LECTURE 4

EXTENSIONS OF SUPPLY AND DEMAND ANALYSIS

January 30, 2020

I.   OVERVIEW

II. REVIEW OF THE SUPPLY AND DEMAND FRAMEWORK
     A. Supply and demand diagram (example: light trucks)
     B. What shifts the demand curve?
     C. What shifts the supply curve?

III. ELASTICITY
     A. Price elasticity of demand
     B. Relationship between elasticity and the slope of the demand curve
     C. Impact of elasticity on the market outcome
     D. Demand elasticity and expenditure (example: illegal opioid drugs)
         1. Comparison of supply-side and demand-side policies
         2. What the simple analysis may be missing
     E. Price elasticity of supply

IV. EFFECTS OF A TAX
     A. Terminology and set-up (example: gas tax)
     B. Effects on price and quantity
     C. Who pays the tax?
     D. Interaction with demand elasticity
     E. Government tax revenue

LECTURE 4
Extensions of Supply and Demand Analysis

January 30, 2020

Announcements

- Problem Set 1 is due next Tuesday (February 4).

- Problem Set Work Session this afternoon (Jan. 30)
  - 4:00–6:00 in 648 Evans Hall

- Ground Rules:
  - Answers must be in your own words, handwritten, and with acknowledgements to the people you worked with.

- Graded on a scale of 1 to 10.

Announcements

- Collecting the Problem Sets:

  - They are due at the *beginning* of lecture.

  - We will have boxes with your GSIs' names on them outside the main doors in the lobby.

Announcements

- Journal article reading for Tuesday (by Kahneman, Knetsch, and Thaler):

  - You can access for free through any University computer, or from off campus using the library proxy (see http://www.lib.berkeley.edu/using-the-libraries/connect-off-campus).

  - Don't stress over every word or parts you don't understand.

  - Read for approach and findings.

I. OVERVIEW

Plan for the Lecture

- What shifts demand and supply curves?

- Discuss elasticity.

- Examine the effect of another government intervention in the market (a tax).
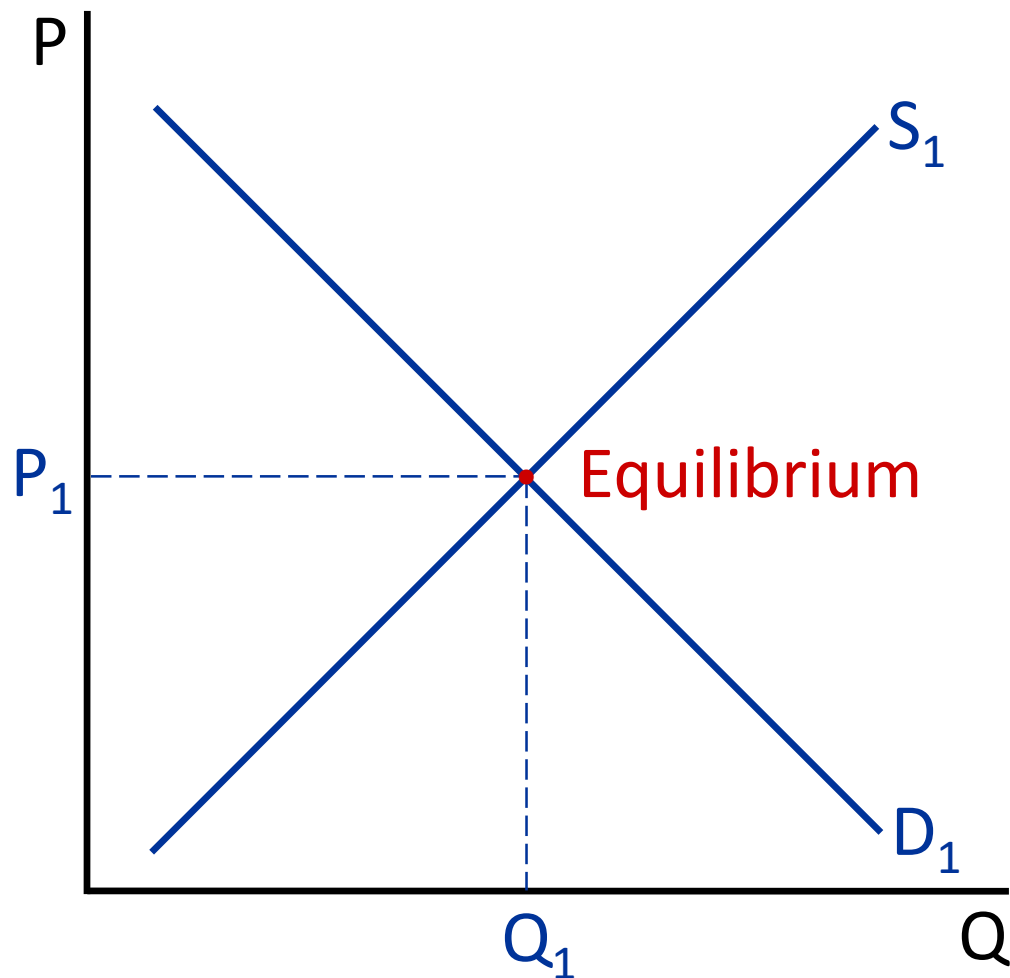
II. REVIEW OF SUPPLY AND DEMAND

U.S. light vehicle market in December 2019, by segment

Segment	Market share
Crossover	40.8%
Pickup	17.9%
Small car	11.2%
Midsized car	10.2%
Sport utility vehicle (SUV)	8.1%
Luxury car	5.4%
Van	5.3%
Large car	1.1%

Market share

0% 5% 10% 15% 20% 25% 30% 35% 40% 45%
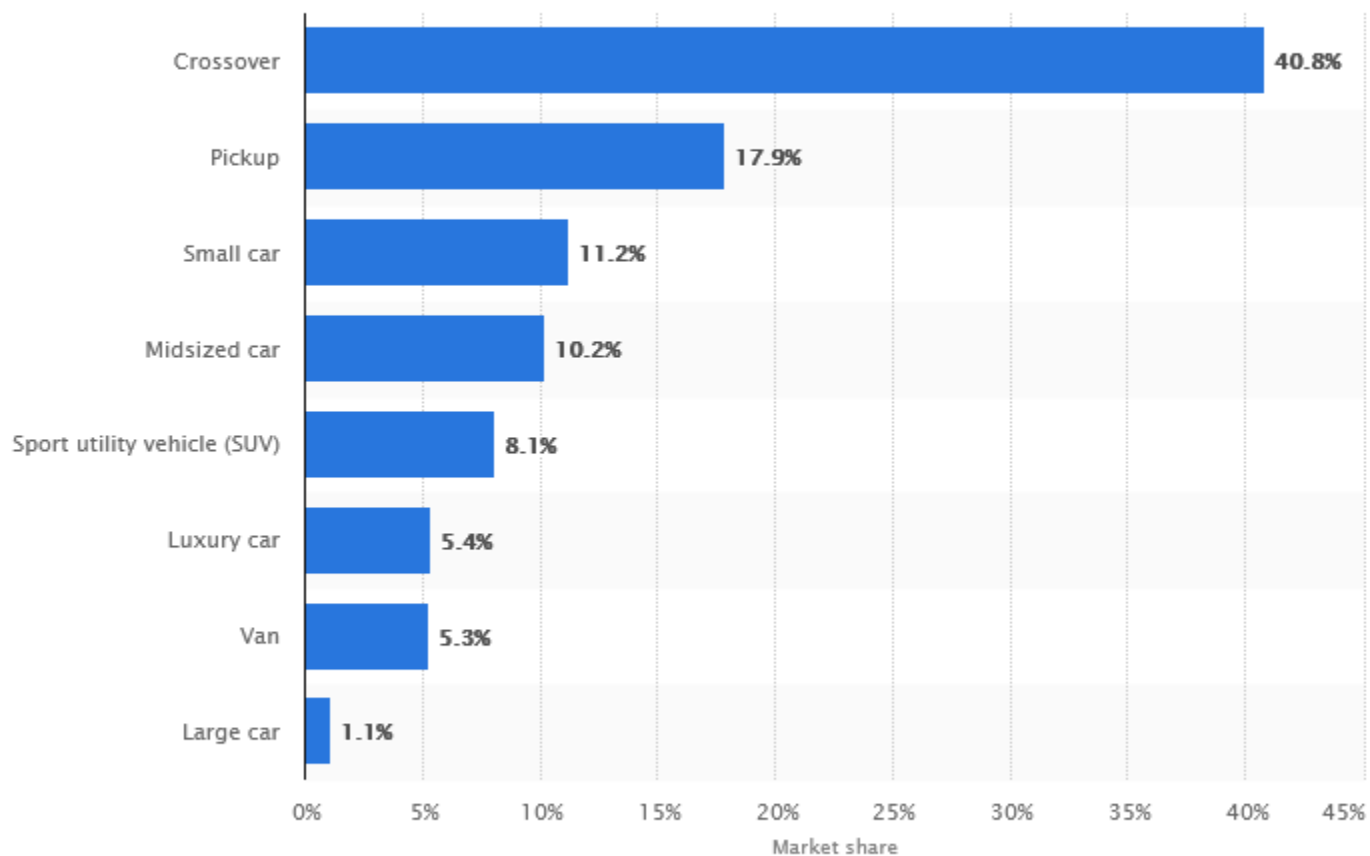
Details: United States; Ward's

© Statista 20

Market for Light Trucks

What Causes the Demand Curve to Shift?

- In general, anything that changes the desirability of the good at a given price.

- Change in the price of a complement.

- Change in tastes; news.

- Change in the price of a substitute.

- Change in demographics.

Retail Price of Gasoline
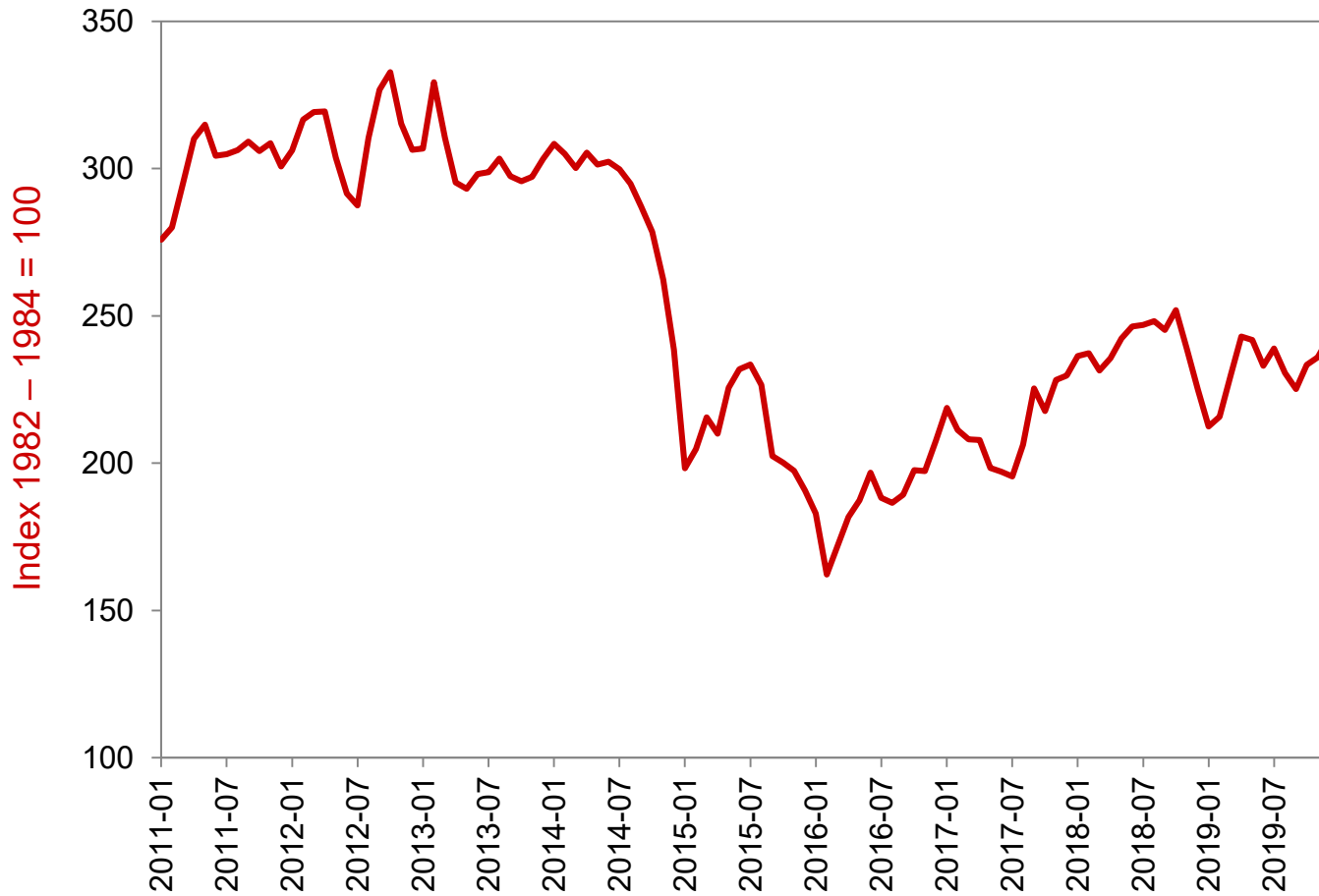
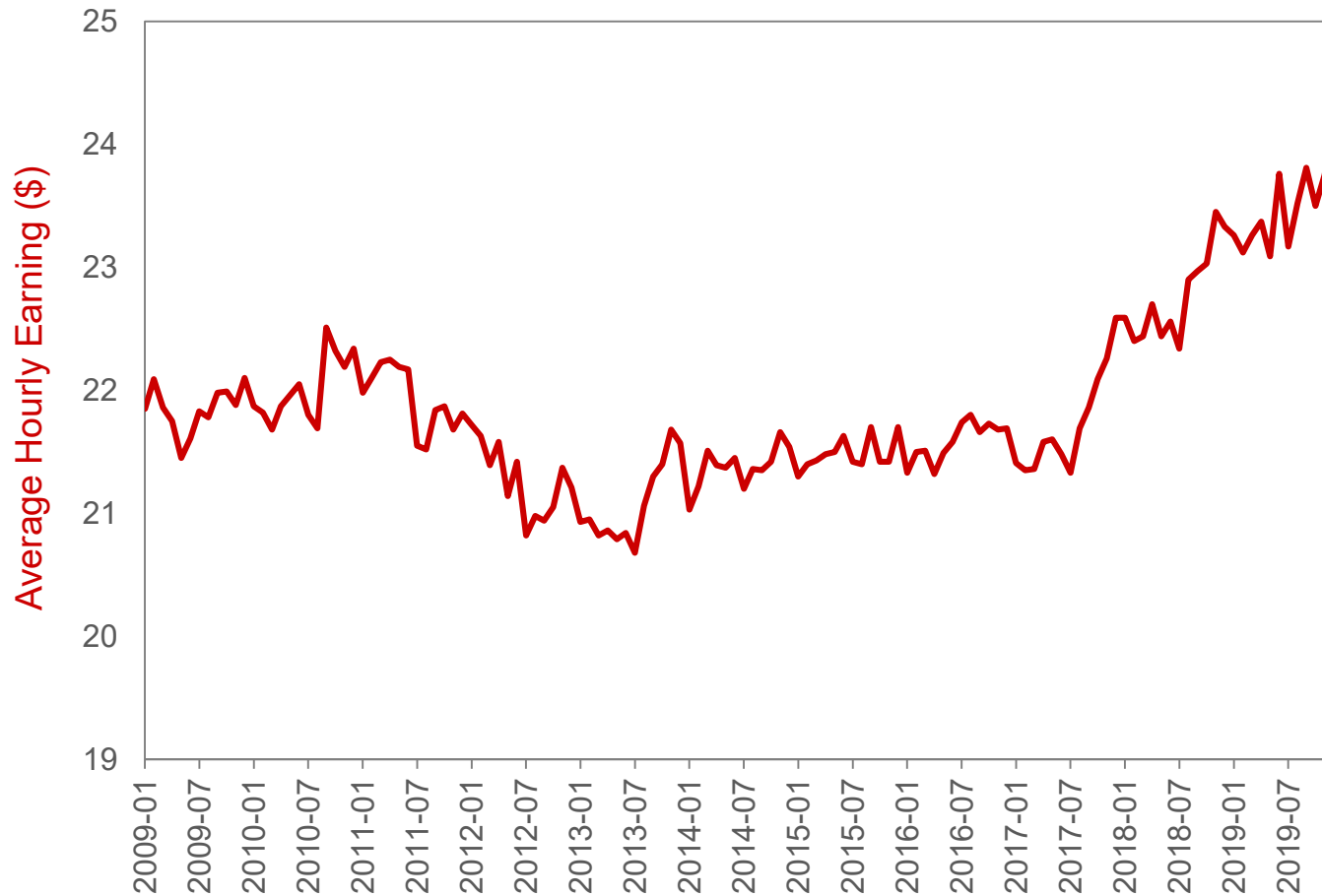Source: Bureau of Labor Statistics.

Market for Light Trucks
Fall in the Price of Gasoline
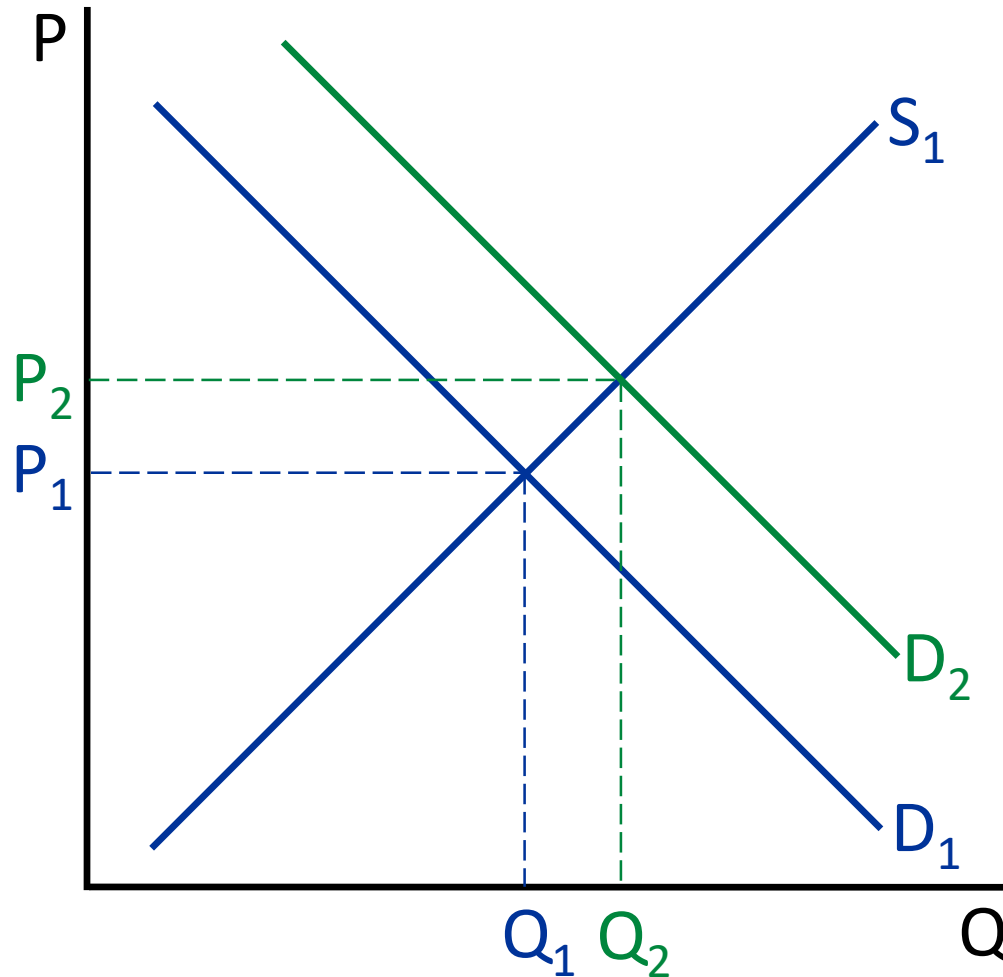
What Causes the Supply Curve to Shift?

- In general, anything that changes the additional cost associated with supplying one more unit at a given quantity of the good.

- Change in the price of an input.

- Change in technology.

Average Hourly Earning of Autoworkers

Source: Bureau of Labor Statistics.

Market for Light Trucks
Rise in Autoworker Wages
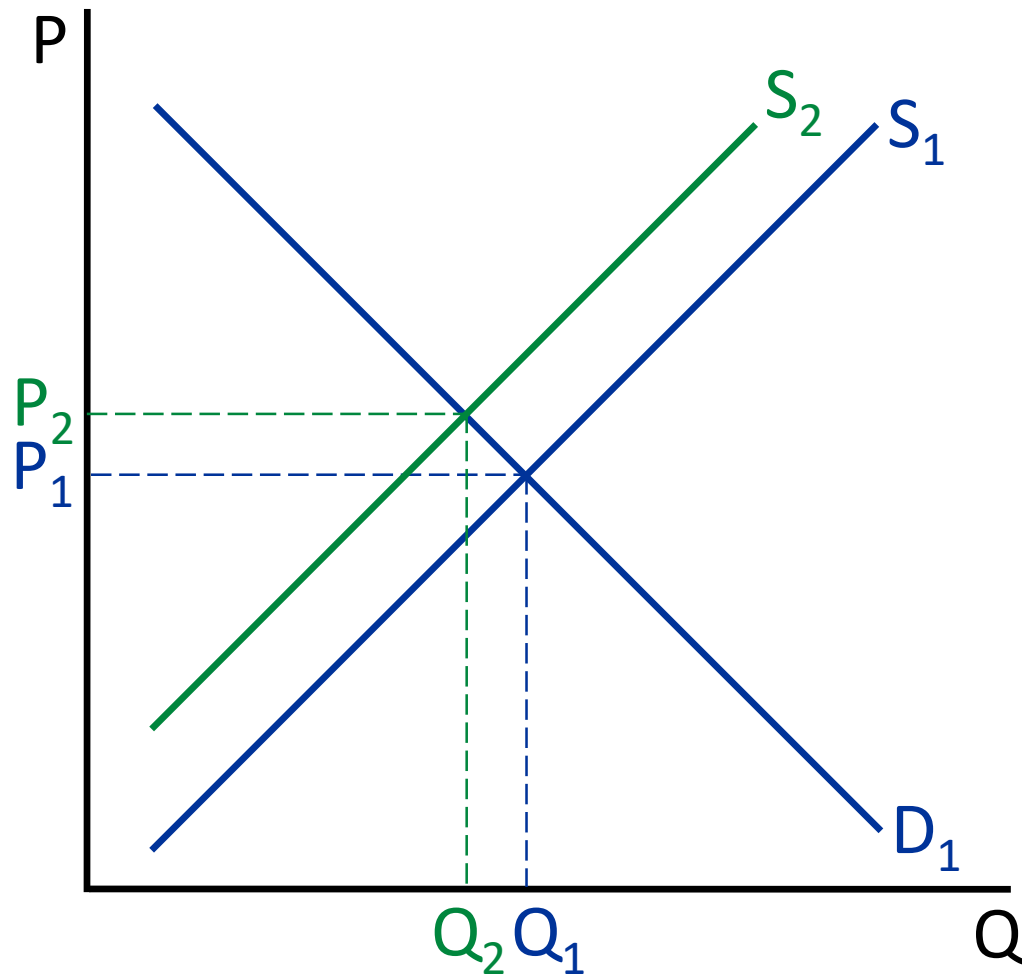
III. ELASTICITY

Price Elasticity of Demand (ε_D)

$$\varepsilon_D = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

(In absolute value)

Elastic	$\varepsilon_D > 1$
Inelastic	$\varepsilon_D < 1$
Perfectly inelastic	$\varepsilon_D = 0$
Perfectly elastic	$\varepsilon_D = \infty$

Relationship between Demand Elasticity and the Slope of the Demand Curve

$$\varepsilon_D = \frac{\Delta Q_D / Q_D}{\Delta P / P}$$

$$= \frac{\Delta Q_D}{\Delta P} \cdot \frac{P}{Q_D}$$

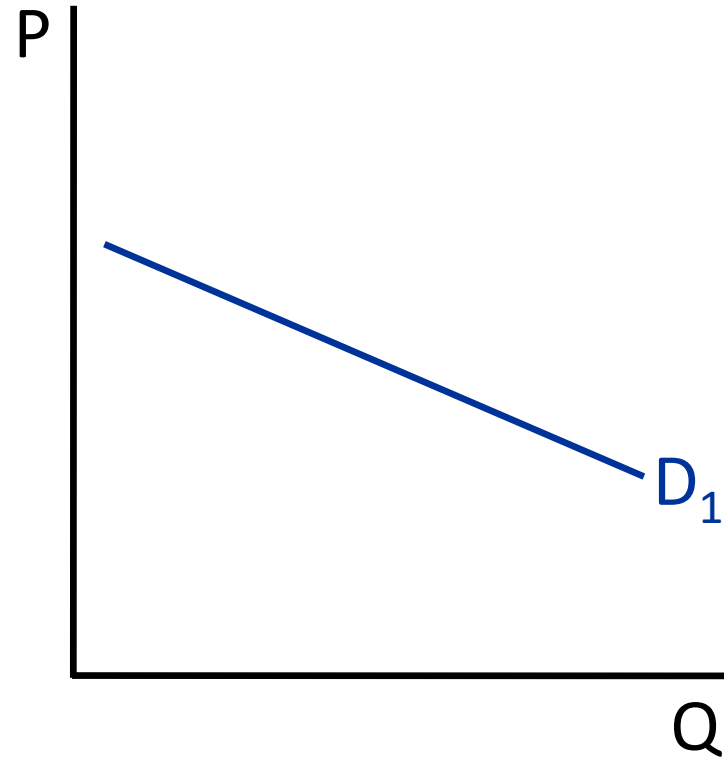$$= \frac{1}{Slope} \cdot \frac{P}{Q_D}$$

Slope of the Demand Curve
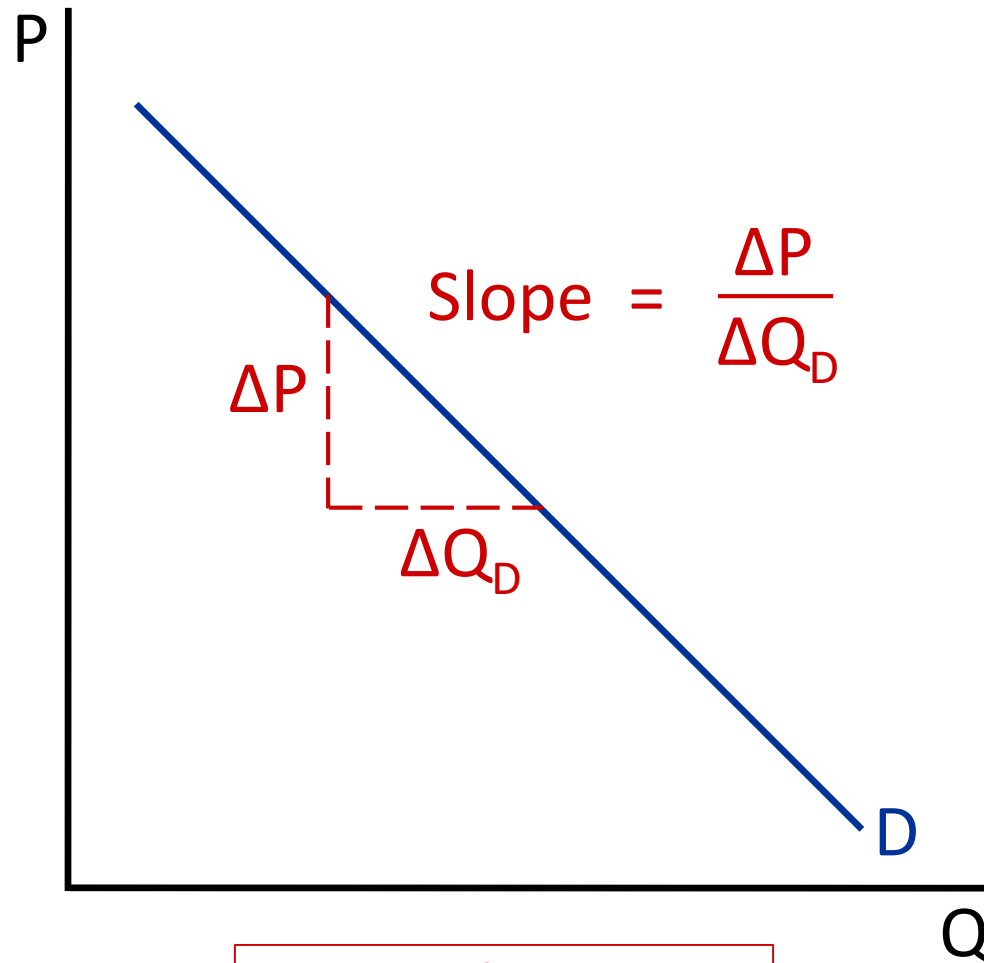
$$\text{Slope} = \frac{\Delta P}{\Delta Q_D}$$

$$\varepsilon_D = \frac{1}{\text{Slope}} \bullet \frac{P}{Q_D}$$

Demand Curves

Inelastic

P

D$_1$

Q

Elastic

P

D$_1$

Q
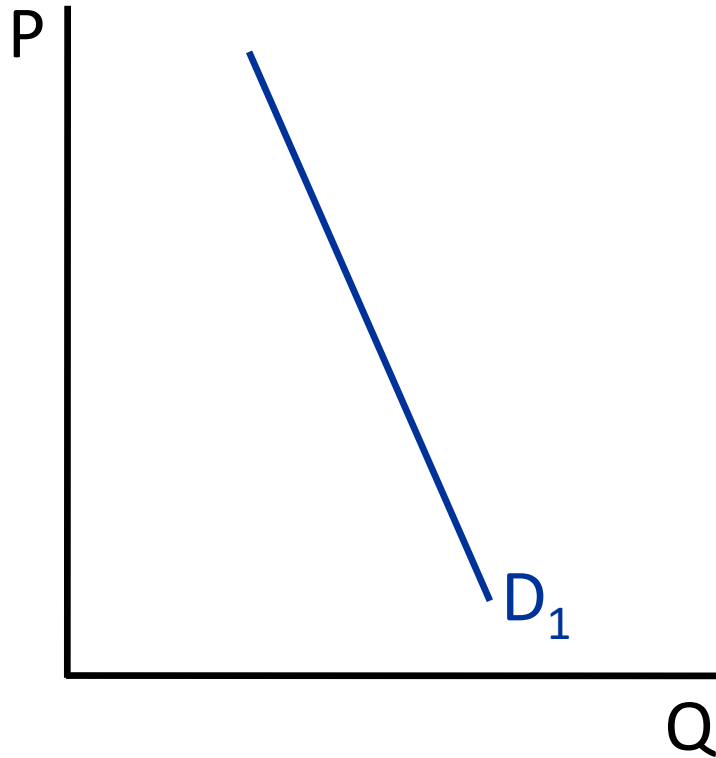
$$\varepsilon_D = \frac{1}{Slope} \bullet \frac{P}{Q_D}$$

Demand Elasticity Matters for Market Outcomes
(Effect of a Shift Out in the Supply Curve)
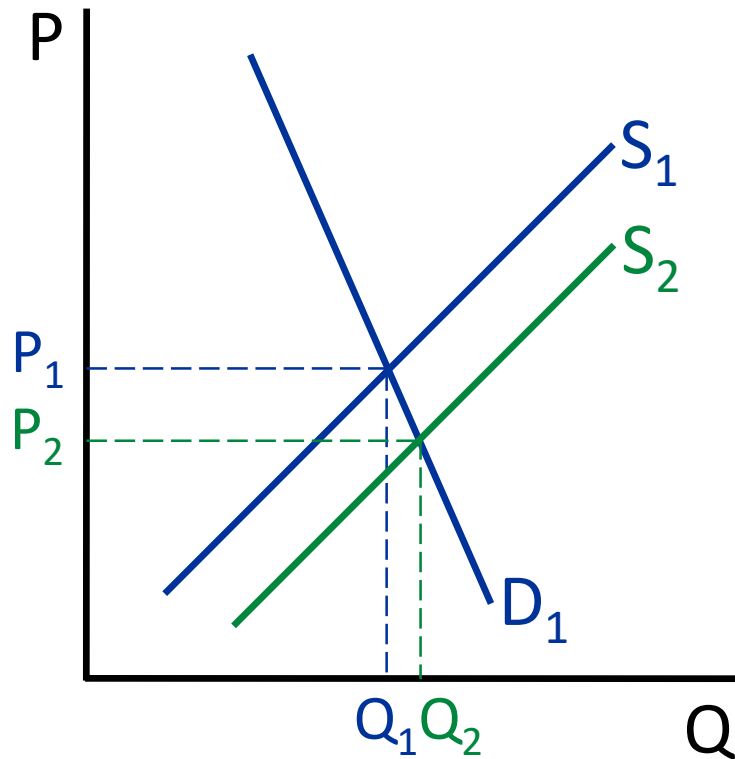
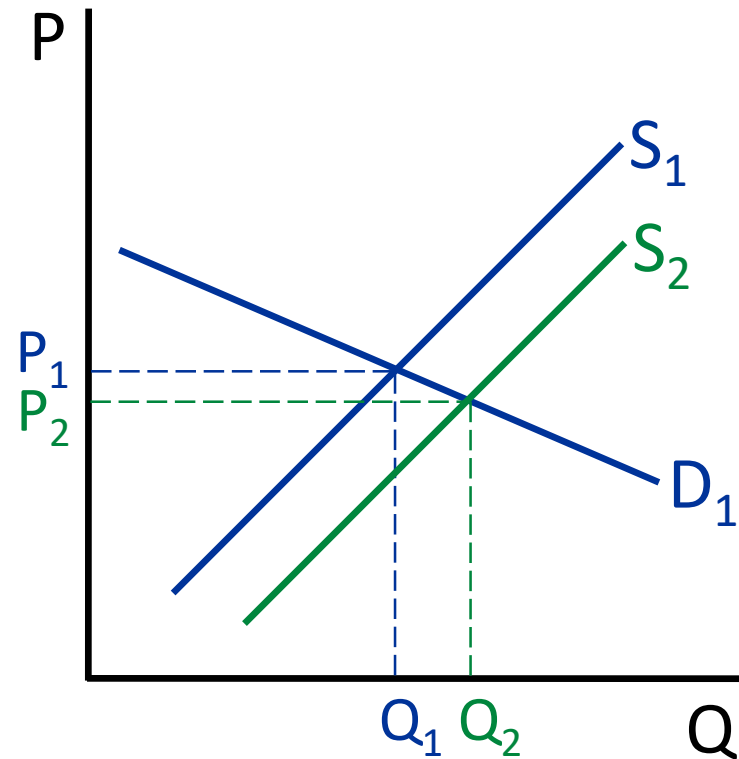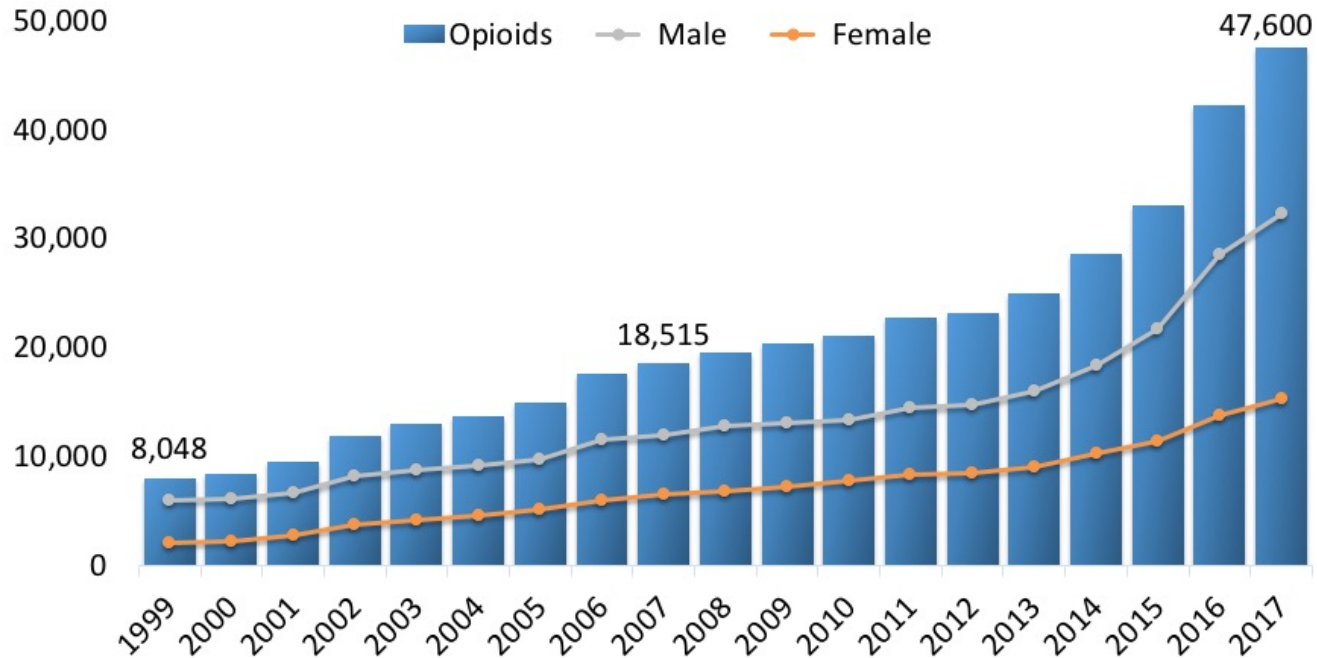Figure 3. **National Drug Overdose Deaths Involving Any Opioid,** Number Among All Ages, by Gender, 1999-2017

Source: : Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2017 on CDC WONDER Online Database, released December, 2018

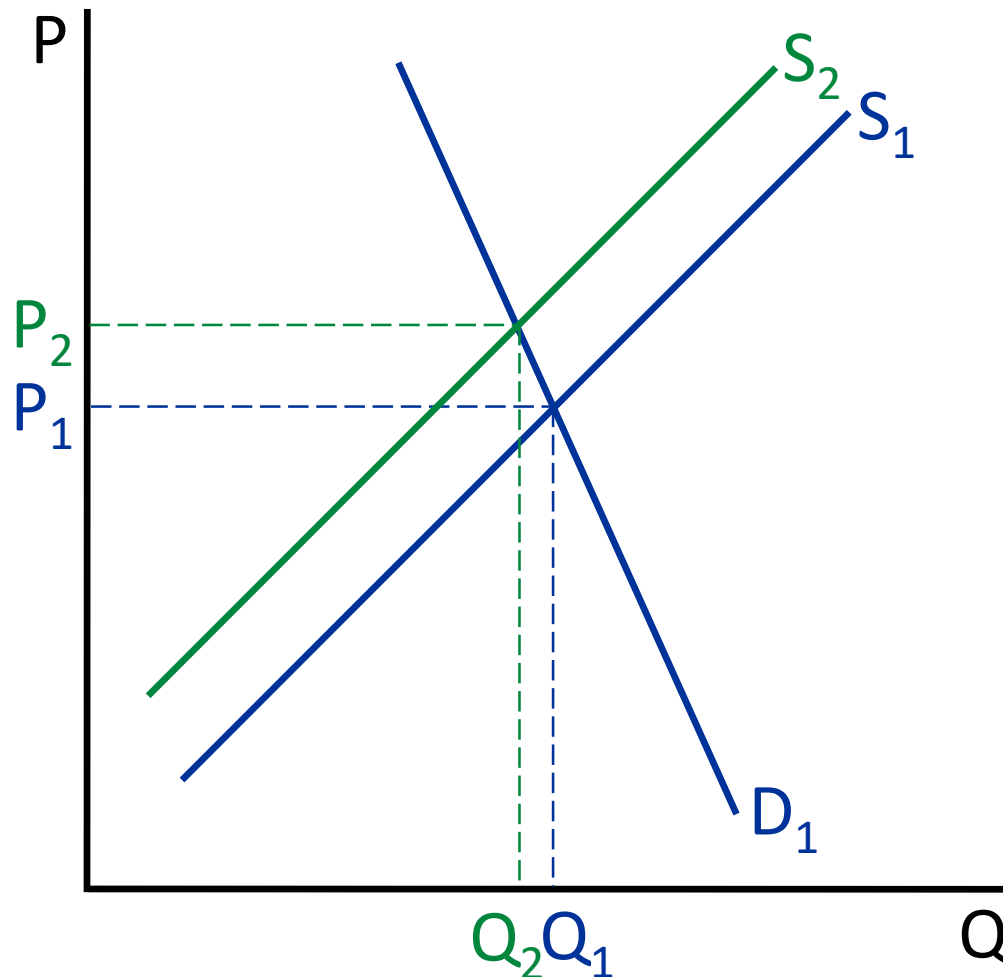Source: National Institute on Drug Abuse; Center for Disease Control.

Market for Illegal Opioid Drugs
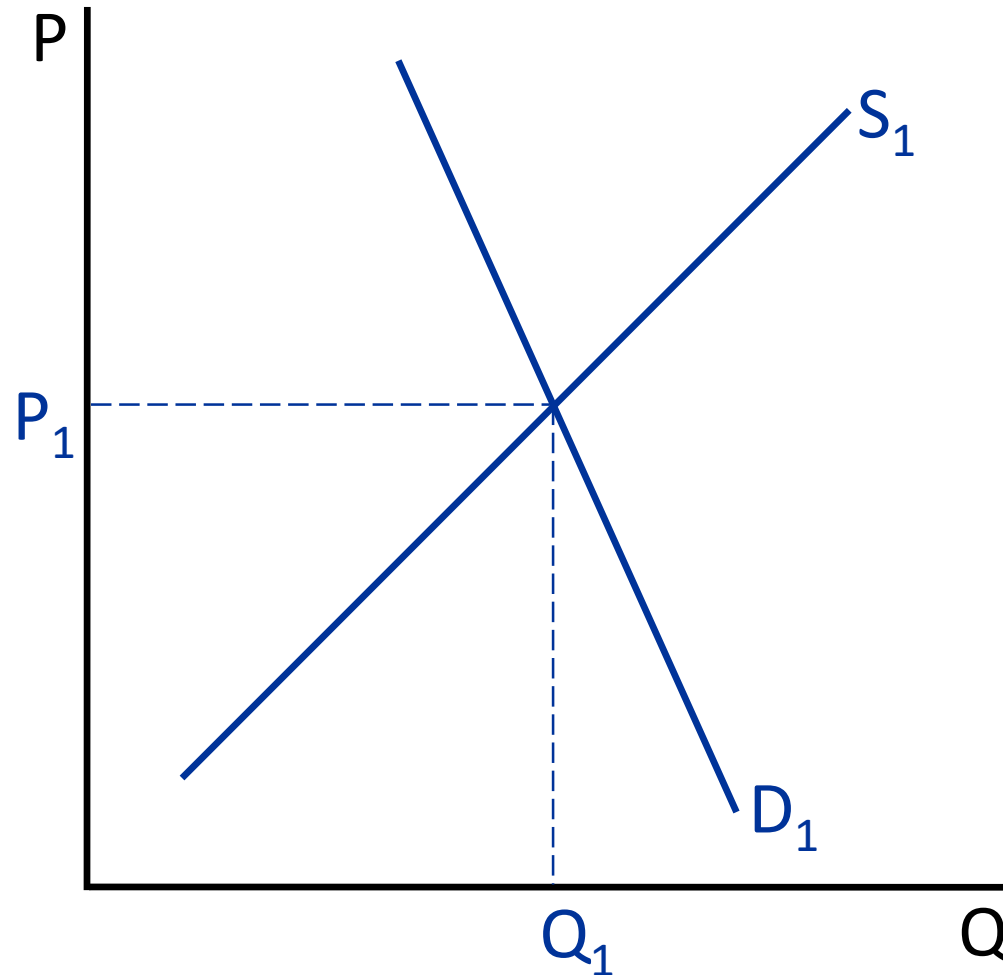
Market for Illegal Opioid Drugs
## (Supply Restriction)

Total Expenditure

Total Expenditure = Price • Quantity

- Total expenditure and total revenue are the same thing.

Demand Elasticity and Expenditure

- Inelastic ($\varepsilon_D < 1$): Total expenditure rises when the supply curve shifts back.

- Elastic ($\varepsilon_D > 1$): Total expenditure falls when the supply curve shifts back.

Market for Illegal Opioid Drugs
(Increased Drug Treatment)
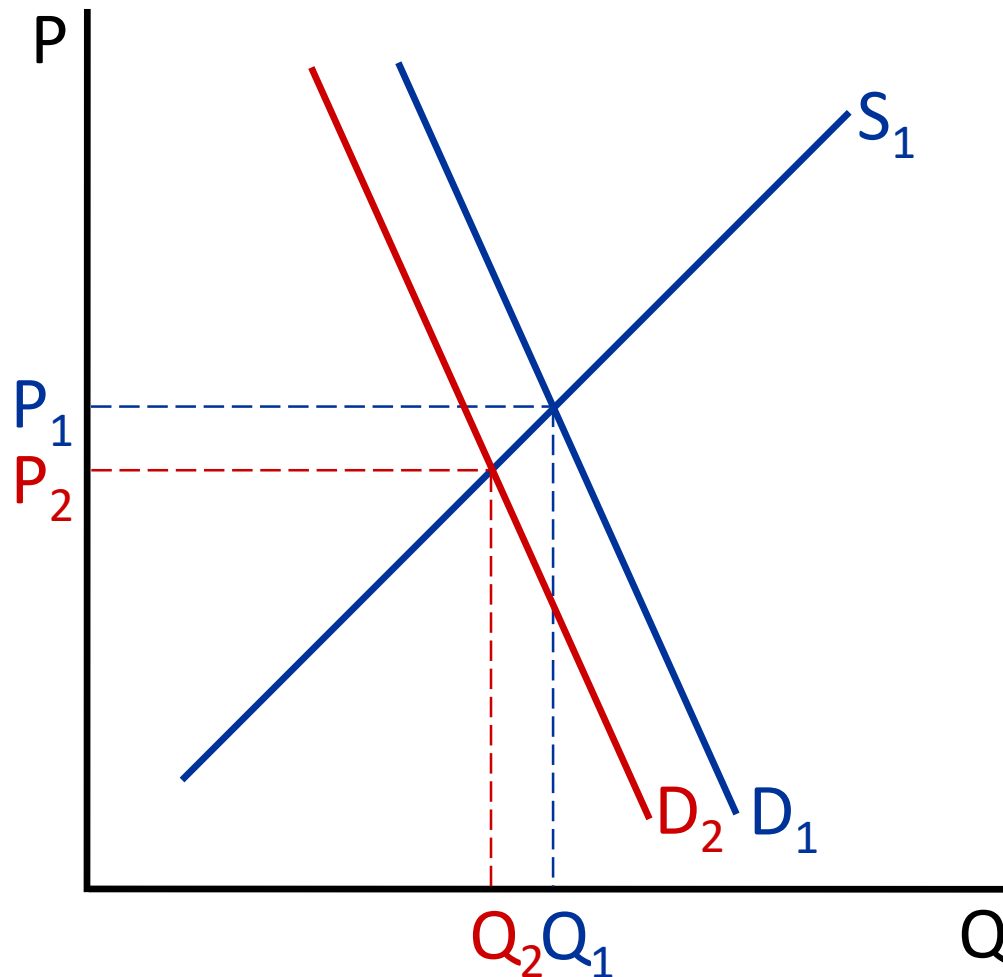
What are some of the complexities that we are ignoring with this analysis?

- It neglects the time element (demand may be more elastic in the long run than in the short run.)

- It neglects new users (new users may be more sensitive to the price).

- It neglects the cost or effectiveness of various policies.

- Others?

Price Elasticity of Supply (ε_S)

$$\varepsilon_S = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

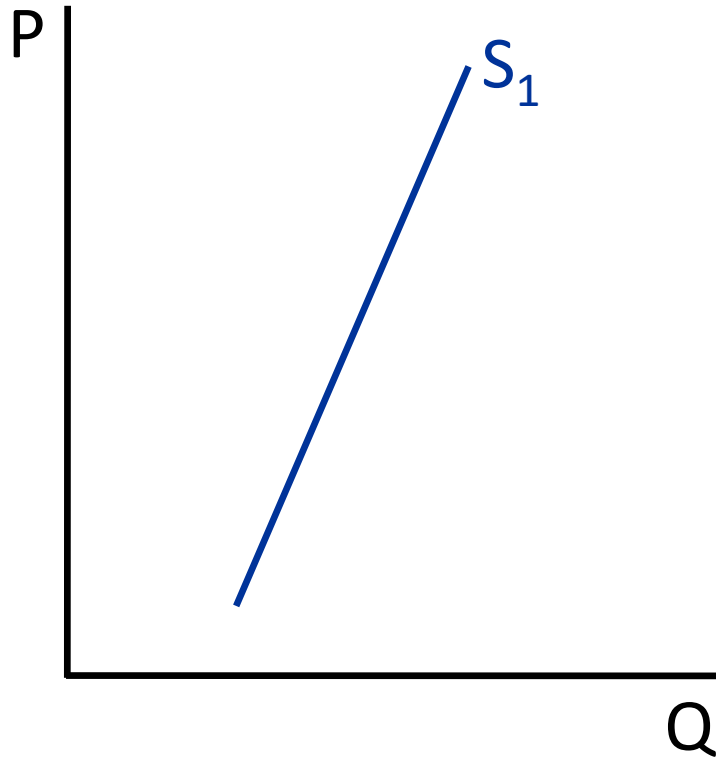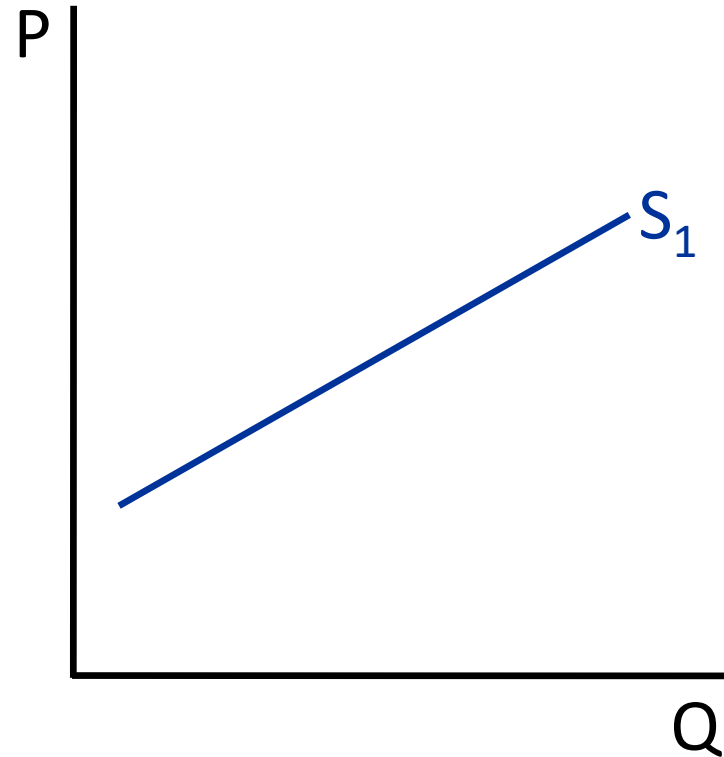|	
Elastic	$\varepsilon_S > 1$
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Supply Curves
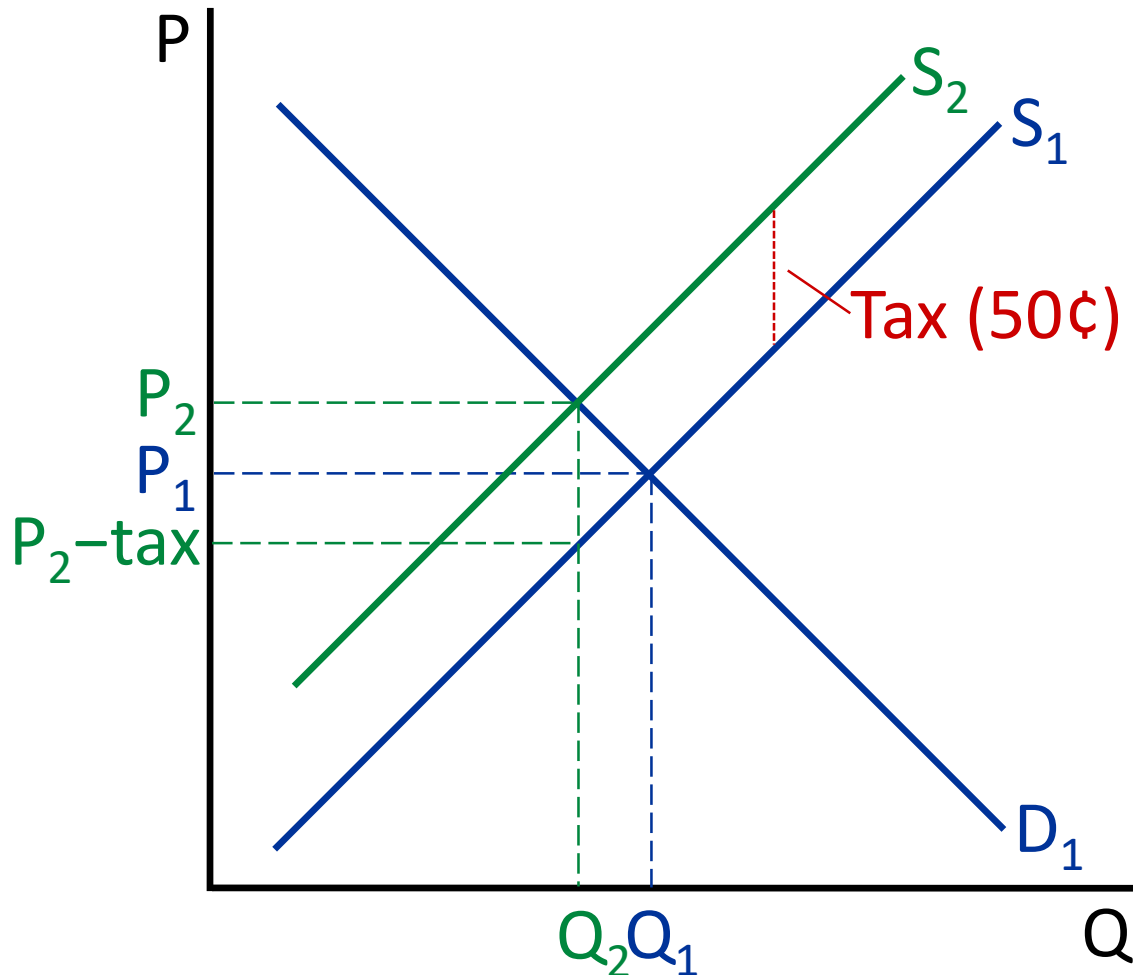
Inelastic

Elastic

As with the ε_D, the relationship between ε_S and the slope of the supply curve is a useful, but crude approximation.

IV. Effects of a Tax

Effect of a New 50¢ per Gallon Tax on Gasoline
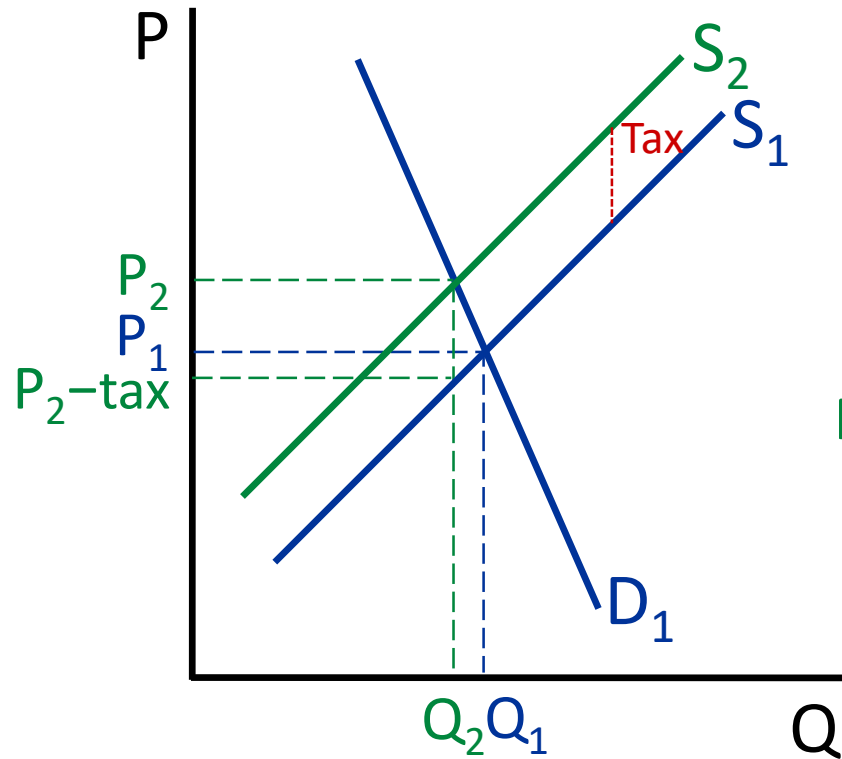(Physically Collected from Sellers)
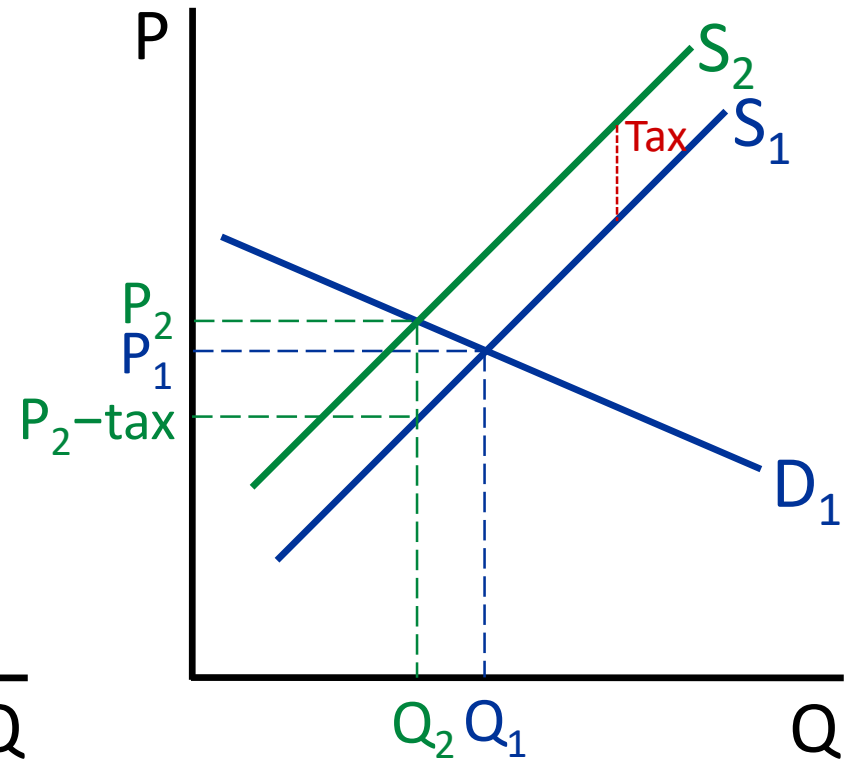
Typical Effects of a Tax

- Quantity bought and sold declines.

- Production and consumption are still allocated by price.

- Price rises by less than the amount of the tax.

- Both sides pay some of the tax.

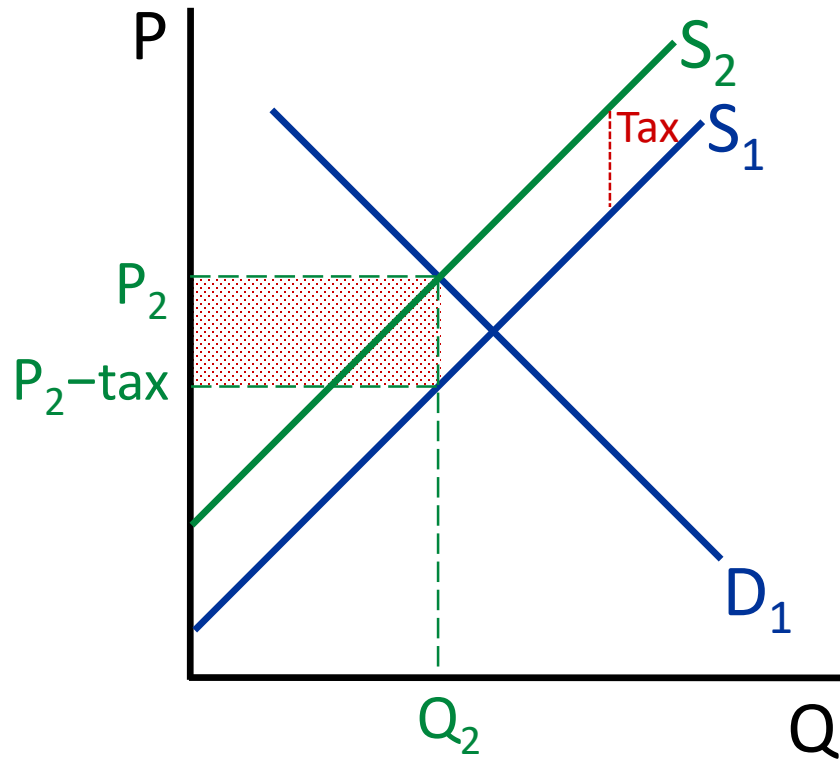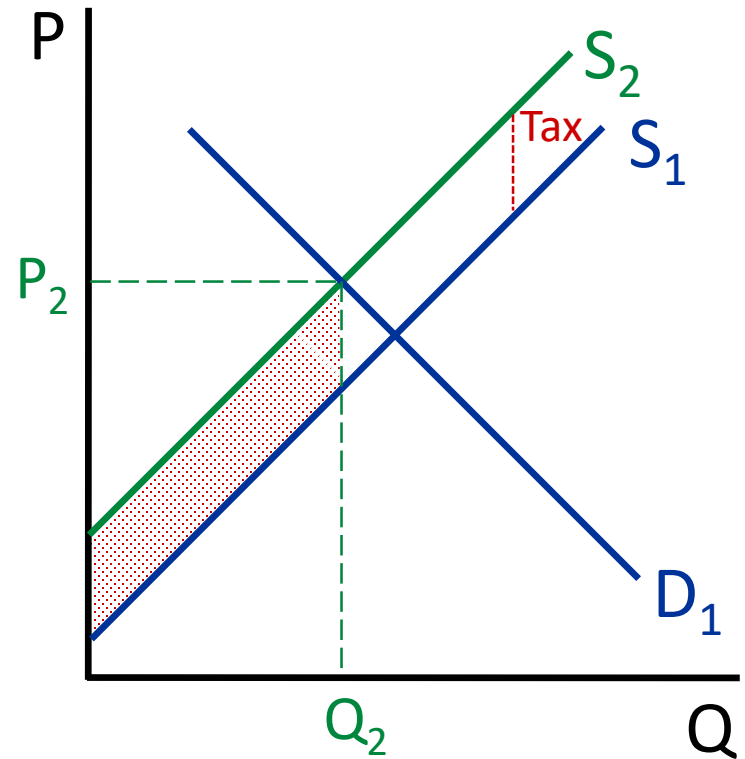# Demand Elasticity and the Effects of a Tax

Inelastic

Elastic

Two Ways of Visualizing Tax Revenues

Demand Elasticity and the Effects of a Tax

- A tax will change the equilibrium quantity more, the more elastic demand is.

- Buyers will pay more of the tax, the less elastic demand is.

- Government revenue from the tax will be larger, the less elastic demand is.