

Trade and  
Resources  
part 1

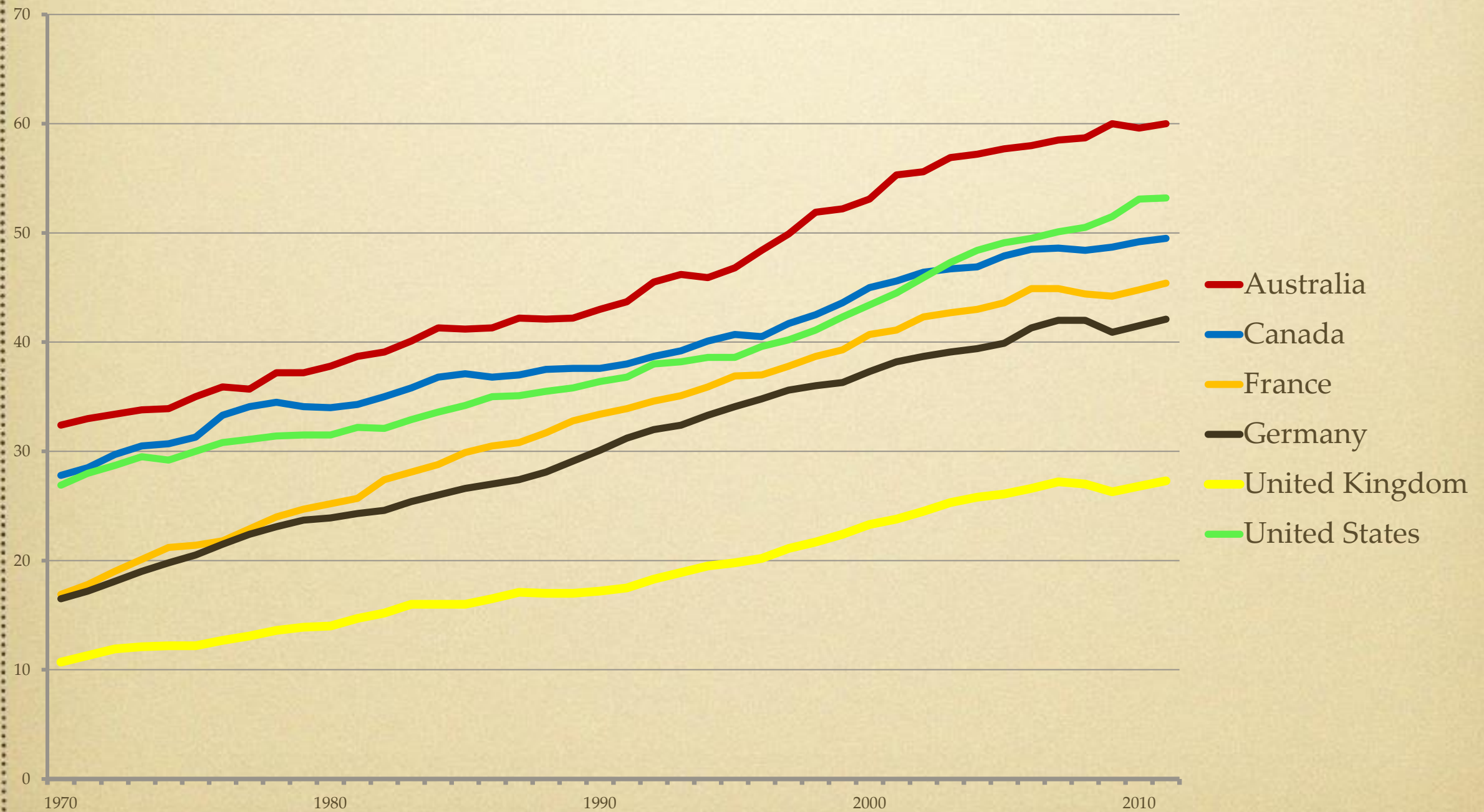


# Some empirical observations

- Falling wages and increasing inequality are often used as a bill of indictment against globalization
- Let's start with several stylized facts



# Fact 1: Labor productivity (output per head) is rising (oecd.org)



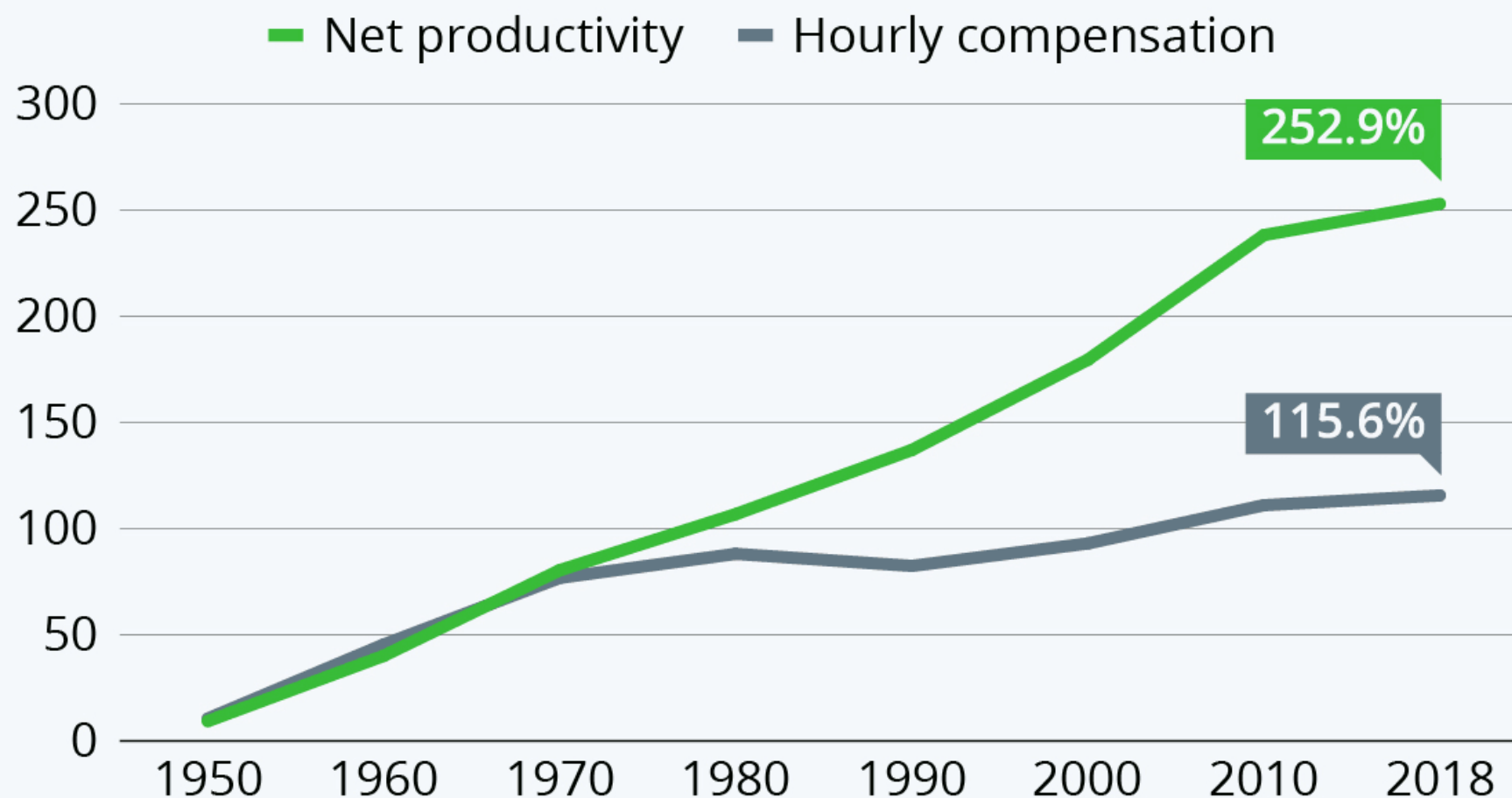


# Some empirical observations

- Fact 1 (continued): but real wages have stagnated for the last thirty years

# Productivity Soars, Wages Stagnate

Percent growth in U.S. productivity and hourly compensation, 1950-2018



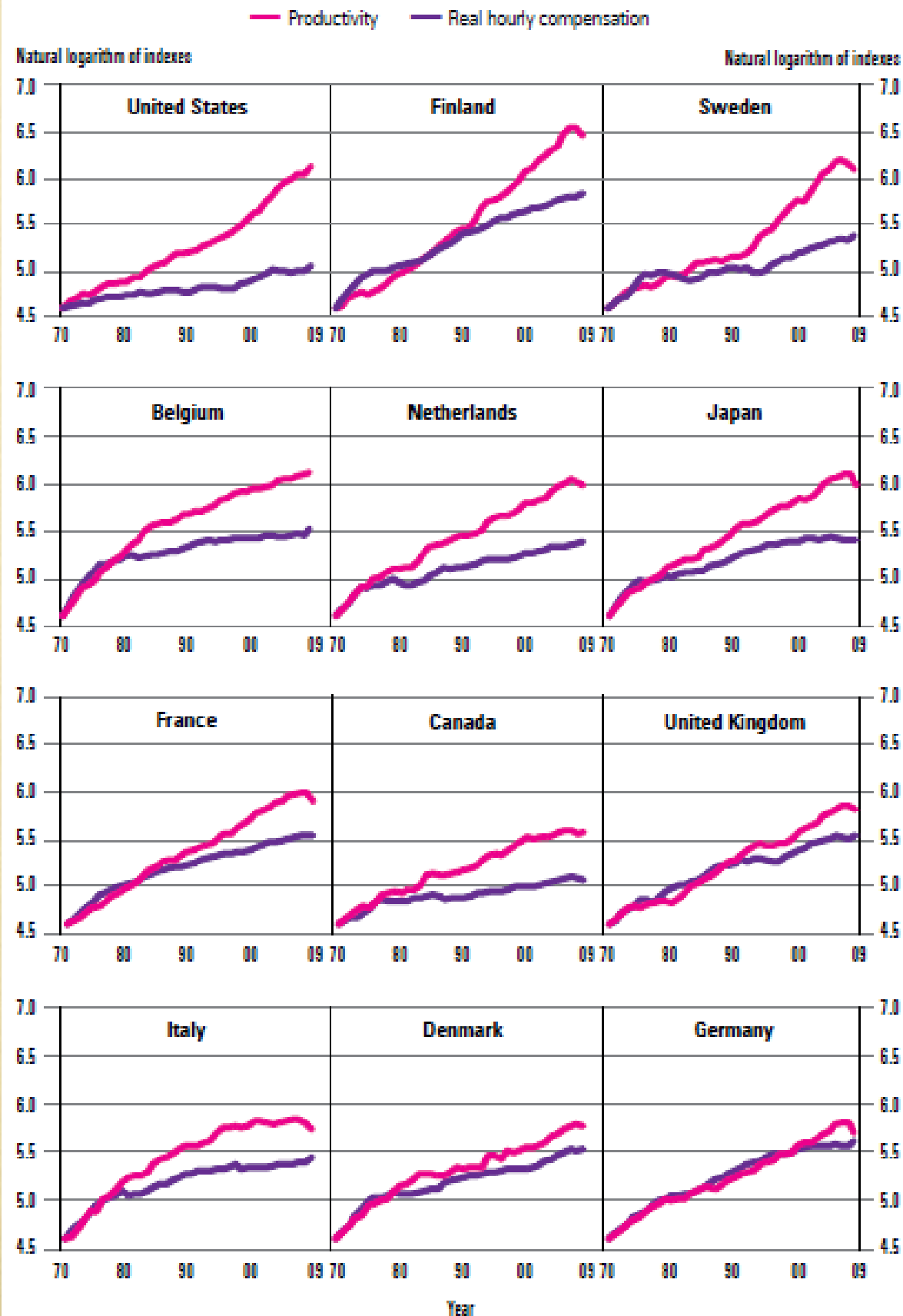
Data on wages from workers in private sector compared to productivity in total economy.

Source: Economic Policy Institute





# Gap between productivity and real hourly compensation in manufacturing, selected countries, 1970–2009



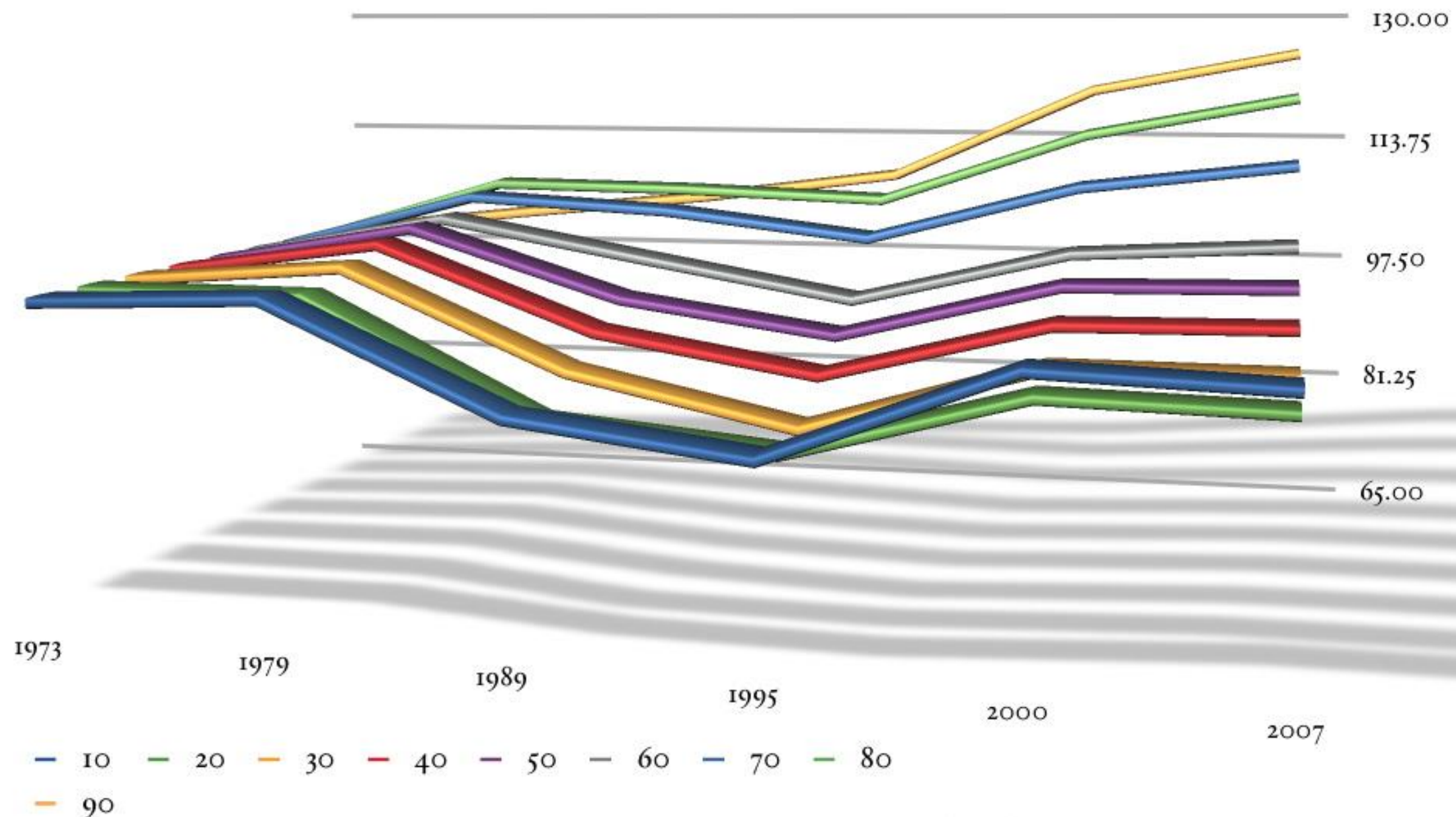
SOURCE: Bureau of Labor Statistics

# Some empirical observations

- Fact 2: Inequality in wages also increased; median wages have been stagnant, and below-median wages have *fallen*.



**Figure 6.2: Male Wage Growth by Percentile, 1973-2005.**



Constructed from Table 3.6 and Figure 3D of Mishel, Bernstein, and Allegretto (2007),

*The State of Working America 2006/2007.*



# Some empirical observations

- Fact 3: This coincides with the big wave of globalization.
- We observed and documented this fact in Introduction



# Questions:

- Are these phenomena related?
- Did globalization cause the stagnation in wages, and the backward slide in incomes of low wage workers?
- Is free trade a rip-off for workers in developed countries?



- Causation is very difficult to prove in economics!
- Post-hoc argument needs to be used with care, as it is possible that both the globalization and the labor market problems were caused by by a common factor



# Our plan:

- Formalize the simplest model that predicts free trade leads to stagnation or reductions in incomes of low-wage workers in OECD countries.
- Then see what other predictions the model has, and test those.
- This model is the *Heckscher-Ohlin* model.



# Heckscher-Ohlin.

- The model was developed by Swedish economist Eli Heckscher (in 1919 article) and his student Bertil Ohlin (in his 1924 dissertation)
- Comparative-advantage model in which trade is driven by differences in factor endowments across countries.



# Heckscher-Ohlin.

- Let's assume there are only two countries: US and China.
- Two goods:
  - Apparel (A) and Plastics (P).
- Two factors of production:
  - Skilled ( $L^S$ ) and unskilled labor ( $L^U$ ).



- We assume that each country's factor supplies are fixed
- Each factor is mobile within its country (no specific factors);
- All agents are price takers



- For simplicity, we'll analyze the model with fixed-coefficients production (Leontieff) because it's easier to understand that way.
- But predictions hold in a general model



- Production of 1 unit of A: requires 1 unit of  $L^S$  and 2 units of  $L^U$
- Production of 1 unit of plastics: requires 3 units of  $L^S$  and 3 units of  $L^U$
- Which good is *unskilled-labor intensive*?
- Which good is *skilled-labor intensive*?



- Production of 1 unit of A: requires 1 unit of  $L^S$  and 2 units of  $L^U$
- Production of 1 unit of plastics: requires 3 units of  $L^S$  and 3 units of  $L^U$
- Apparel is *unskilled-labor intensive*
- Plastics are *skilled-labor intensive*.



- Comment 1: Note that these are relative terms - comparison of skilled-to-unskilled labor *ratio* in the two industries.
- Comment 2: Note the assumption that both country have the same technology



- Assume that the US has 72 million unskilled workers, 60 million skilled workers.
- Assume that China has 540 million unskilled workers, 300 million skilled workers.



- Which country is rich in skilled labor?
- Which country is poor in skilled labor?
- Which country is rich in unskilled labor?
- Which country is poor in unskilled labor?



- US is *skilled-labor abundant* (or *skilled-labor rich*);
- US is *unskilled-labor scarce* (or *unskilled-labor poor*);
- China is *unskilled-labor abundant* (or *unskilled-labor rich*);
- China is *skilled-labor scarce* (or *skilled-labor poor*).



- Note once again these are *relative* terms.
- China in this example has more skilled workers than the US.
- That doesn't make it unskilled-labor abundant; it's the *ratio* that matters.

- How do we solve this model?
- How many markets in each country?



# How do we solve this model?

- First, we look at autarky equilibrium in each country
- That is we need to understand supply, demand and equilibrium
- First, we will discuss how factor markets work, and then analyze goods markets.
- Then, we will look at trade equilibrium



# Production: US.

- Unskilled labor market clearing
  - $2A + 3P = 72$  million.
- Skilled labor market clearing:
  - $A + 3P = 60$  million.
- Two equations and two unknowns.



Plastics  
(millions)

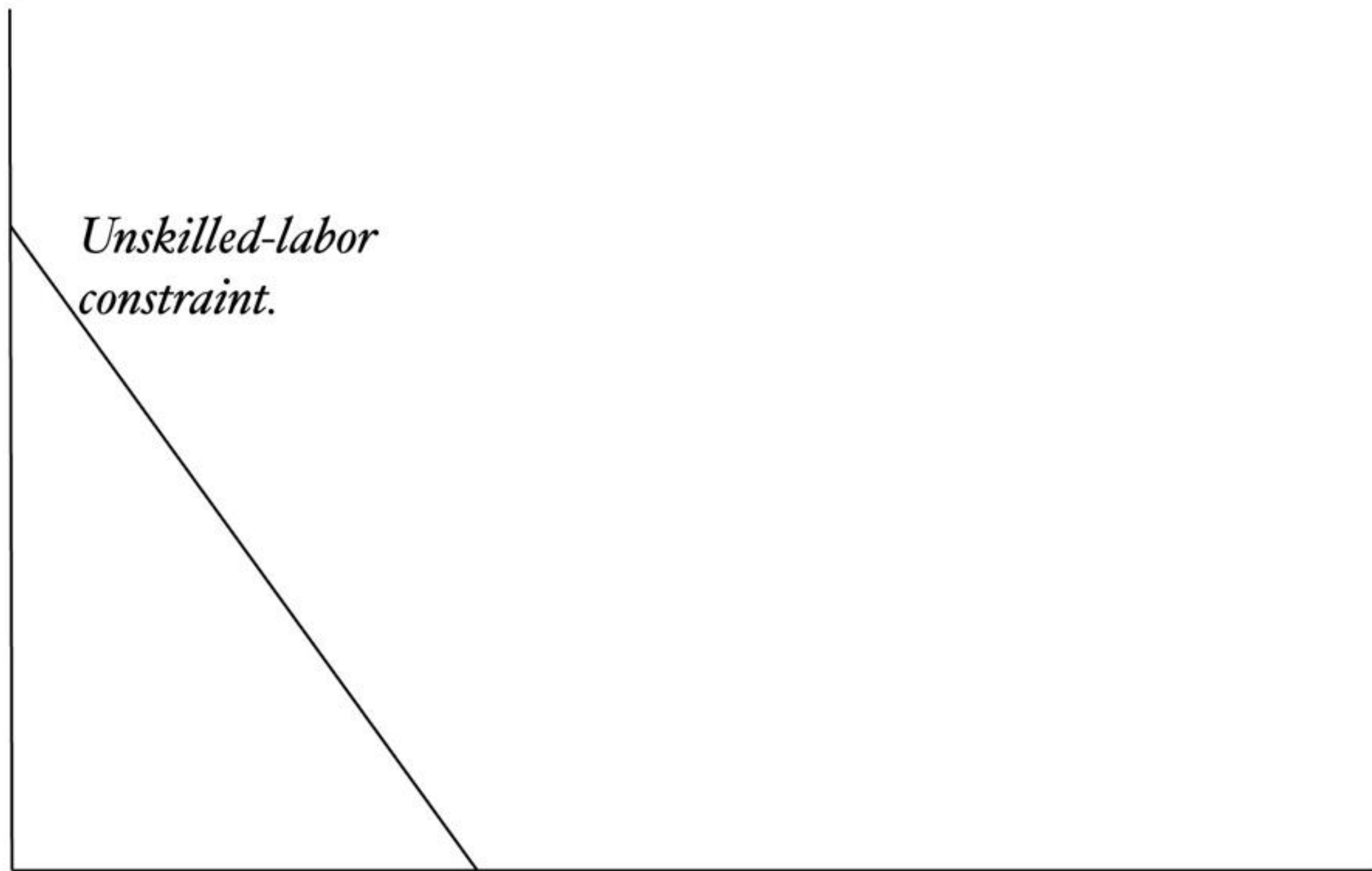
24

*Unskilled-labor  
constraint.*

36

Apparel (millions)

Figure 6.3: Production in the US economy.



Plastics  
(millions)

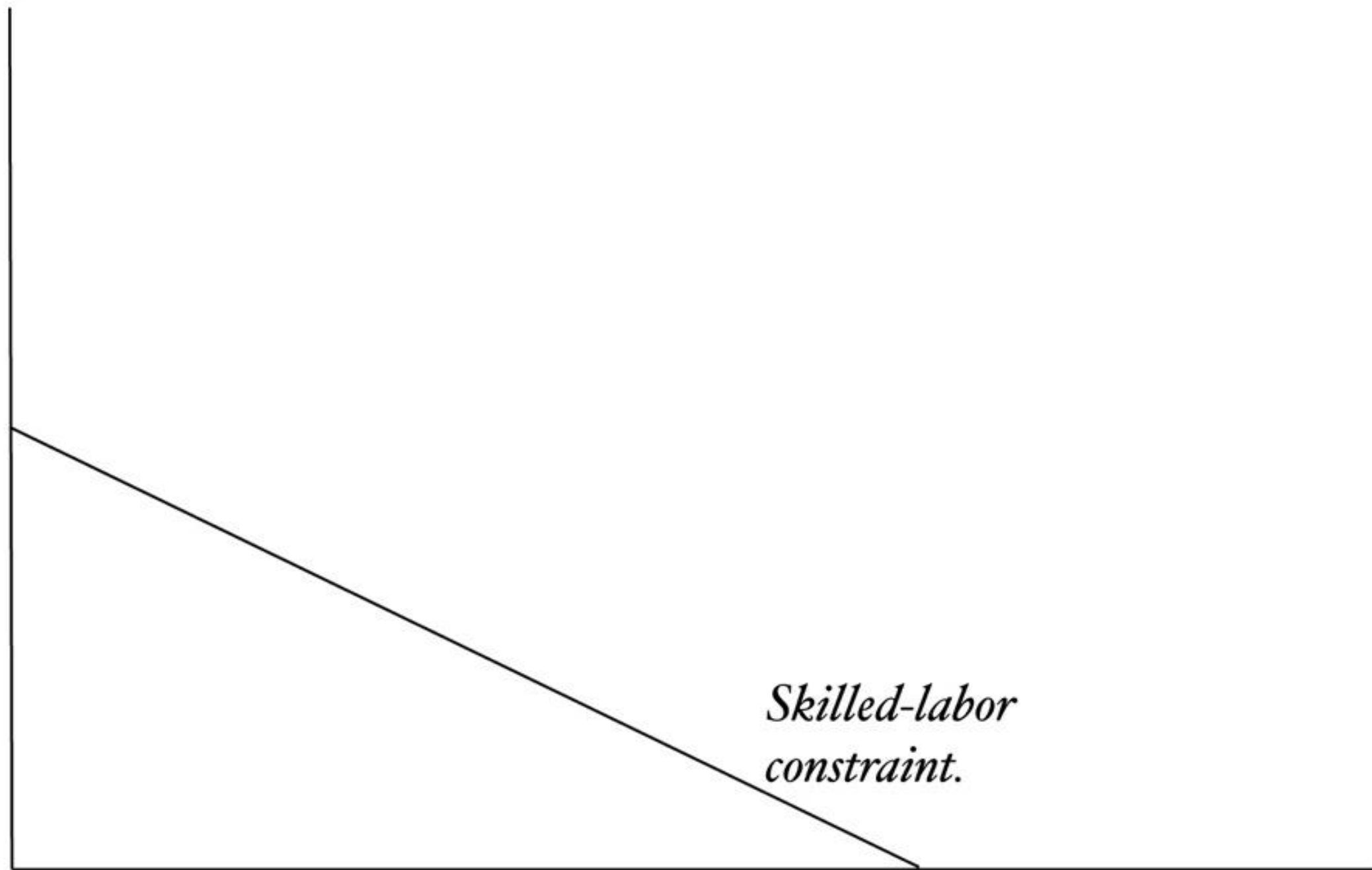
20

*Skilled-labor  
constraint.*

60

Apparel (millions)

Figure 6.3: Production in the US economy.





Plastics  
(millions)

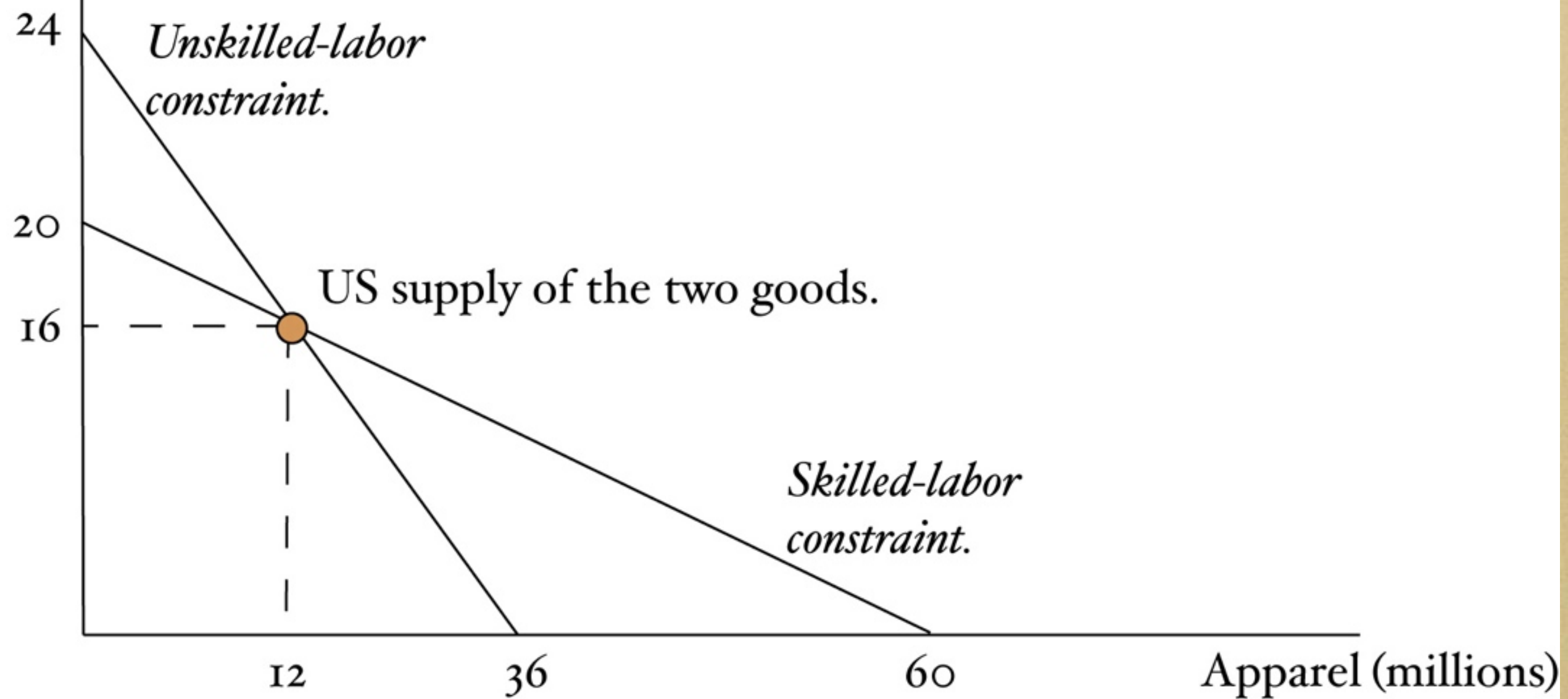


Figure 6.3: Production in the US economy.

- Relative supply does not depend on  $P^A/P^P$ .
- Therefore, relative supply curve is....
  - .... vertical.



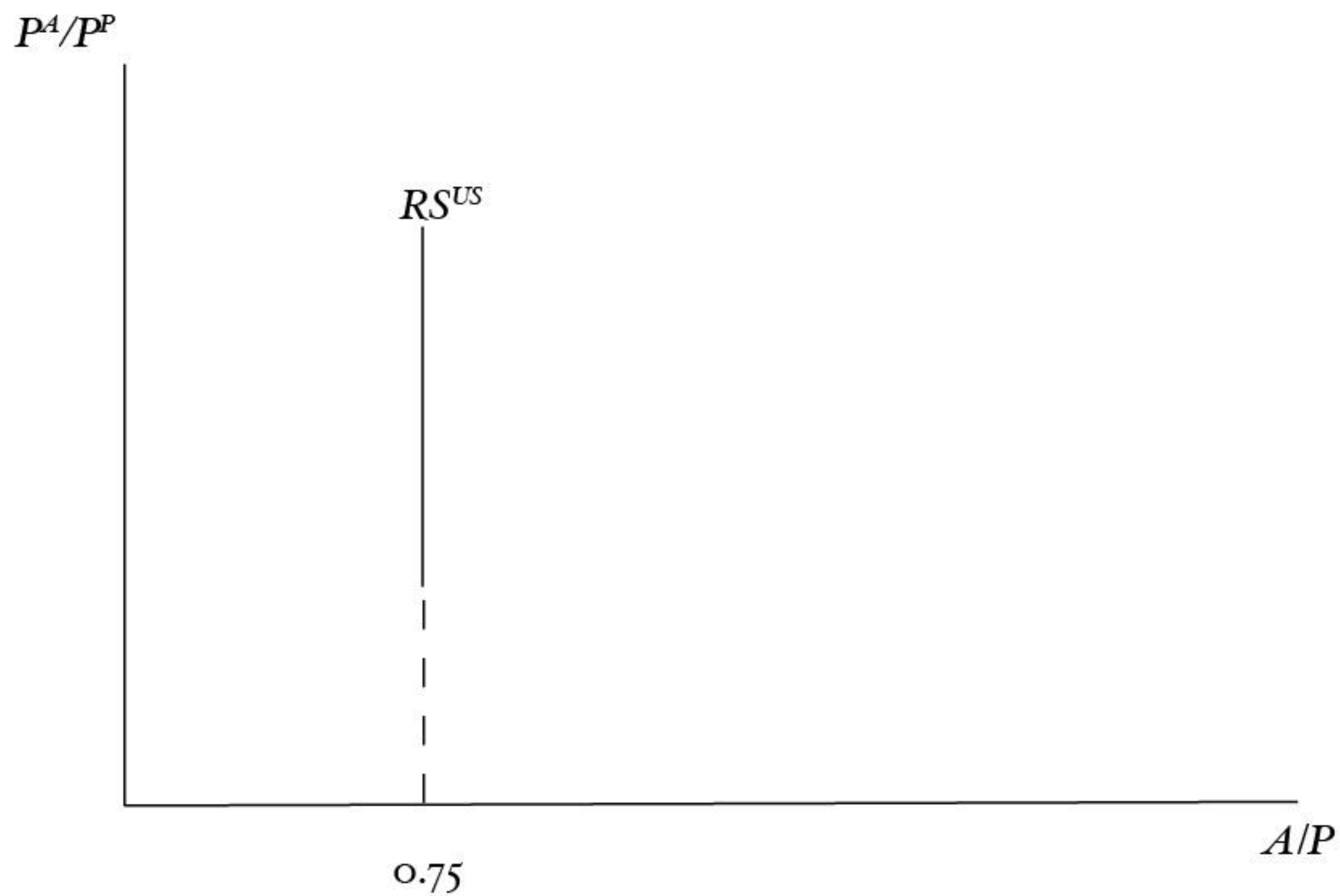


Figure 6.4: The US relative supply curve.

# In class exercise

- The manufacturing of Electric cars (E) takes
  - 6 units K and 2 units of L
- The manufacturing of processed foodstuff (F) takes
  - 2 units of K and 2 units of L.
- $K = 100$  and  $L = 40$
- Outputs of E and F? Relative supply of E/F?



- Suppose we doubled the endowment of both kinds of labor -- the relative supply of apparel would.....
  - ... not change.

- Therefore, we can think of RS as a function of  $L^U/L^S$  alone.
- Now, is it increasing or decreasing in  $L^U/L^S$ ?
- I.e., what happens if we raise  $L^U$  without changing  $L^S$ ?



# Plastics

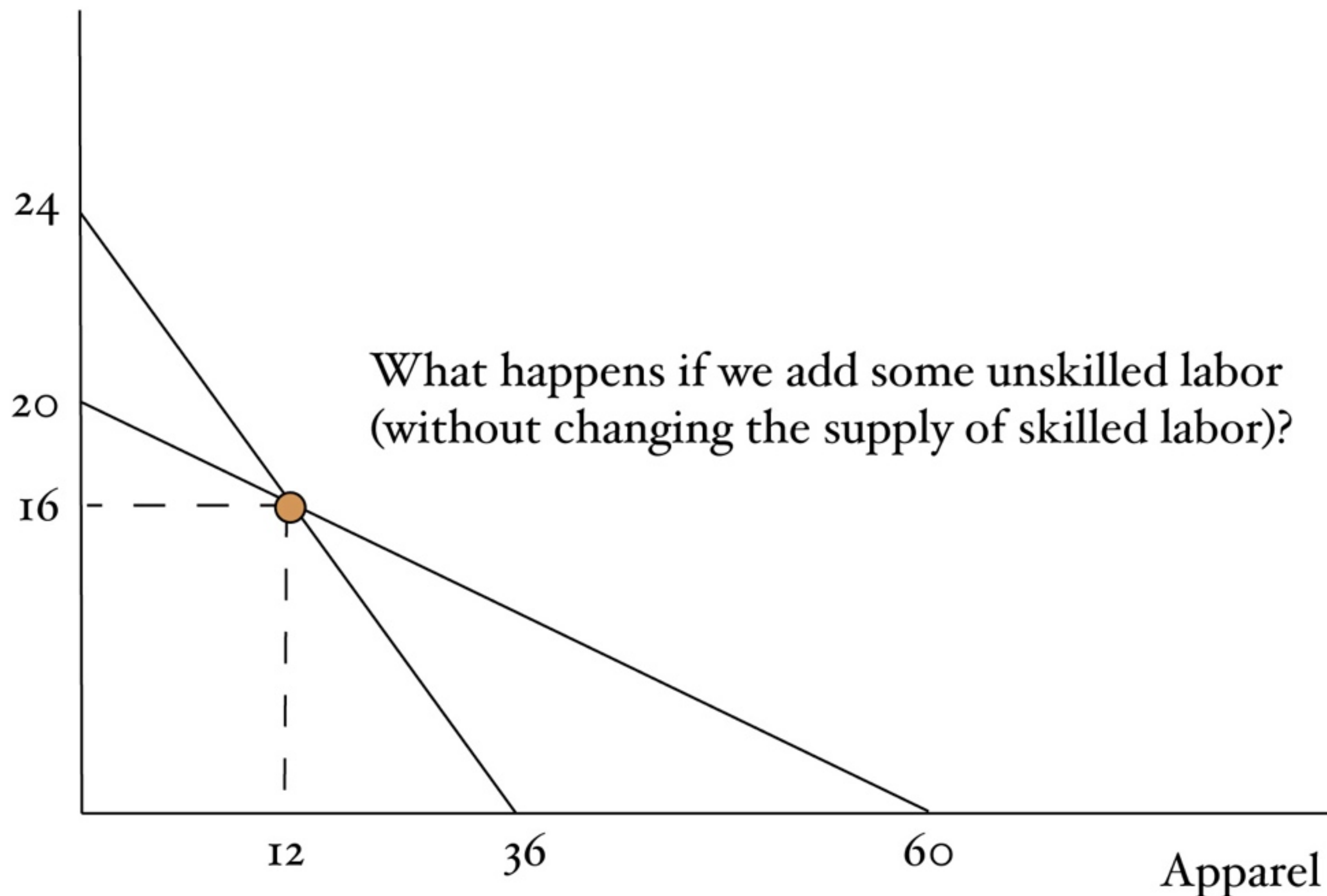


Figure 6.5: The Effect of a Change in Factor Supplies.

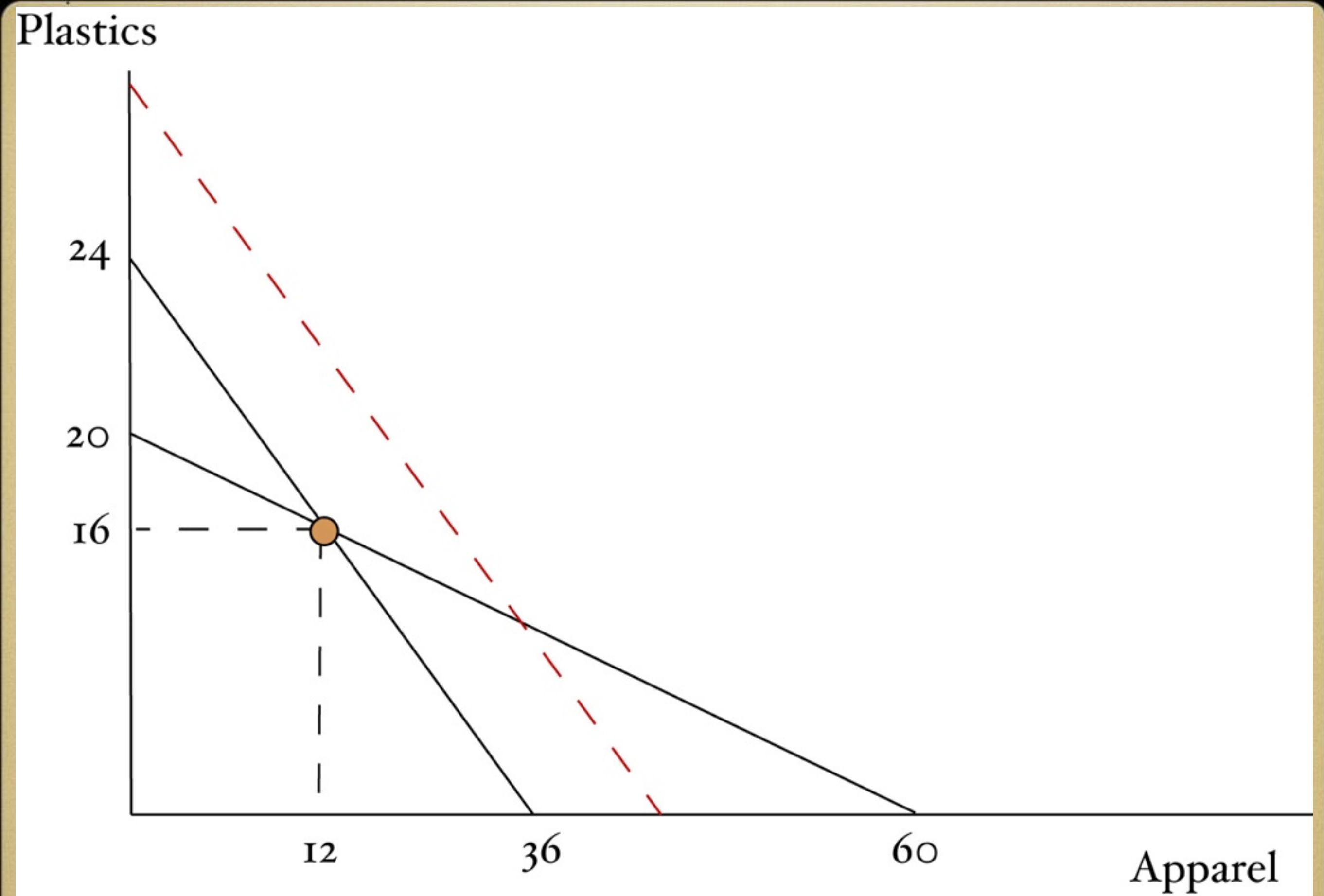


Figure 6.5: The Effect of a Change in Factor Supplies.



Plastics

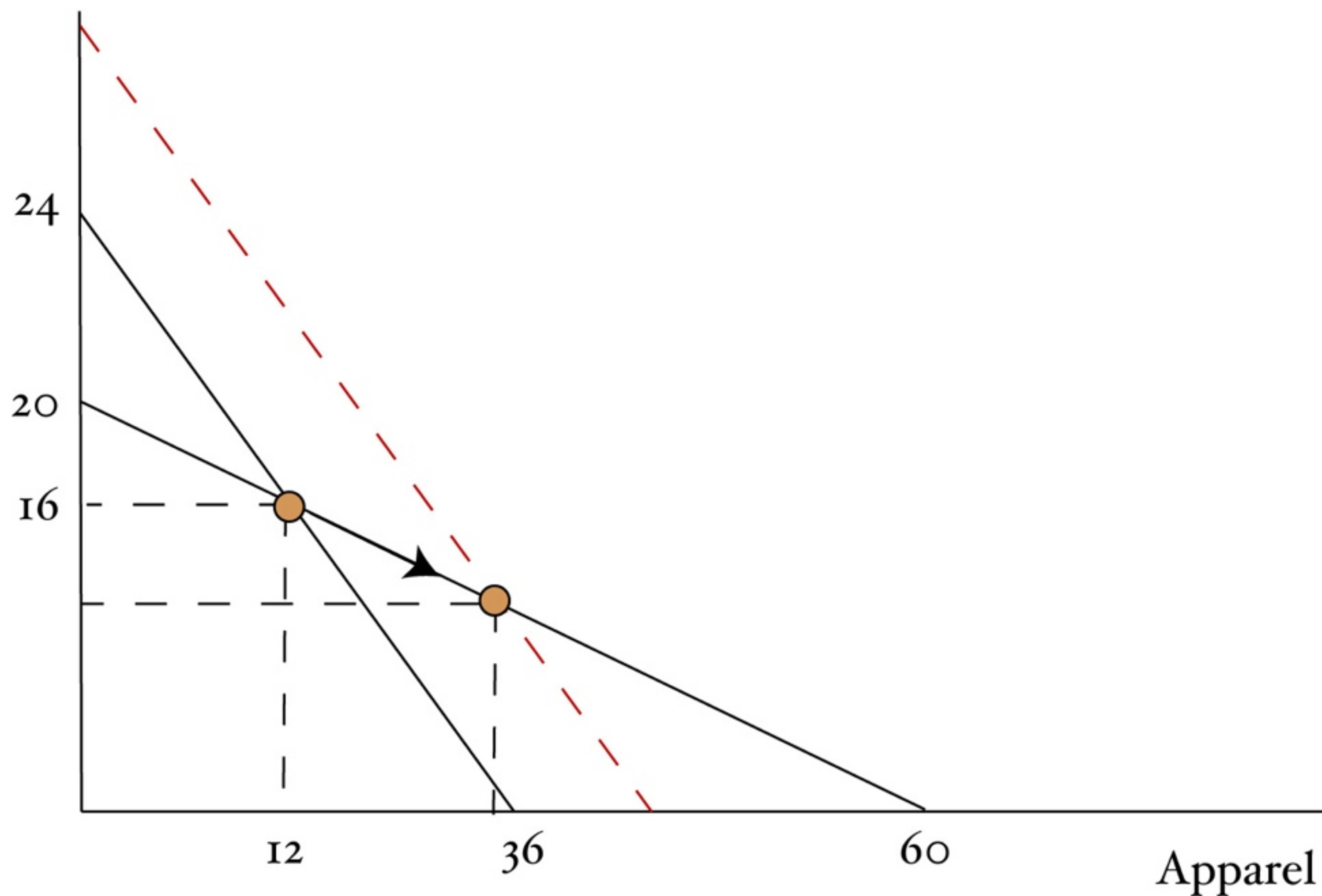


Figure 6.5: The Effect of a Change in Factor Supplies.

- Answer:  $Q^A$  goes up, and  $Q^P$  goes down.
- Our result: RS is increasing in  $L^U/L^S$ .



# In class exercise 2

- The manufacturing of Electric cars (E) takes
- 6 units K and 2 units of L
- The manufacturing of processed foodstuff (F) takes
- 2 units of K and 2 units of L.
- $K = 100$  and  $L = 40$  then  $E = 15$  and  $F = 5$
- Suppose now  $L = 60$
- What happens to  $E/F$ ?



# Production: China

- Now we know that China, with a higher unskilled/skilled ratio, should also have a higher relative supply of apparel.
- Unskilled labor market:  $2A + 3P = 540$  million.
- Skilled labor market:  $A + 3P = 300$  million.
- China produces 240 million units of apparel and 20 million units of plastics



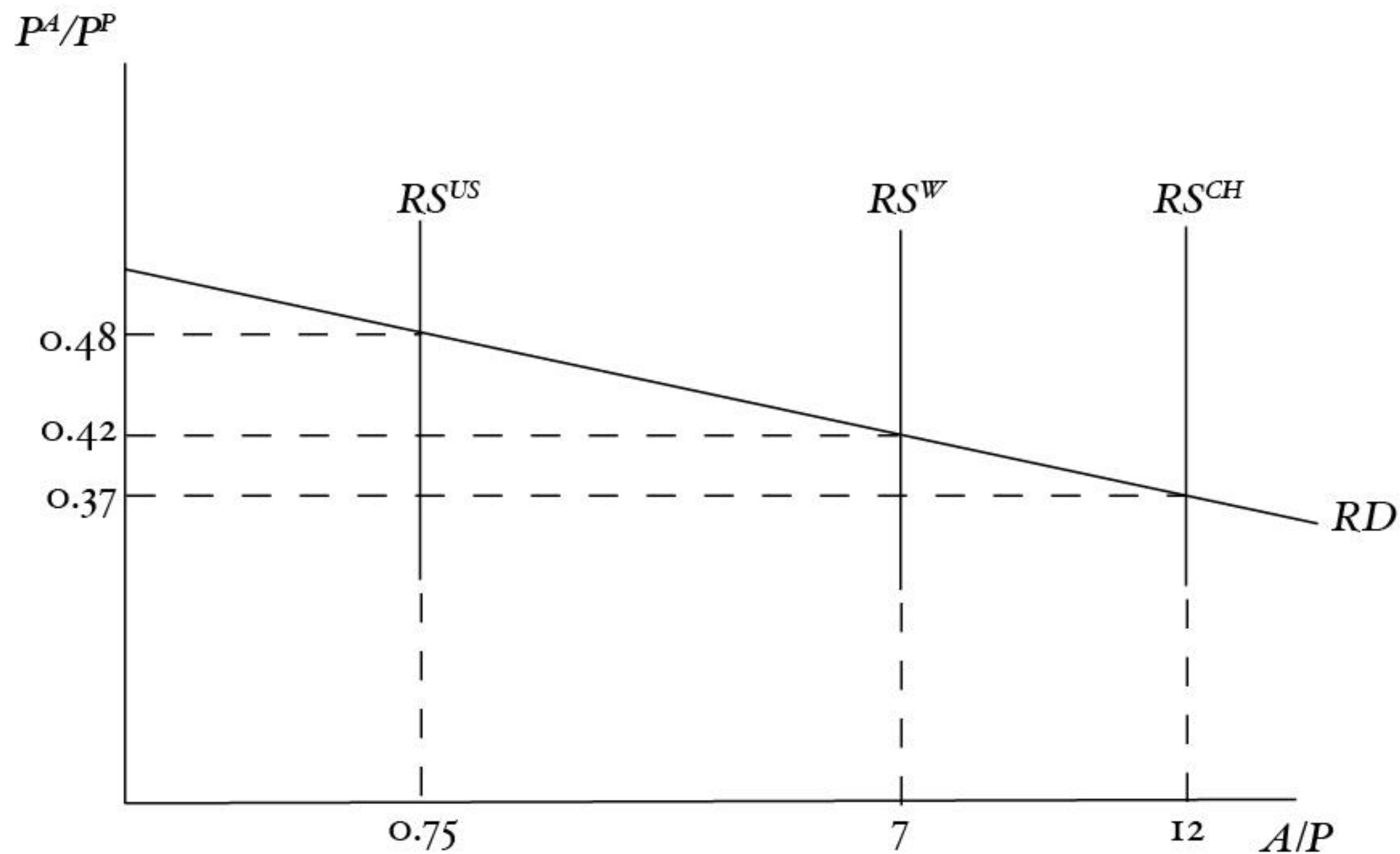


Figure 6.6: Relative supply, relative demand, and equilibrium.

- Assume that all consumers in both countries have the same relative demand curve
- We have that the autarky relative prices of apparel for the US and China are given by 0.48 and 0.37



- Now we need to compute the free-trade equilibrium
- Hence, we need the *world relative* supply curve
- World supply of apparel is  $(12 + 240)$  million, and world supply of plastics is  $(16 + 20)$  million,
- We have that world relative supply of apparel is 7 and equilibrium relative price equals 0.42

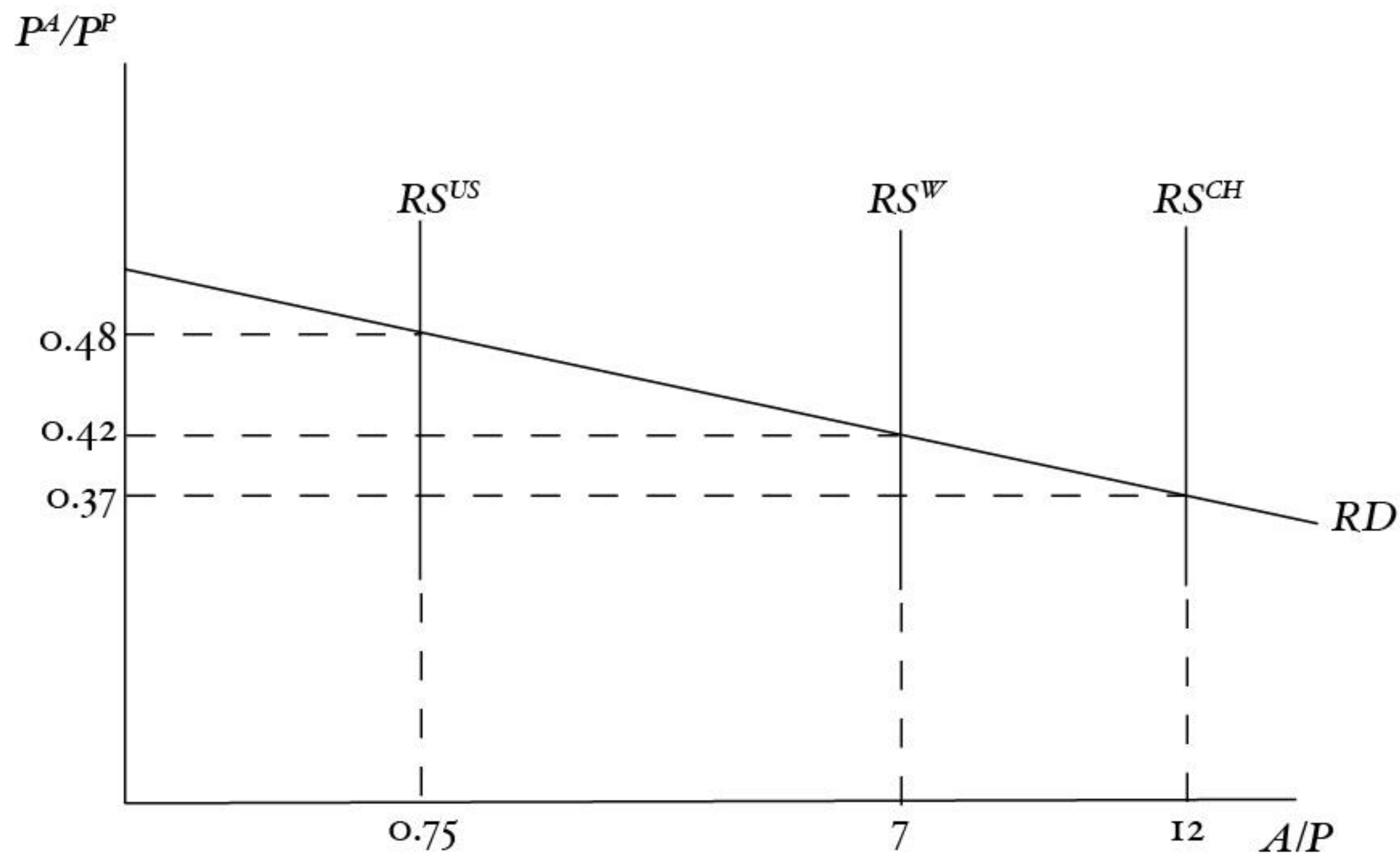


Figure 6.6: Relative supply, relative demand, and equilibrium.



- Trade raises the relative price of apparel in China
- But lowers price of apparel in the US
- This makes sense: the US is the unskilled-labor-scarce country, and so the unskilled-labor-intensive good, apparel, is expensive there compared to the unskilled-labor abundant country



- At the free-trade equilibrium, China's relative supply of apparel (12) exceeds its relative demand for apparel (7), so it exports apparel and imports plastics.
- The US' relative demand for apparel (7) exceeds its relative supply (0.75), so it imports apparel and exports plastics.
- Each country exports the good that is intensive in the factor in which it is abundant.
- This is called the *Heckscher-Ohlin theorem*.



# the *Heckscher-Ohlin* *theorem*

- *With two goods and two factors, each country will export the good that uses intensively the factor of production it has in abundance, and will import the other good*



# Gains from trade in the aggregate.

- Thought experiment: consider an egalitarian society.
- Each worker earns wage and then throws it into a pot.
- Then we all share equally.
- Can speak in terms of a 'representative consumer.'



Plastics  
(millions)

16 — — — *A*

12

Apparel (millions)

Figure 6.7: The Gains from Trade in the US.

Plastics  
(millions)

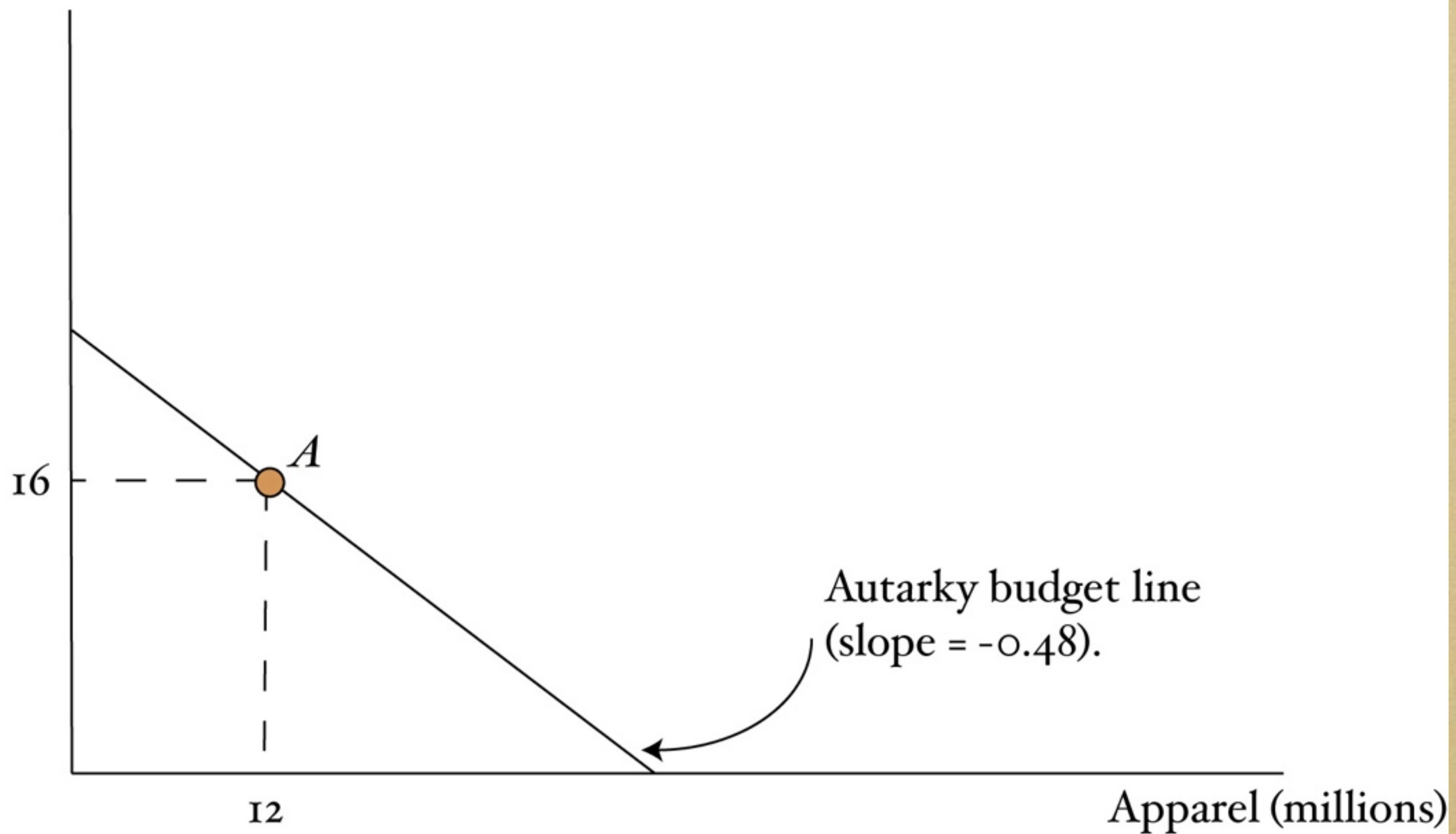


Figure 6.7: The Gains from Trade in the US.



- With trade, does the new budget line still go through point A?
- Is apparel now relatively cheaper or expensive?
- Where the representative agent will be able to consume?
- Were these options available in autarky?

Plastics  
(millions)

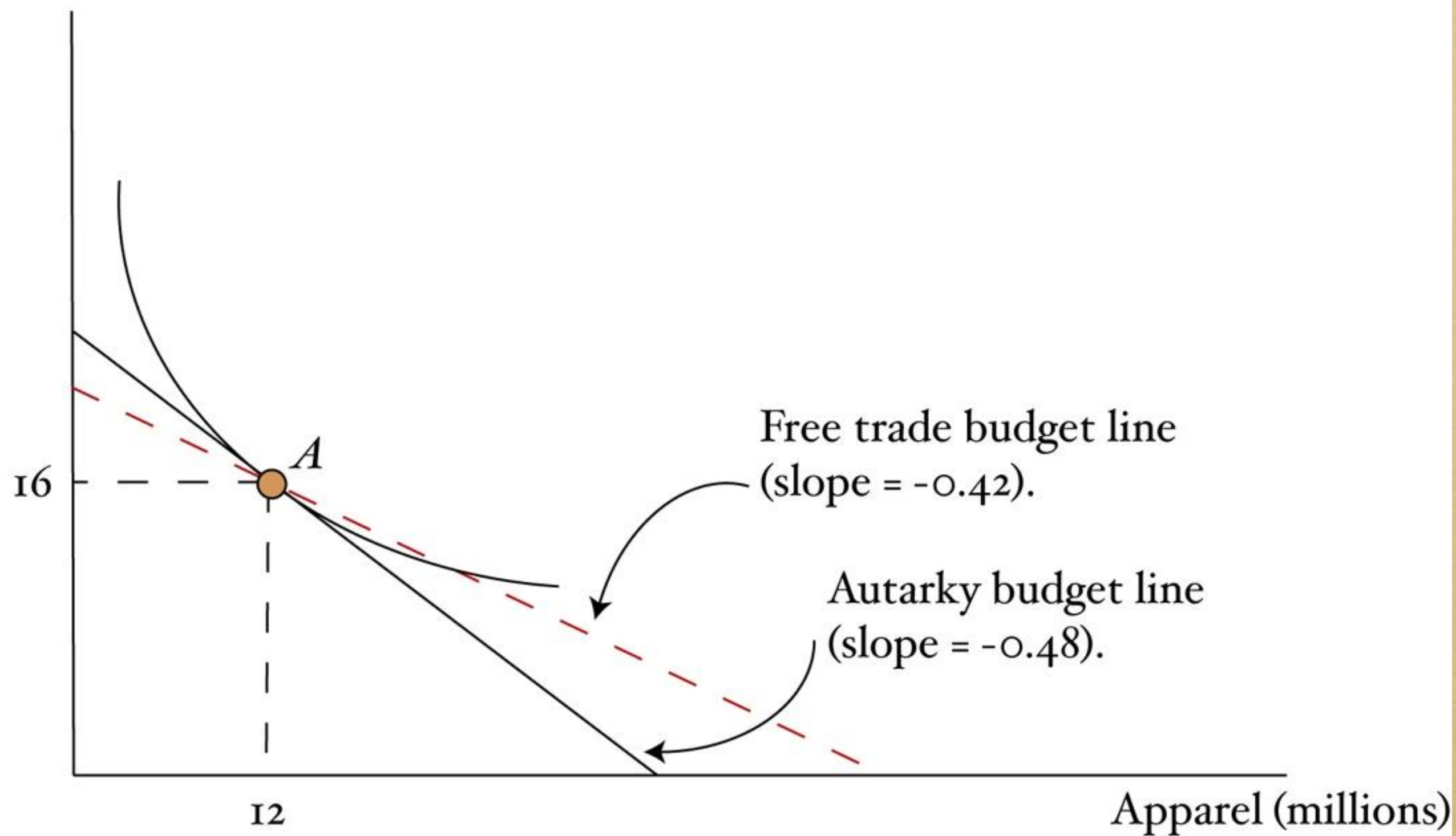


Figure 6.7: The Gains from Trade in the US.



- Hence, total US welfare is higher under free trade than under autarky.
- Put differently, that the US as a whole gains from trade.
- What about China's aggregate welfare?



- The fact that each country as a whole gains from trade does not guarantee that every citizen is happy about trade!
- Income distribution problem
- Recall tensions over trade policy in specific factors model