Understanding and Predicting the Effects of Changing Market Conditions

- Let's begin with the equations for supply and demand:

  Demand: $Q_D = a - bP$

  Supply: $Q_S = c + dP$

- We must choose numbers for *a, b, c,* and *d.*

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Understanding and Predicting the Effects of Changing Market Conditions

- ■ Step 1:

  Recall:

$$E = (P/Q)(\Delta Q/\Delta P)$$

Understanding and Predicting the Effects of Changing Market Conditions
of Changing Market Conditions

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- For linear demand curves, the change in quantity divided by the change in price is constant (equal to the slope of the curve).

Understanding and Predicting the Effects of Changing Market Conditions

- Substituting the slopes for each into the formula for elasticity, we get:

$$E_D = -b(P^*/Q^*)$$

$$E_S = d(P^*/Q^*)$$

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Understanding and Predicting the Effects of Changing Market Conditions

- Since we will have values for E_D, E_S, P^*, and Q^*, we can solve for b & d, and a & c.

$$Q_D{}^* = a - bP^*$$

$$Q_S{}^* = c + dP^*$$

- Deriving the long-run supply and demand for copper:

  - The relevant data are:

    - $Q^* = 7.5$ mmt/yr.

    - $P^* = 75$ cents/pound

    - $E_S = 1.6$

    - $E_D = -0.8$

Understanding and Predicting the Effects of Changing Market Conditions

- $E_s = d(P*/Q*)$

- $1.6 = d(75/7.5)$
    $= 0.1d$

- $d = 1.6/0.1 = 16$

- $E_d = -b(P*/Q*)$

- $-0.8 = -b(.75/7.5)$
    $= -0.1b$

- $b = 0.8/0.1 = 8$

Understanding and Predicting the Effects of Changing Market Conditions

- Supply = $Q_S{}^* = c + dP^*$
- $7.5 = c + 16(0.75)$
- $7.5 = c + 12$
- $c = 7.5 - 12$
- $c = -4.5$
- $Q = -4.5 + 16P$

- Demand = $Q_D{}^* = a - bP^*$
- $7.5 = a - (8)(.75)$
- $7.5 = a - 6$
- $a = 7.5 + 6$
- $a = 13.5$
- $Q = 13.5 - 8P$

Understanding and Predicting the Effects of Changing Market Conditions

- Setting supply equal to demand gives:

Supply = -4.5 + 16*p* = 13.5 - 8*p* = *Demand*

16*p* + 8*p* = 13.5 + 4.5

p = 18/24 = .75

Understanding and Predicting the Effects of Changing Market Conditions

Price

a/b

Supply: $Q_S = -4.5 + 16P$

.75

-c/d

Demand: $Q_D = 13.5 - 8P$

7.5

Mmt/yr

Chapter 2: The Basics of Supply and Demand

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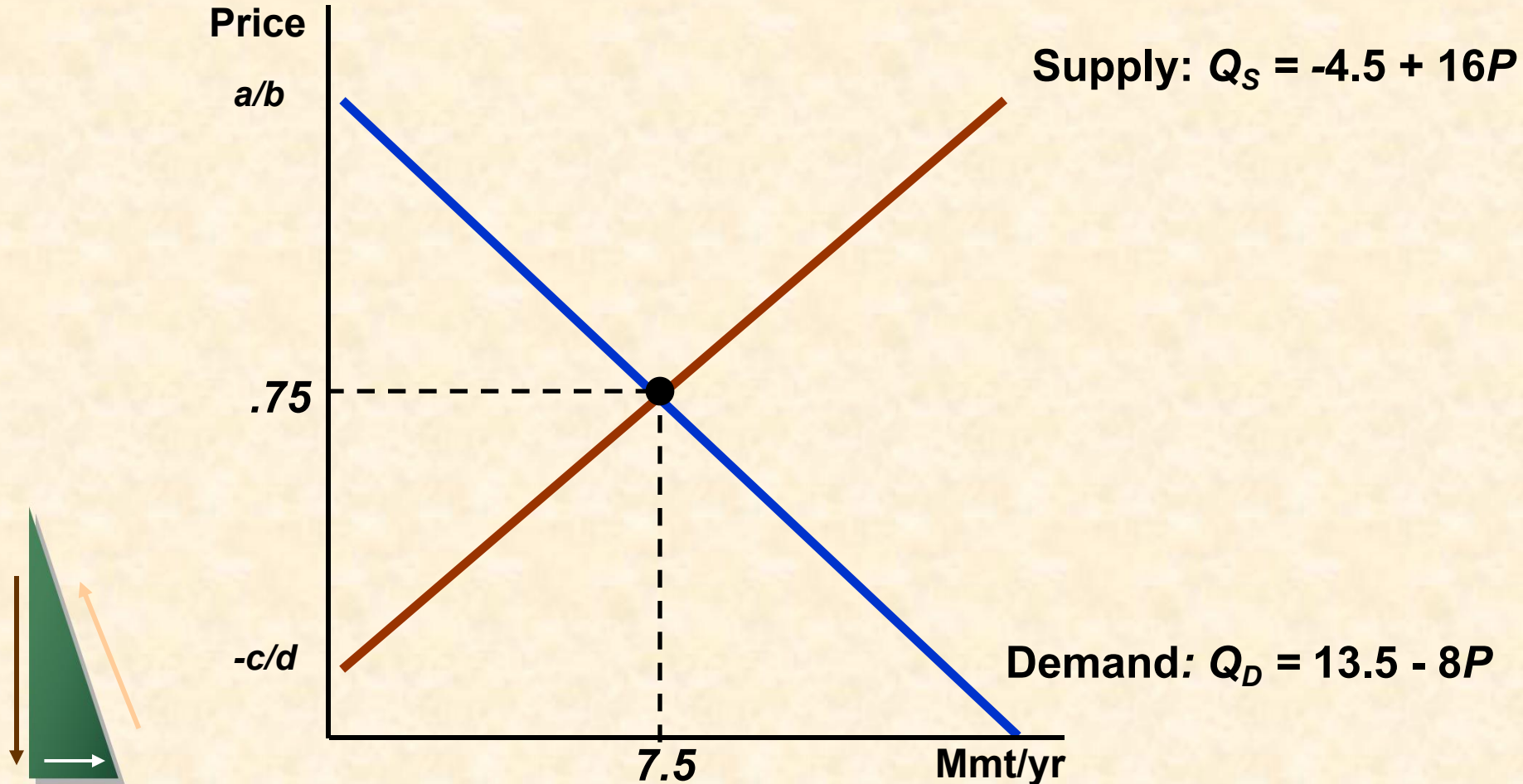
Understanding and Predicting the Effects of Changing Market Conditions

- We have written supply and demand so that they only depend upon price.

- Demand could also depend upon income.

- Demand would then be written as:

$$Q = a - bP + fI$$

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Understanding and Predicting the Effects of Changing Market Conditions

- We know the following information regarding the copper industry:

  - I = 1.0

  - $P^* = 0.75$

  - $Q^* = 7.5$

  - $b = 8$

  - Income elasticity: $E = 1.3$

- *f* can be found by substituting known values into the income elasticity formula:

$$E = (I/Q)(\Delta Q/\Delta I)$$

$$and$$

$$f = \Delta Q/\Delta I$$

Understanding and Predicting the Effects of Changing Market Conditions

- Solving for *f* gives:

$$1.3 = (1.0/7.5)f$$

$$f = (1.3)(7.5)/1.0 = 9.75$$

- Solving for *a* gives:

$$Q^* = a - bP^* + fI$$

7.5 = *a* - 8(0.75) + 9.75(1.0)

a = 3.75

Declining Demand and the Behavior of Copper Prices
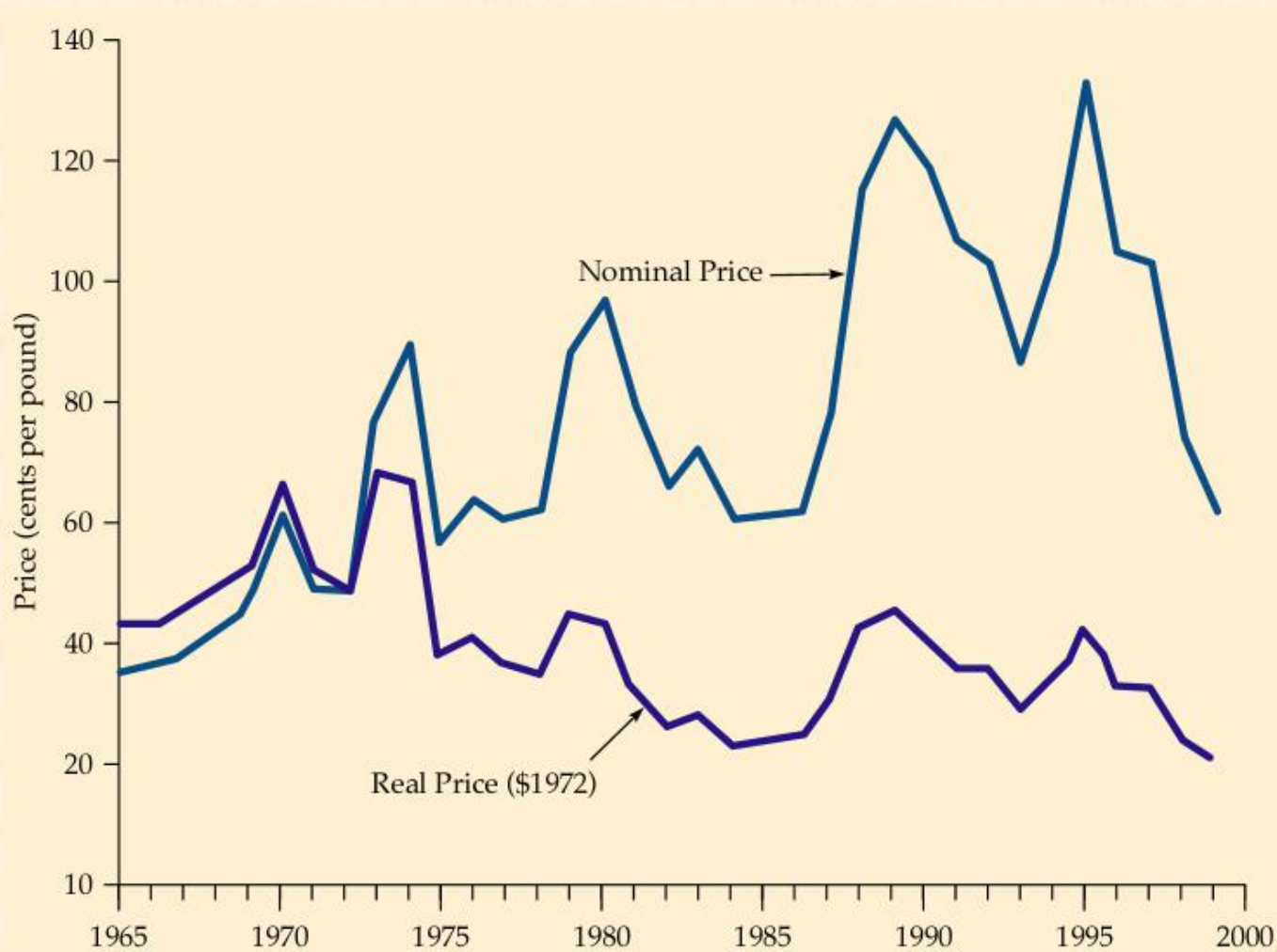
- The relevant factors leading to a decrease in the demand for copper are:

  1) A decrease in the growth rate of power generation

  2) The development of substitutes: fiber optics and aluminum

Real versus Nominal Prices of Copper 1965 - 1999

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■ We will try to estimate the impact of a 20 percent decrease in the demand for copper.

■ Recall the equation for the demand curve:

$$Q = 13.5 - 8P$$

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- Multiply this equation by 0.80 to get the new equation. This gives:

$$Q = (0.80)(13.5 - 8P)$$

$$Q = 10.8 - 6.4P$$

- Recall the equation for supply:

$$Q = -4.5 + 16P$$

- The new equilibrium price is:

$$-4.5 + 16P = 10.8 - 6.4P$$

$$-16P + 6.4P = 10.8 + 4.5$$

$$P = 15.3/22.4$$

$$P = 68.3 \text{ cents/pound}$$

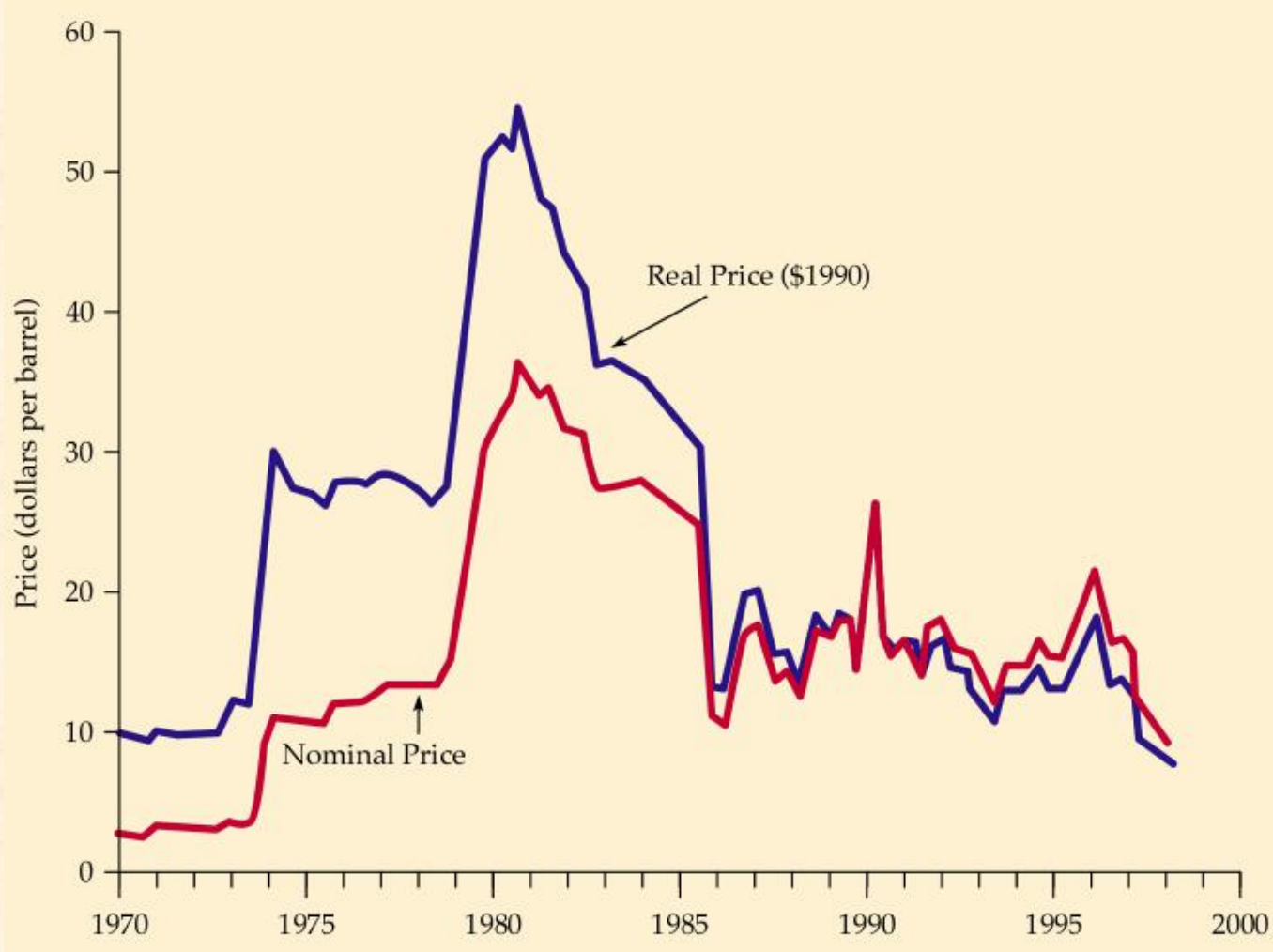- The twenty percent decrease in demand resulted in a reduction in the equilibrium price to 68.3 cents from 75 cents, or 10 percent.

Price of Crude Oil

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Upheaval in the World Oil Market

- We can predict numerically the impact of a decrease in the supply of OPEC oil.

- In 1995:
  - *P** = $18/barrel
  - World demand and total supply = 23 bb/yr.
  - OPEC supply = 10 bb/yr.
  - Non-OPEC supply = 13 bb/yr

Price Elasticity Estimates

	Short-Run	Long-Run
World Demand:	-0.05	-0.40
Competitive Supply (non-OPEC)	0.10	0.40

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Upheaval in the World Oil Market

- Short-Run Impact of a stoppage of Saudi Production equal to 3 bb/yr.

  - Short-run Demand

    - $D = 24.08 - 0.06P$

  - Short-run Competitive Supply

    - $S_C = 11.74 + 0.07P$

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Upheaval in the World Oil Market

- Short-Run Impact of a stoppage of Saudi Production equal to 3 bb/yr.

  - Short-run Total Supply--before supply reduction (includes OPEC, 10bb/yr)

    - $S_T = 21.74 + 0.07P$

  - Short-run Total Supply--after supply reduction

    - $S_T = 18.74 + 0.07P$

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Upheaval in the World Oil Market

- New Price After Reduction

Demand = Supply

24.08 - 0.06P = 18.74 + 0.07P

P = 41.08

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Impact of Saudi Production Cut

Short-Run Effect

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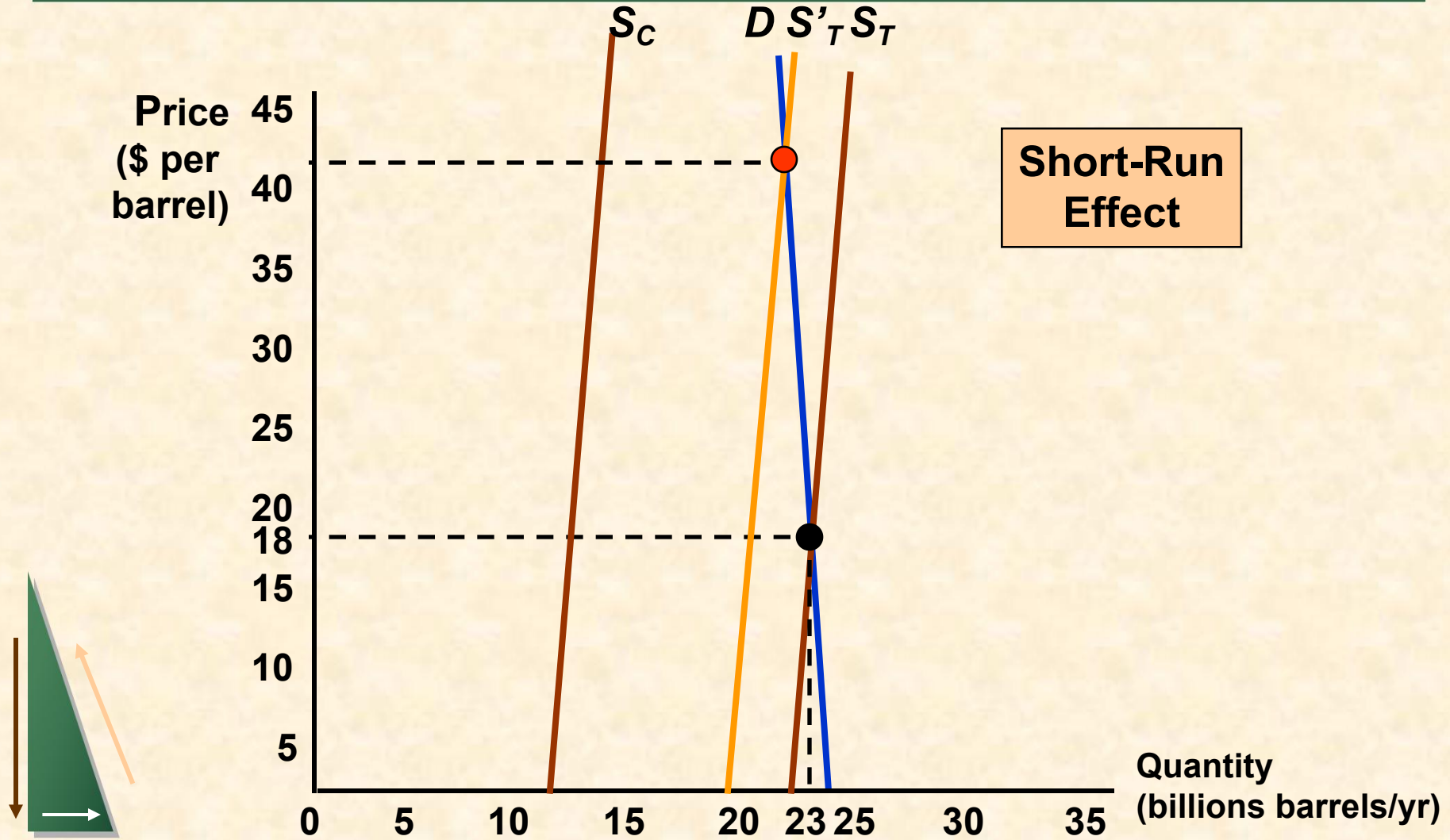
Upheaval in the World Oil Market

- **Long-Run Impact of a stoppage Saudi Production equal to 3 bb/yr..**
  - Long-run Demand
    - ◆ $D = 32.18 - 0.51P$
  - Long-run Total Supply
    - ◆ $S = 17.78 + 0.29P$

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Upheaval in the World Oil Market

- New Price is found setting long-run supply equal to long-run demand:

$$32.18 - 0.51P = 14.78 + 0.29P$$

$$P = 21.75$$