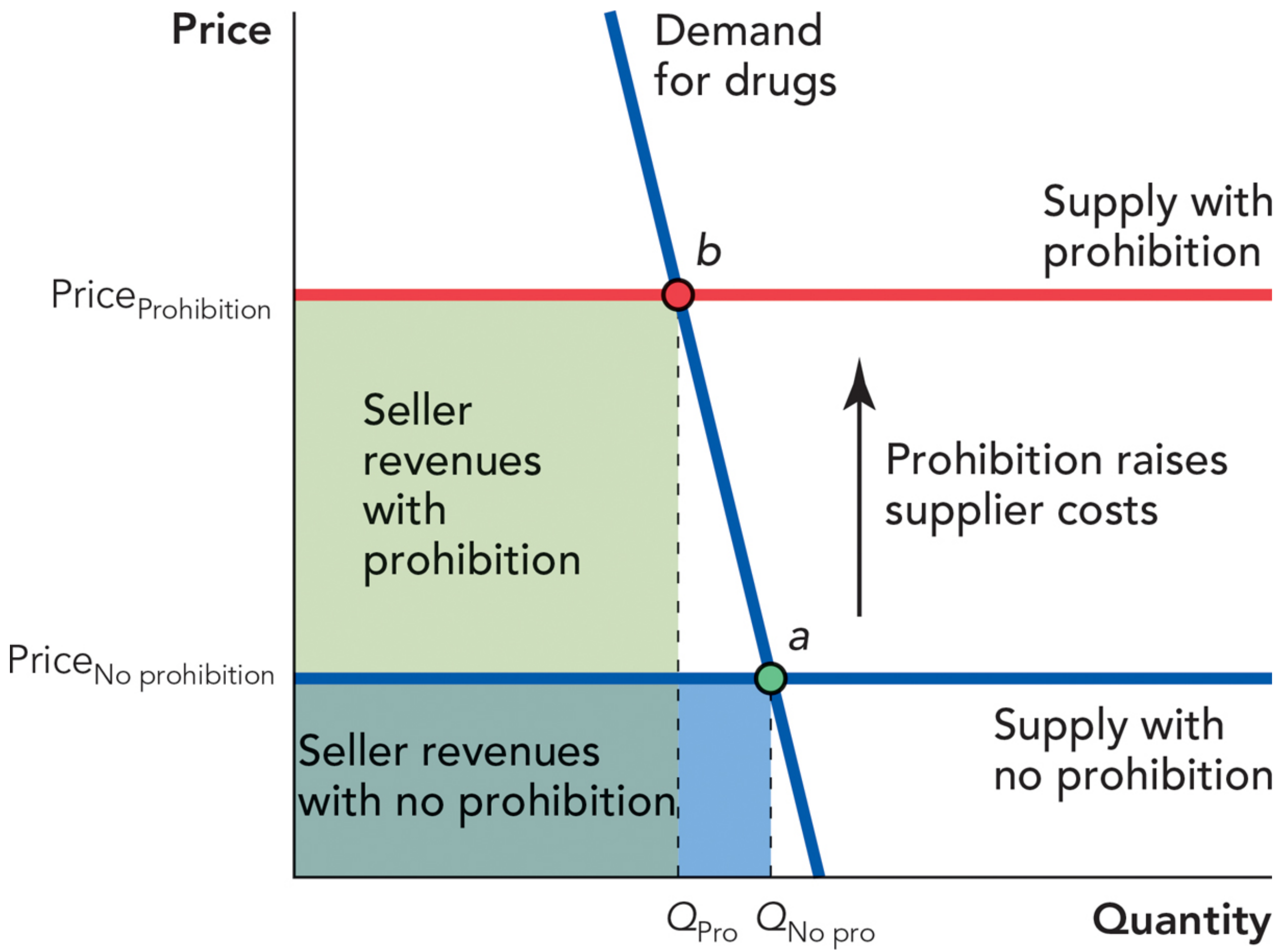
Then Blank sat on an alternative: a 21-inch seat. It was perfect, he said. The design team warned him: If he opted for the wider seat, the stadium would mushroom in size and cost. All for two inches.

Source: Wall Street Journal (Feb 3, 2019)

"While leaguewide average attendance dropped .43% this season to its lowest level since 2010, Atlanta's attendance rose for the second season. Mercedes-Benz Stadium and the Falcons have become the model for drawing fans and keeping them happy."

"Instead of charging elevated sums—a long-held industry practice that fans despised—the Falcons would price most of its food at what it sold for on the street...**Prices plunged 50%.** Fans rejoiced. **Although the team made less money on each $2 hot dog it sold, it made more overall.** Average fan spending per game rose 16%. Atlanta's food services, which ranked 18th in the NFL in the 2016 annual league survey, shot up to No. 1 in 2017 in every metric—and by a wide margin."

Price Elasticity and Revenues: Example III

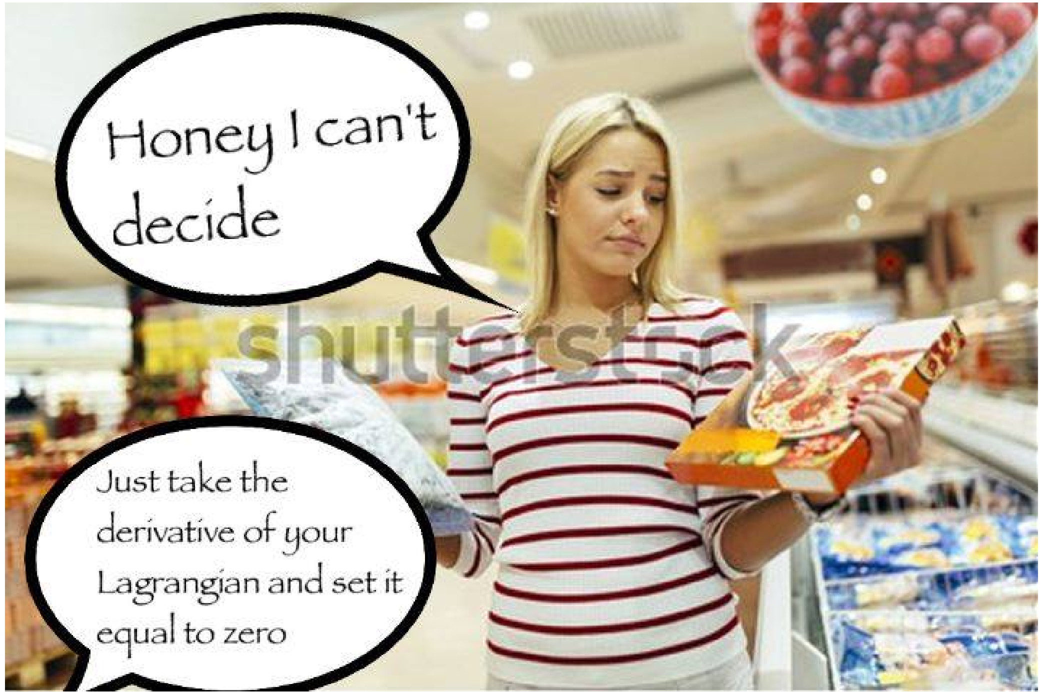


Cowen & Tabarrok (2014: p.75)

Price Elasticity and Revenues: Example IV

Summing Up Unit 1

Models of Individual Choice I



> "All models are lies. The art is telling useful lies." - George Box

- Remember, we're not modelling the **process** by which people **actually** choose

- We're **predicting consequences** (in people's choices) when **parameters change**

Models of Individual Choice II

- Constrained optimization models are the **main** workhorse model in economics

- All constrained optimization models have three moving parts:

1. **Choose:** < some alternative >

2. **In order to maximize:** < some objective >

3. **Subject to:** < some constraints >

Models of Individual Choice III

Applications of Consumer Theory

- See today's class notes page for some applications of consumer theory:

1. **Uncertainty**: risky outcomes & insurance

2. **Exchange**: two individuals trading their endowments, general equilibrium, & Pareto efficiency

3. **Taxes**: Which is better for consumers, a consumption tax or a (revenue-equivalent) income tax?

4. **Intertemporal choice**: saving, borrowing, lending, & interest