PubPol/Econ 541

Class 17

Behind the Standard Model

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2024

Quiz 7

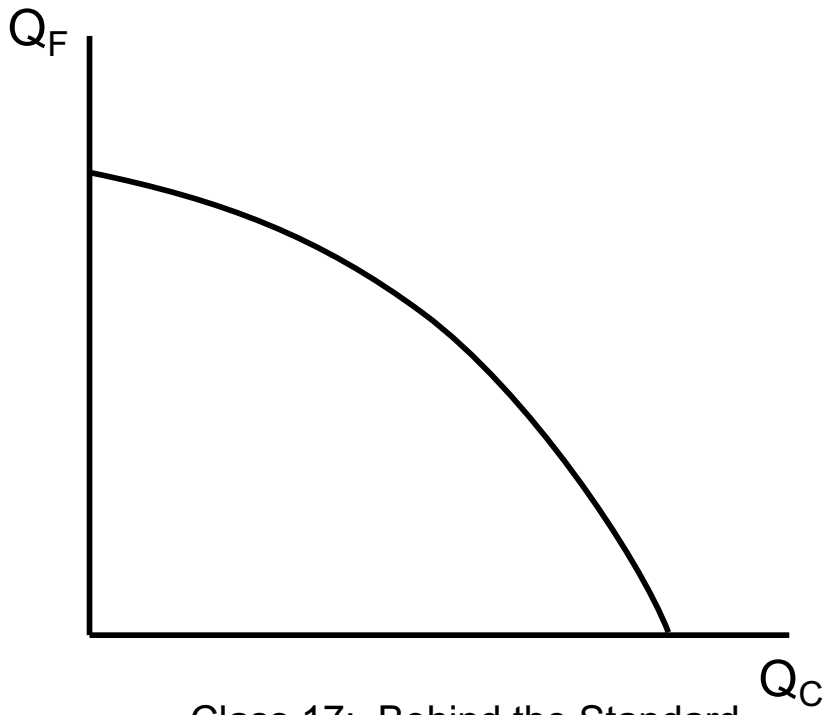
	Q5	Q6	Q7
Mean	9.08	6.92	8.06
Median	9	7	8
Max	10	10	9.5
Min	8	4	6
Standard deviation	0.79	1.89	0.84

Announcements

- Paper 2
  - Due in a week: Nov 6
  - Some points:
    - I don't have "correct" numbers this time
      - Use your judgement on what numbers to use
    - Do assume Canada a small country
    - Report results for all three years
    - Supply elasticity: Your guess is good as mine (1)
    - Do sensitivity analysis, especially on supply elasticity

Purpose Today

To look behind the Production Possibilities of the Standard Model:



Purposes

Why?

1. To see what determines Comparative Advantage and thus trade
2. To see how trade has affects inside economies, especially wages

Pause for Discussion

Questions on KOM

- "To produce more of one good, the economy must sacrifice some production of another good."
  - Is this always true?
  - What if there is unemployment?

Outline

- Ricardian Model
- Comparative Advantage
- Heckscher-Ohlin Model
- Trade and Wages

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The Ricardian Model

- Assumes
  - Two goods: cloth C and food F
    - Outputs: Q_F, Q_C
    - Prices: P_F, P_C
  - One factor: labor L
    - Perfectly mobile between sectors
  - Two countries: Home and Foreign (*)
  - Takes as given
    - Unit labor requirements: a_C, a_F, a_C^*, a_F^*

      Fixed (they do not vary with output)

Implies that factors earn the same in both.

Very important!

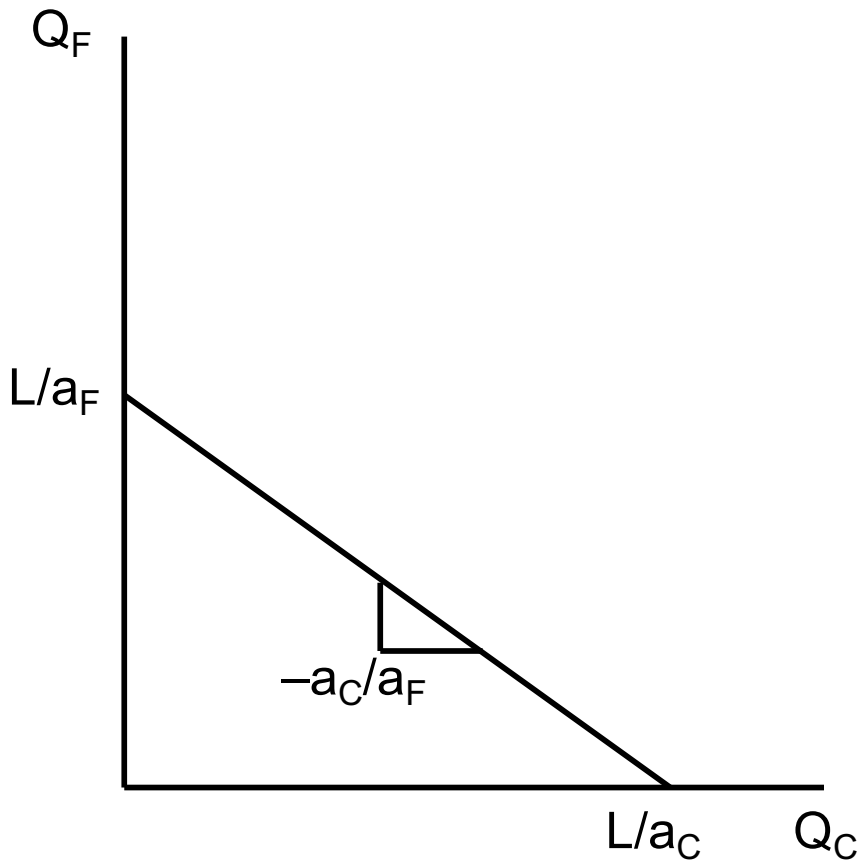
Ricardian Technology

- Unit labor requirements
  - a_i, a_i^* = amount of labor needed to produce one unit of output of good i = C,F
  - Assume (so that Home will end up exporting C, as we'll see below):

$$\frac{a_C}{a_F} < \frac{a_C^*}{a_F^*}$$

i.e., Home (without *) needs relatively less labor to produce cloth than food, compared to foreign (*)

Ricardian PPF

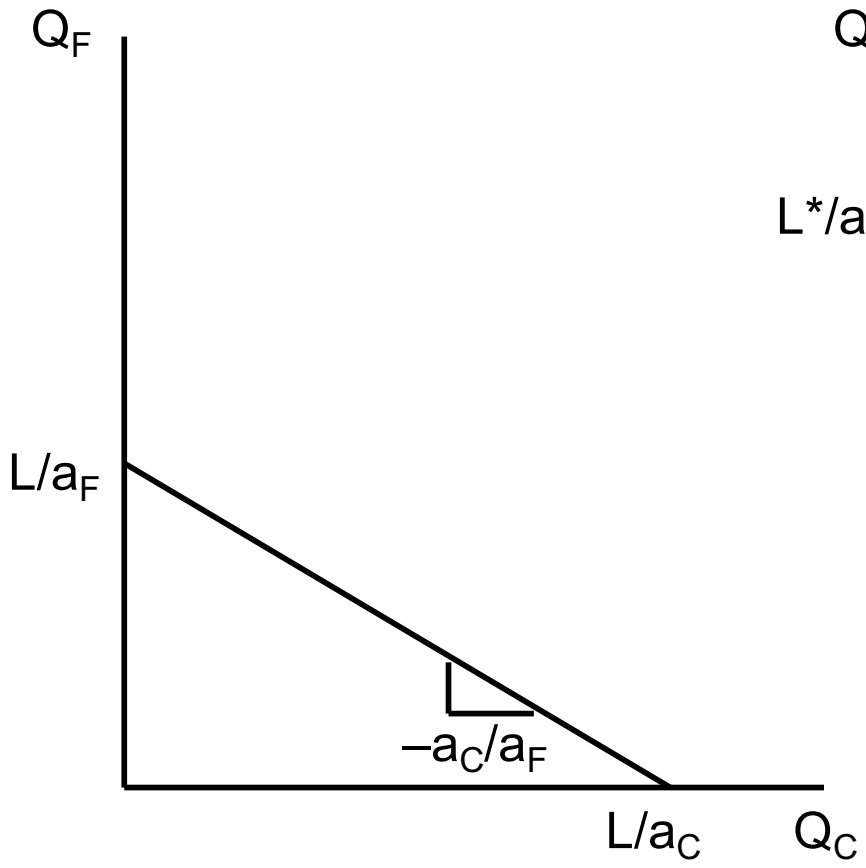


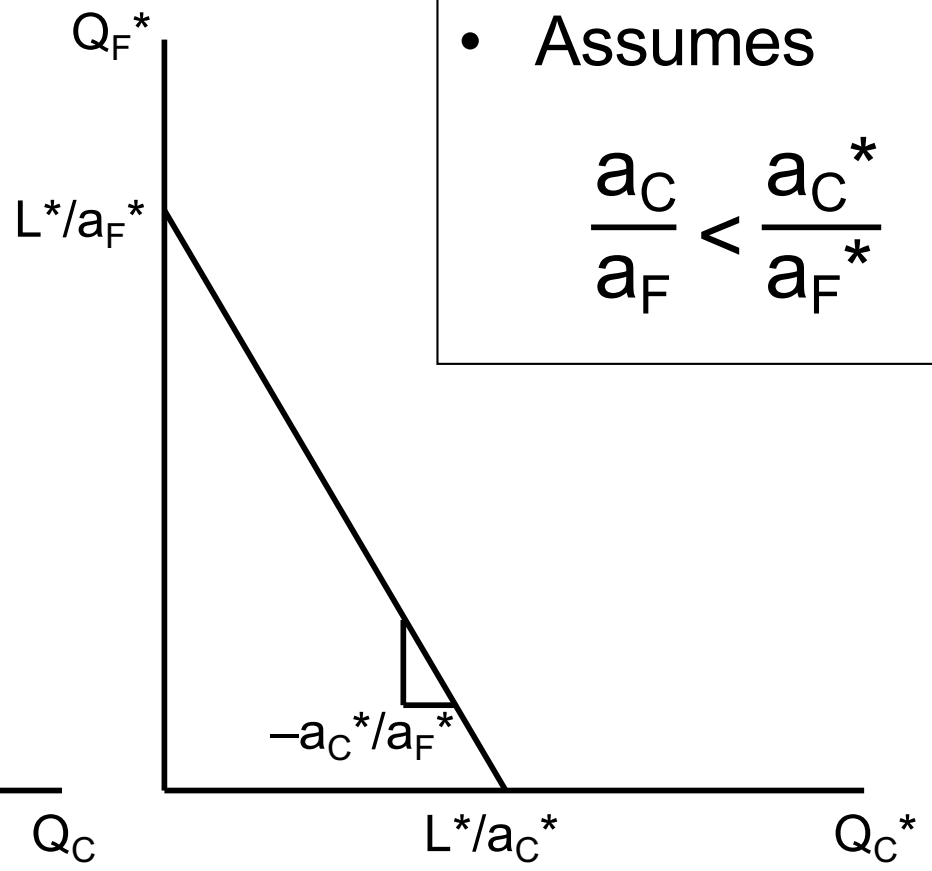
- Full employment requires

  $L = a_C Q_C + a_F Q_F$
- and thus, solving for Q_F:

  $Q_F = L/a_F - (a_C/a_F)Q_C$

2-Countries' PPFs

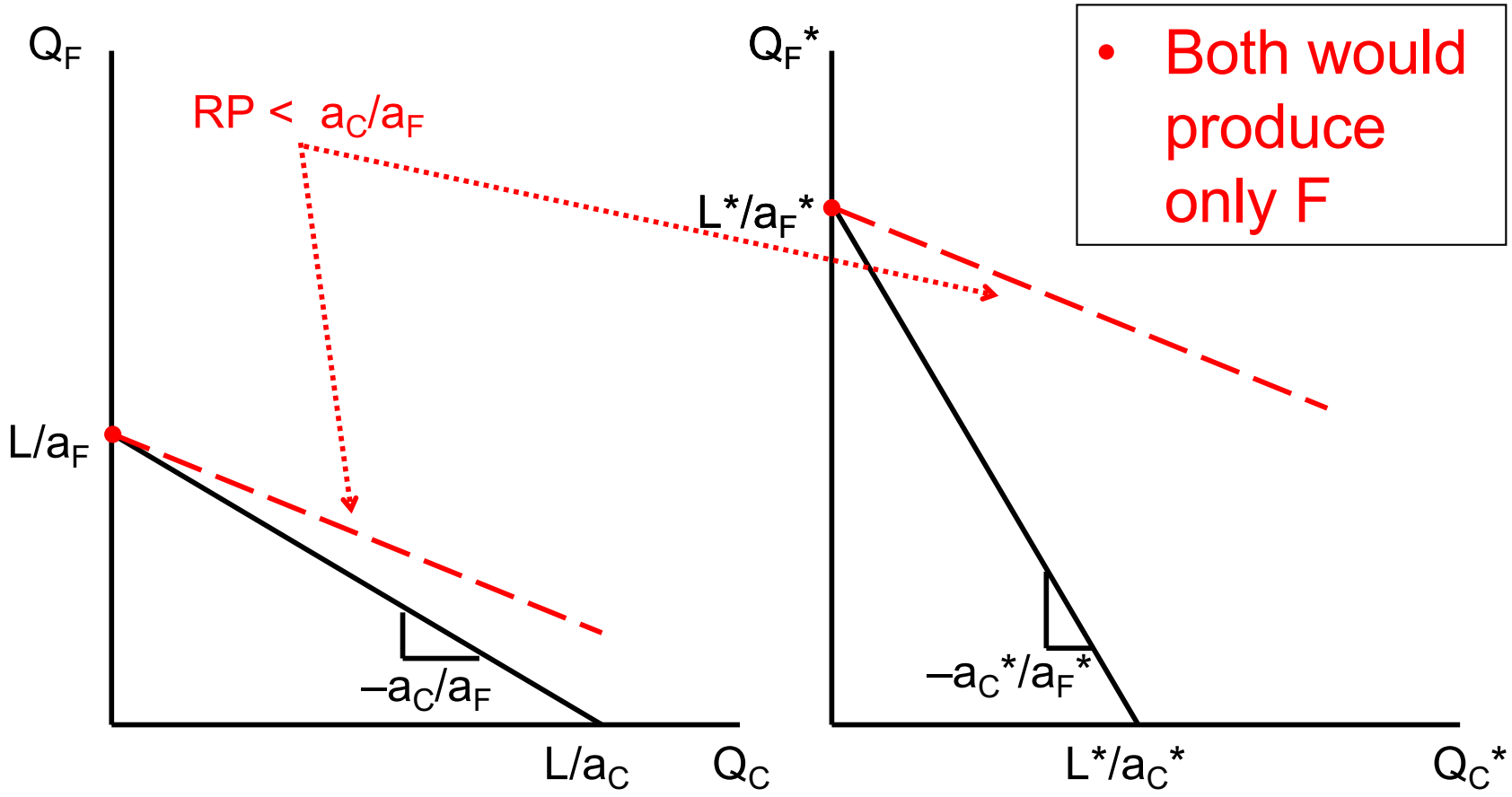




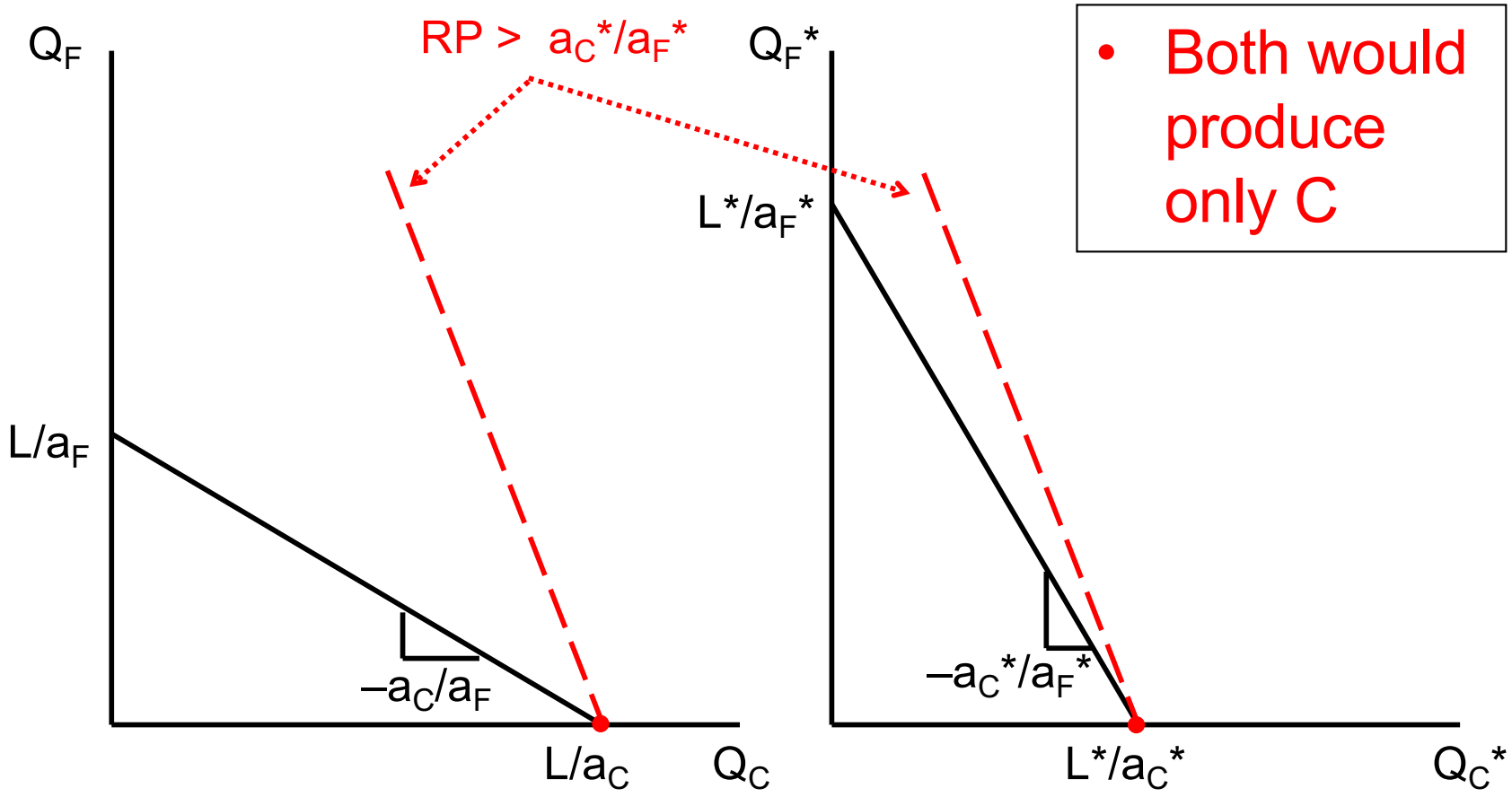
- Assumes

$$\frac{a_C}{a_F} < \frac{a_C^*}{a_F^*}$$

NOT equilibrium: RP < a_C/a_F

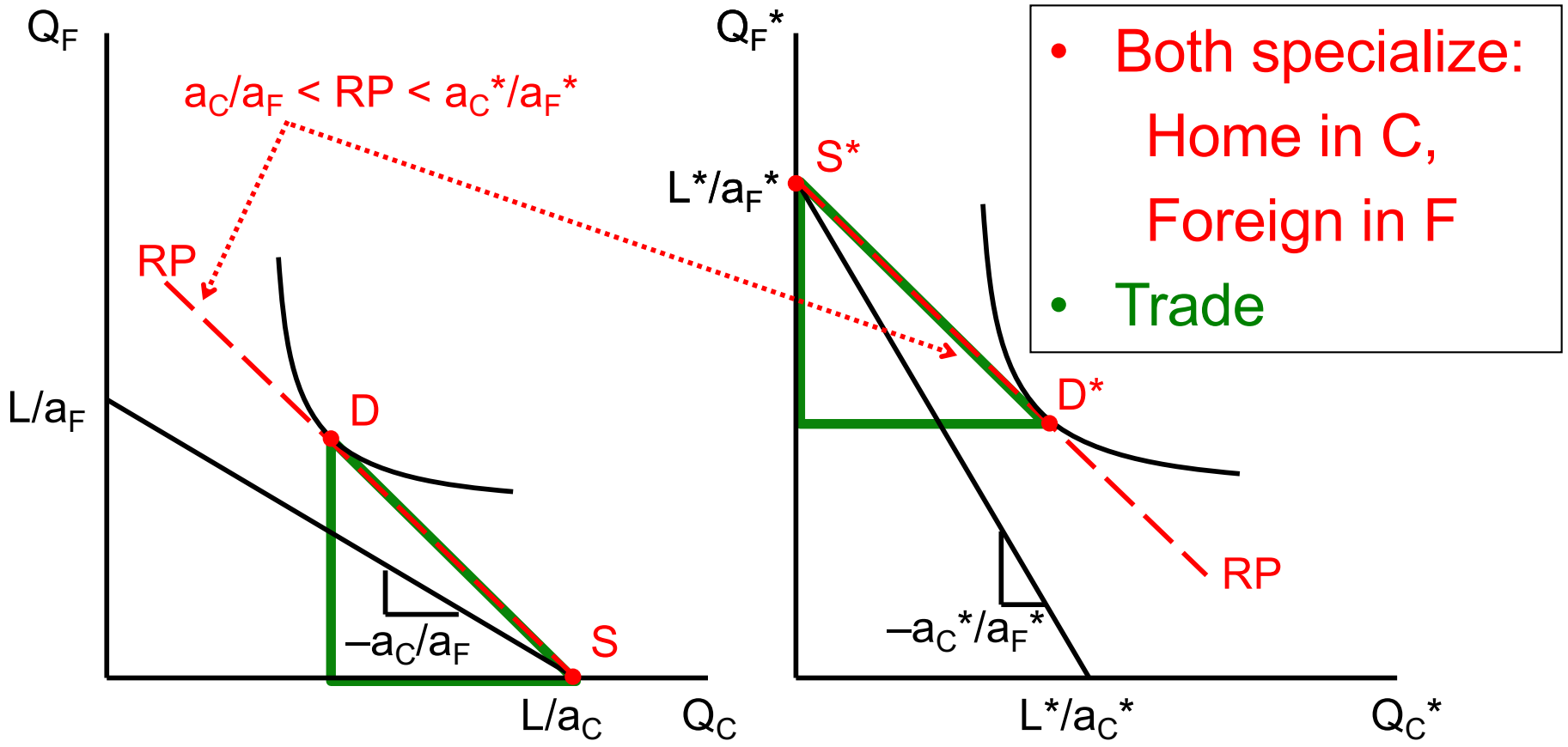


NOT equilibrium: RP > a_C^*/a_F^*



- Both would produce only C

Specialized Equilibrium: $a_C/a_F < RP < a_C^*/a_F^*$



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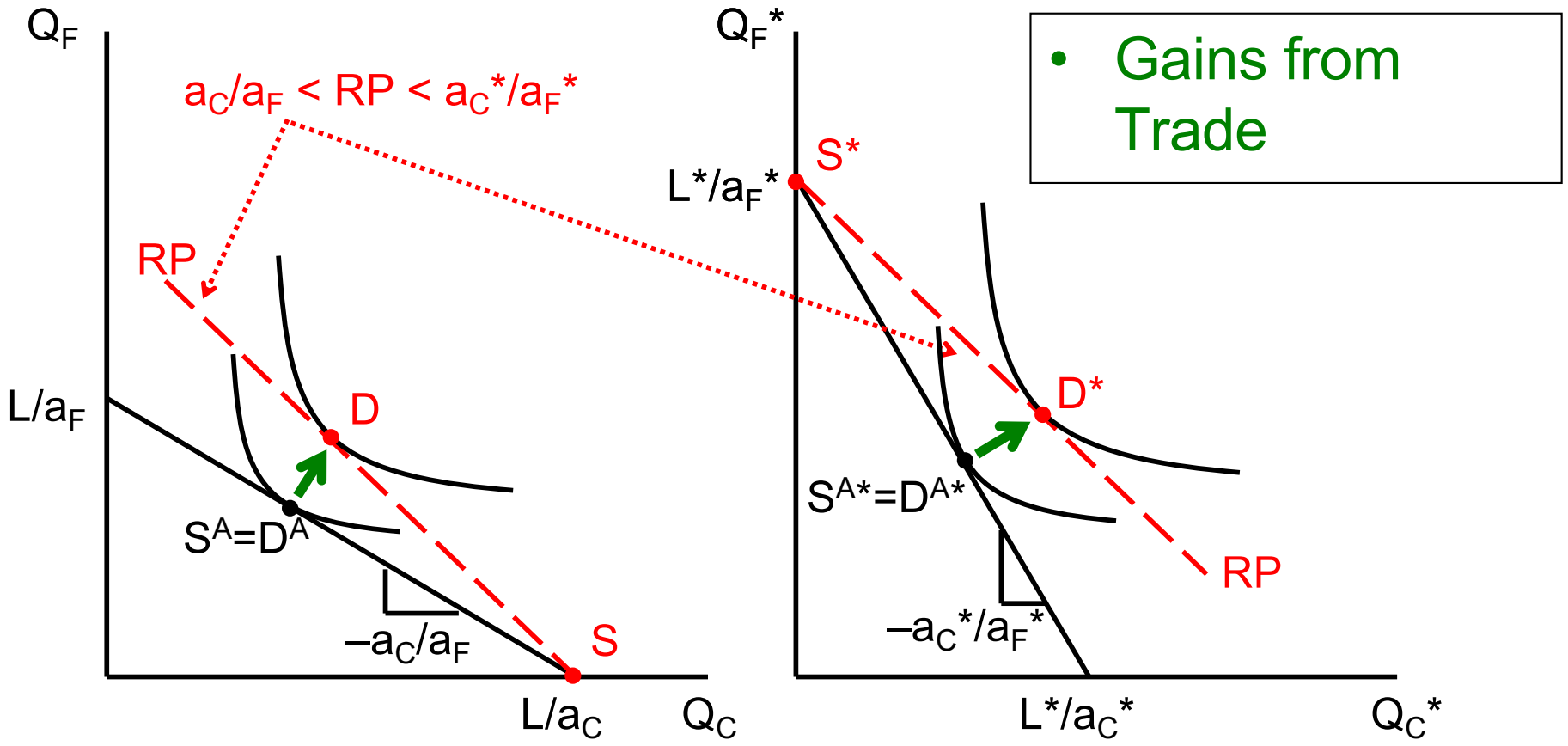
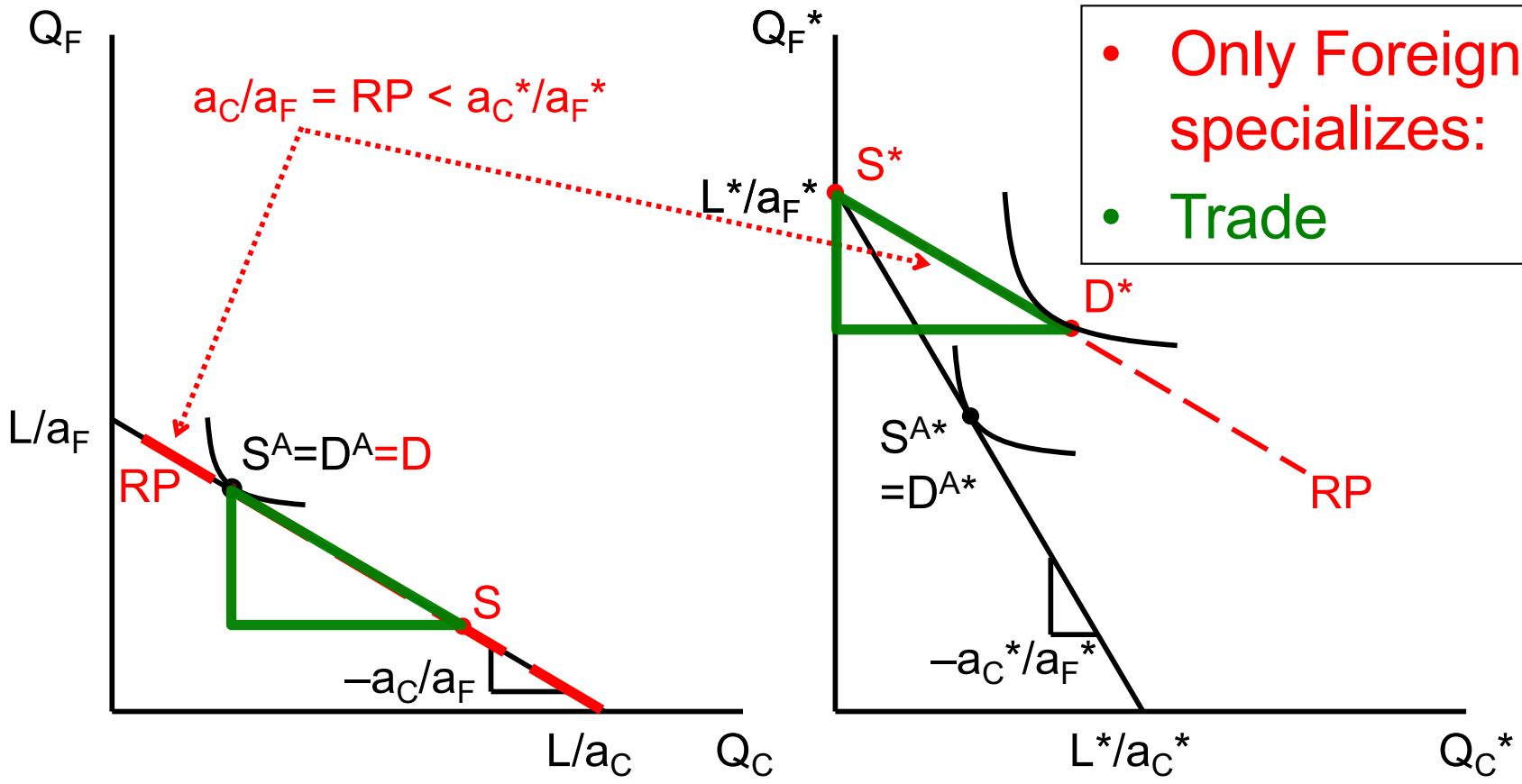
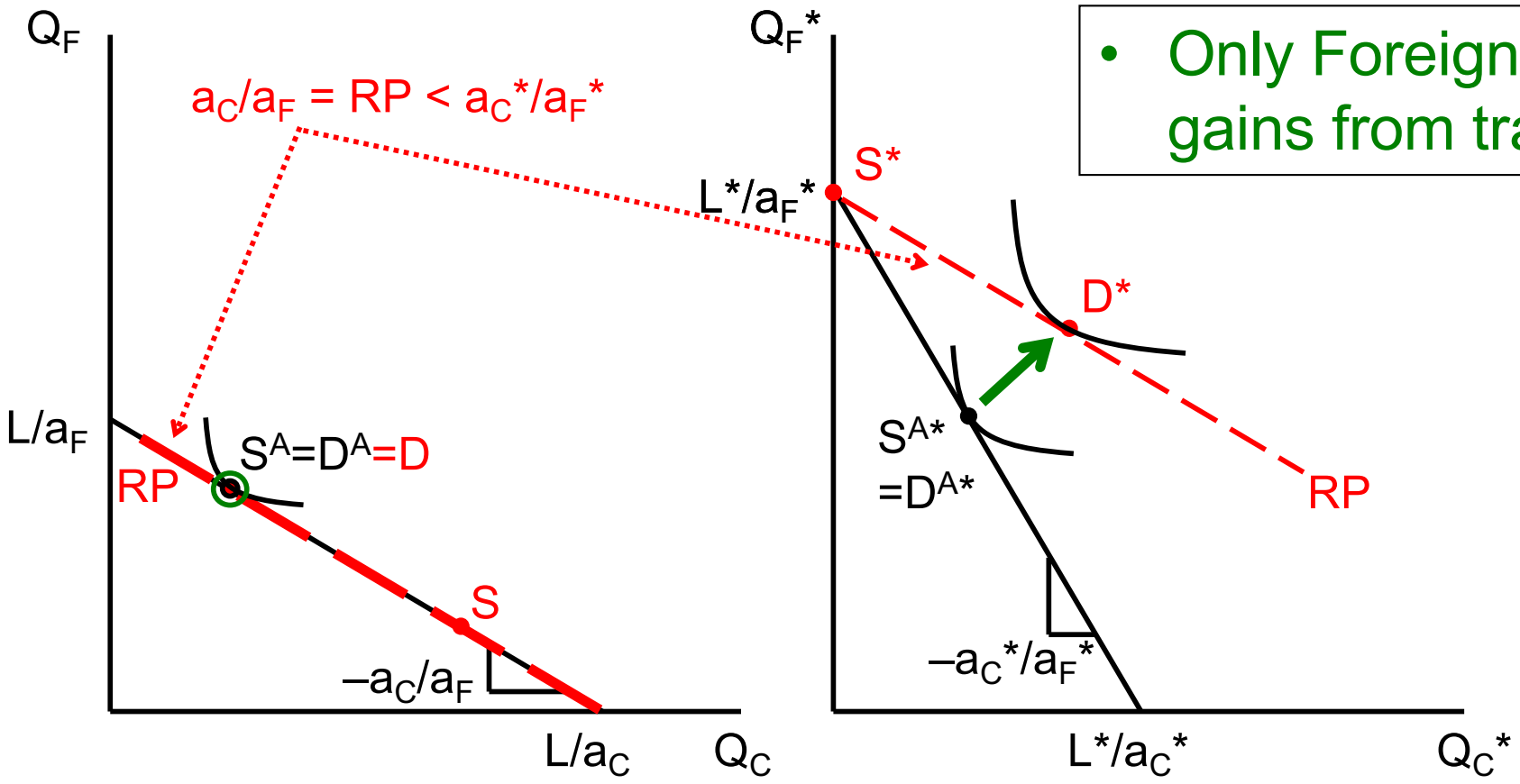


Home-Diversified Equilibrium: $a_C/a_F = RP < a_C^*/a_F^*$



Home Diversified Equilibrium: $a_C/a_F = RP < a_C^*/a_F^*$



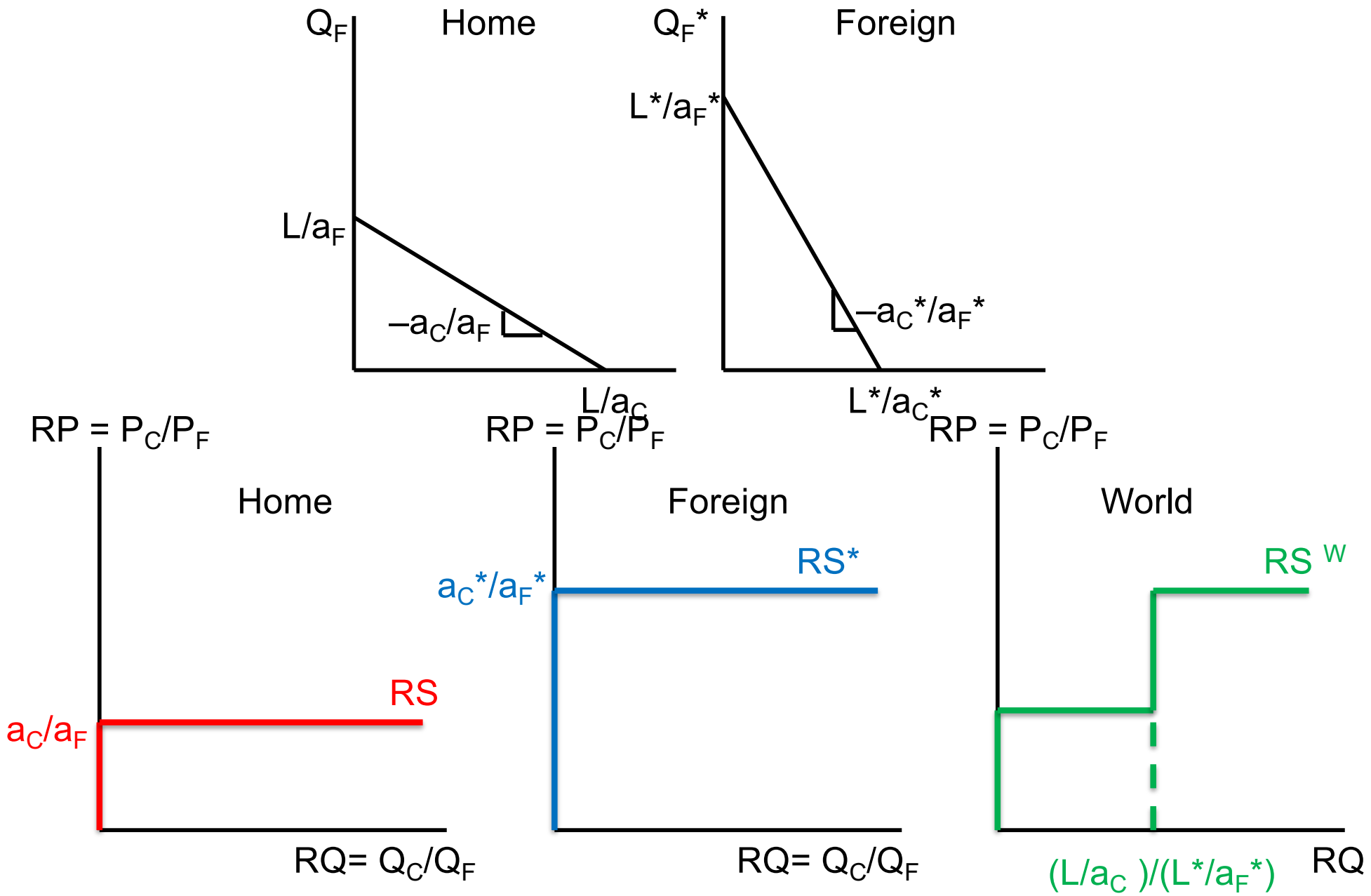
Effects of Trade in Ricardian Model

- Labor moves – wholly or partially – out of import-competing sector
- All labor paid the same wage (due to perfect mobility), so all share any gains from trade
- Real wage rises as price of import falls
- Note that transition, not modelled, could be painful

Pause for Discussion

Questions on KOM

- In the Ricardian Model, do both countries necessarily gain from trade? Is it possible for a country to lose from trade?
- What do the relative supply and demand curves of a country look like in the Ricardian Model, and why? What do they look like for the world of two countries?


Q_F
Home
L/a_F
$-a_C/a_F$
L/a_C
Q_F^*
Foreign
L^*/a_F^*
$-a_C^*/a_F^*$
L^*/a_C^*
RP = P_C/P_F
Home
RS
a_C/a_F
RQ= Q_C/Q_F
RP = P_C/P_F
Foreign
RS*
a_C^*/a_F^*
RQ= Q_C/Q_F
RP = P_C/P_F
World
RS ^{W}
$(L/a_C)/(L^*/a_F^*)$
RQ

More Questions on KOM

- Suppose that preferences change so that, at given prices, demanders everywhere increase their preferred consumption of one good and decrease it for the other. In most models, such a change will cause both the price and the quantity of the preferred good to increase. Is that true in the Ricardian Model, of a closed economy and/or of a two-country world?

Outline

- Ricardian Model
- Comparative Advantage
- Heckscher-Ohlin Model
- Trade and Wages

Comparative Advantage

- Before Ricardo, we knew that
  - if each country had “absolute advantage” in one good
    (Meaning they were better at producing it)
  - Then they would export it
- But it was thought that,
  - if one country had absolute advantage in both goods,
  - then
    - trade might be impossible
    - or the disadvantaged country would lose from trade

Comparative Advantage

- Ricardo showed that this was wrong.
- What matters is “comparative advantage”
- A less productive country
  - can still gain by exporting the good in which its disadvantage is relatively smaller
  - & it will surely gain if prices change for it at all

Comparative Advantage

- Ricardo used numerical examples like the following, with unit labor requirements:
- Absolute advantage:

Unit labor requirements	US	UK
Food (hr/lb)	0.01	0.02
Cloth (hr/yd)	0.02	0.01

- Comparative advantage:

Unit labor requirements	US	UC
Food (hr/lb)	0.01	0.20
Cloth (hr/yd)	0.02	0.10

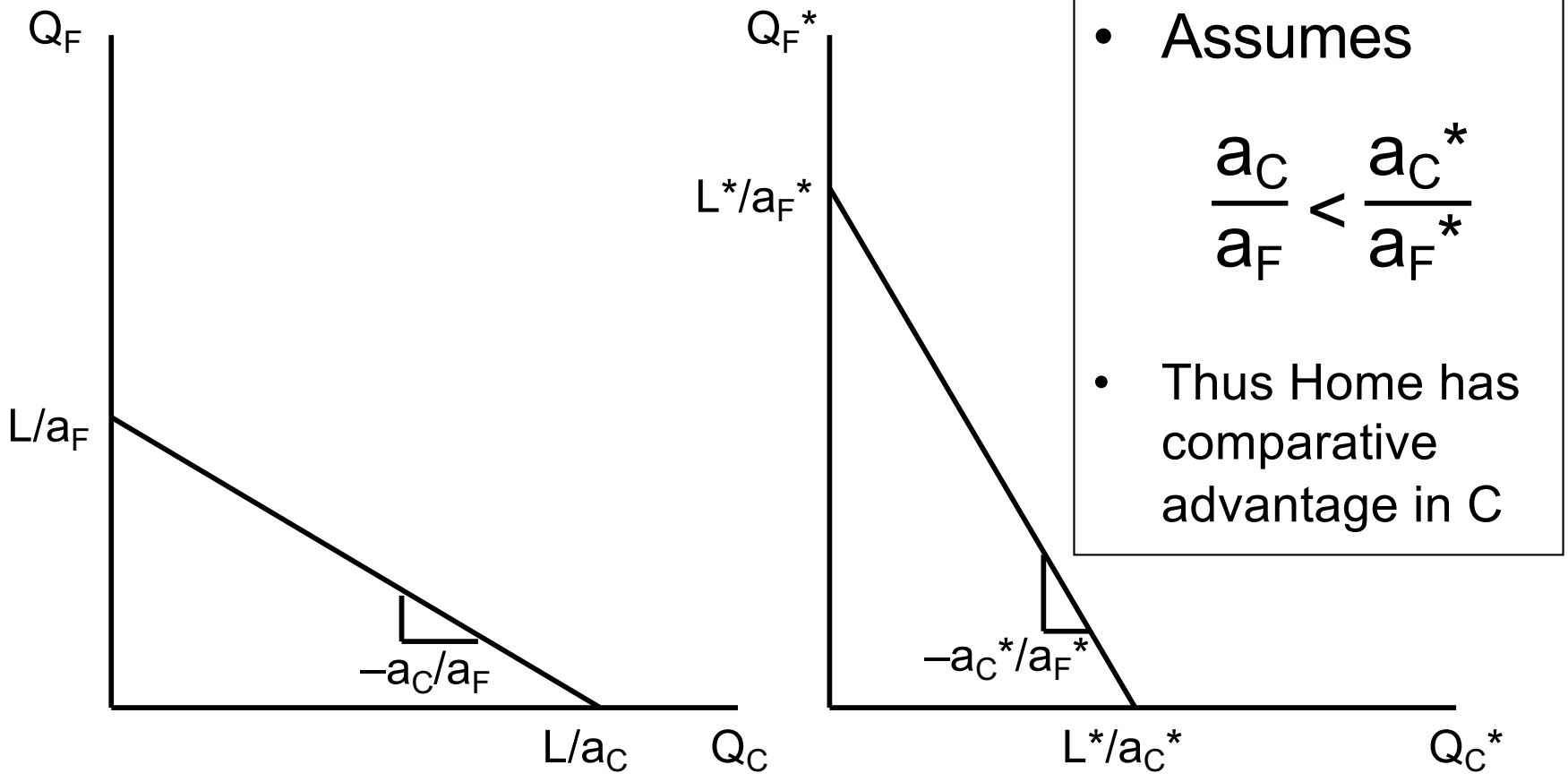
Comparative Advantage

- By assigning amounts of labor to the countries, one can show that each can consume more of both goods if
  - US exports Food
  - Other (UK or UC) exports Cloth
- UC has comparative advantage in Cloth because its relative labor cost is lower:

$$\frac{1}{2} = \frac{0.10}{0.20} = \frac{a_C^{UC}}{a_F^{UB}} < \frac{a_C^{US}}{a_F^{US}} = \frac{0.02}{0.01} = 2$$

Comparative Advantage

- Recall from Ricardian Model:



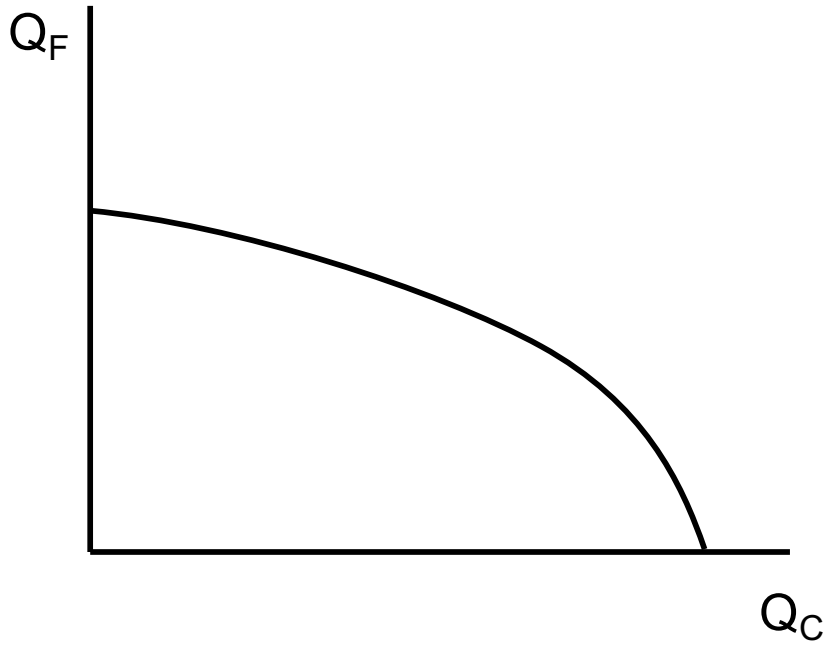
- Assumes

$$\frac{a_C}{a_F} < \frac{a_C^*}{a_F^*}$$

- Thus Home has comparative advantage in C

Comparative Advantage

- In a much more general context than the Ricardian model, comparative advantage needs to be defined in terms of relative autarky prices.
- Why? Because costs vary along production possibility curve:



Comparative Advantage

- Relative autarky prices.
  - Let $\tilde{p}_g^c$ be the autarky price of good g in country c.
- Then country c has a comparative advantage in good g_1 relative to g_2, compared to another country c', if

$$\frac{\tilde{p}_{g_1}^c}{\tilde{p}_{g_2}^c} < \frac{\tilde{p}_{g_1}^{c\prime}}{\tilde{p}_{g_2}^{c\prime}}$$

Pause for Discussion

Questions on KOM

- Does comparative advantage imply absolute advantage? Does absolute advantage imply comparative advantage?

Questions on Deardorff

- How can one identify comparative advantage in terms of
  - Unit labor requirements for producing goods?
  - Output per worker in producing the goods?
  - Opportunity cost?
- Why is comparative advantage a relative concept in two senses simultaneously?

Questions on Deardorff

- When a high-wage country trades with a low-wage country in the Ricardian model, who is hurt, or hurt more: The high-wage workers or the low-wage workers?

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The Heckscher-Ohlin (H-O) Model

- Assumes
  - Two goods: cloth C and food F
    - Outputs: Q_F, Q_C
    - Prices: P_F, P_C

The Heckscher-Ohlin (H-O) Model

- Assumes
  - Two factors: labor L, land T
    - Endowments: L, T, L*, T*
  - Both are assumed perfectly mobile between industries
  - Thus there is, within the country, a single
    - wage, w, paid to labor, and
    - rental, r, paid to land

      (If there weren't, then all would move to the sector paying more.)

Again, very important!

The Heckscher-Ohlin (H-O) Model

- Assumes
  - Two countries: Home and Foreign (*)
    - Differ (only) in relative factor endowments

The Heckscher-Ohlin (H-O) Model

- Assumptions:
  - Takes technologies as given
    - Constant-returns-to-scale production functions
    - Same in both countries
  - Homothetic preferences are also the same in both countries, as in the Standard Model

H-O Technology

- Unit factor requirements
  - $a_{ij} = a_{ij}^*$ = amount of factor i = L, T needed to produce one unit of output of good j = C,F
    - (Usually, but not here, these are taken to be variable, depending on factor prices.)
  - Assume (so that Home will end up exporting C, as we'll see below):

$$\frac{a_{LC}}{a_{TC}} > \frac{a_{LF}}{a_{TF}}$$

  - That is, production of cloth is "labor-intensive" relative to land, compared to production of food

H-O Endowments

- Factor endowments
  - H-O takes as given the countries' "endowments" of the two factors
  - Assume (again so that Home will end up exporting C, as we'll see below):

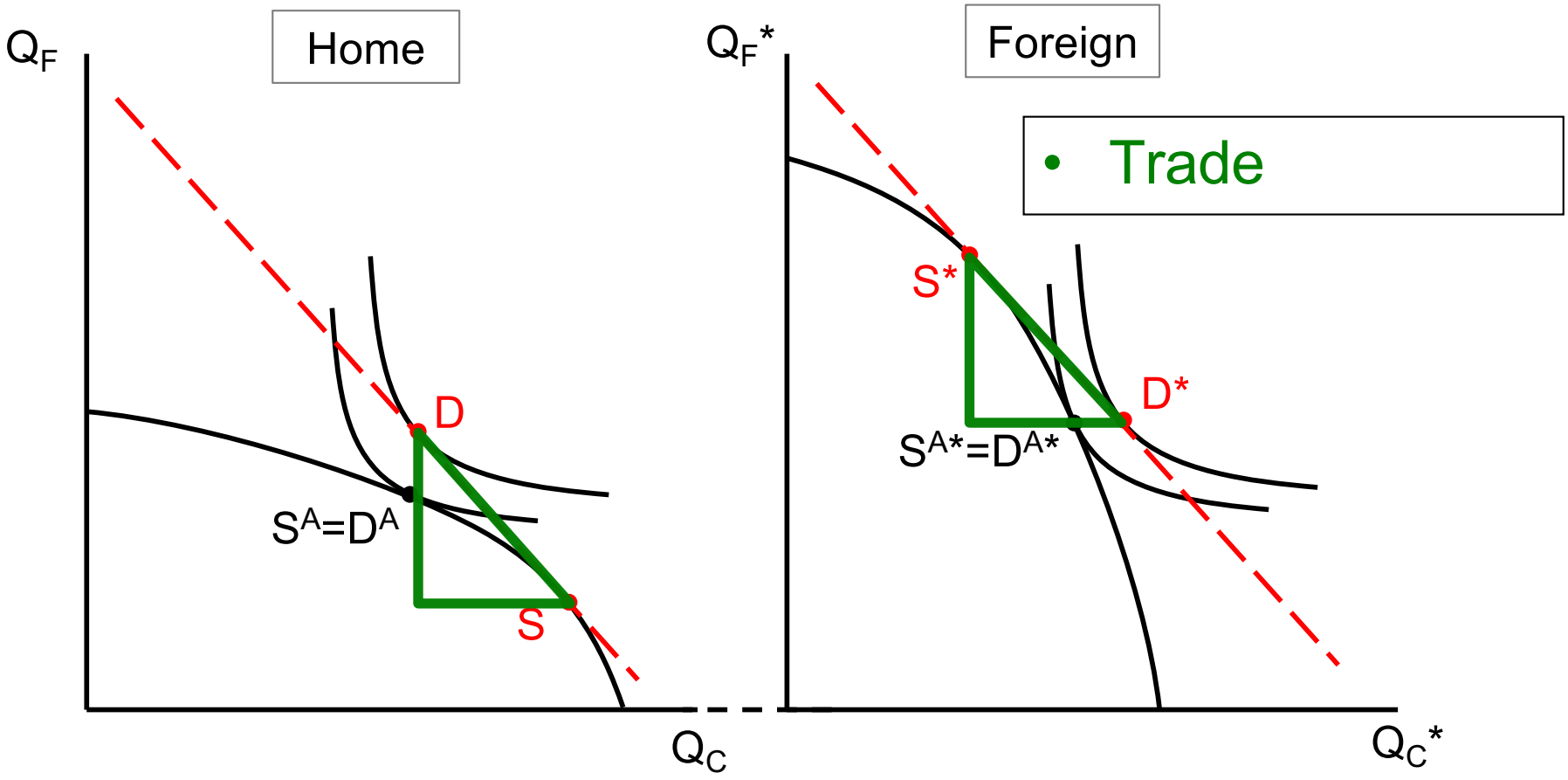
$$\frac{L}{T} > \frac{L^*}{T^*}$$

  - That is, Home is relatively well-endowed with labor (relative to land, compared to Foreign)

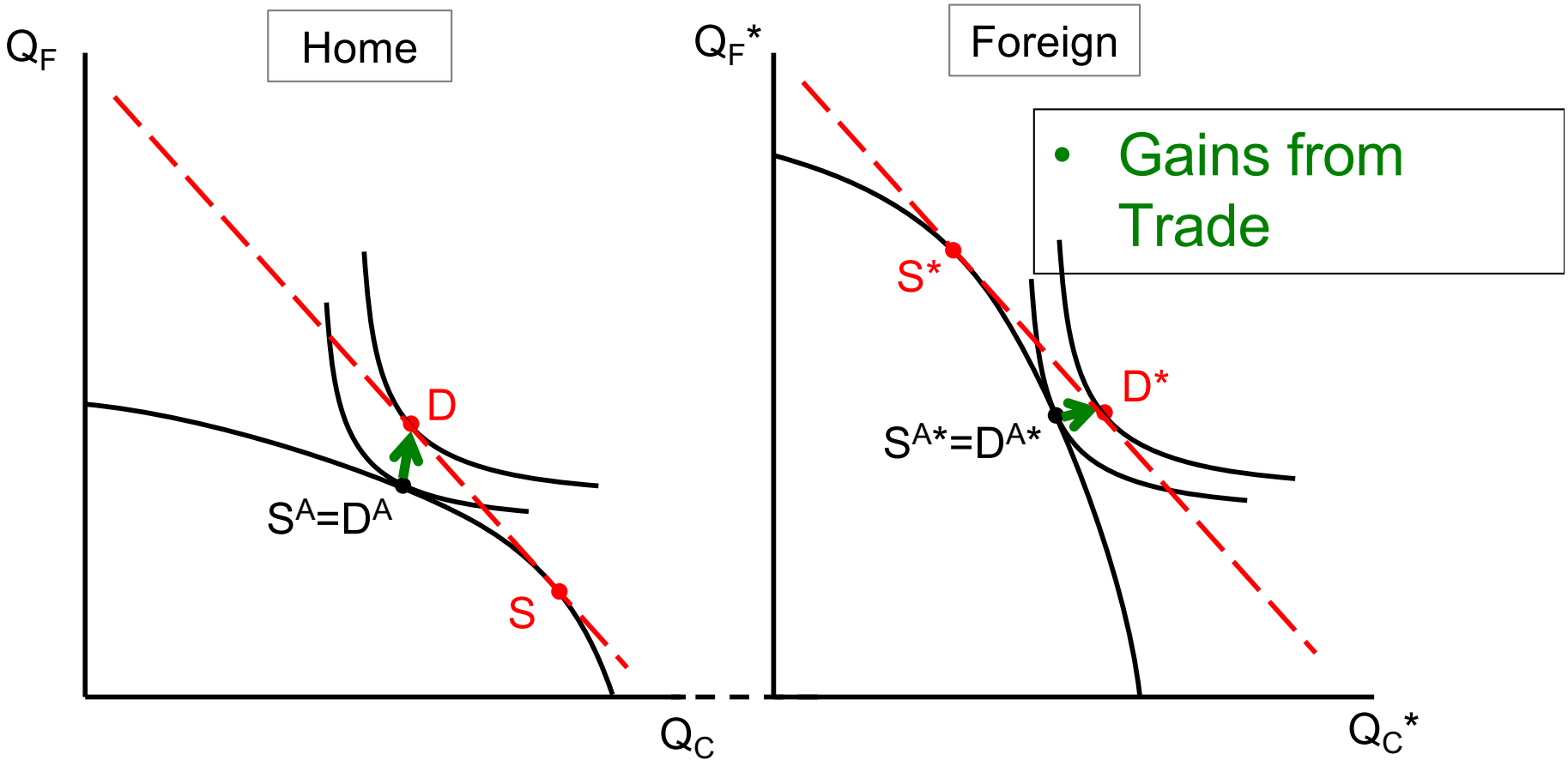
H-O PPFs

- With these assumptions, it can be shown that PPFs are curved, as in the Standard Model.
- Home, because it is relatively well endowed with labor, is better able to produce the labor-intensive good C.
- PPFs therefore look as we saw them in the Standard Model.

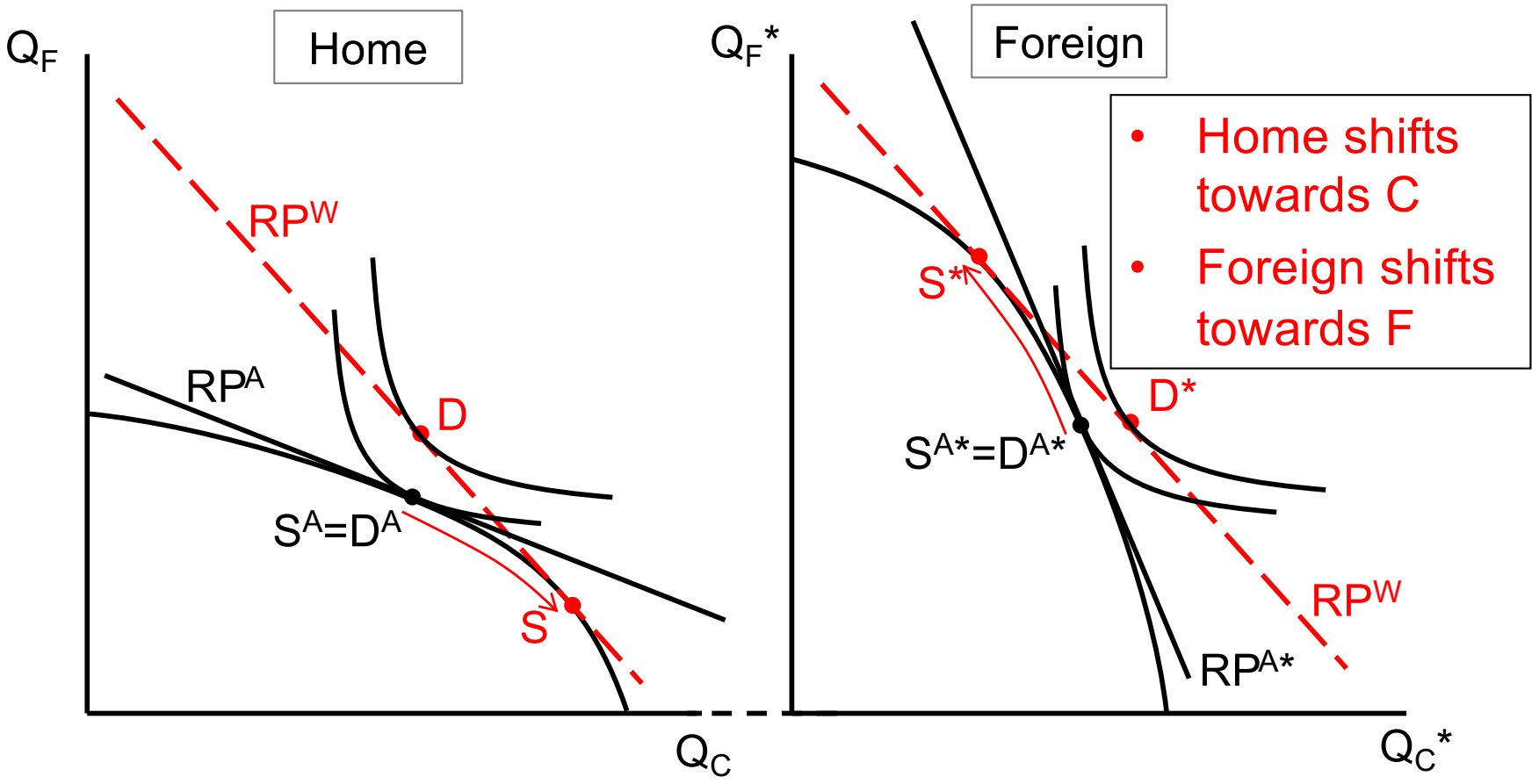
H-O Trade Equilibrium



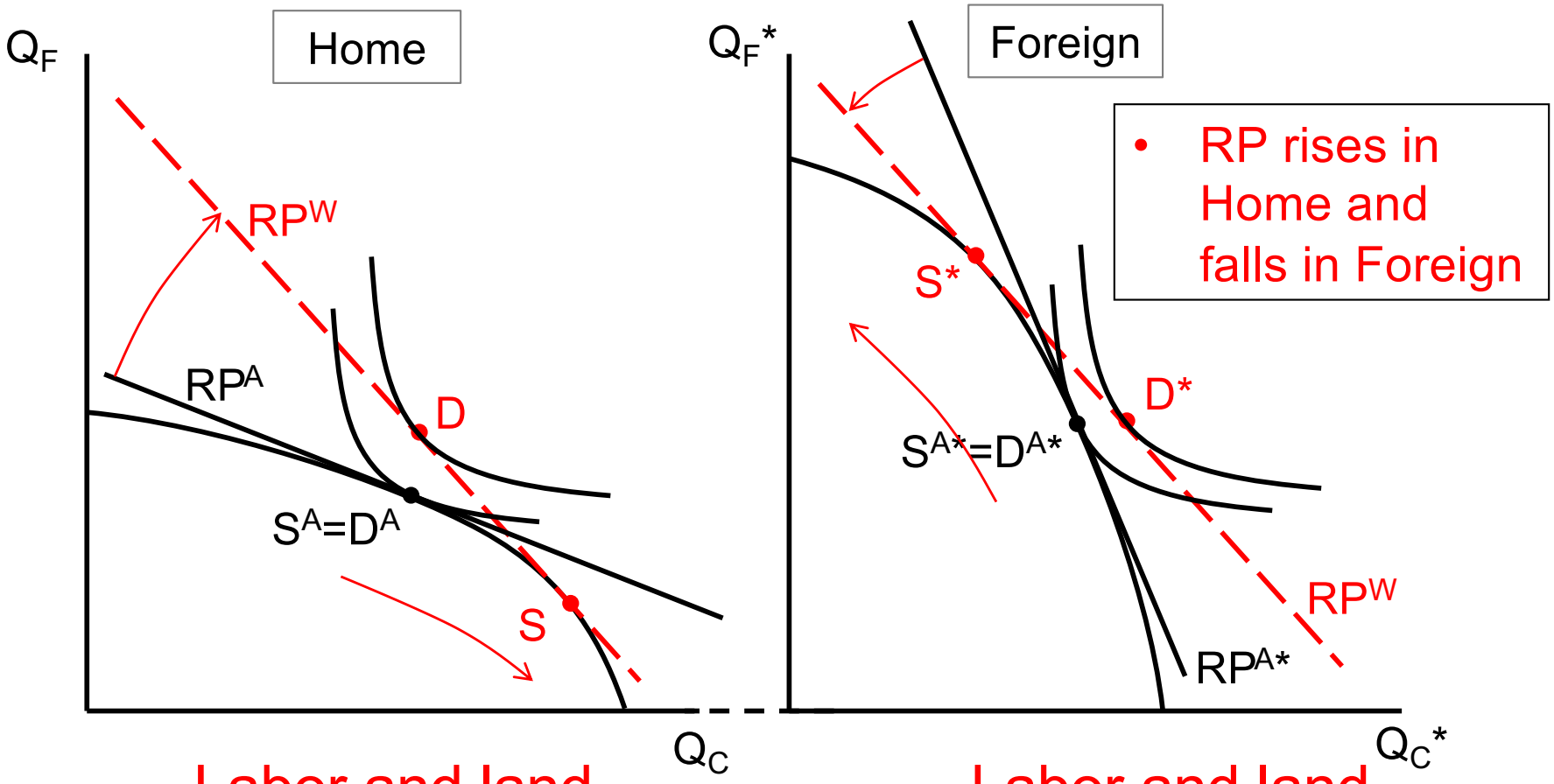
H-O Gains from Trade



H-O Production Changes Due to Trade



H-O Price Changes Due to Trade



Labor and land move from F to C

Labor and land move from C to F

H-O Effects on Factor Prices

- Can't be seen in these pictures, but
  - Factor Price Equalization (FPE)
    - Equality of goods prices (due to free trade) causes equality of factor prices (wage of labor and rent of land)
  - Stolper-Samuelson Theorem (SS)
    - As price rises for good using intensively the abundant factor,
      - Real wage or rent of that factor rises (in both sectors)
      - Real wage or rent of other ("scarce") factor falls (in both sectors)

Factor Price Equalization

- Simple analytics

$$P_C = wa_{LC} + ra_{TC}$$

$$P_F = wa_{LF} + ra_{TF}$$

$$\Rightarrow \quad w = (a_{TF}P_C - a_{TC}P_F)/\Delta$$

$$r = (a_{LF}P_C - a_{LC}P_F)/\Delta$$

$$\text{where } \Delta = a_{LC}a_{TF} - a_{LF}a_{TC}$$

- Thus (FPE): If $P_C = P_C^*$ & $P_F = P_F^*$ Then $w = w^*$ & $r = r^*$

Stolper-Samuelson Theorem

Recall

$$\frac{a_{LC}}{a_{TC}} < \frac{a_{LF}}{a_{TF}}$$

- It can also be shown that

  If $\%\Delta P_C > \%\Delta P_F$, so that $\Delta(P_C/P_F) > 0$

  Then $\%\Delta w > \%\Delta P_C > \%\Delta P_F > \%\Delta r$

- So that

  w rises relative to <u>both</u> prices, and

  r falls relative to <u>both</u> prices

- That is (SS):

  if $\Delta(P_C/P_F) > 0$, then real wage rises, and real rent falls

SS Interpretations

1. A rise in relative price of a good increases the real return to the factor used intensively in its production and lowers the real return to the other factor.
2. Free trade benefits the abundant factor and hurts the scarce factor
3. Protection benefits the scarce factor and hurts the abundant factor

Pause for Discussion

Questions on KOM

- If one country has more of both land and labor than the other country, what will it export?
- Is the Heckscher-Ohlin Theorem, as a theory of trade, an alternative to the theory of comparative advantage?
- Who gains and who loses from trade, in the two-factor model?

Outline

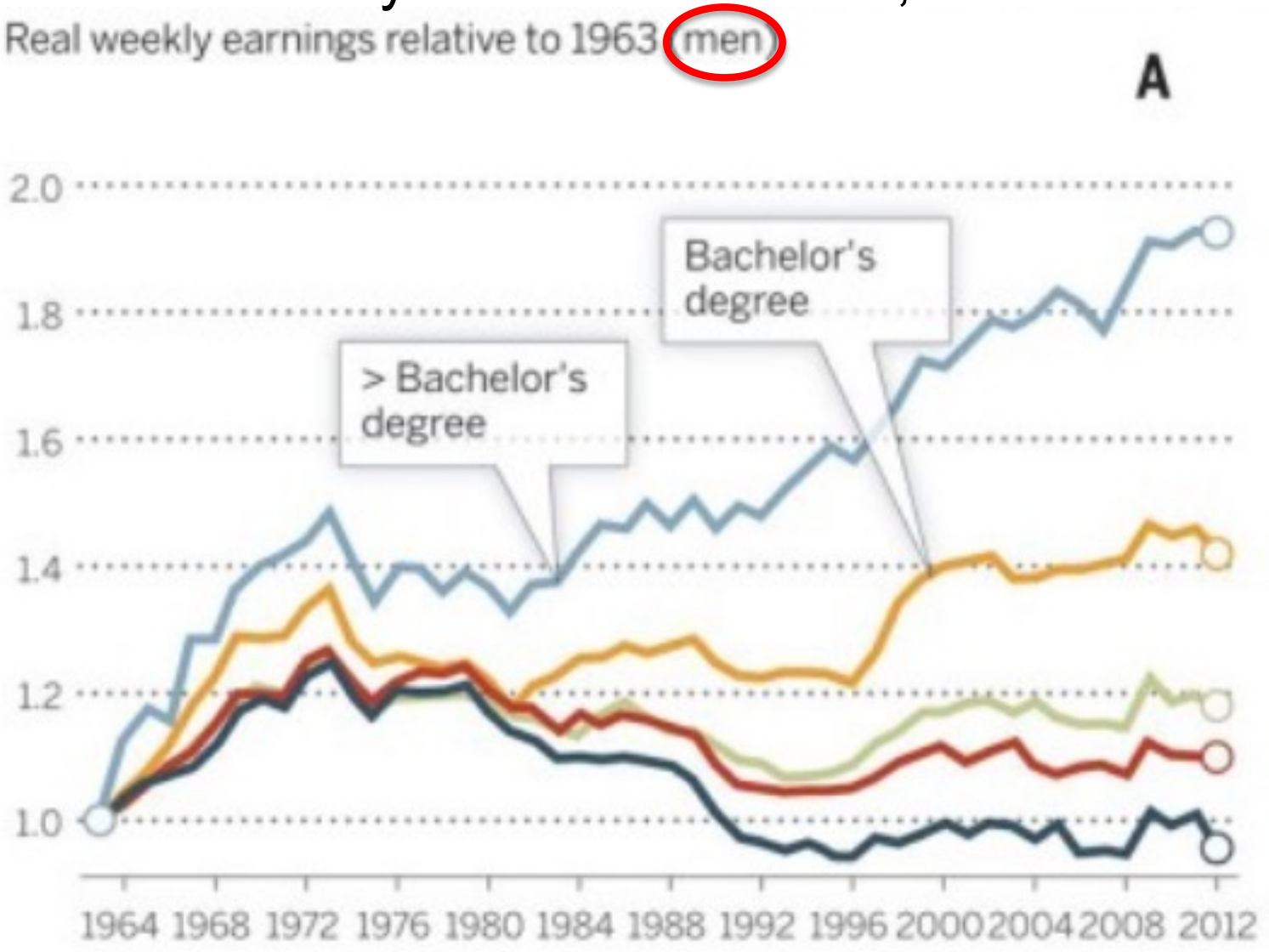
- Ricardian Model
- Comparative Advantage
- Heckscher-Ohlin Model
- Trade and Wages

Trade and Wages

- Starting in about 1980
  - Wages of more educated labor rose
  - Wages of less educated labor
    - Rose less rapidly, or
    - Fell
  - Thus there was a rise in the
    - Return to education
    - “Skill Premium”

Our World in Data

Changes in real wage levels of full-time U.S. workers by sex and education, 1963-2012



Source: Roser & Nagdy, 2013

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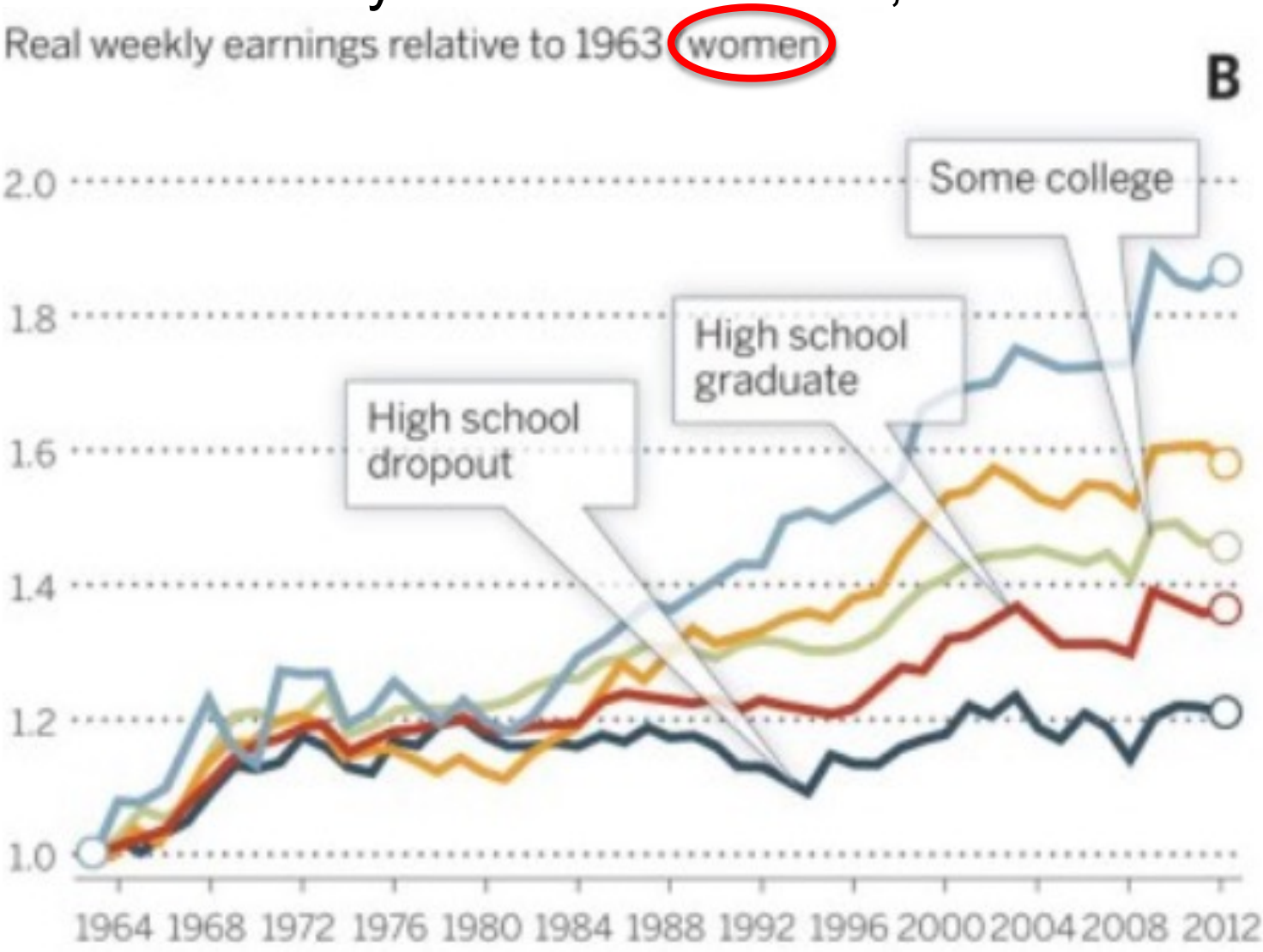

Source: Roser & Nagdy, 2013

Trade and Wages

- Why did this happen? Several possible causes were studied
  - Immigration
  - Scarcity of education
  - Decline of unions
  - Globalization
  - Technological change

Trade and Wages

- Why did this happen? Several possible causes were studied
  - Immigration
  - Scarcity of education
  - Decline of unions
  - ➢ Globalization
  - ➢ Technological change
- Of these, only the last two found empirical support

Trade and Wages

- How could globalization cause this?
  - If countries lowered tariffs, this is exactly what is predicted by the Stolper-Samuelson Theorem
    - In the US less educated labor is the scarce factor
      - Not because there are few of them absolutely
      - But because there are fewer compared to more educated
  - Also, if the portion of the world with more low-educated workers grows
    - This too will push down low-educated wages
    - Note the opening and growth of China

Trade and Wages

- How could technology cause this?
  - Increased use of computers and other information technology
    - Increases demand for educated labor

Trade and Wages

- What the empirical studies found (see Freeman)
  - "…trade matters, but it is neither all that matters nor the primary cause of observed changes."
  - My recollection of the literature
    - Trade accounted for 30-40%
    - The rest was technology

Pause for Discussion

Questions on KOM

- How have the wages of skilled and unskilled labor in the US changed since the 1970s? Could this change be due to trade? Is it in fact due primarily to trade?
- In what sense can trade in goods be regarded as equivalent to trade in (or international movement of) factors?
- What are some of the reasons why the prediction of international factor price equalization does not hold in the real world?

Questions on Freeman

- Contrast the changes in skilled and unskilled wages and employment in the U.S. and Europe.
- Two empirical approaches to studying the effects of globalization are described by Freeman, one looking at the “factor content of trade” and the other looking at prices. What is the reasoning behind each?