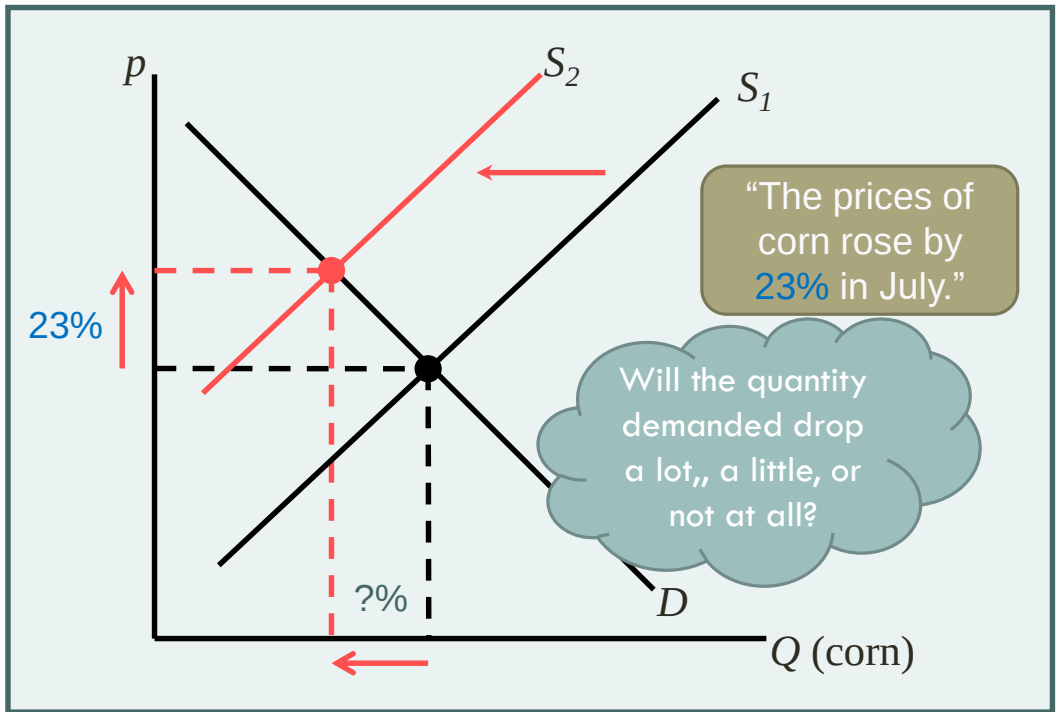
3. ELASTICITY

ECON1005 Principles of Economics I (Microeconomics)

APPLICATION: SOARING GRAIN PRICES

- A lack of rain has brought the worst drought in over 50 years to a region that usually provides over half the corn (maize).
- The world's other big corn-exporting areas, South America and Ukraine, have also suffered droughts.

(Source: Corn on the cusp, *The Economist*, 4 August, 2012)




The Economist August 4th 2012

Soaring grain prices

Corn on the cusp

Another food crisis looms

DARK clouds gathered on the horizon foretell doom in the popular imagination. Yet it is the prolonged absence of them in America's Midwest that threatens global grain and soyabean markets. A lack of rain has brought the worst drought in over 50 years to a region that usually provides over half the corn (maize) and more than two-fifths of the soya to world markets. A downpour in the next few days will not save the corn—it has been too hot and dry for too long—but it might limit damage to the soya crop and the market as a whole.

After two lean seasons, expectations for a bumper corn crop were high, according to Kona Haque of Macquarie, a bank. The bad years meant high prices. Planting began early and hit a record as corn won the battle for acres with soya and cotton. The weather began well. In May three-quarters of the corn was judged in good or excellent condition by America's Department of Agriculture. Parched earth means that just a quarter of the crop now gets that rating, one of the lowest ever.

Corn prices have climbed (see chart) and hopes that low stocks might be replenished have been dashed. America's crop goes in roughly equal measure to producing ethanol, feeding livestock and for export. All three will feel the pinch.

Ethanol production has already dropped sharply. American law requires that a set amount is blended with petrol. Discretionary blending above the mandate is falling. Poultry, beef and pork producers, facing rising feed bills, have called for the mandate to be waived. This would probably not help much. By reducing exports, drawing from stocks and using paper credits accrued from exceeding mandates previously, ethanol supplies can be maintained while corn demand is cut.

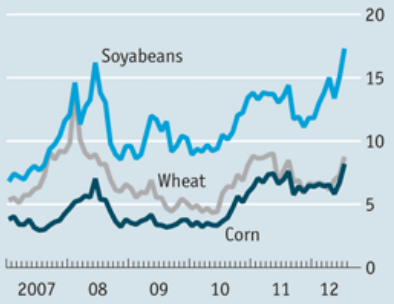
And in an election year Barack Obama is unlikely to risk the wrath of corn-growing swing states such as Ohio, Michigan and Iowa by doing anything that will hit prices. Livestock farmers have no such clout and face a tough decision. A wobbly economy makes it hard to pass on rising feed prices to customers. Some are sending animals for slaughter, pushing prices down. Others are hanging on, in the hope that prices will later surge as a result.

America can cut corn exports. But the world's other big corn-exporting regions, South America and Ukraine, have also suffered droughts. Big importers, such as Japan, South Korea and many poor countries, face a problem. Bad weather in Russia will also hit exports of wheat. And high corn prices last year encouraged a switch to feeding livestock with low-grade wheat, depleting stockpiles. So the prospects for substitution are limited.

If the rains come too late to save America's soya harvest, a bad situation could become dire and hit the whole food sector, according to Abdolreza Abbassian of the UN Food and Agriculture Organisation. Bad weather in South America has affected soya already. Rising wheat prices and a failure of America's soya harvest might scare nervy Asian countries into a new export ban just as during the 2008 crisis of 2007-08. Even if they do not, hopes for a sustained drop in food prices have been dashed for another year. ■

Field events

Grain and oilseed prices, $ per bushel



Source: Thomson Reuters

1. ELASTICITY: MEASURING SENSITIVITY

- Economists usually use the concept of **elasticity** to measure the *sensitivity* of one variable to another.
  - E.g. the sensitivity of the quantity demanded to *any* demand determinant.

$$y = f(x, \dots)$$

- In general, elasticity is the *percentage change* in one variable, say *y*, in response to a given *percentage change* in another variable, say *x*, *ceteris paribus*.

$$E_{y,x} = \frac{\text{percentage change in } y}{\text{percentage change in } x} = \frac{\frac{\Delta y}{y} \times 100\%}{\frac{\Delta y}{y} \times 100\%}$$

  - It is interpreted as the percentage change in *y* when *x* changes by *one percent*, ceteris paribus.
    - If $\boldsymbol{E_{y,x} = 2}$, it means that when x increases by 1%, y will increase by 2%, ceteris paribus.

2. PRICE ELASTICITY OF DEMAND: HOW SENSITIVE ARE BUYERS TO PRICE CHANGES?

- It measures the sensitivity of the quantity demanded to the price of the good.

$$Q^d = D(p, Y, p_y \dots)$$

- The **price elasticity of demand** is the percentage change in quantity demanded in response to a given percentage change in the price, ceteris paribus. That is

$$E_{D,p} = \frac{\text{percentage change in } Q^d}{\text{percentage change in } p} = \frac{\frac{\Delta Q^d}{Q^d} \times 100\%}{\frac{\Delta p}{p} \times 100\%}$$

  - It is interpreted as the percentage change in quantity demanded when price changes by *one percent*, ceteris paribus.

- The law of demand implies that $E_{D,p} < 0$ (MUST be a negative number).
  - So, when we discuss about price elasticity of demand, we can focus on its absolute value.

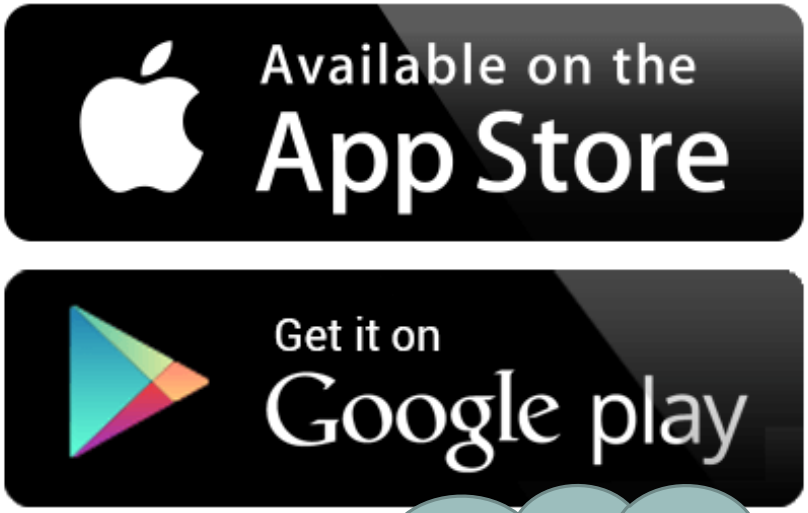
APPLICATION: PRICE ELASTICITY OF APPS

The Apple App Store (iOS) and Google Play (Android) each have about 1.4 million apps as of early 2015.

Ghose and Han (2014) estimated that **the price elasticity of demand for an app in the Apple App Store is 2.0**.

On the other hand, the estimated **price elasticity of demand for an app in Google Play is 3.7**.

Android users are almost twice as sensitive to price changes as Apple users.



Which group of consumers are more sensitive to price changes for apps?

(Source: Ghose, A., and Han, S.P., "Estimating Demand for Mobile Applications in the New Economy," *Management Science*, 60(6), June 2014, p.1470-1488.)

2. PRICE ELASTICITY OF DEMAND

- Based on its sensitivity to price change, demand for a good can be categorized into:

Category	Elasticity Value
Perfectly elastic demand	$E_{D,p} = \infty$
Elastic demand	$\infty > E_{D,p} > 1$
Unit elastic demand	$E_{D,p} = 1$
Inelastic demand	$1 > E_{D,p} > 0$
Perfectly inelastic demand	$E_{D,p} = 0$

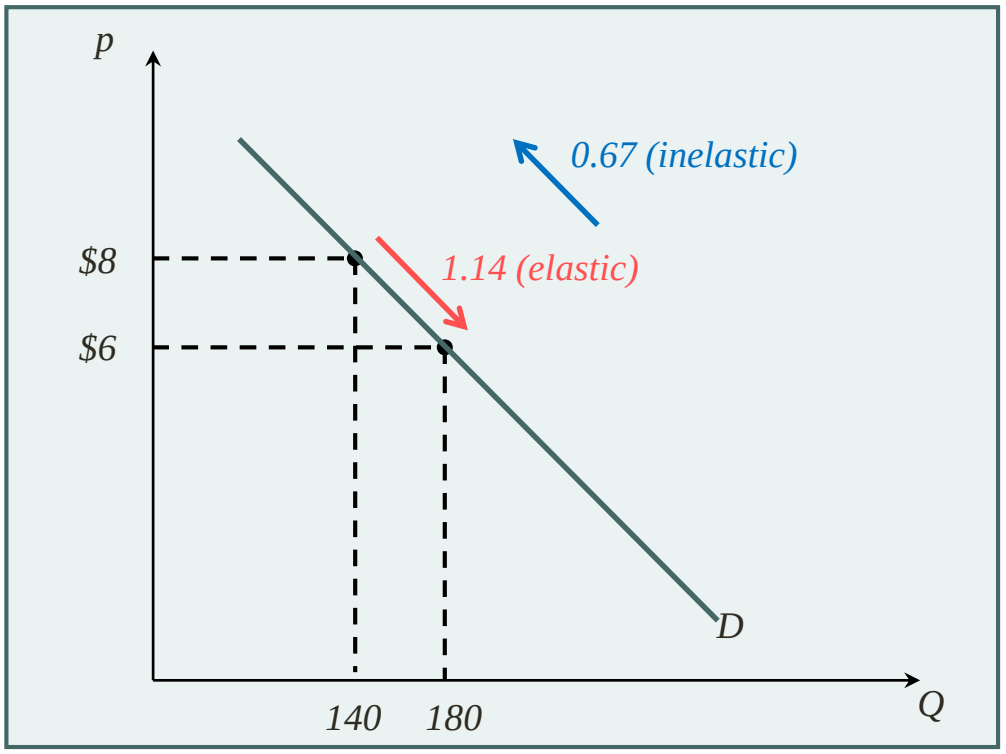


2. PRICE ELASTICITY OF DEMAND

Price	Quantity demanded
$10	100
$8	140
$6	180
$4	220
$2	260

When *p* drops from **$8 to $6**, the Q^d rises from **140 to 180**.
What is the price elasticity of demand over this range?

$$E_{D,p} = \frac{\frac{40}{140} \times 100\%}{\frac{2}{8} \times 100\%} = \frac{28.57\%}{25\%} = 1.14$$



When *p* rises from **$6 to $8**, the Q^d drops from **180 to 140**.
What is the price elasticity of demand?

$$E_{D,p} = \frac{\frac{40}{180} \times 100\%}{\frac{2}{6} \times 100\%} = \frac{22.22\%}{33.33\%} = 0.67$$

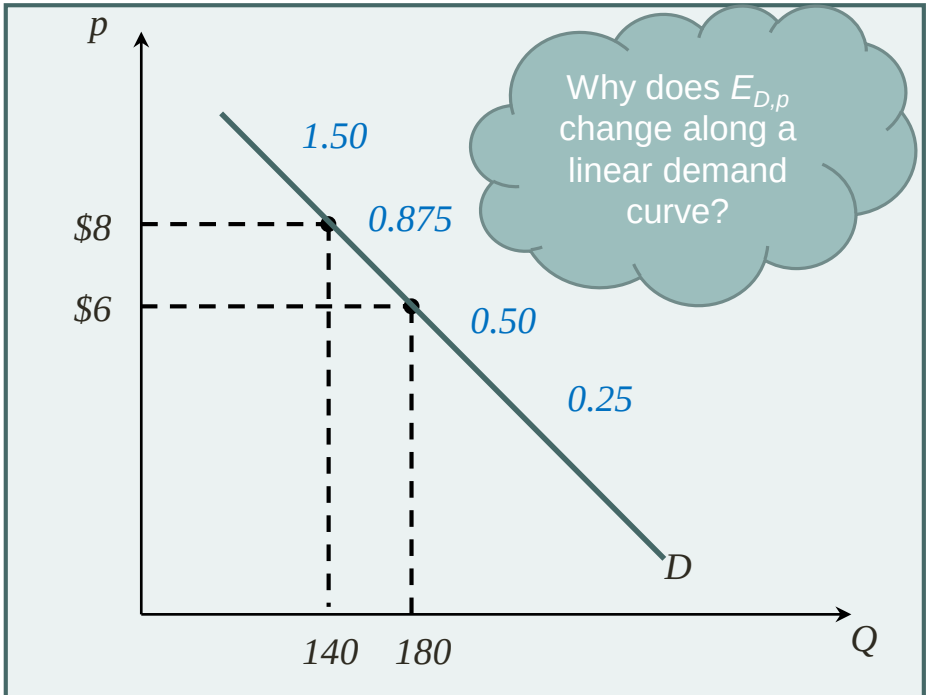
2. PRICE ELASTICITY OF DEMAND

- To obtain a consistent elasticity value, the *midpoint formula* is therefore used in computing elasticity:

$$E_{D,p} = \frac{\text{percentage change in } Q^d}{\text{percentage change in } p} = \frac{\frac{\Delta Q^d}{Q^d_{Avg}} \times 100\%}{\frac{\Delta p}{p_{Avg}} \times 100\%}$$

- Using the midpoint formula, the price elasticity of demand *between $6 and $8* can be calculated:

$$E_{D,p} = \frac{\frac{40}{160} \times 100\%}{\frac{2}{7} \times 100\%} = \frac{25\%}{28.57\%} = 0.875$$



- *Which method should we use?*

The difference between the two methods are insignificant when price changes are small.

3. PRICE ELASTICTY AND THE SHAPE OF DEMAND CURVES

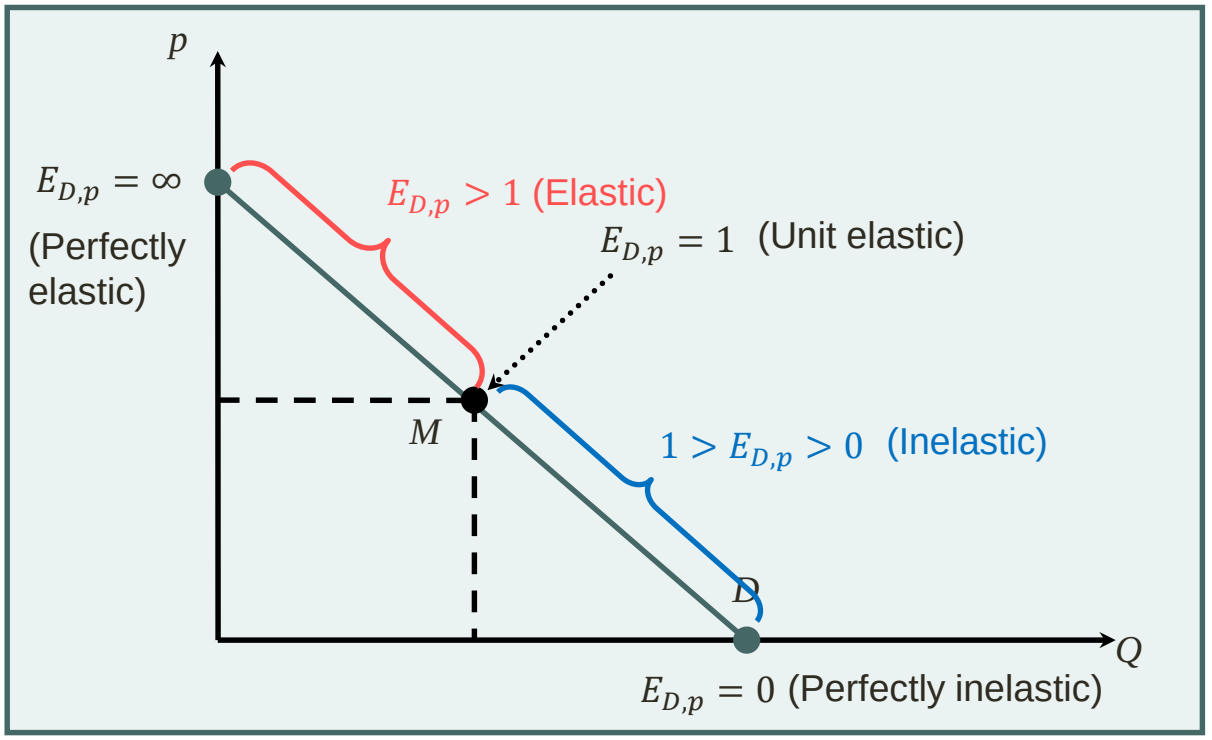
- Along a *straight-line* (or *linear*) demand curve, demand becomes less elastic as we move downward.

$$E_{D,p} = \frac{\frac{\Delta Q^d}{Q^d}}{\frac{\Delta p}{p}} = \frac{\Delta Q^d}{\Delta p} \times \frac{p}{Q^d}$$

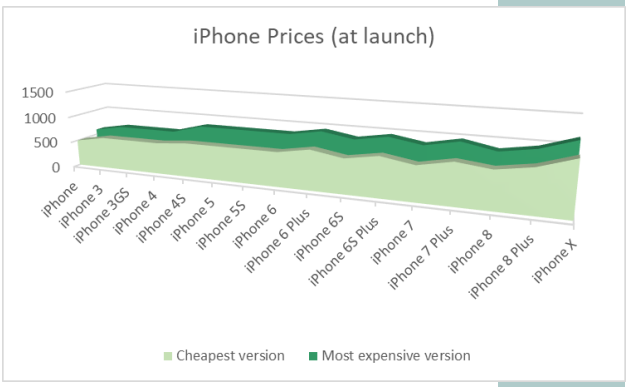
$$= \frac{1}{\text{Slope of Demand Curve}} \times \frac{p}{Q^d}$$

The slope is constant along a straight-line demand curve

When p drops and Q^d rises, i.e. moving down the demand curve, how would $E_{D,p}$ change?







(Source: Apple results to show iPhone growth problem and Cook's plan to fix it. Samsung Note 8 price soars as competition heats up, *The Nation*, Sept 4th, 2017.)



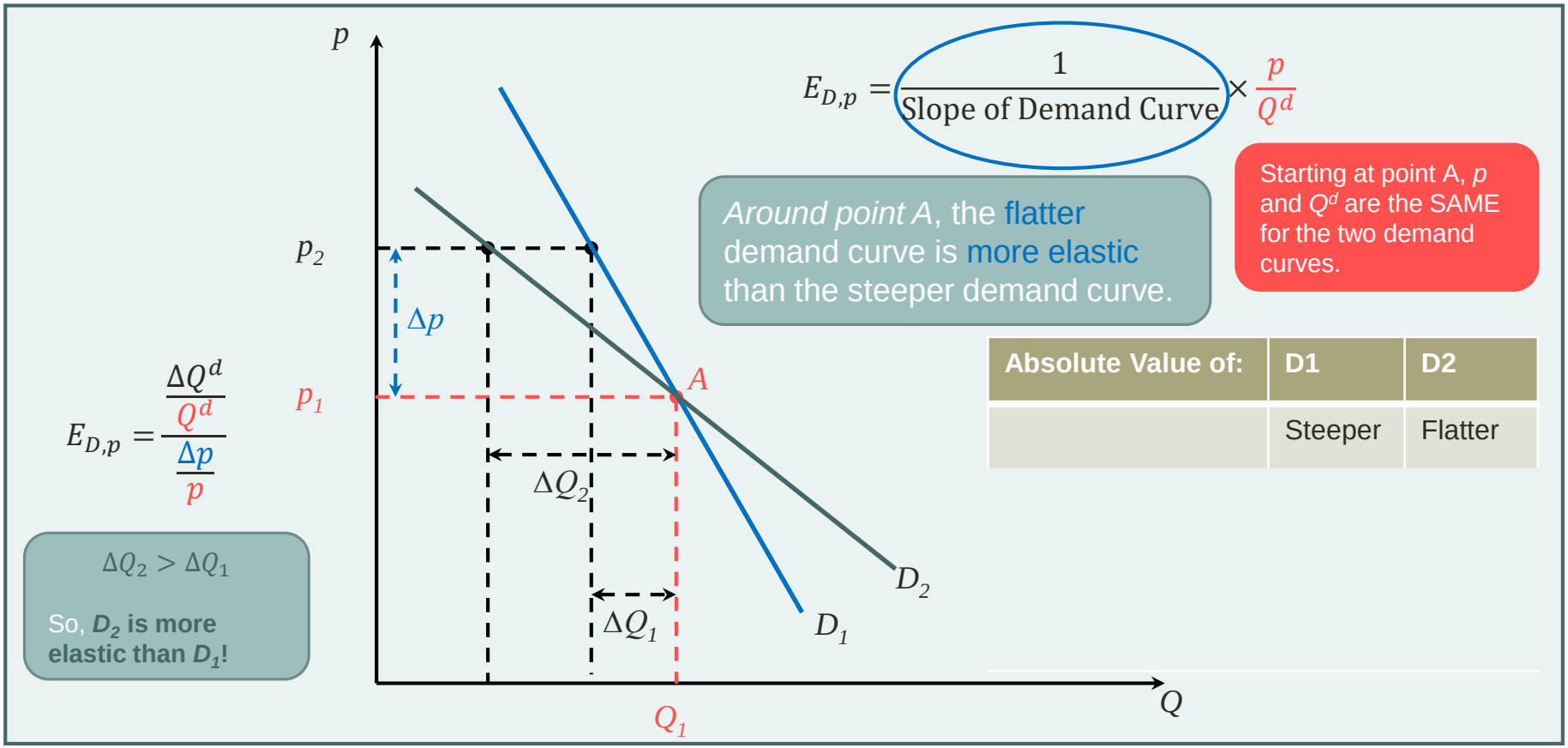
(Source: iPhone price increase would pose the risk of demand destruction: UBS, *Investing.com*, Sept 8th, 2025.)

APPLICATION: IPHONE PRICING

- For years, demand for iphone was price inelastic.
- In 2017, Apple launched the iPhone X for **$999** (much higher than previous models).
  - Sales dropped more than Apple expected. Apple had to cut their sales estimates and its stock price fell by almost 8% in two weeks.
- According to Bernstein analyst, **the high price** was too much for many buyers. Apple may have somewhat **mis-estimated price elasticity** this time!
  - Apple later released the **iPhone XR** at around **$700**, a price that's proven successful for many years.
- ***Will history repeat itself?***
- With **iPhone 17** coming soon, **UBS analysts** warn that raising prices implicitly (by cutting 128GB model) or explicitly would pose the risk of demand destruction, when smartphone **elasticity remain high**.

3. PRICE ELASTICTY AND THE SHAPE OF DEMAND CURVES

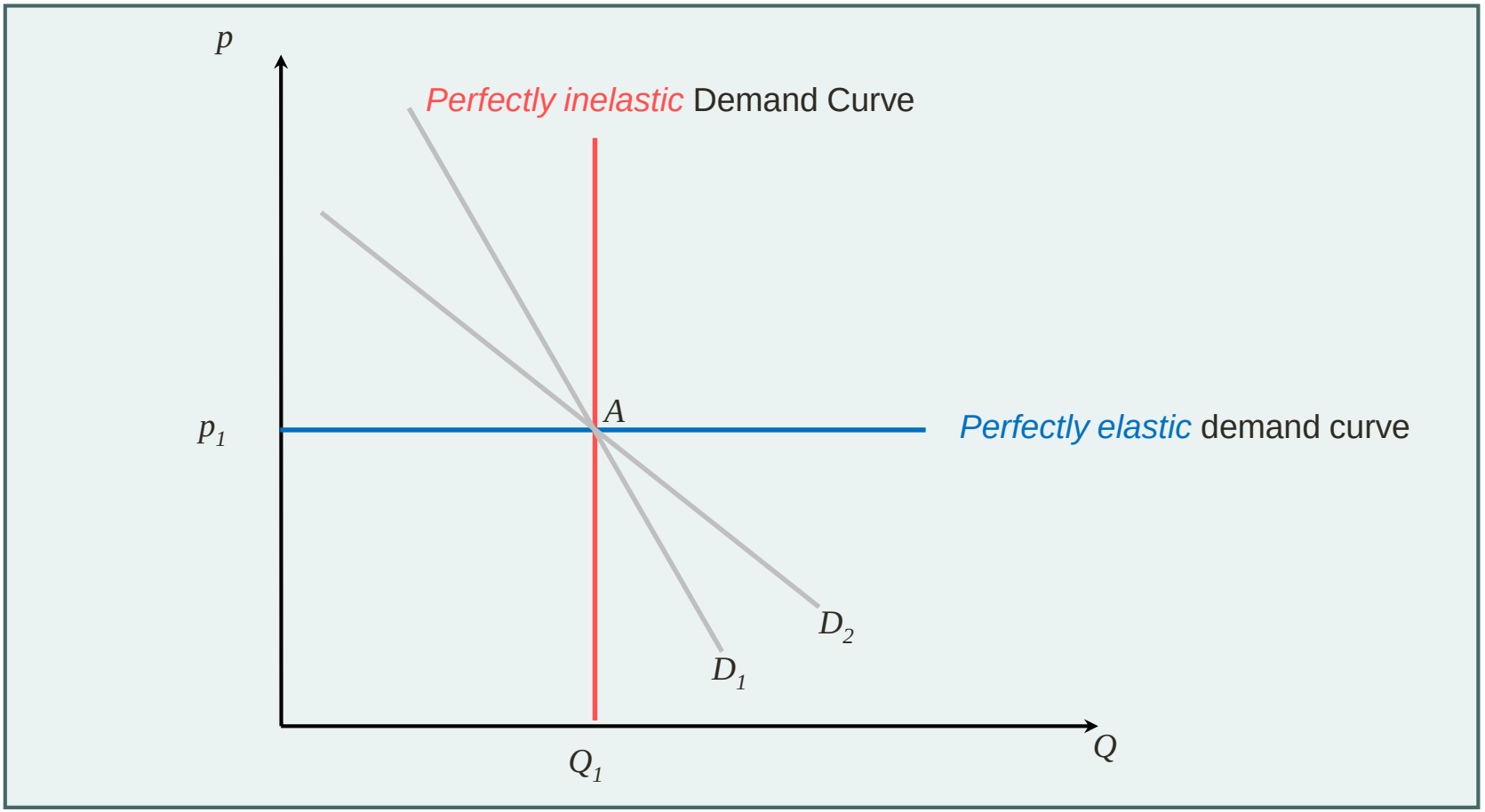
- The price elasticity of demand between two demand curves can be compared based on their shape (slope in particular) *if they cross at the same point* (say, point A).



Absolute Value of:	D1	D2
	Steeper	Flatter

3. PRICE ELASTICTY AND THE SHAPE OF DEMAND CURVES

- Two special cases:



APPLICATION: ELASTIC BRANDS

- Prices are higher due to inflation, but many Americans are still spending. *Why?*
- There is a shift in consumers' sensitivity to prices, or "**price elasticity of demand**".
- In the past year, experts, investors and company executives said people have become **less sensitive to prices**.
  - Bosses PepsiCo, talked of favourable "demand elasticity trends".
- Using data on prices and sales across more than 125,000 supermarkets and other stores, IRI, a market research firm, shows that consumers were **about 20% less price sensitive** recently than before the COVID pandemic.
- James Quincey, boss of Coca-Cola, said, "I expect elasticity to increase at some point in the future. Will that be next quarter? Or will that be next year? I can't give you the answer to that."

(Source: Elastic brands, *The Economist*, 13 October, 2022)



4. PRICE ELASTICITY OF DEMAND AND TOTAL REVENUE

- ***How would the total revenue change when there is an increase in price?***

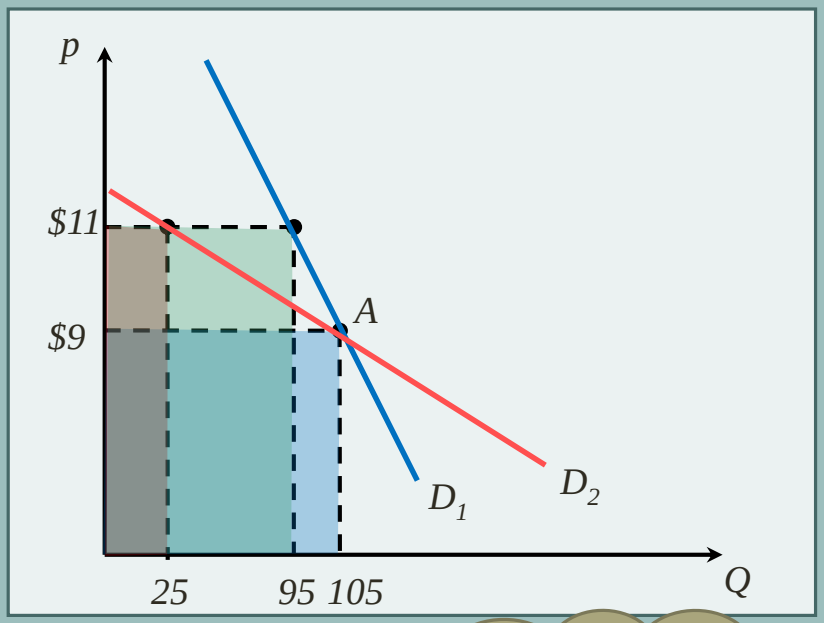
- **Total Revenue** (*TR*) is defined as:

$$TR = p \times Q$$

↓ ↑ by 1% ↓ by > 1%

↑ ↓ by < 1%

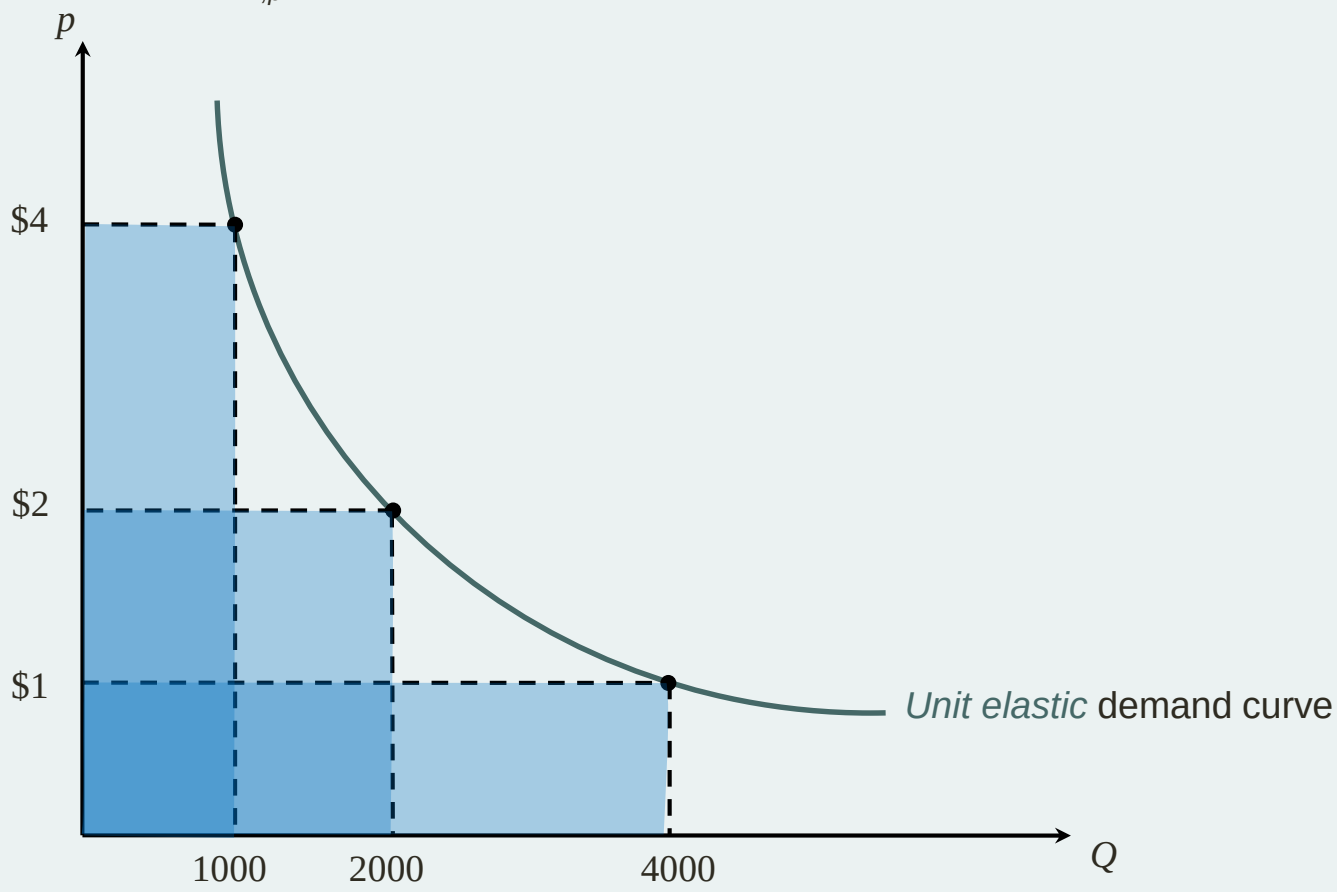
- Given a price increase,
  - If demand is price elastic, $E_{D,p} > 1$, *TR* will decrease.
  - If demand is price inelastic, $E_{D,p} < 1$, *TR* will increase.
  - If demand is unit elastic, $E_{D,p} = 1$, *TR* will remain unchanged.



Why do businesses care about price elasticity of demand?

4. PRICE ELASTICITY OF DEMAND AND TOTAL REVENUE

- *The shape of an unit elastic demand curve:*
  - If demand is unit elastic, $E_{D,p} = 1$, *TR* will remain unchanged.





WHAT'S NEXT

INNOVATION & TECHNOLOGY

Microsoft's Aggressive New Pricing Strategy

CEO Ballmer is increasingly willing to accept lower margins in exchange for higher overall profits

By Peter Burrows

Microsoft has long enjoyed Olympian profit margins, using its monopoly power to maintain prices on its software even in tough times. But now, amid a terrible downturn and rising competition, CEO Steven A. Ballmer is shifting to a scrappier approach. He is cutting prices on a variety of

so cloudy, "we're focusing on gaining share in those areas that are most critical," says Stephen A. Elop, who heads the business division.

On July 13, Elop demonstrated the new Office 2010 in New Orleans. While Microsoft expects most customers to pay for the program the way they always have, less powerful, ad-supported

All of these moves amount to a risky experiment in price elasticity. By lowering prices, the company hopes to increase sales of existing products while making fast headway with new ones. If the company can gain enough market share to cover its massive costs in Web services and Internet search—notably, its vast data centers—every extra dollar will be pure profit. "I'm not saying it will be easy," says Ballmer. "But we have great opportunities to grow total profit dollars."

ONLY $29 IN CHINA

Microsoft is cutting the price of Office and offering the free versions of Word, Excel, and other programs to head off competition from Google and other rivals that offer similar software at little or no cost. Microsoft has so many promotions for Office that its effective price is $100, down from $150, and even lower in such countries as Brazil and India. But the experience is sparking optimism at Microsoft about the new strategy. The company says unit sales of Office surged 415% in the second half of last year.

The most aggressive price cut has come in China, where Microsoft says 95% of Office installations have been pirated. Since it began testing a $29 offer in China last September, sales have soared more than 800%. The low price was "like taking firewood from under the cauldron" of piracy, says Liu Tianxiang, a vice-president with Beijing Federal Software, a Chinese software distributor. He figures Microsoft has sold 80,000 copies of Office in China since the trial started. Now Microsoft intends to make the low price permanent.

Not surprisingly, Microsoft continues to hunt for ways to offset price cuts.



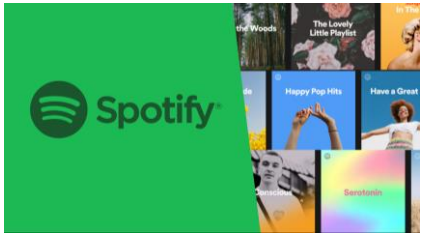
APPLICATION: MICROSOFT'S PRICING STRATEGY

- In 2009, Microsoft decided to offer web applications cloud computing to compete with Google and other similar rivals.
  - The management aims to gain enough revenues from its current product to cover its massive development costs.
- Microsoft's pricing strategy is based on **price elasticity**:
  - Microsoft cut its effective price from $150 to $100 **(by 40%)** (and even lower in some countries, like Brazil and India)
    - Unit sales of Office **jumped by 415%**.!
  - The most aggressive price cut has come in **China**, where Microsoft says **95% of Office installations have be pirated**.
    - Microsoft tried selling Office for just $29, sales have soared more than **800%**.

(Source: Cloud business boosts Microsoft's quarterly revenue, share rise, *Reuters* News, 19 Jul, 2016; Microsoft Aggressive New Pricing Strategy, *Businessweek*, July 27, 2009.)

4. PRICE ELASTICITY OF DEMAND AND TOTAL REVENUE

- Revenue maximization is relevant when additional production costs are zero or very low (i.e. a pure selling problem):
  - Software/video streaming firms selling its app on cloud/video.
    - E.g. Netflix, Spotify, Adobe (Creative Cloud apps), Apple Music, Microsoft (Office 365)
  - A manufacturer selling (or otherwise dispose of) its unsold inventory
    - E.g. Nike Factory Stores, Zara outlets …
  - Airlines/Sport teams filling its empty seats
    - E,g. FC Barcelona (unsold seats via their official platforms or partner resale sites like Ticketmaster or Viagogo as match day approaches), Dallas Mavericks / Miami Heat (Special last-minute deals)







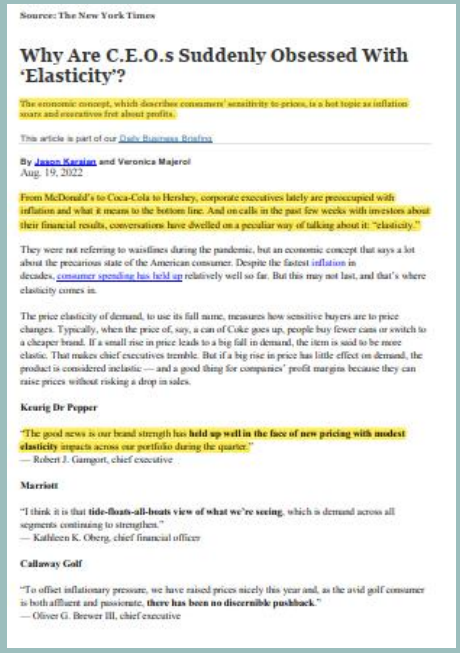




APPLICATION: WHY ARE C.E.O.S SUDDENLY OBSESSED WITH ELASTICITY?

- Recently, as companies raise prices to cover their own rising costs, big brands like McDonald's, Coca-Cola, and Hershey's are paying a lot of attention to the concept of **price elasticity** since higher prices can affect their profits.
- Some companies notice that higher prices reduce demand significantly for some products.
  - Leisure travelers have a price elasticity effect where you can't go much higher – Southwest Airlines
- Other companies, such as Starbucks, stress that their products have remained in demand despite higher prices.
  - The good news is our brand strength has held up well in the face of new pricing with modest elasticity – Keurig Dr Pepper
  - In the first half of the year, we saw minimal price elasticity across our portfolio, we continue to expect more elasticity in the second half of the year than what we have experienced year to date – Hershey's

Why do price elasticities vary across different markets?



Source: The New York Times

Why Are C.E.O.s Suddenly Obsessed With 'Elasticity'?

The economic concept, which describes consumers' sensitivity to prices, is a hot topic as inflation soars and executives fret about profits.

This article is part of our Daily Business Briefing.

By Jason Karaian and Veronica Majerol
Aug. 19, 2022

From McDonald's to Coca-Cola to Hershey, corporate executives lately are preoccupied with inflation and what it means to the bottom line. And on calls in the past few weeks with investors about their financial results, conversations have dwelled on a peculiar way of talking about it: "elasticity."

They were not referring to waistlines during the pandemic, but an economic concept that says a lot about the precarious state of the American consumer. Despite the fastest inflation in decades, consumer spending has held up relatively well so far. But this may not last, and that's where elasticity comes in.

The price elasticity of demand, to use its full name, measures how sensitive buyers are to price changes. Typically, when the price of, say, a can of Coke goes up, people buy fewer cans or switch to a cheaper brand. If a small rise in price leads to a big fall in demand, the item is said to be more elastic. That makes chief executives tremble. But if a big rise in price has little effect on demand, the product is considered inelastic — and a good thing for companies' profit margins because they can raise prices without risking a drop in sales.

Keurig Dr Pepper

"The good news is our brand strength has **held up well in the face of new pricing with modest elasticity** impacts across our portfolio during the quarter."
— Robert J. Gamgort, chief executive

Marriott

"I think it is that **tide-floats-all-boats view of what we're seeing**, which is demand across all segments continuing to strengthen."
— Kathleen K. Oberg, chief financial officer

Callaway Golf

"To offset inflationary pressure, we have raised prices nicely this year and, as the avid golf consumer is both affluent and passionate, **there has been no discernible pushback**."
— Oliver G. Brewer III, chief executive

Source: Why are C.E.O.s Suddenly Obsessed with "Elasticity"?, The New York Times, Aug 20th, 2022.



5. DETERMINANTS OF PRICE ELASTICITY OF DEMAND

- Availability of close substitutes
  - When there are more close substitutes available for a good, its demand tends to be more price elastic.



Some taxi drivers asked for an extra fare of $200 during typhoon in HK. Some people said that they were willing to pay whatever the asking price were.
Why?

(Source: *SCMP*, 21 Oct, 2016.)

Price Elasticities of Demand for Selected Automobiles, 2018

Brand	Fuel Type	Price (US$)	Own-Price Elasticity
Toyota Camry	Gasoline	26,969	-5.28
Honda CR-V	Gasoline	30,508	-4.87
Toyota RAV4	Gasoline	30,514	-5.32
Ford F-150	Gasoline	40,789	-5.00
Chevy Bolt	BEV	36,449	-3.96
Tesla Model 3	BEV	56,096	-3.73
Tesla Model S	BEV	95,581	-2.96
Tesla Model X	BEV	105,015	-2.94

Source: Leard, B., and Wu, Y., "New Passenger Vehicle Demand Elasticities: Estimates and Policy Implications," RFF Working paper, August 2023.

How about $E_{D,P}$ for car!?

What are the price elasticities of demand for (i) Gasoline cars and (ii) BEVs?
-0.53 -1.91

Brand-level vs. **market-level** $E_{D,P}$ are different!

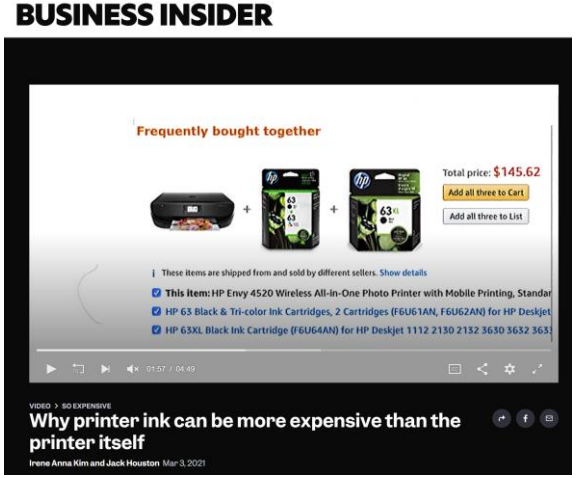
5. DETERMINANTS OF PRICE ELASTICITY OF DEMAND

- Necessities vs. Luxuries
  - Demand for goods that people regard as necessities tend to be less elastic than that for luxuries.
    - If a good is used together with another product that consumers have committed themselves to, then its demand tends to be less price elastic.

Price Elasticities of Demand for Selected Goods

Categories	Price Elasticity
Food and non-alcoholic beverages	-0.511
Clothing and footwear	-0.761
Housing and utilities	-0.828
Transport	-0.838
Health	-0.874
Recreation and culture	-1.245
Restaurants and hotels	-1.541

Source: Zereyesus, Y.A., Xia, T., Nava, N.J., Li, X., and Cardell, L., "International Income and Price Elasticity Estimates: An Update," USDA, Economic Research Service, 2025.



Why **printer ink** can be more expensive than the printer itself?

(Source: *Business Insider*, 3 Mar, 2021.)

America's baby milk formula shortage has **forced parents into a hunt for supplies.**

(Source: *SCMP*, 13 May, 2022.)



5. DETERMINANTS OF PRICE ELASTICITY OF DEMAND

- Spending as a proportion of buyer's total expenditure
  - When the spending on a good makes a large proportion of the buyer's total expenditure, demand for that good tends to be more price elastic.



Price Elasticities of Demand for Ice-cream in Lower- and Higher-Income Stores		
Ice-cream Brand	*Lower-income groups*	*Higher-income groups*
Private Label 1	2.315	2.168
Private Label 2	2.283	2.685
Breyers	4.538	3.293
Dreyer's	3.559	2.734
Haagan Dazs	4.342	3.535

Source: Akbay, C. and Jones, E., "Demand Elasticities and Price-Cost Margin Ratios for Grocery Products in Different Socioeconomic Groups," *Agricultural Economics - Czech*, 52 (5), 2006, pp.225-235.





vs.





5. DETERMINANTS OF PRICE ELASTICITY OF DEMAND

- Time Horizon (the time we wait after a change in price to measure the quantity response)
  - Long-run elasticity of demand for a good tends to be larger than its short-run elasticity (*why?*)
  - *Are durable goods different?*



Short-run and Long-run Elasticities of Demand for Crude Oil

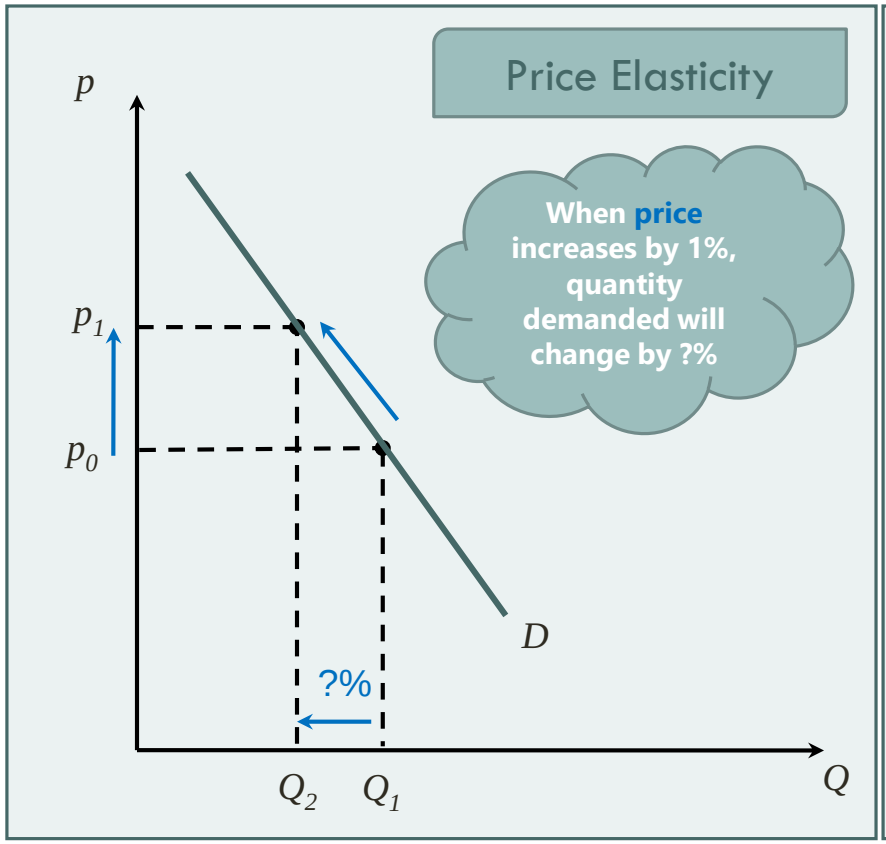
Country	Short-run Elasticity	Long-run Elasticity
Canada	0.04	0.35
China	0.00	0.00
France	0.07	0.57
Germany	0.02	0.28
Italy	0.04	0.21
Japan	0.07	0.36
Korea	0.09	0.18
Spain	0.09	0.15
United Kingdom	0.07	0.18
United States	0.06	0.45

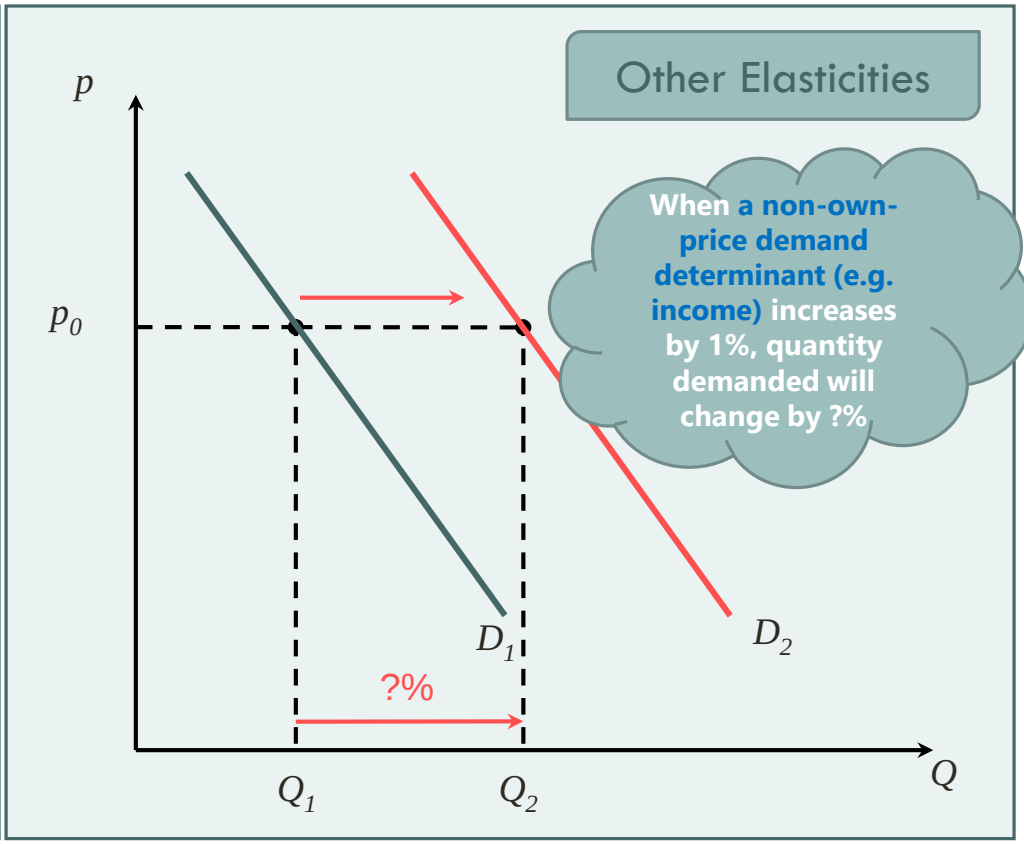
Source: Cooper J., "Price Elasticity of Demand for Crude Oil: Estimates for 23 Countries," OPEC Review: Energy Economics & Related Issues, 27:1, March 2003.

6. OTHER ELASTICITIES

$$Q^d = D(p, Y, p_y \dots)$$

- Economists usually use the concept of **elasticity** to measure the *sensitivity* of one variable to another.
  - E.g. the sensitivity of the quantity demanded to *any* demand determinant.





INCOME ELASTICITY OF DEMAND: HOW SENSITIVE ARE BUYERS TO INCOME CHANGES?

- **Income elasticity of demand** measures the sensitivity of the quantity demanded to buyers' *incomes* (*Y*).
- It measures the percentage change in quantity demanded in response to a given percentage change in income, ceteris paribus. That is,

$$Q^d = D(p, Y, p_y \dots)$$

$$E_{D,p} = \frac{\text{percentage change in } Q^d}{\text{percentage change in } Y} = \frac{\frac{\Delta Q^d}{Q^d} \times 100\%}{\frac{\Delta Y}{Y} \times 100\%}$$

  - It is interpreted as the percentage change in quantity demanded when income changes by *one percent*, ceteris paribus.

- Unlike $E_{D,p}$, income elasticity can be positive or negative:
  - Positive: **normal goods** $\quad Y \uparrow \rightarrow Q^d \uparrow$
  - Negative: **inferior goods** $\quad Y \uparrow \rightarrow Q^d \downarrow$

WHICH ONE DO YOU PREFER? STRAIGHT VS. CURVED?

- Which *shape of croissants, straight vs. curved (crescent-shaped)*, do you like?
- Traditionally crescent-shaped croissants are made with margarine, while the straight one are made with butter and are therefore seen as superior!
- In 2016, Tesco has to openly tell its customers even the curved croissants are now made with butter rather than margarine.
  - "After demand for crescent shaped croissants started falling, we spoke to our customers and nearly 75% of them told us that they preferred straight ones."



(Source: Tesco says au revoir to the traditional French curved croissant because Brits prefer them straight, *The Telegraph*, 18 Feb, 2016.)





Income Elasticity of Demand for Fats	
Butter	0.20
Margarine	-0.37

Source: Lechene, V., and Department for Environment, Food and Rural Affairs. "Income and Price Elasticities of Demand for Foods Consumed in the Home," *National Food Survey*, 2000, 89-109.

CROSS-PRICE ELASTICITY OF DEMAND: HOW SENSITIVE ARE BUYERS TO CHANGES IN OTHER PRICES

- **Cross-price elasticity of demand** measures the sensitivity of the quantity demanded to the price *of another good* (p_y).
- It measures the percentage change in quantity demanded in response to a given percentage change in the price of another good, ceteris paribus. That is,

$$E_{D,p} = \frac{\text{percentage change in } Q^d}{\text{percentage change in } p_y} = \frac{\frac{\Delta Q^d}{Q^d} \times 100\%}{\frac{\Delta p_y}{p_y} \times 100\%}$$

$$Q^d = D(p, Y, p_y \ldots)$$

  - It is interpreted as the percentage change in quantity demanded when the price of another good changes by *one percent*, ceteris paribus.
- Unlike $E_{D,p}$, cross-price elasticity can be positive or negative:
  - Positive: The two goods are **substitutes**
  - Negative: The two goods are **complements**

$$P_y \uparrow Q_y^d \downarrow \rightarrow Q_x^d \uparrow$$

$$P_y \uparrow Q_y^d \downarrow \rightarrow Q_x^d \downarrow$$

CROSS-PRICE ELASTICITY OF DEMAND

When the price of … increases by 1%

with respect to the price of:

Qᵈ of … changes by …%

Elasticity of demand for:

…ce Elasticities of Demand for Automobiles

	Toyota Auris	Renault Megane	BMW 3-series	Mercedes C-class
Toyota Auris	-3.094	0.012	0.018	0.014
Renault Mégane	0.010	-3.364	0.018	0.015
BMW 3-series	0.007	0.008	-4.307	0.082
Mercedes C-class	0.006	0.008	0.096	-4.587

…and Wildenbeest, M.R., "Consumer Search and Prices in the Automobile

Why are these numbers so close to zero, does it make sense?

Cross-price elasticities (positive: Substitutes)

Own-price elasticities (all negative)






Which brand is a closer substitute for Mercedes?

APPLICATION: MOUNTAIN DEW VS SPRITE

- Mountain Dew will launch its latest version, a clear lemon-lime soda called Mtn Dew Ice, PepsiCo announced.
  - The news reporter believed that the new drink takes aim at Sprite and 7Up.

Is it really the case?



(Source: Mountain Dew's new lemon-lime flavor takes aim at Sprite, 7Up, *USA Today*, Jan 9, 2018.)

CROSS-PRICE ELASTICITY OF DEMAND

Coca-Cola and Pepsi are very close substitutes

Price Elasticities of Demand for Carbonated Soft Drink

	Coke	Sprite	Pepsi	Mountain Dew
Coke	-3.795	0.002	2.181	0.431
Sprite	0.147	-2.840	3.678	-1.857
Pepsi	2.338	0.600	-3.938	0.253
Mountain Dew	3.506	-2.728	1.766	-4.388

Source: Dhar, T., Chavas, J-P., Cotterill, R.W., and Gould, B.W., "An Econometric Analysis of Brand-Level Strategic Pricing Between Coca-Cola Company and PepsiCo," *Journal of Economics & Management Strategy*, 14 (4), 2005, 905-931.

Why are Sprite and Mountain Dew complements!?





- "…There's one key difference, though. Mountain Dew's version has caffeine, an ingredient found in colas but mostly missing from the lemon-lime category."
- Various studies (e.g. Dube, 2004) found that caffeinated and non-caffeinated carbonated soft-drinks are **complements** to consumers.

6. OTHER ELASTICITIES

- Other elasticities of demand
  - *Advertising expenditure elasticity? Temperature? …*

- **Price elasticity of supply** measures the sensitivity of the quantity supplied to the price of a good.
  - It measures the percentage change in quantity supplied in response to a given percentage change in the price of a good, ceteris paribus. That is,

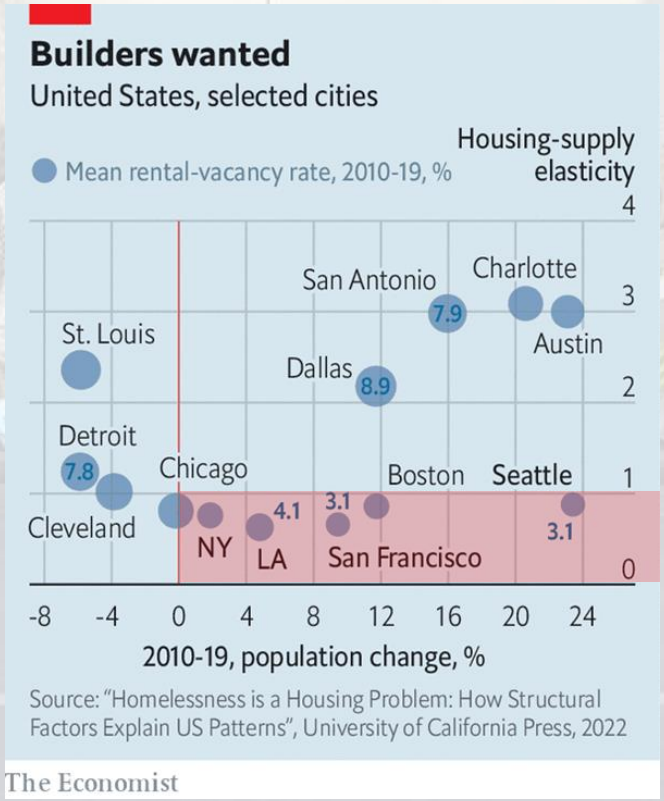
$$E_{D,p} = \frac{\text{percentage change in } Q^s}{\text{percentage change in } p} = \frac{\frac{\Delta Q^s}{Q^s} \times 100\%}{\frac{\Delta p}{p} \times 100\%}$$

  - It is interpreted as the percentage change in quantity supplied when price changes by *one percent*, ceteris paribus.

APPLICATION: ROUGH SLEEPERS

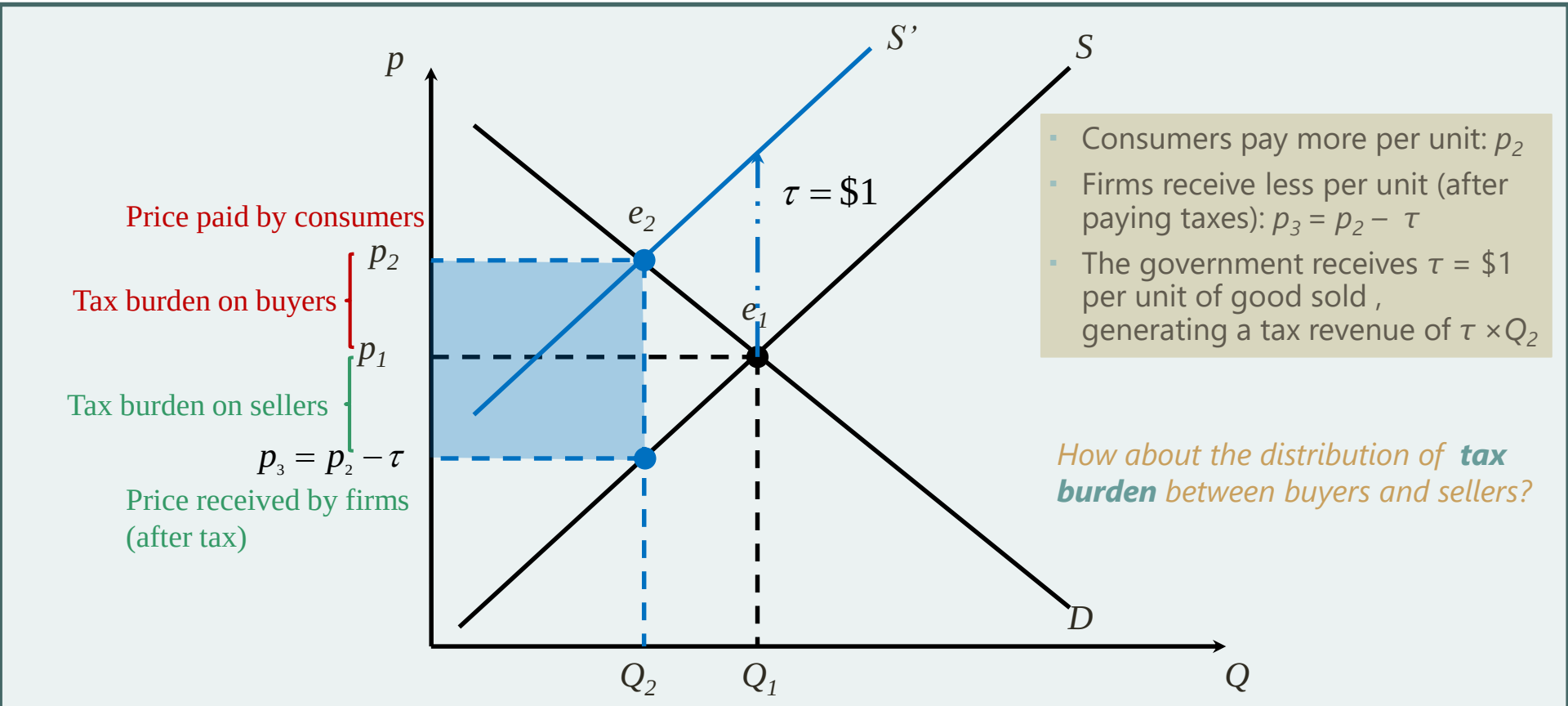
- As of December 2020, about **226,000** Americans were living without shelter, which is 30% more than in 2015.
- The main reason for this increase is the high cost of housing.
  - Researchers compare the population growth rates and **housing supply elasticity** in several American cities.
  - The cities with the worst homelessness problems often have high population growth, but low housing supply elasticity (i.e. Not much new homes are built, even as rents go up).
  - Fewer homes mean lower vacancy rates and higher rents.

(Source: Rough sleepers, *The Economist*, Aug 5th, 2021.)



EFFECTS OF A UNIT TAX

- Suppose the government collects a unit tax of τ = \$1 per unit of good sold *from sellers*.
- After imposing the tax, it shifts the *supply curve* upward by τ = \$1 from *S* to *S'* *(why?)*

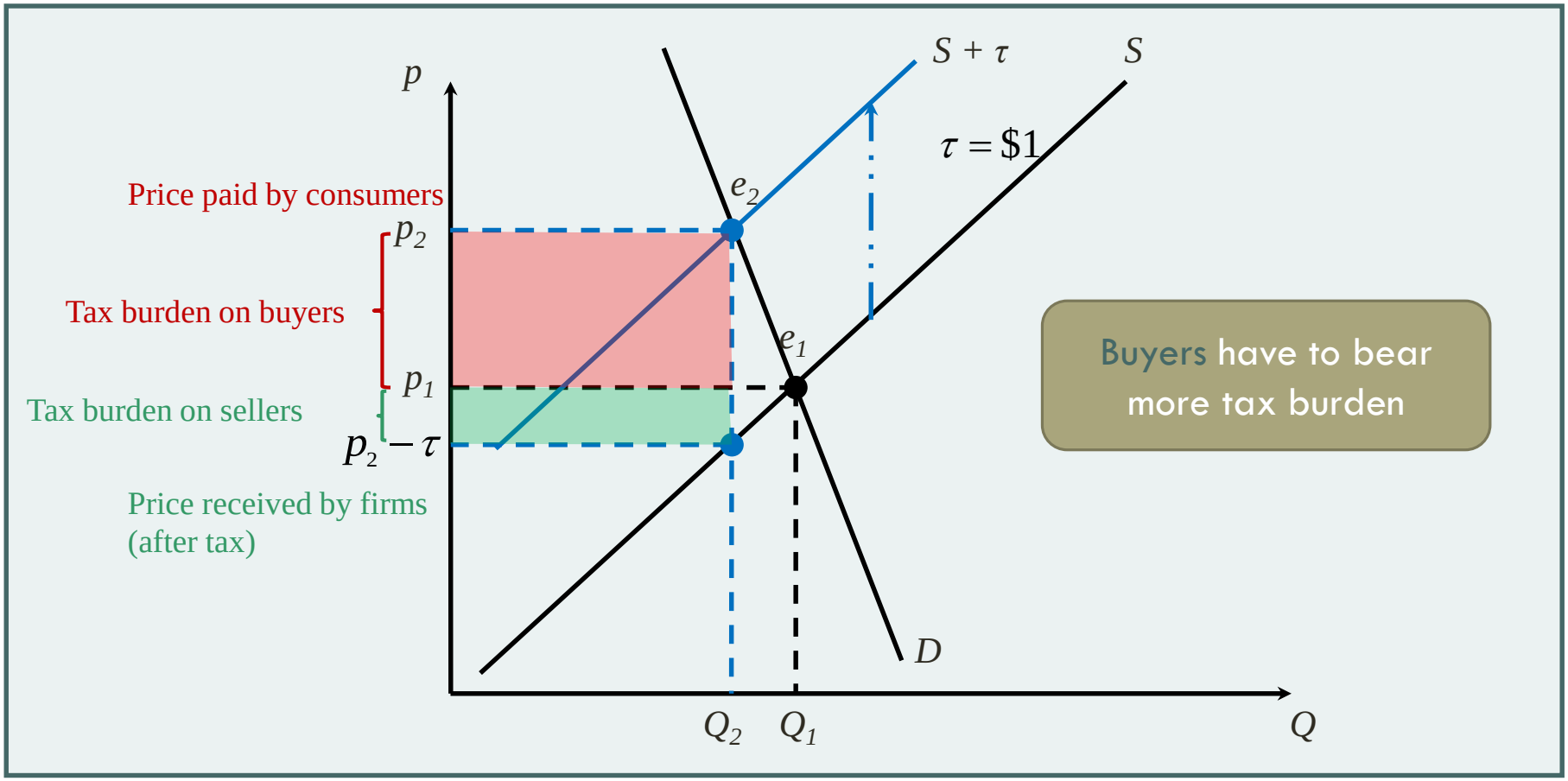


- Consumers pay more per unit: p_2
- Firms receive less per unit (after paying taxes): $p_3 = p_2 - \tau$
- The government receives τ = \$1 per unit of good sold , generating a tax revenue of $\tau \times Q_2$

How about the distribution of ***tax burden*** *between buyers and sellers?*

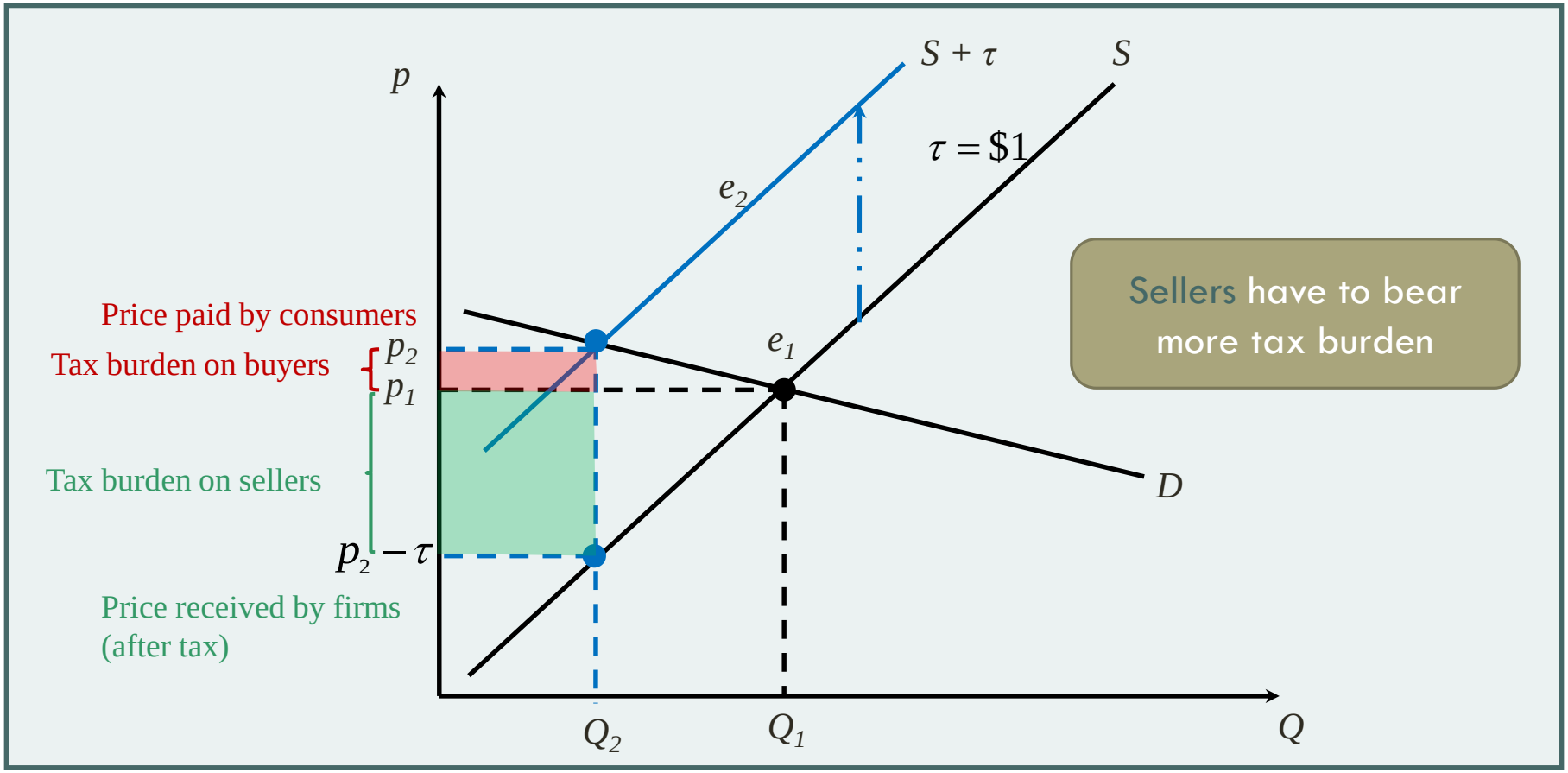
7. ELASTICITIES AND SALES TAX

- Demand is relatively more price inelastic than supply



7. ELASTICITIES AND SALES TAX

- Demand is relatively more price elastic than supply



APPLICATION: SODA STREAM

- Sugar taxes becoming common. As of 2024, more than 50 countries and dozens of cities and regions have passed **taxes on sugary drinks**.
  - Supporters say that the taxes help pay for health costs from diseases like obesity, diabetes and heart disease.
  - Opponents argue that the taxes are *regressive*, meaning they hit poorer people harder since they spend a bigger share of their incomes on soft drinks.
- A key factor for setting the optimal tax rate is the **price elasticity of demand** for sugary drinks.
  - If demand is **price elastic**, a tax makes people buy fewer sugary drinks, benefiting poorer people health.
  - If demand is **price inelastic**, people keep buying a lot of sugary drinks, making the regressive effects stronger.
- Allcott, Lockwood and Taubinsky (2019) estimated that ***the demand elastic enough that a tax is socially beneficial***. They computed an optimal tax rate of 1-2 cents per ounce of soft drink in America.



The Economist, May 23rd, 2019

Soda stream

How to tax sugary drinks

Even allowing for the fact that people like sugar, a tax is desirable

May 23rd 2019

Sugar taxes are on a high. Around 40 countries and seven American cities have started to tax sugary drinks, mostly in the past few years. Supporters say such levies compensate for the costs imposed on health services by higher rates of obesity, diabetes and heart disease. They might also help short-termist buyers avoid the long-term consequences of sugary indulgences. Opponents counter that such levies are a fun-killer, souring people's pleasure, and regressive, because poorer people spend a bigger share of their incomes on soft drinks.

Two working papers published on May 20th seek to help policymakers find the sweet spot. Hunt Allcott of New York University, Benjamin Lockwood of the University of Pennsylvania and Dmitry Taubinsky of the University of California, Berkeley, compute the "optimal" tax rate that maximises social well-being, taking into account differences in consumers' income and behavioural biases.

Consumer data show that a soda tax does indeed have regressive effects. American households earning less than $10,000 a year buy twice as much sugary drink as those earning $100,000. Weighed against that, the gap between desired and actual consumption is wider for poorer people than it is for richer ones. The authors surveyed households to gauge their knowledge of sweet drinks' nutritional content and how much their consumption outstrips what they regard as ideal. The average household, they conclude, would consume a third less if it had expert nutritional knowledge and perfect self-control. That rises to a half for poorer households.

(Source: Soda stream, *The Economist*, May 23rd 2019.)