Trade and Resources

Part 2

- 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

Income distribution

- Next, we look at product markets
- Recall that we assumed perfect competition and free entry/exit
- What does this imply about profits in equilibrium?

- 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

- The US has 72 million unskilled workers, 60 million skilled workers.
- China has 540 million unskilled workers, 300 million skilled workers

Zero-profit conditions.

- Zero profits are the key to understanding wages in this model
- Apparel: $2w^U + w^S = P^A$
- Plastics: $3w^U + 3w^S = P^P$

- Actually, we're really interested not in nominal wages but in real wages

- Why?

- w^U/P^A, w^U/P^P, w^S/P^A, w^S/P^P

- Let's divide zero-profit conditions by the output prices.
- Let's start with P^A
- Apparel: $2w^U + w^S = P^A$
- Plastics: $3w^U + 3w^S = P^P$
- Apparel: $2w^U/P^A + w^S/P^A = 1$
- Plastics: $3w^U/P^A + 3w^S/P^A = P^P/P^A$

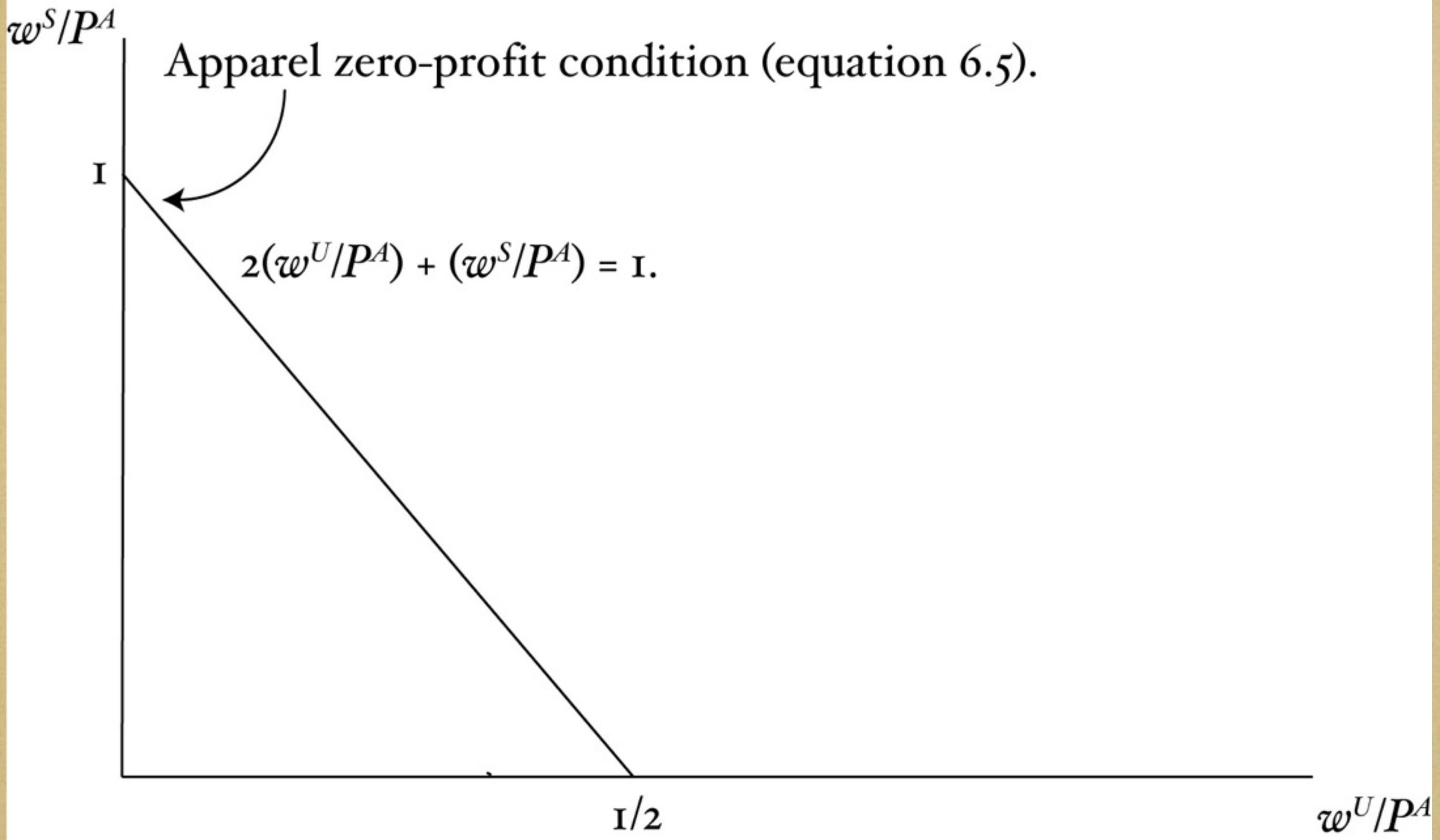
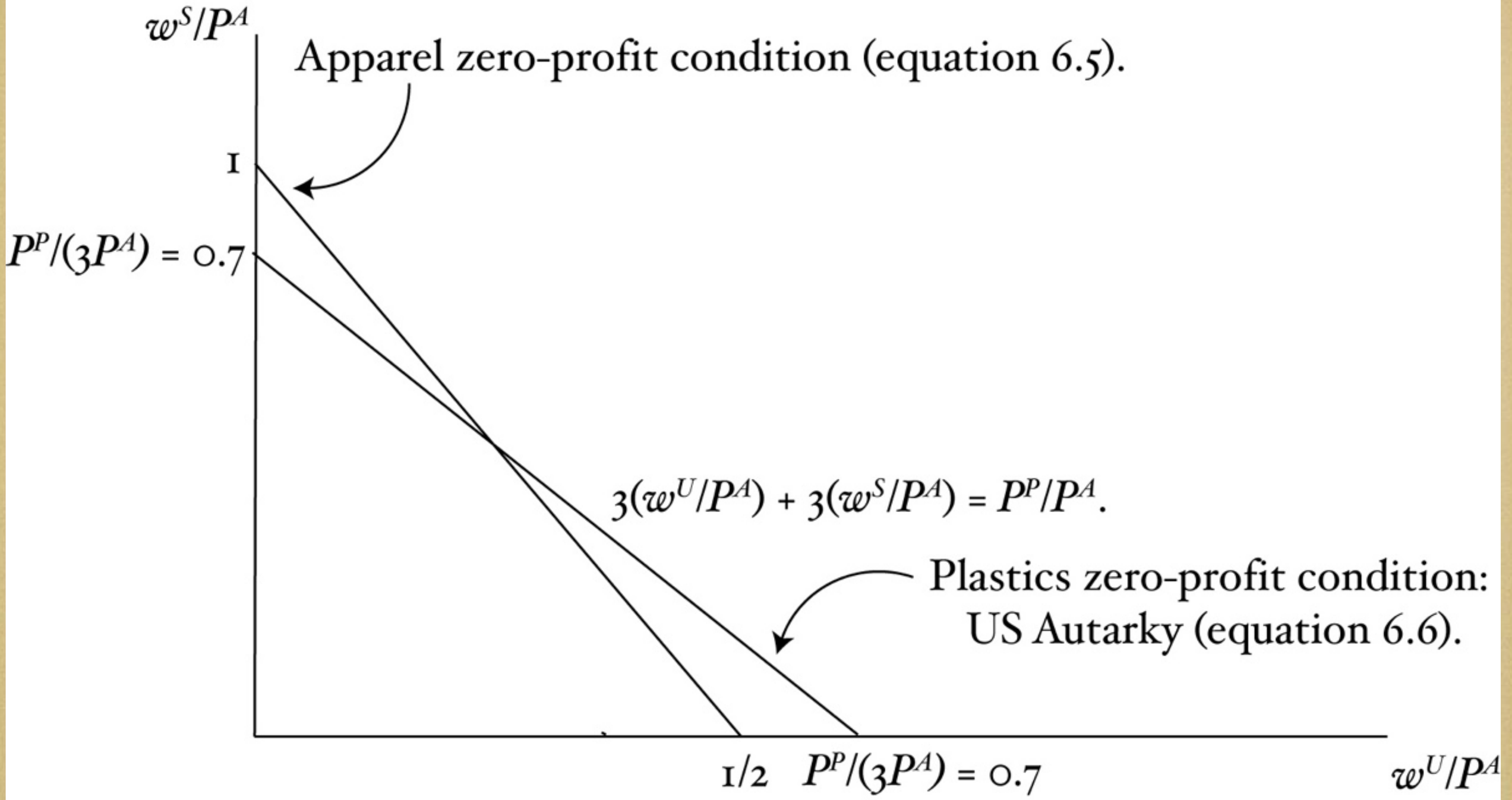


Figure 6.8: Equilibrium real wages.



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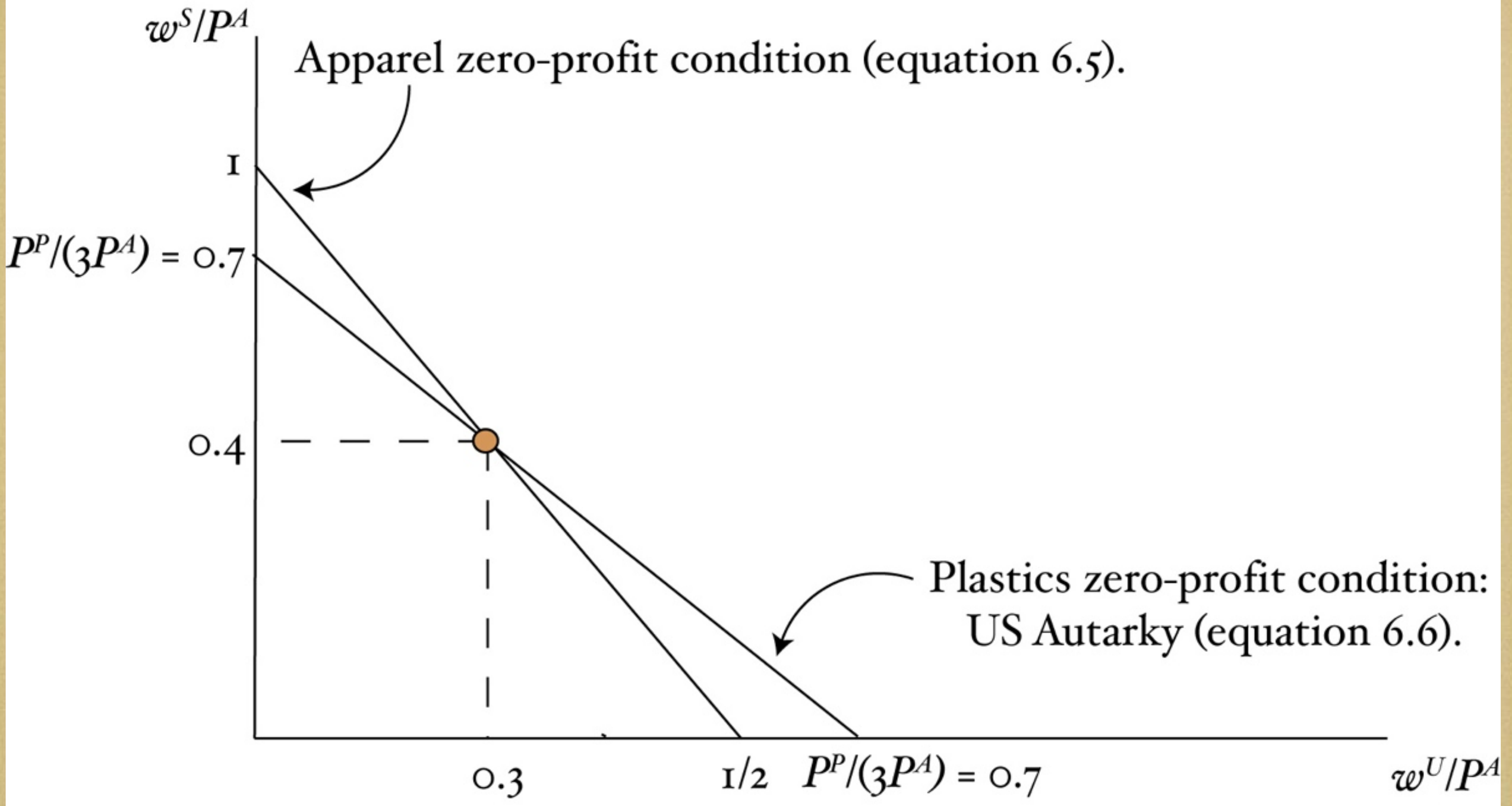


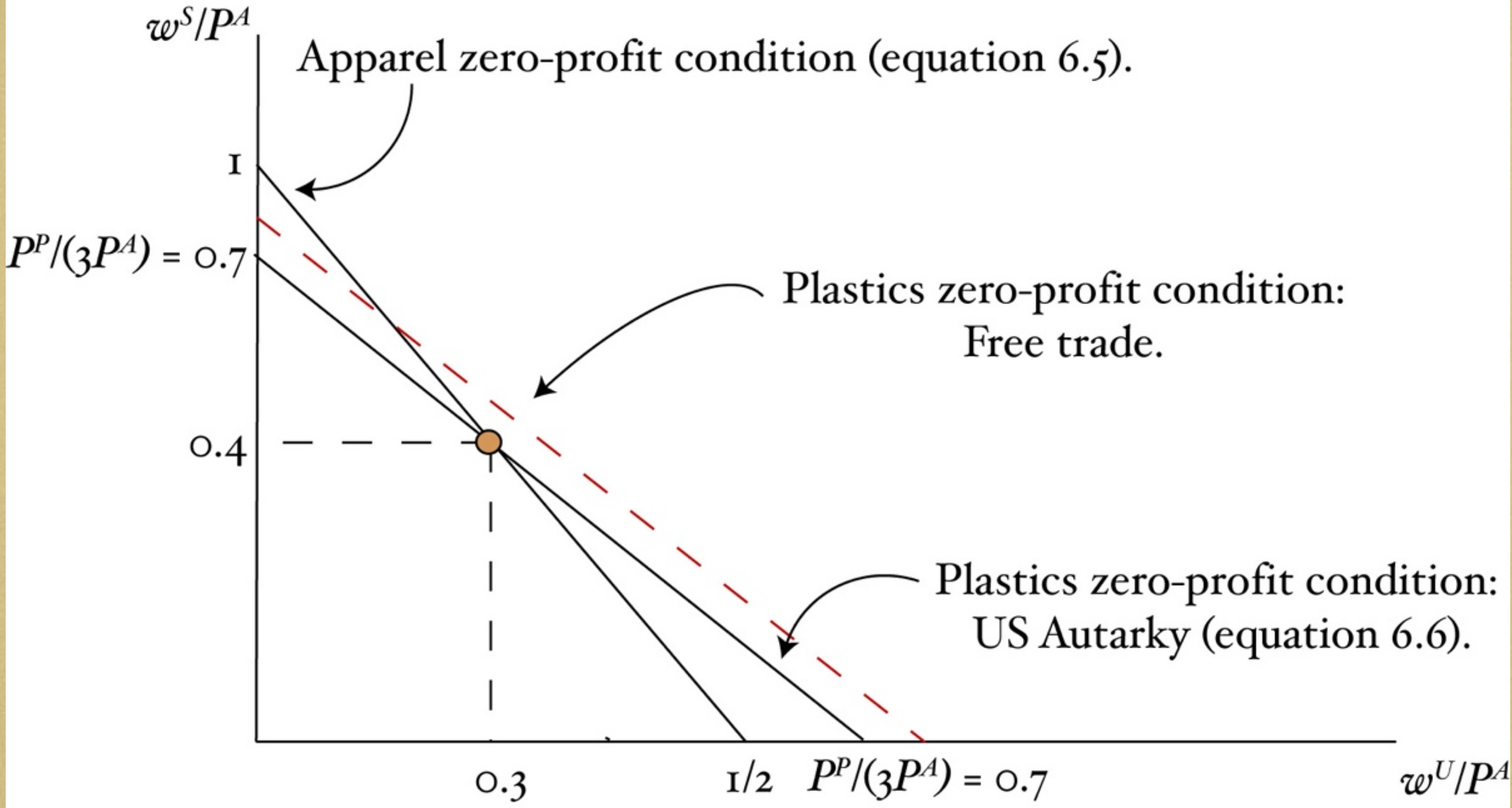
Figure 6.8: Equilibrium real wages.

- The apparel zero-profit line is steeper because it is unskilled-labor intensive.

- I.e., unskilled wages are a bigger cost factor for the apparel industry than the plastics industry.

- This is crucial for understanding the effects of trade on income distribution

- How does trade change these lines?
- Now note the crucial point: when trade is opened up, the relative output price P^A/P^P in the US falls
- Hence P^P/P^A must rise



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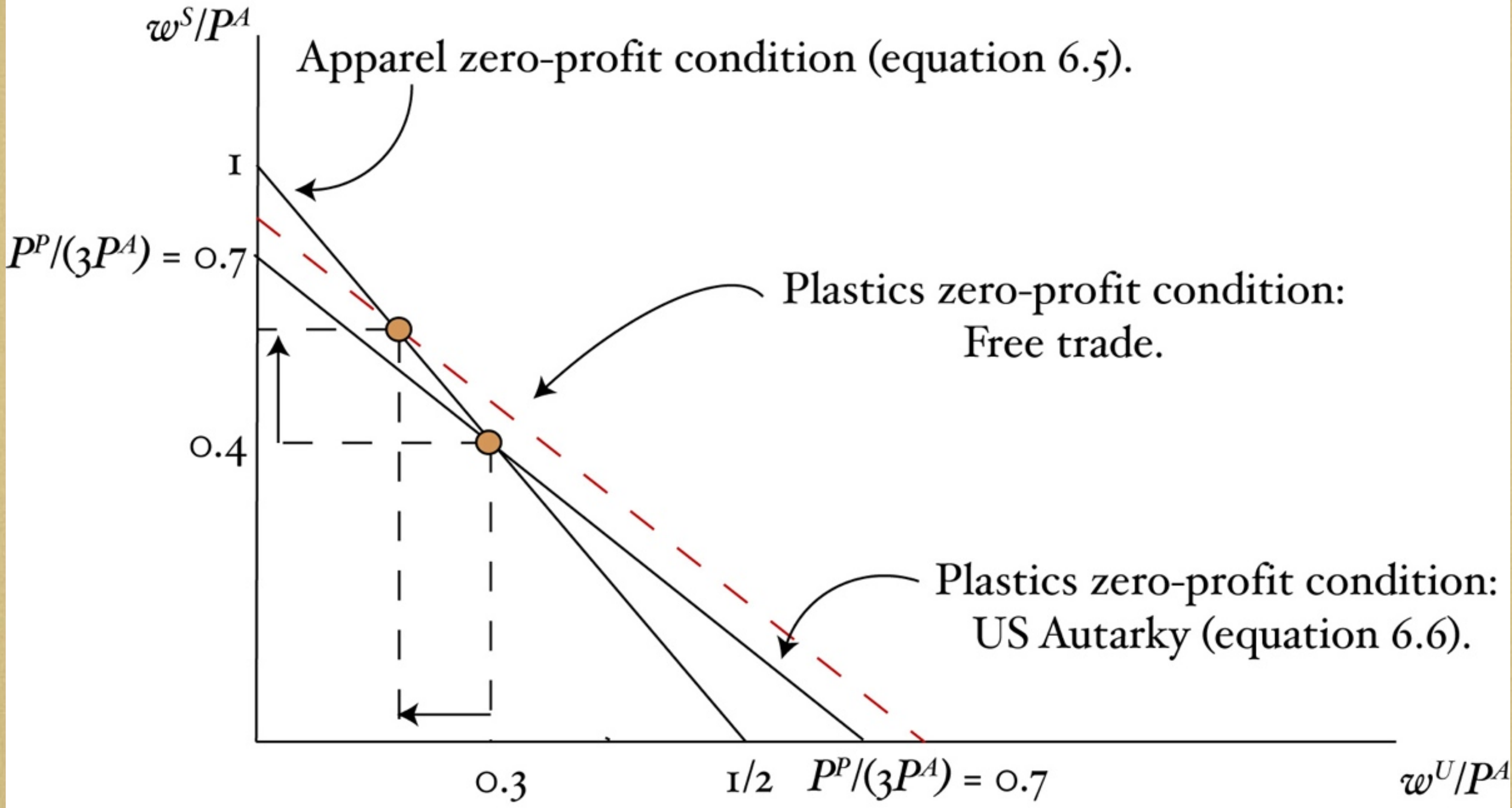


Figure 6.8: Equilibrium real wages.

- Hence, trade results in an increase in w^S/P^A and a decrease in w^U/P^A !

- Something similar occurs in the plastics-axis intercepts
- Apparel: $2w^U + w^S = P^A$
- Plastics: $3w^U + 3w^S = P^P$
- Apparel: $2w^U/P^P + w^S/P^P = P^A/\ P^P$
- Plastics: $3w^U/P^P + 3w^S/P^P = 1$

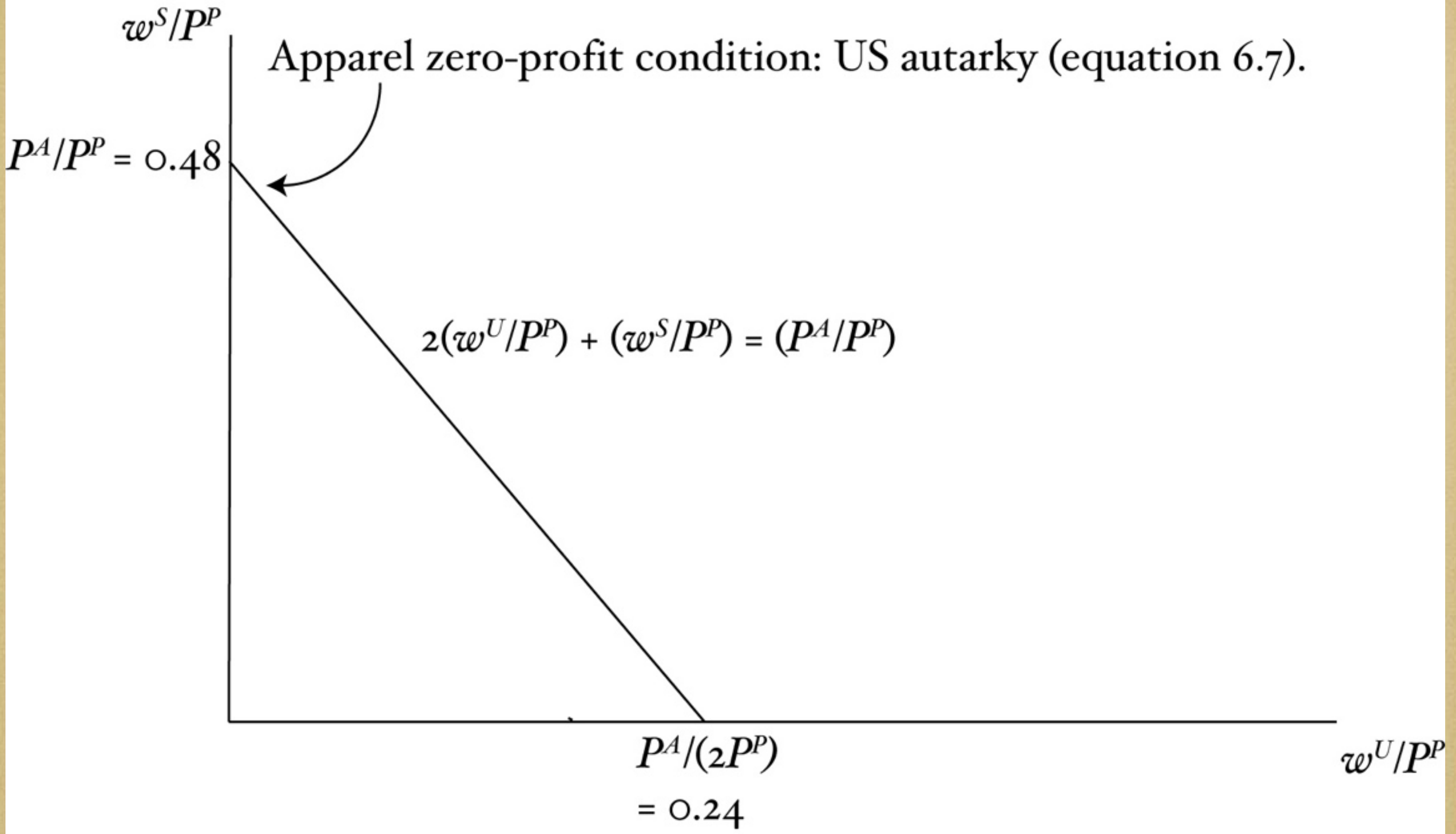
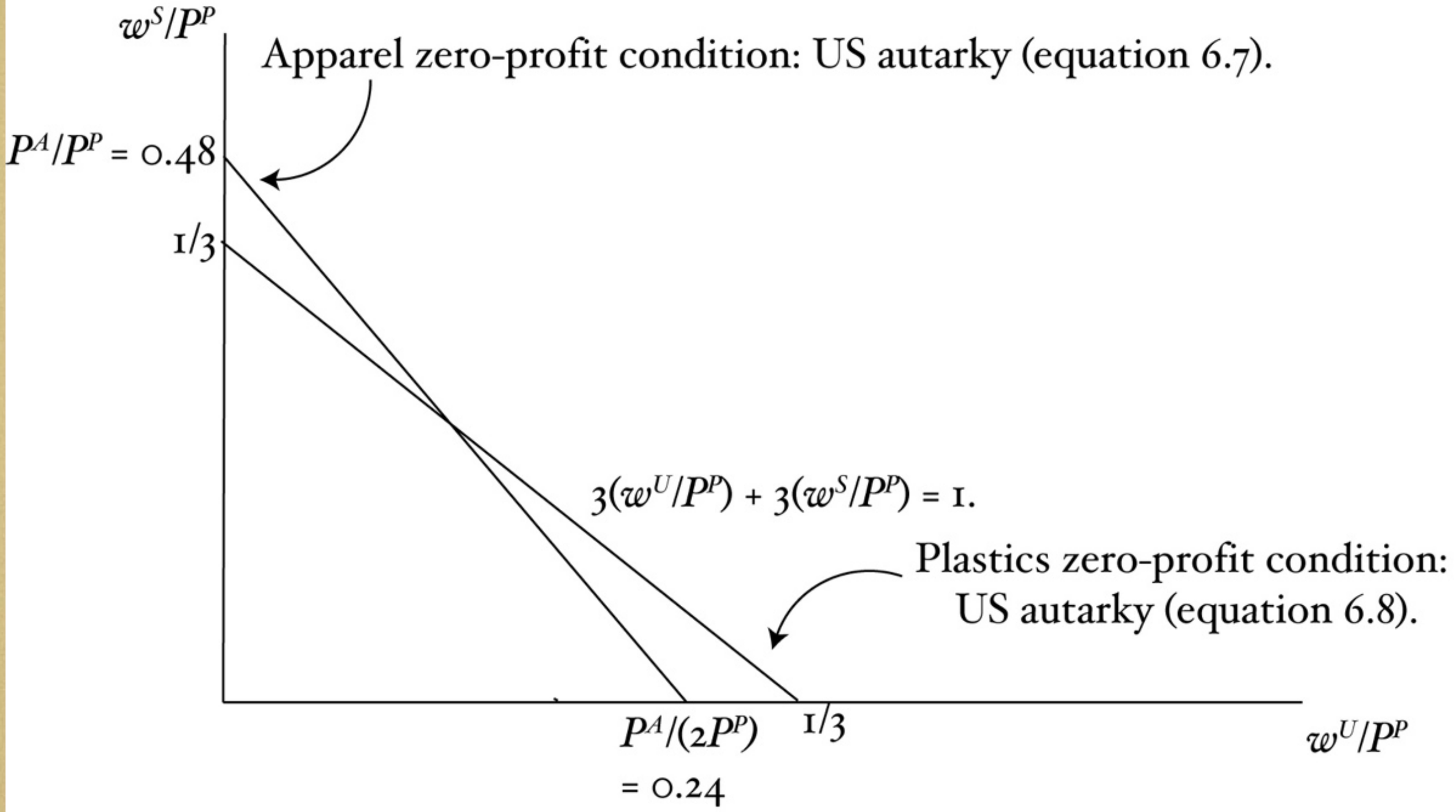


Figure 6.9: Equilibrium real wages.



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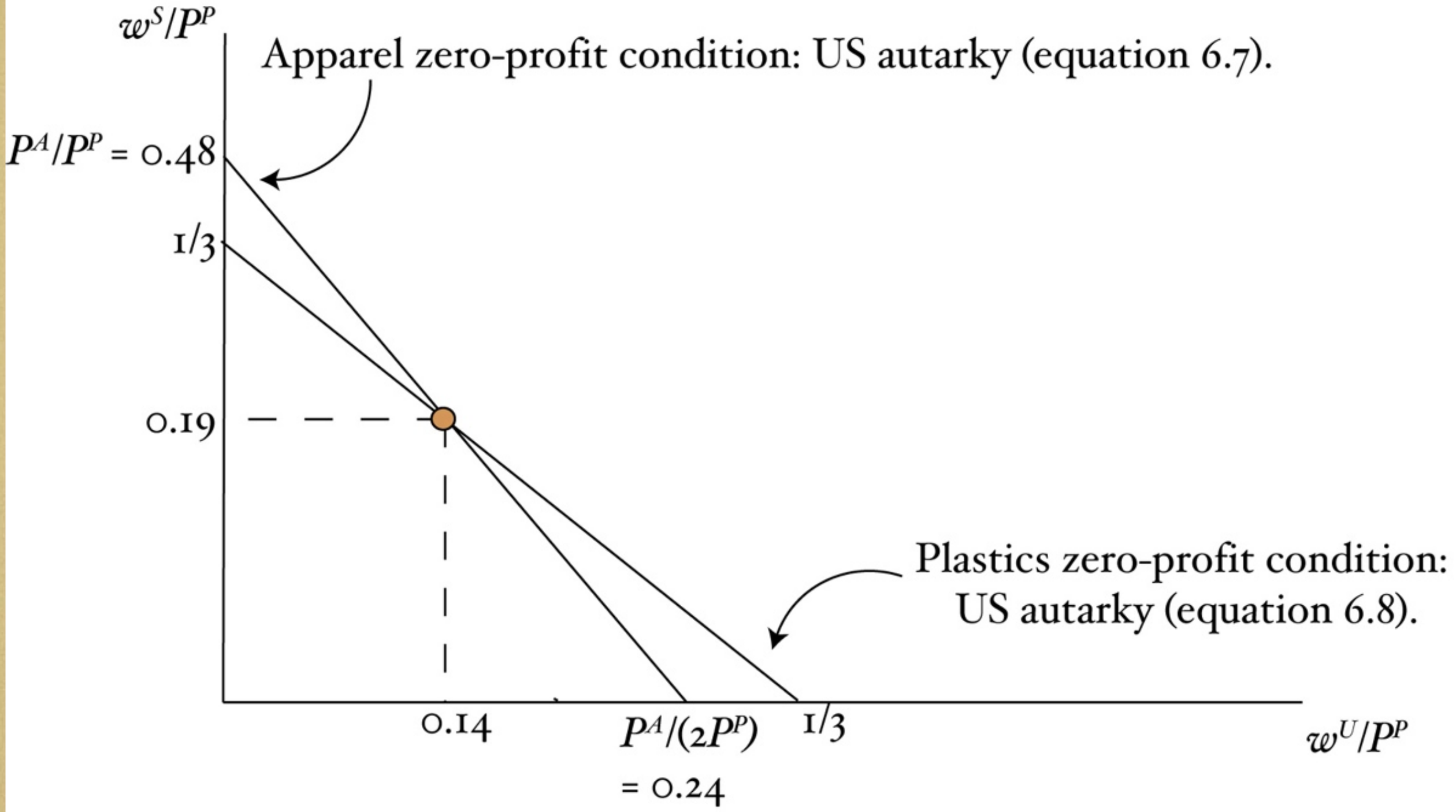

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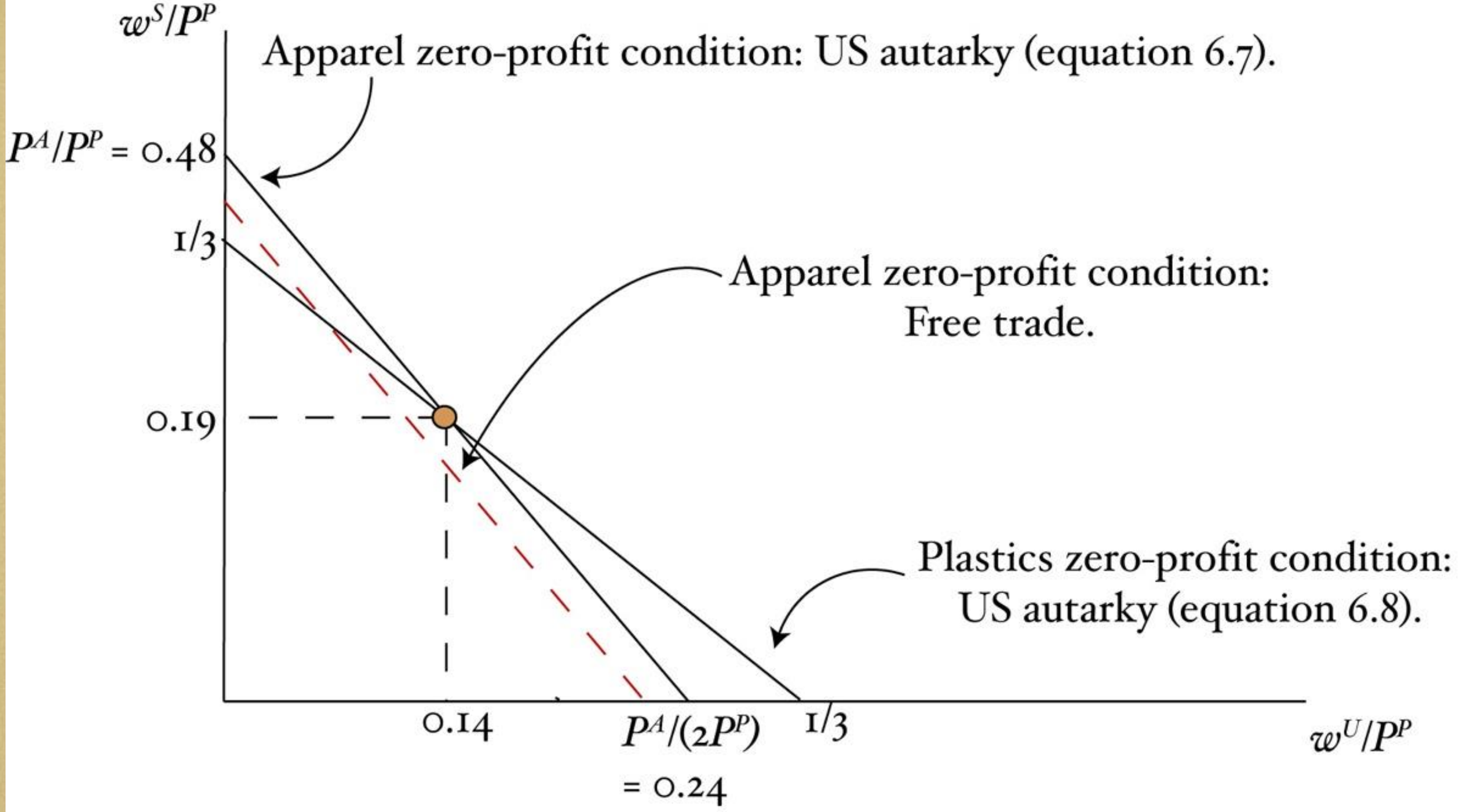

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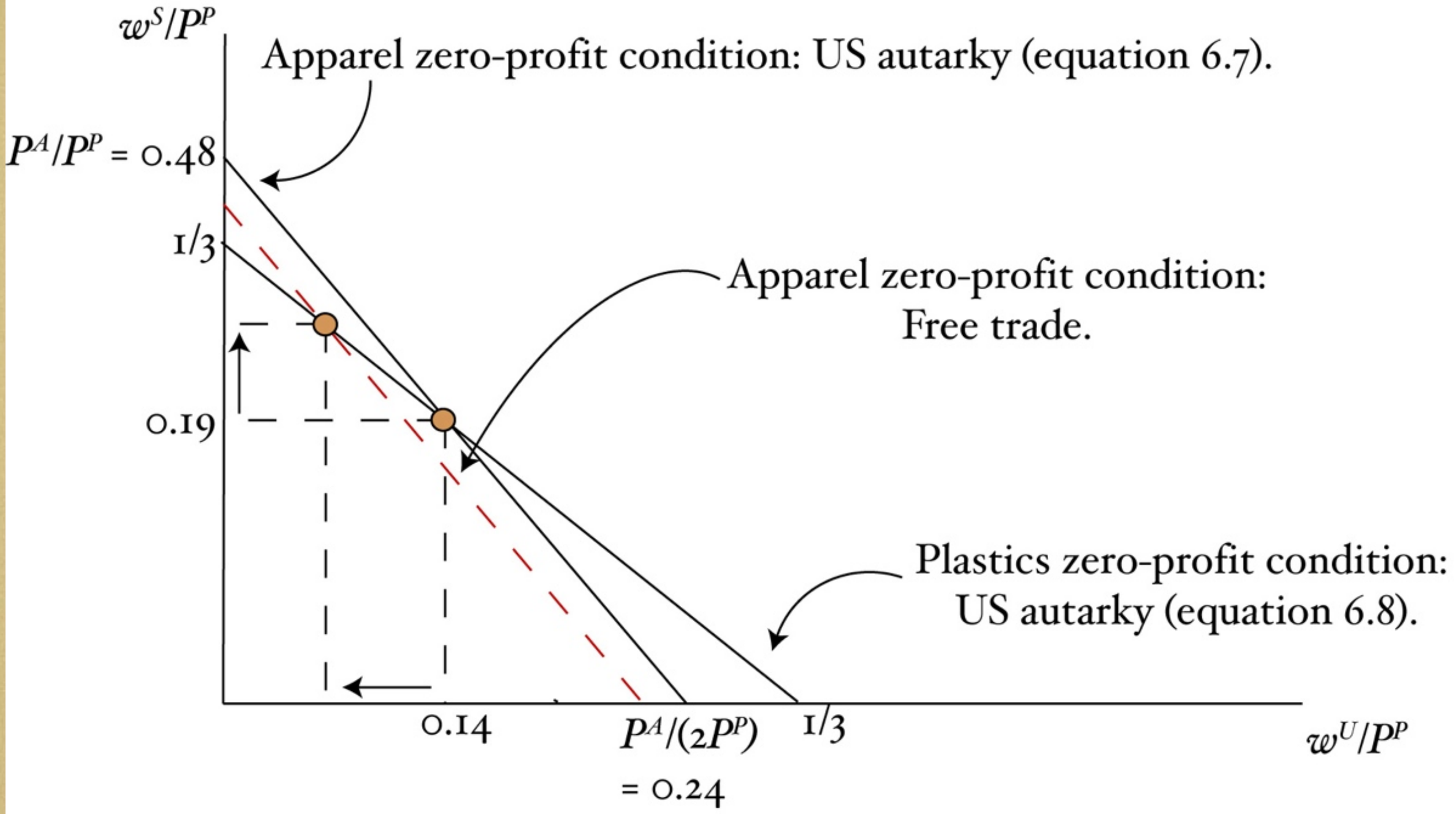


Figure 6.9: Equilibrium real wages.

- Hence, in the US trade raises w^S in terms of both goods,

- and reduces w^U in terms of both goods.

In class-exercise:

- do the same analysis for China

- What happens to *real wages?*

- In each country, the scarce factor's income falls when trade opens in terms of both goods, and the abundant factor's income rises in terms of both goods.

- With trade, wage inequality increases in the US
- *Note:* the *opposite* happens in China.

- *Important*: This means that the Heckscher-Ohlin model provides a coherent theory under which *trade does cause the labor market performance listed under our stylized facts above*.

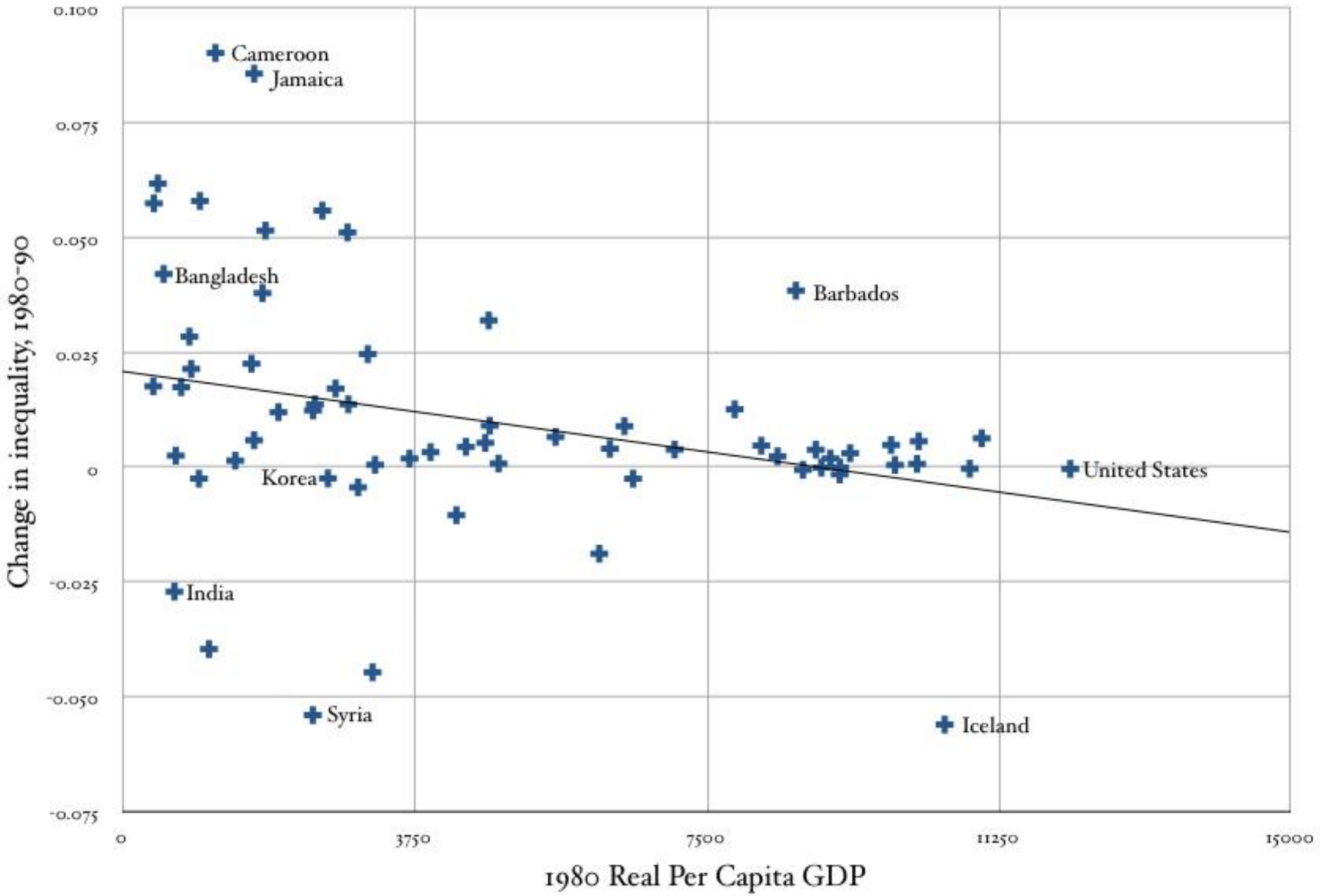
- But how do we know it is a good theory?

- We need to test it empirically!

- ***The model predicts:*** In high-per-capita income countries, relative skilled wages rise, but in low-per-capita income countries they fall.

- Empirical evidence: from Berman, Bound and Machin (1998).

Figure 6.15: Changes in Income Inequality, and Initial GDP per capita, 1980-90.



- HO model predicts a positive relationship between the two variables

- However, there is no such positive relationship in the figure!

  - in fact, the two variables show a *negative correlation!*

The Upshot

- The stylized facts at the outset show uncharacteristically sluggish labor market performance.

- The Heckscher-Ohlin model offers a plausible theory that makes trade the culprit (In the US, but not in China)

- But H-O makes another prediction that is not supported by the data.

- Most economists conclude that trade is not the culprit.
- (Or at least there's something else going on that it much bigger.)

Back to HO model

- Recall 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

- This seems like a plausible result

Testing the Heckscher-Ohlin Theorem: Leontief's Paradox

- Wassily Leontief performed the first test of the H-O theorem in 1953 using data for the U.S. from 1947

- Leontief measured the amounts of labor and capital used in all industries needed to produce $1 million of U.S. exports
  - used directly in the production of final good exports in each industry
  - used indirectly in the industries that produced the intermediate inputs used in making exports

Leontief's Test

	Exports	Imports
Capital ($ millions)	$2.55	$3.1
Labor (person-years)	182	170
Capital/labor ($/person)	$14,000	$18,200

- It was impossible for Leontief to get information on the amount of labor and capital used to produce imports
- Why?
- He used data on U.S. technology to calculate estimated amounts of labor and capital used in imports from abroad
    - Remember the H-O model assume technologies are the same across countries

Leontief's Paradox

- Leontief assumed correctly that in 1947 the U.S. was capital abundant
- From H-O model, Leontief expected that the U.S. would export capital intensive goods and import labor intensive goods
- Leontief, however, found the opposite
  - The capital labor ratio for U.S. imports was higher than for exports
- This contradiction came to be called ***Leontief's paradox***

Heckscher-Ohlin Model

Leontief's Test

	Exports	Imports
Capital ($ millions)	$2.55	$3.1
Labor (person-years)	182	170
Capital/labor ($/person)	$14,000	$18,200

Why would this paradox exist?

1. U.S. and foreign technologies are not the same as assumed
2. By focusing only on labor and capital, land abundance in the U.S. was ignored
3. No distinction between skilled and unskilled labor
4. The data for 1947 could be unusual due to the recent end of WWII

- Question: Which one of these possible explanations is the most important?

- First modification to the model:
  - allow for more than two goods, factors, and countries
- Second modification: allow the technologies used to produce each good to differ across countries

- Go back to Leontief data
- We can multiply his capital and labor inputs by the actual value of U.S. exports and U.S. imports

Measuring the Factor Content of Trade

- These values are called the **factor content of exports** and **factor content of imports**
  - They measure the amounts of labor and capital used to produce exports and imports
- Take the difference between the factor content of exports and factor content of imports
  - factor content of net exports (trade)

Factor Content of Trade for the United States, 1947

	EXPORTS, *X*		IMPORTS, *M*		NET EXPORTS (*X* – *M*)
	For $1 Million Exports	For Total Exports	For $1 Million Imports	For Total Imports	
Capital ($ millions)	$2.55	$42,600	$3.1	$19,200	$23,400
Labor (person-years)	182	3.04 million	170	1.05 million	2 million
Capital/labor ($/person)	$14,000	$14,000	$18,200	$18,200	$16,700

Measuring the Factor Content of Trade

- Since both these factor contents are positive, we see that the U.S. was running a trade surplus
  - The U.S. exported large amounts of goods to Europe

Measuring Factor Abundance

- How should we measure factor abundance when there are more than two factors and two countries?
  - If the share of a factor > share of world GDP
    - The country is ***abundant*** in that factor
- If the share of factor < share of world GDP
  - The country is ***scarce*** in that factor

Differing Productivities Across Countries

- **Effective Factor Endowment** is the actual factor endowment times the factor productivity

- We have now abandoned many of the assumptions we previously made
  - We allow for many goods, factors, and countries
  - We also allow for factors to differ in productivity

- We need a new version of H-O theorem!
- A new version called the "**sign test**" is available
  - If a country is ***abundant*** in an effective factor, then the factor's content in net exports should be ***positive***
  - If a country is ***scarce*** in an effective factor, then that factor's content in net exports should be ***negative***

Going back to Leontief paradox

- The sign test for capital:
  - Using 35 countries, the U.S. share of GDP of those countries was 33%
  - Given the timing after WWII, we can assume that the U.S. share of world capital was more than 33%
  - Therefore, the U.S. was *abundant* in capital
  - Since that factor's content of net exports was positive, it *passes* the sign test

Factor Content of Trade for the United States, 1947

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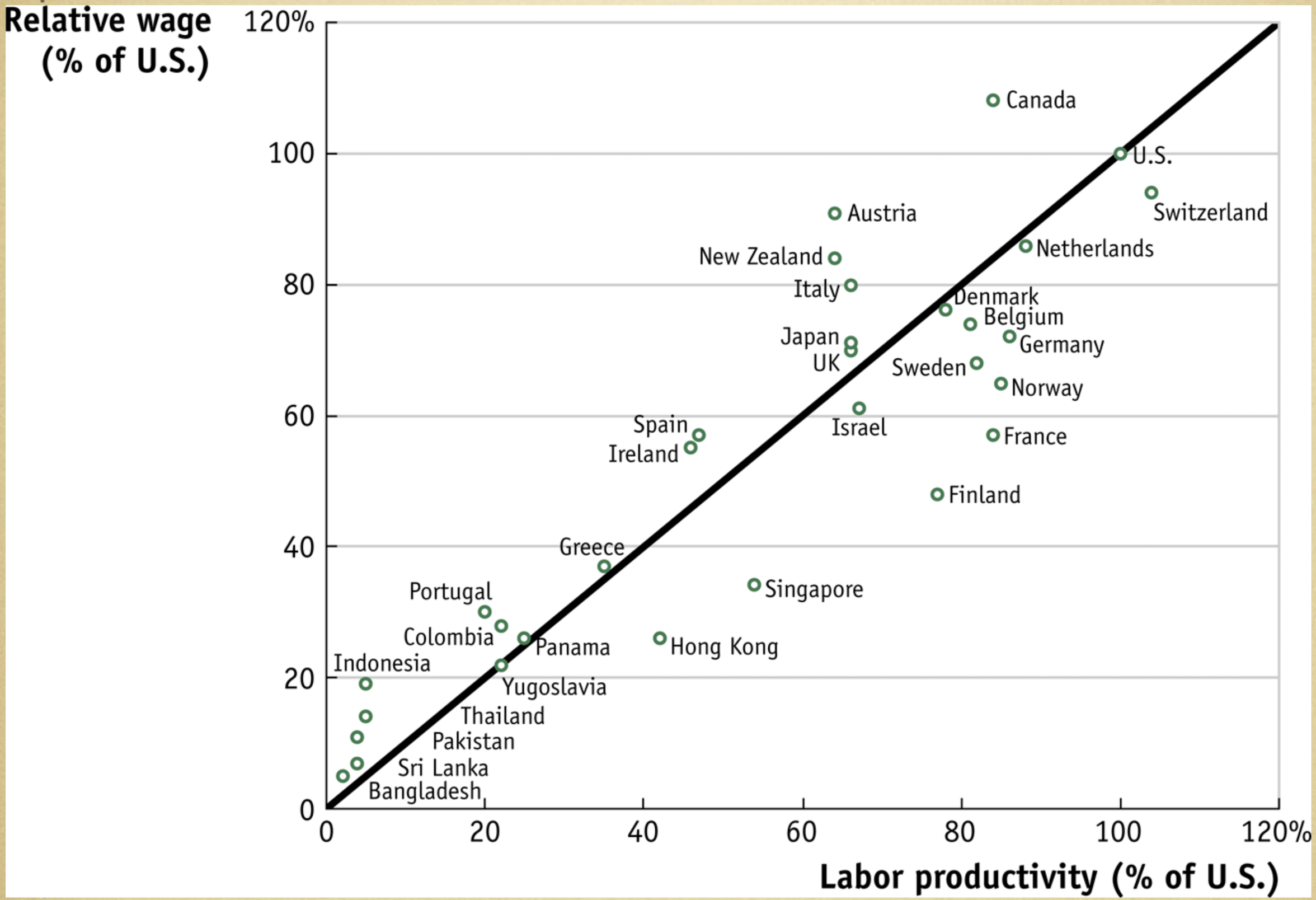
The Sign Test for Labor

- The U.S. share of population for the 35 countries was about 8%
- This is less than the U.S. share of GDP, 33%
  - Therefore the U.S. was scarce in labor, but the net exports was positive
  - The labor is *opposite* of the sign of its factor content of net exports
- The sign test *fails* for the U.S. in 1947 in labor

- How's about technological differences among countries and effective labor?
- One way to measure productivity is to use wages paid to workers
- The effective amount of labor found in each country equals the actual amount of labor times the wage


Relative wage (% of U.S.)
120%
100
80
60
40
20
0
0
20
40
60
80
100
120%
Labor productivity (% of U.S.)
Canada
U.S.
Switzerland
Austria
Netherlands
New Zealand
Italy
Denmark
Belgium
Japan
Germany
UK
Sweden
Norway
Spain
Israel
France
Ireland
Finland
Greece
Singapore
Portugal
Colombia
Panama
Hong Kong
Indonesia
Yugoslavia
Thailand
Pakistan
Sri Lanka
Bangladesh

The Sign Test for Labor

- Doing this for 30 countries and comparing it to the U.S. we find that the U.S. was abundant in effective labor
  - The US accounted for 42-44% of labor wages in 1947
- Given that U.S. was abundant in effective factor, then labor also *passes* the sign test!

- There is no “paradox” in the U.S. pattern of trade!

- This explanation for Leontief’s paradox relies on taking into account the productivity differences in labor across countries

Sign Test: including other countries

- **First test:** we will not correct for differing productivities across countries

- Sign of (country's % share of factor minus the % share of world GDP)

  =

  Sign of (Country's factor content of net exports)

- Data from 1990
- 33 countries
- Nine factors
  - Seven kinds of labor
  - Capital
  - Land
- Use USA technology to construct factor content of trade
- Need to do 33·9=297 tests

Country Group	GDP per Capita (% of U.S. GDP)	Number of Factors Passing Sign Test	Number of Factors Failing Sign Test
Lowest GDP per capita	4%–33%	3.4	5.6
Middle GDP per capita	33%–66%	4.3	4.7
Highest GDP per capita	66%–100%	5.3	3.7
All countries	4%–100%	4.5	4.5

The test fails miserably

- We would have the same success rate if we just flipped a coin!

- Second test: take into account different productivities across countries

- Sign of (country's % share of effective factor minus the % share of world GDP)

  =

  Sign of (Country's factor content of net exports)

Country Group	GDP per Capita (% of U.S. GDP)	Number of Factors Passing Sign Test	Number of Factors Failing Sign Test
Lowest GDP per capita	4%–33%	5.9	3.1
Middle GDP per capita	33%–66%	5.7	3.3
Highest GDP per capita	66%–100%	5.3	3.7
All countries	4%–100%	5.6	3.4

Conclusion:

allowing productivities to differ across countries allows H-O model to better predict actual trade patterns!