PubPol/Econ 541

Class 17
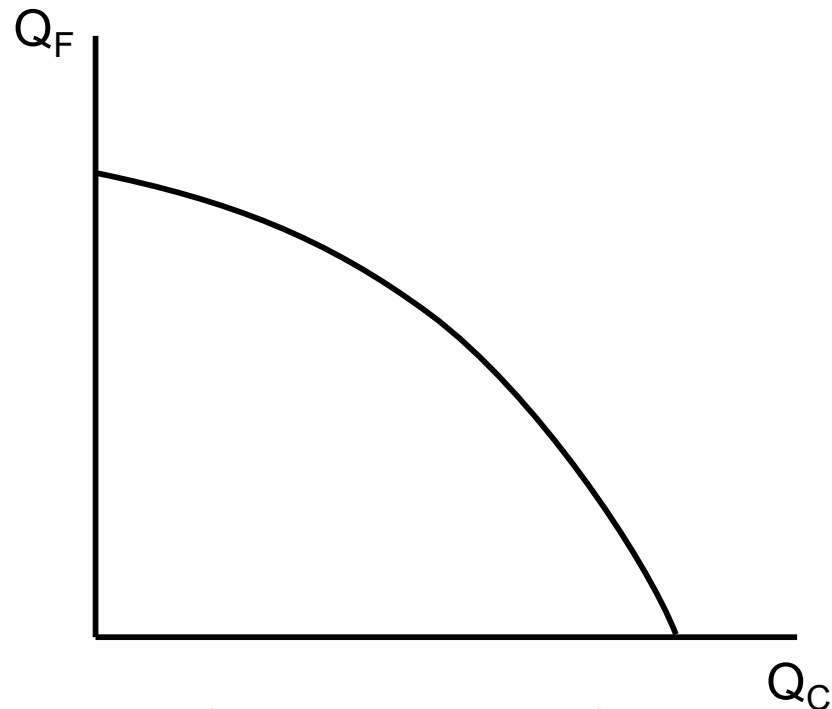
Behind the Standard Model

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2020

Announcement

- Quizzes
  - This week (due Oct 31) covers Standard Model
    - Which we did in class last Thursday and Tuesday
  - Next week (due Nov 7) will cover both today and next <u>Thursday</u>
    - because we have no class on election day Nov 4
  - So from now on, quizzes will cover material from both classes of the week that they end.
  - Less time to study each Thursday's material

Purpose Today

To look behind the Production Possibilities of the Standard Model:

Q_F

Q_C

Purposes

Why?

1. To see what determines Comparative Advantage and thus trade

2. To see how trade affects economies

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

Outline

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

The Ricardian Model

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

      Very important!

  - One factor: labor L
    - Perfectly mobile between sectors
  - Two countries: Home and Foreign (*)
  - Takes as given
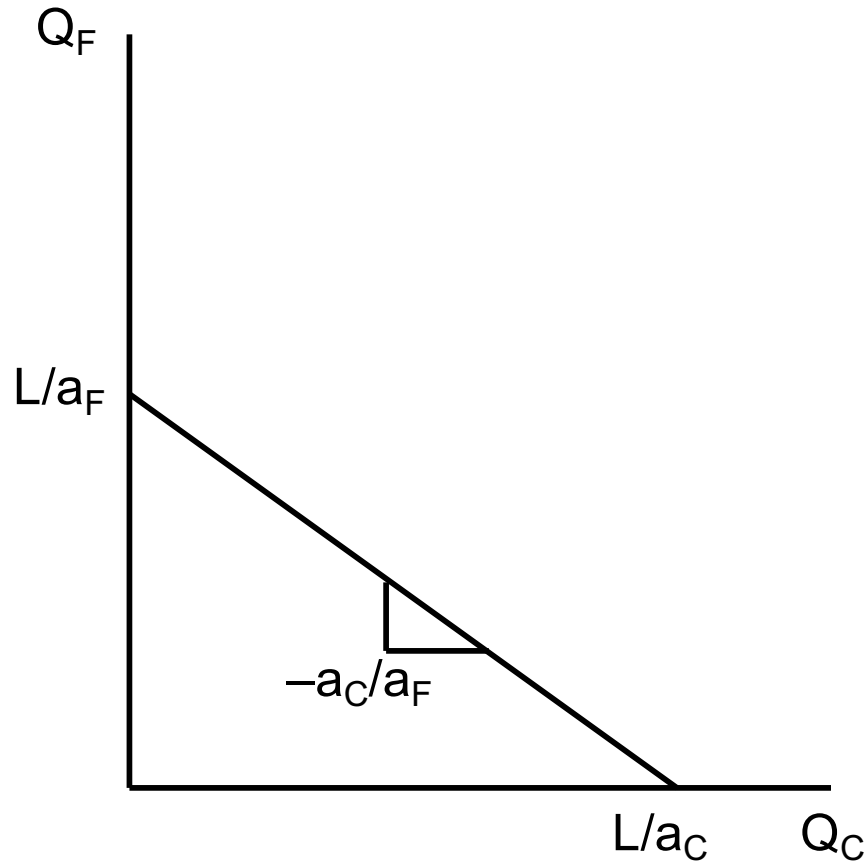   - Unit labor requirements: a_C, a_F, a_C^*, a_F^*

      Fixed, do not vary with output

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):

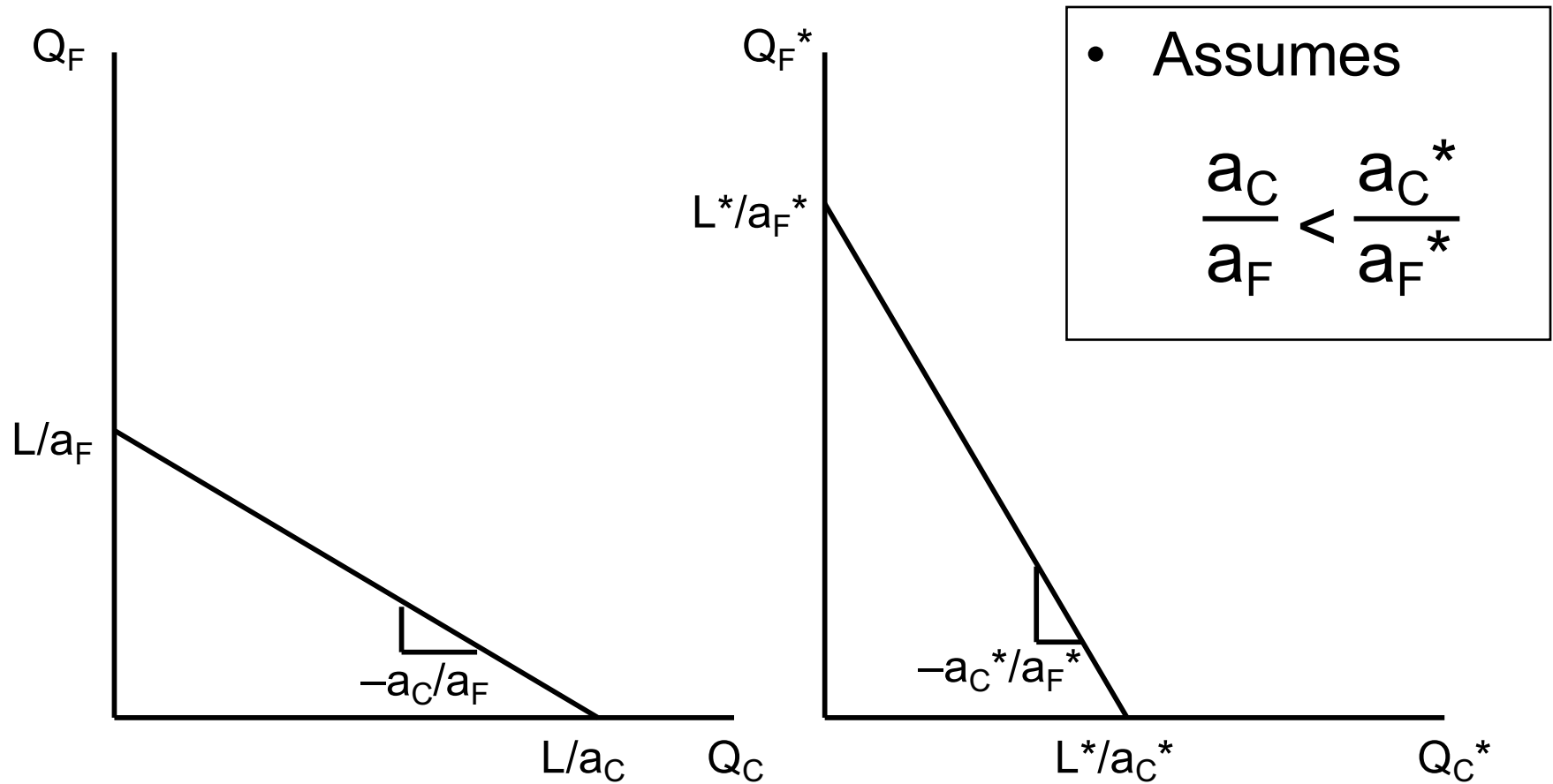$$\frac{a_C}{a_F} < \frac{a_C{}^*}{a_F{}^*}$$

Ricardian PPF

Q_F

L/a_F

$-a_C/a_F$

L/a_C Q_C

- Full employment requires
  $$L = a_C Q_C + a_F Q_F$$
- and thus
  $$Q_F = L/a_F - (a_C/a_F)Q_C$$

2-Countries' PPFs

- Assumes

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

NOT equilibrium: RP < a_C/a_F

Q_F

Q_F*

RP < a_C/a_F

- Both would produce only F

$L*/a_F*$

L/a_F

$-a_C/a_F$

$-a_C*/a_F*$

L/a_C Q_C

$L*/a_C*$ Q_C*

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

$RP > a_C^*/a_F^*$

Q_F

L/a_F

$-a_C/a_F$

L/a_C Q_C

Q_F^*

L^*/a_F^*

$-a_C^*/a_F^*$

L^*/a_C^* Q_C^*

- Both would produce only C
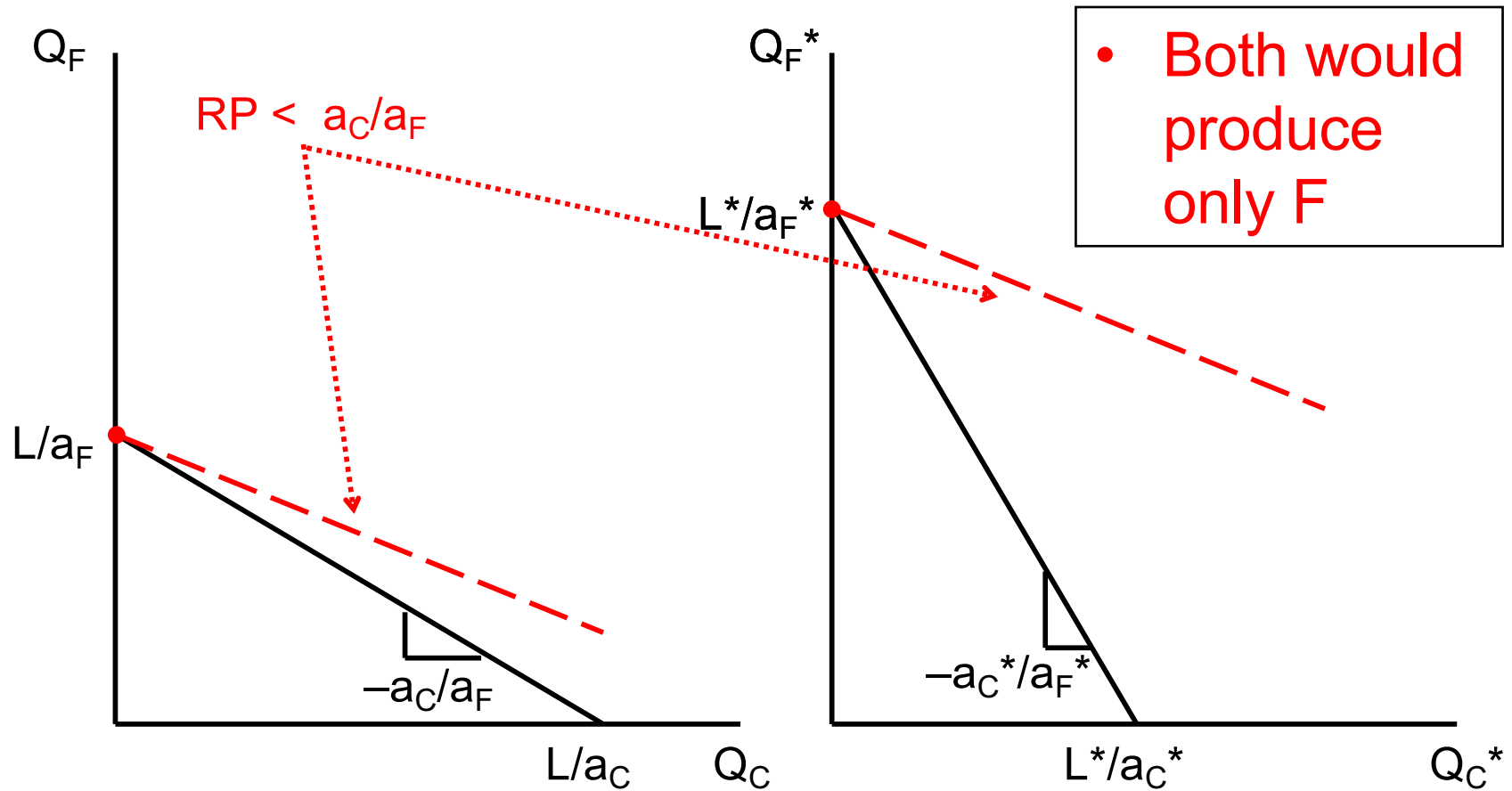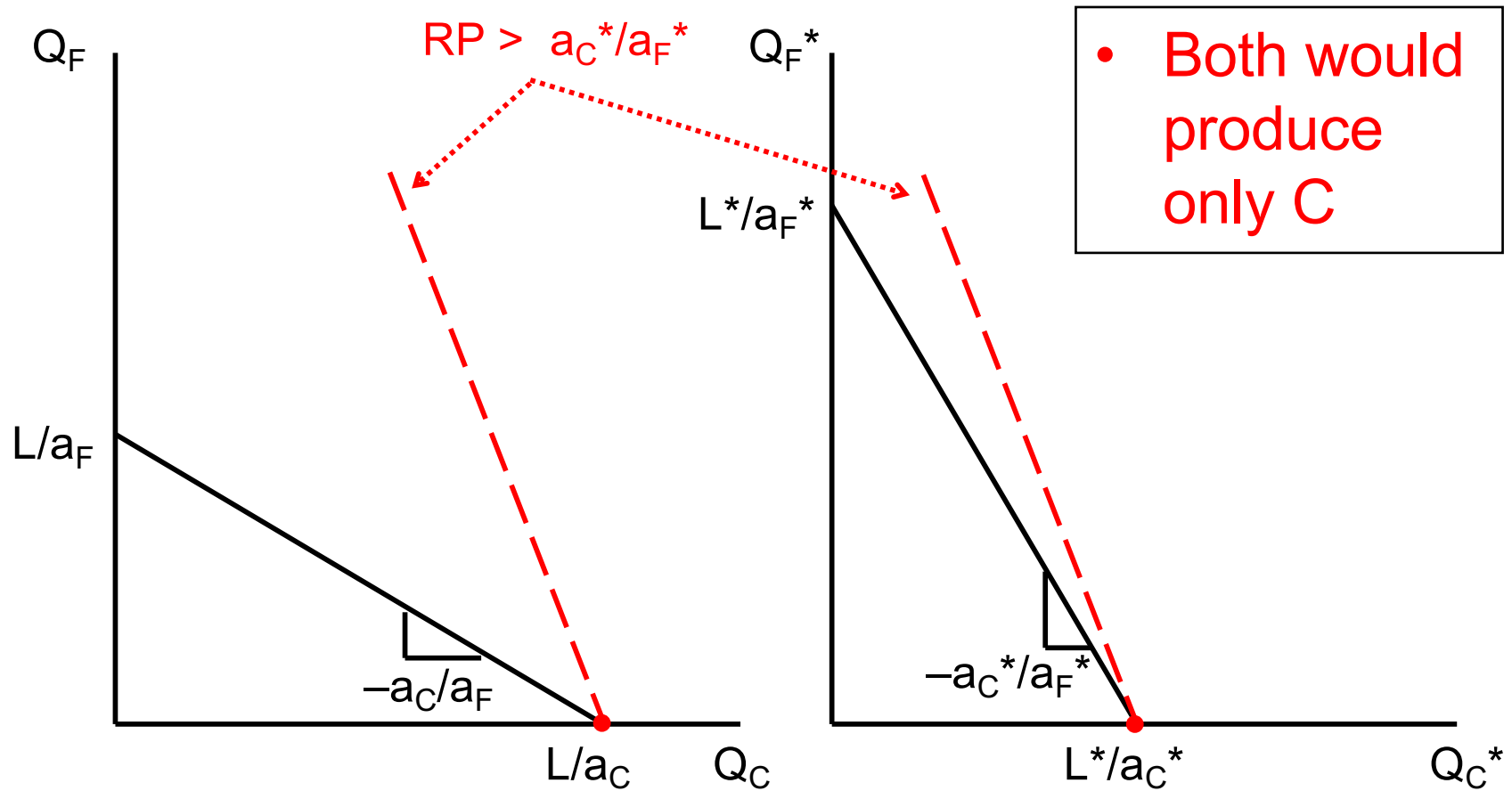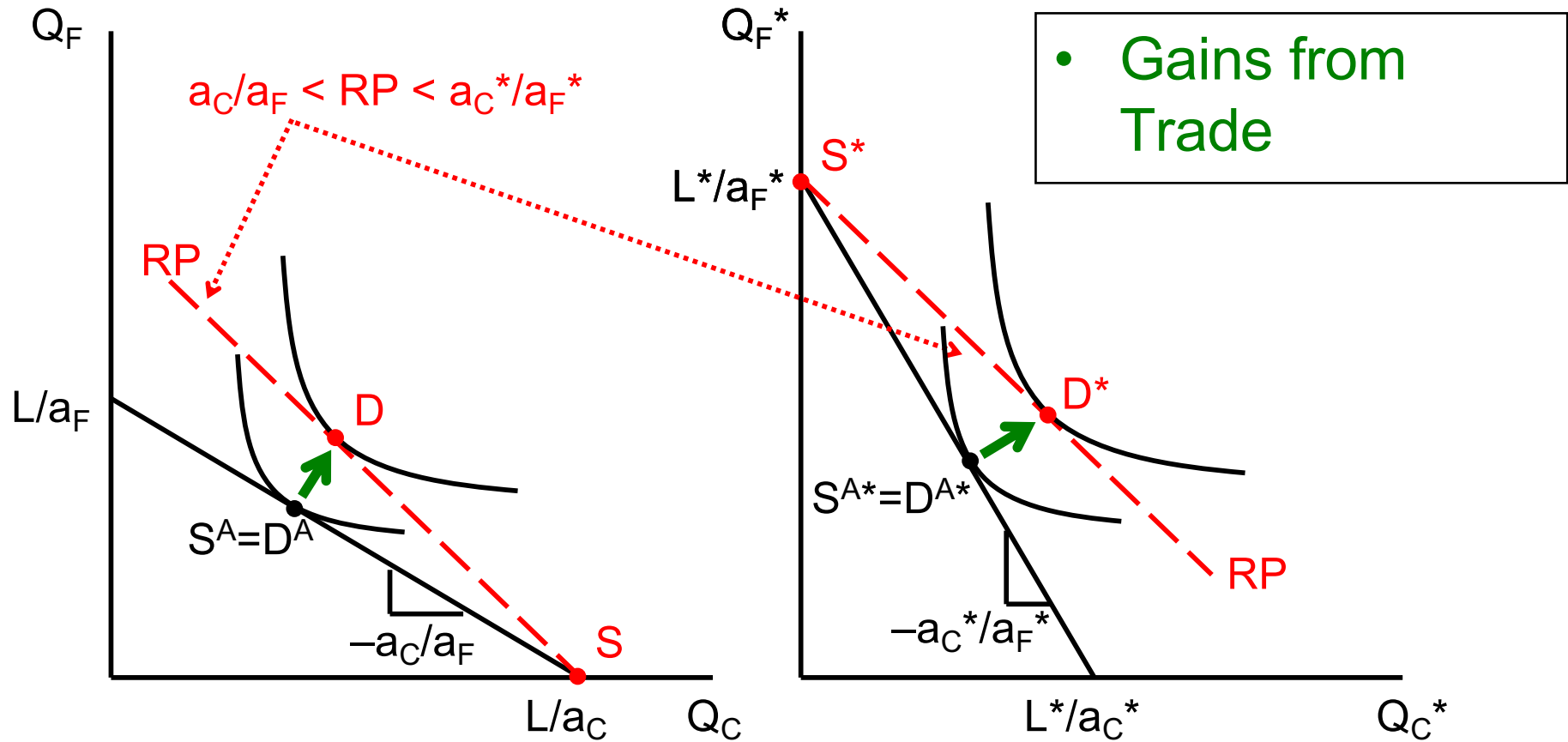
Specialized Equilibrium: $a_C/a_F < RP < a_C^*/a_F^*$

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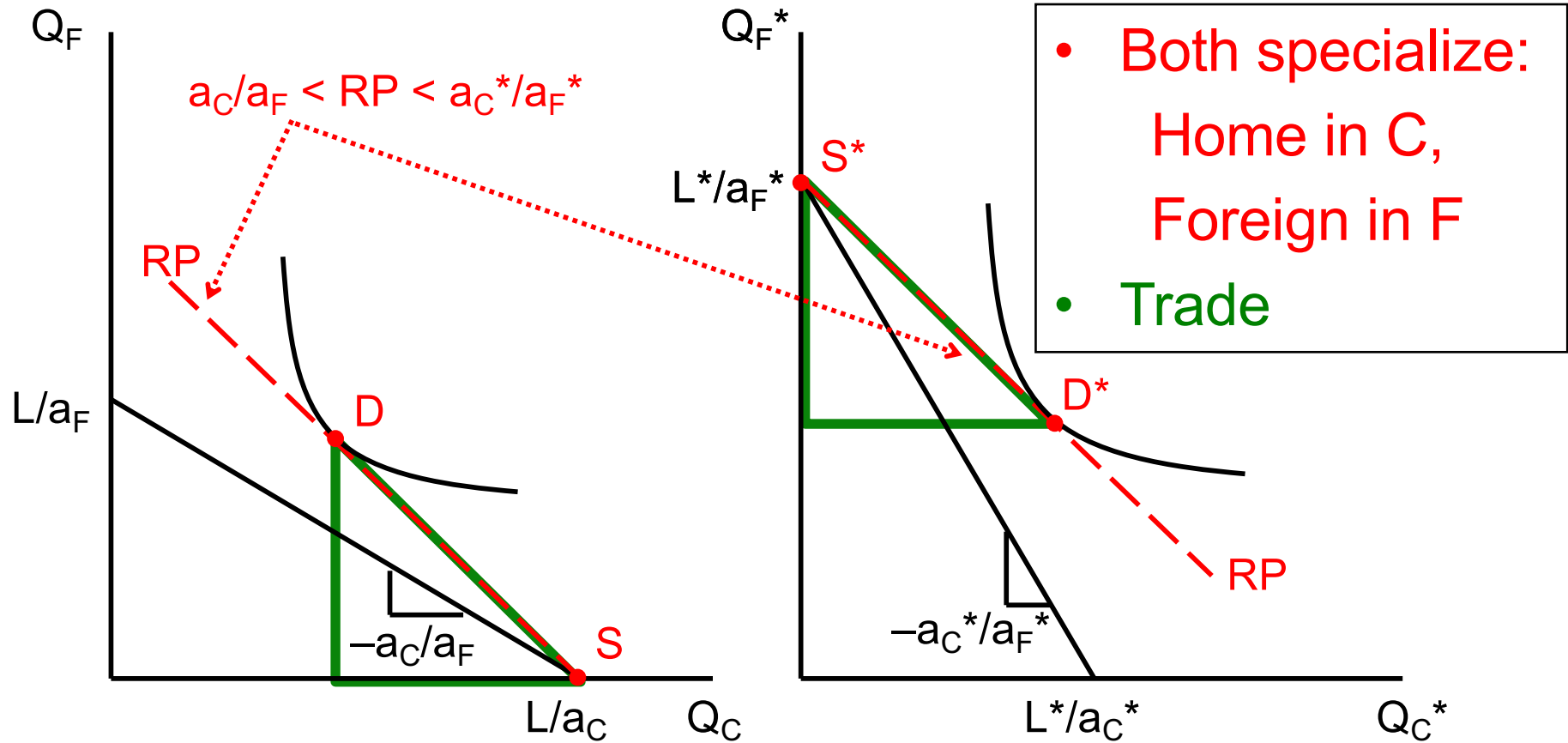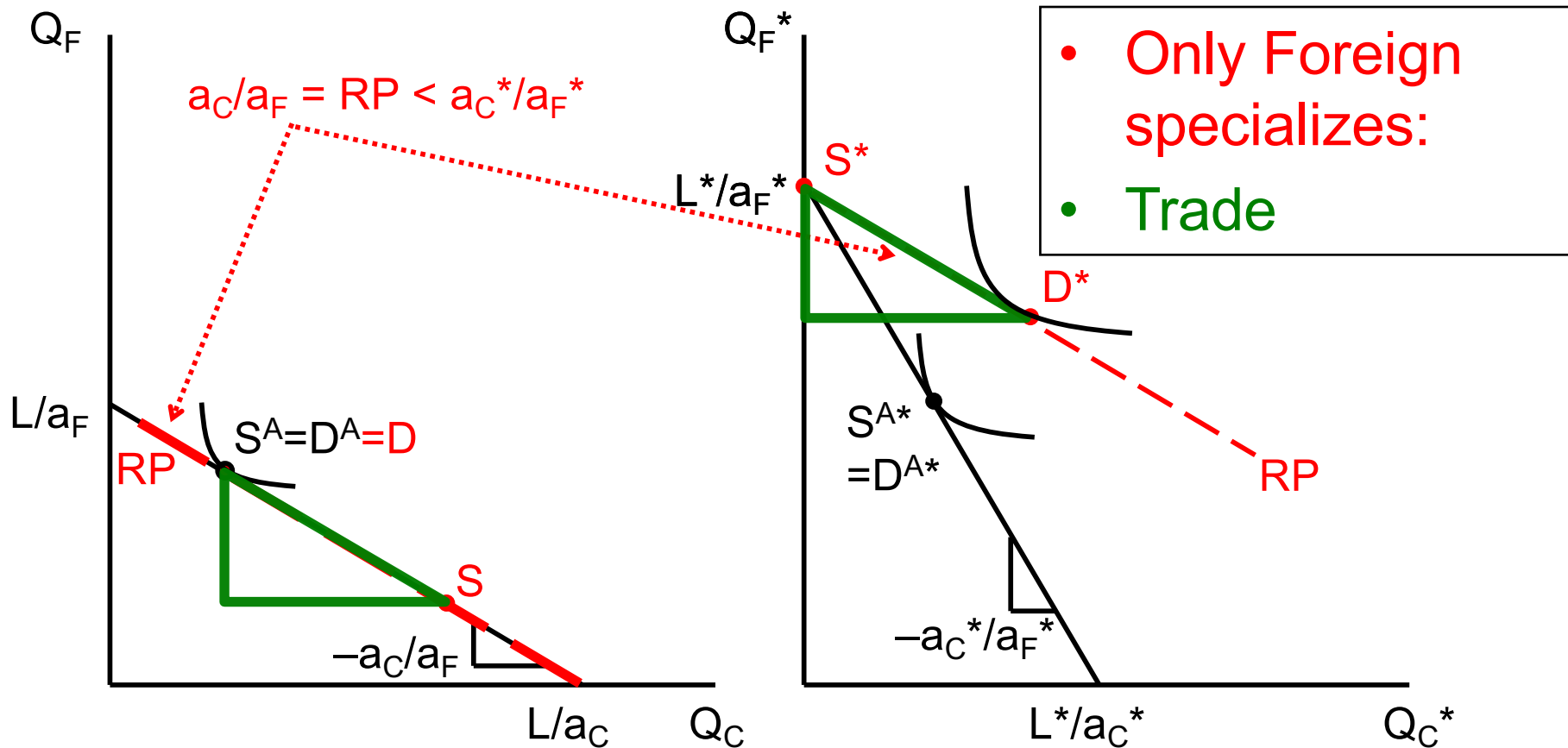
Home-Diversified Equilibrium: $a_C/a_F = RP < a_C^*/a_F^*$

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

Q_F

$a_C/a_F = RP < a_C^*/a_F^*$

Q_F^*

- Only Foreign gains from trade

S^*

L^*/a_F^*

D^*

L/a_F

RP

$S^A=D^A=D$

S^{A*}
$=D^{A*}$

RP

S

$-a_C/a_F$

$-a_C^*/a_F^*$

L/a_C Q_C

L^*/a_C^*

Q_C^*
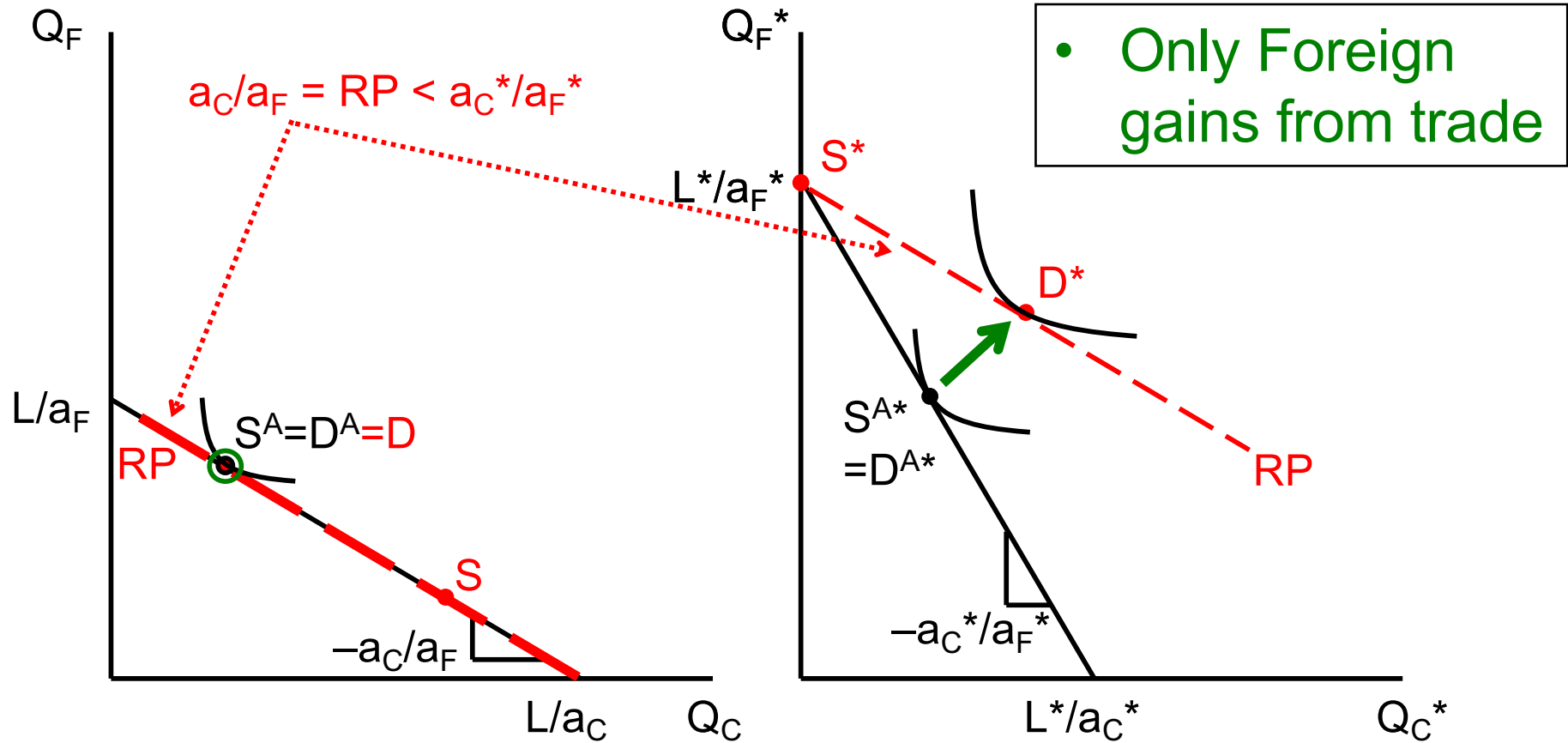
Effects of Trade in Ricardian Model

- Labor moves – wholly or partially – out of import-competing sector

- All labor paid the same wage (due to perfect mobility), so all share the gains from trade

- Real wage rises as price of import falls

- Note that transition, not modelled, could be painful
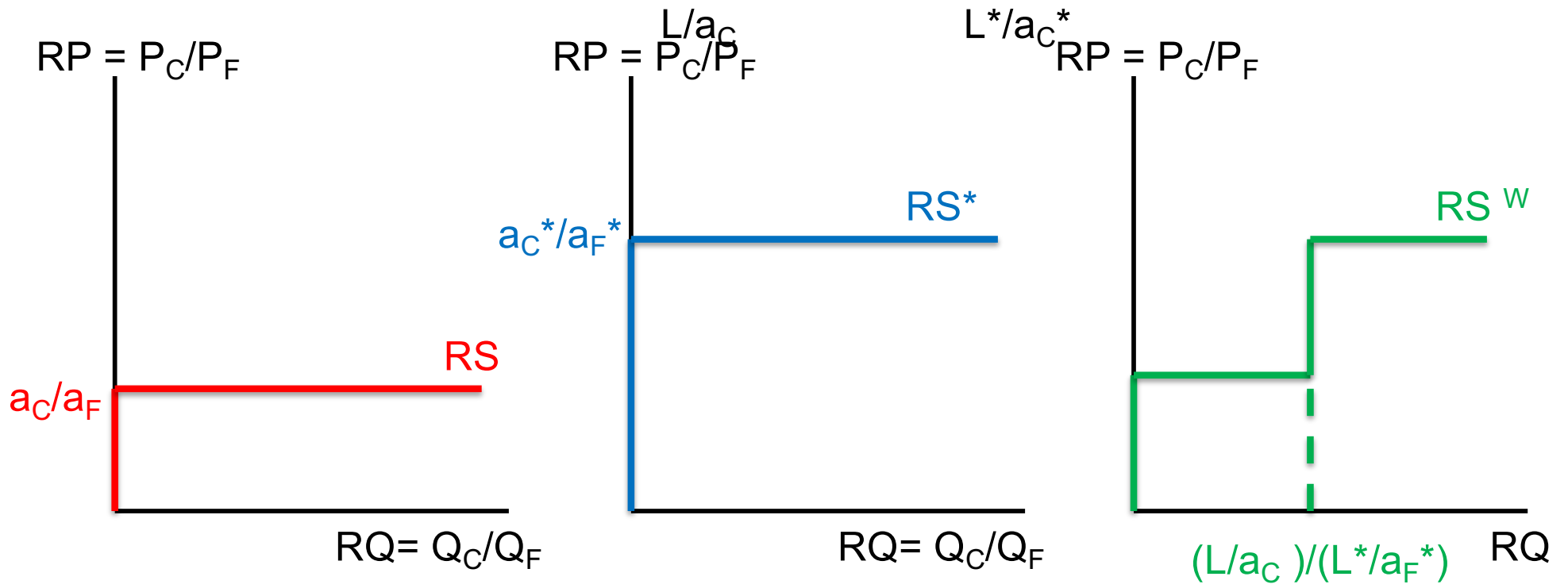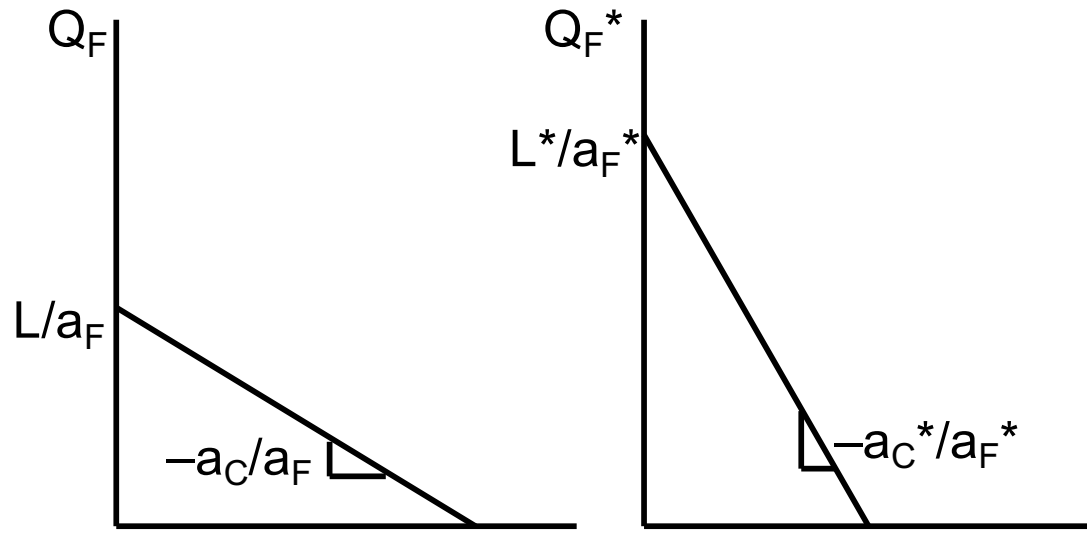
Pause for Discussion

Questions

- In the Ricardian Model, do both countries necessarily gain from trade? Is it possible for a country to lose from trade?

Questions

- 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?

Questions

- 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?

Q_F

L/a_F

$-a_C/a_F$

L/a_C

Q_F*

$L*/a_F*$

$-a_C*/a_F*$

$L*/a_C*$

$RP = P_C/P_F$

a_C/a_F

RS

$RQ = Q_C/Q_F$

$RP = P_C/P_F$

a_C*/a_F*

RS*

$RQ = Q_C/Q_F$

$RP = P_C/P_F$

RS ^{W}

$(L/a_C)/(L*/a_F*)$

RQ

Class 17: Behind the Standard Model

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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 if one country had absolute advantage in <u>both</u> goods, then trade might be impossible

Comparative Advantage

- Ricardo showed that this was wrong.

- What matters is "comparative advantage"

- A less productive country can gain by exporting the good in which its disadvantage is <u>relatively</u> smaller

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:

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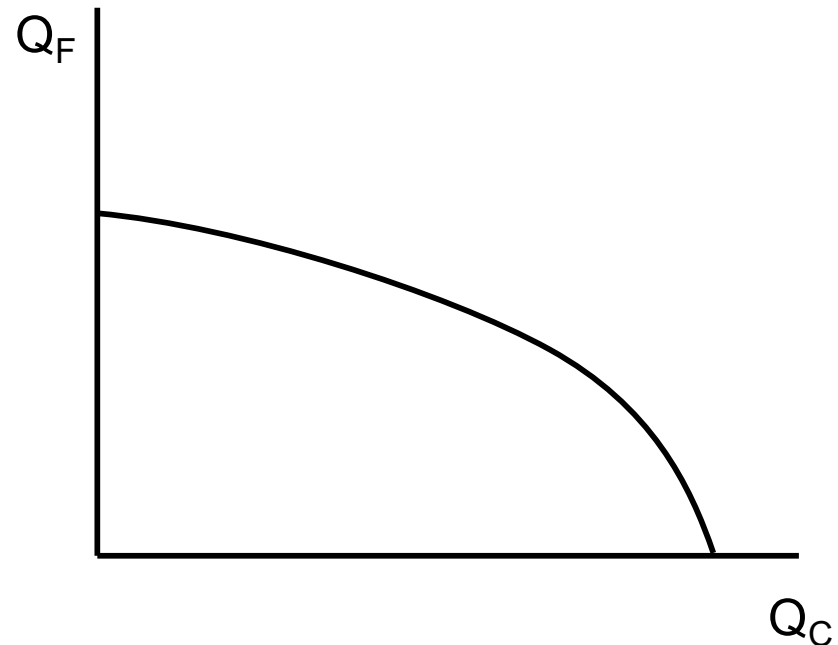
Comparative Advantage

- Recall from Ricardian Model:
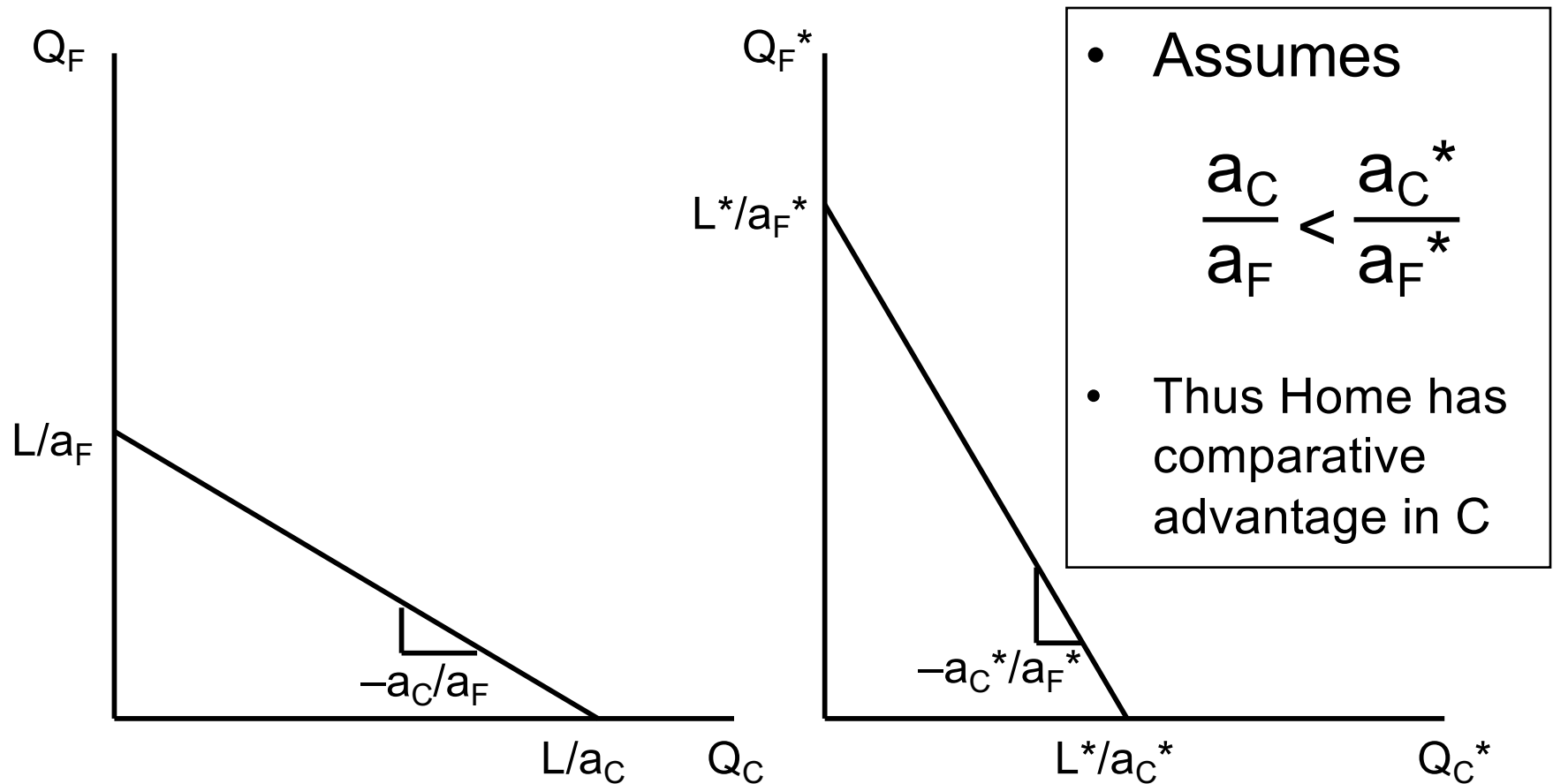
- Assumes

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

- 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 <u>relative autarky prices</u>.

- Why? Because costs vary along production possibility curve:

Q_F

Q_C

Comparative Advantage

- In a much more general context than the Ricardian model, comparative advantage needs to be defined in terms of <u>relative autarky prices</u>.

- 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

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

Pause for Discussion

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Questions

- How can one identify comparative advantage in terms of
  - Unit labor requirements for producing goods?
  - Output per worker in producing the goods?
  - Opportunity cost?

Questions

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

- Why is comparative advantage a relative concept in two senses simultaneously?

- 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?

Outline

- Ricardian Model

- Comparative Advantage

- **Heckscher-Ohlin Model**

- Trade and Wages

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 assumed perfectly mobile between industries
    - Thus a single
        - wage, w, paid to labor, and
        - rental, r, paid to capital

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

- Assumes
  - Takes 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
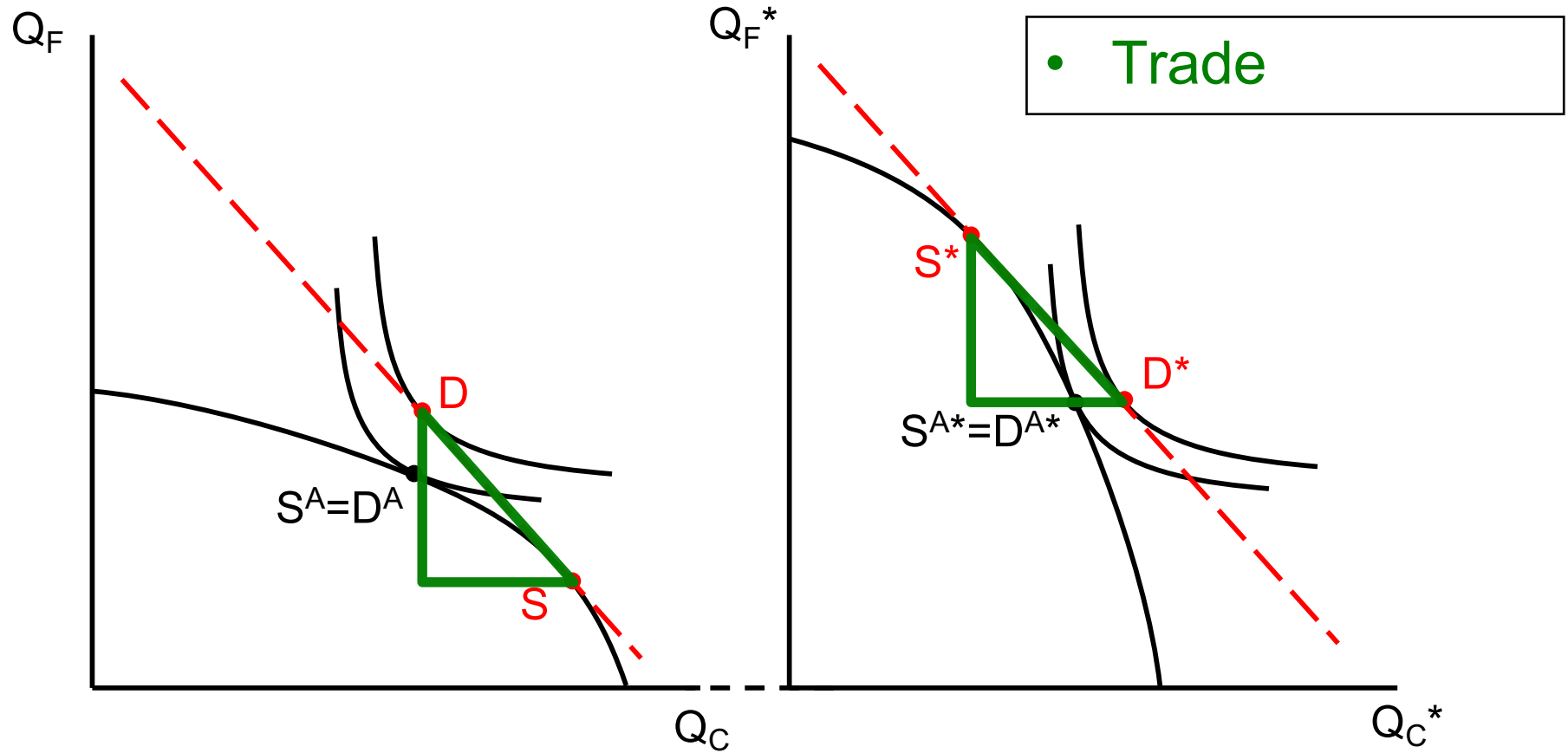 - Assume (again so that Home will end up exporting C, as we'll see below):

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

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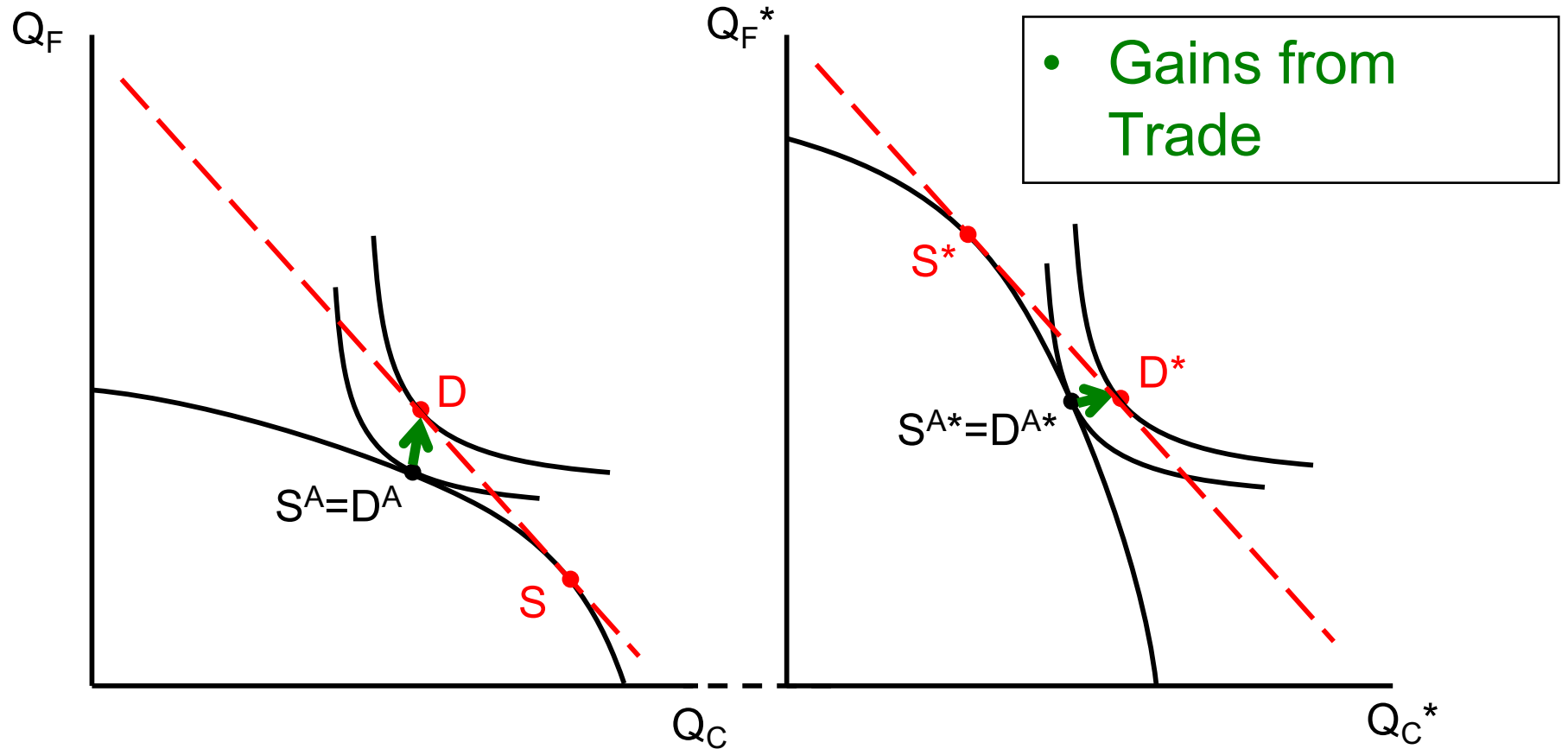
H-O PPFs

- 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.
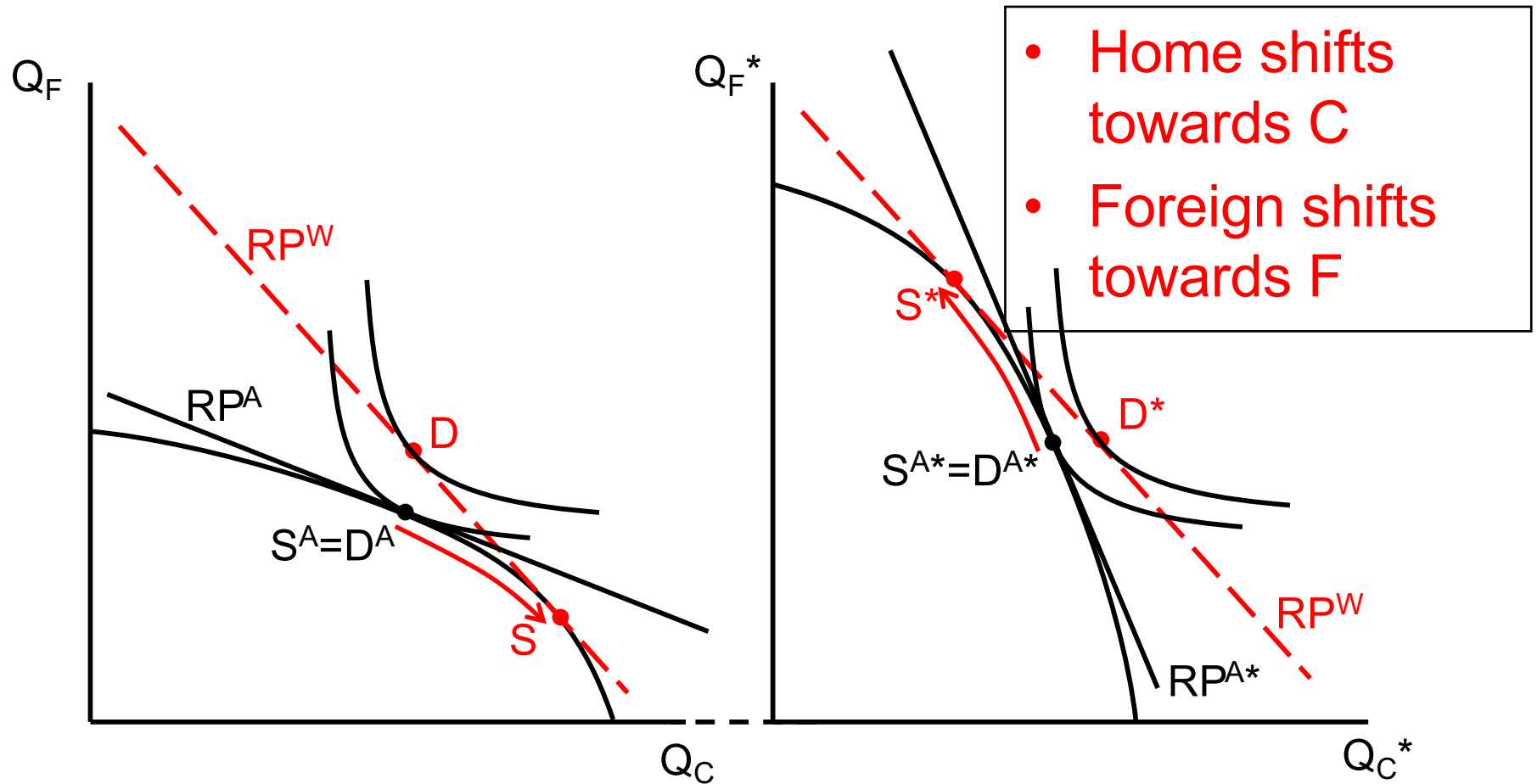
H-O Trade Equilibrium

H-O Gains from Trade

- Gains from Trade

Q_F

Q_C

D

S

$S^A = D^A$

Q_F^*

Q_C^*

S*

D*

$S^{A*} = D^{A*}$

H-O Production Changes Due to Trade

- Home shifts towards C
- Foreign shifts towards F

H-O Price Changes
Due to Trade

Q_F

RP^W

RP^A

D

$S^A = D^A$

S

Q_C

Q_F*

- RP rises in Home and falls in Foreign

$S*$

$D*$

$S^{A*} = D^{A*}$

RP^W

RP^{A*}

Q_C*
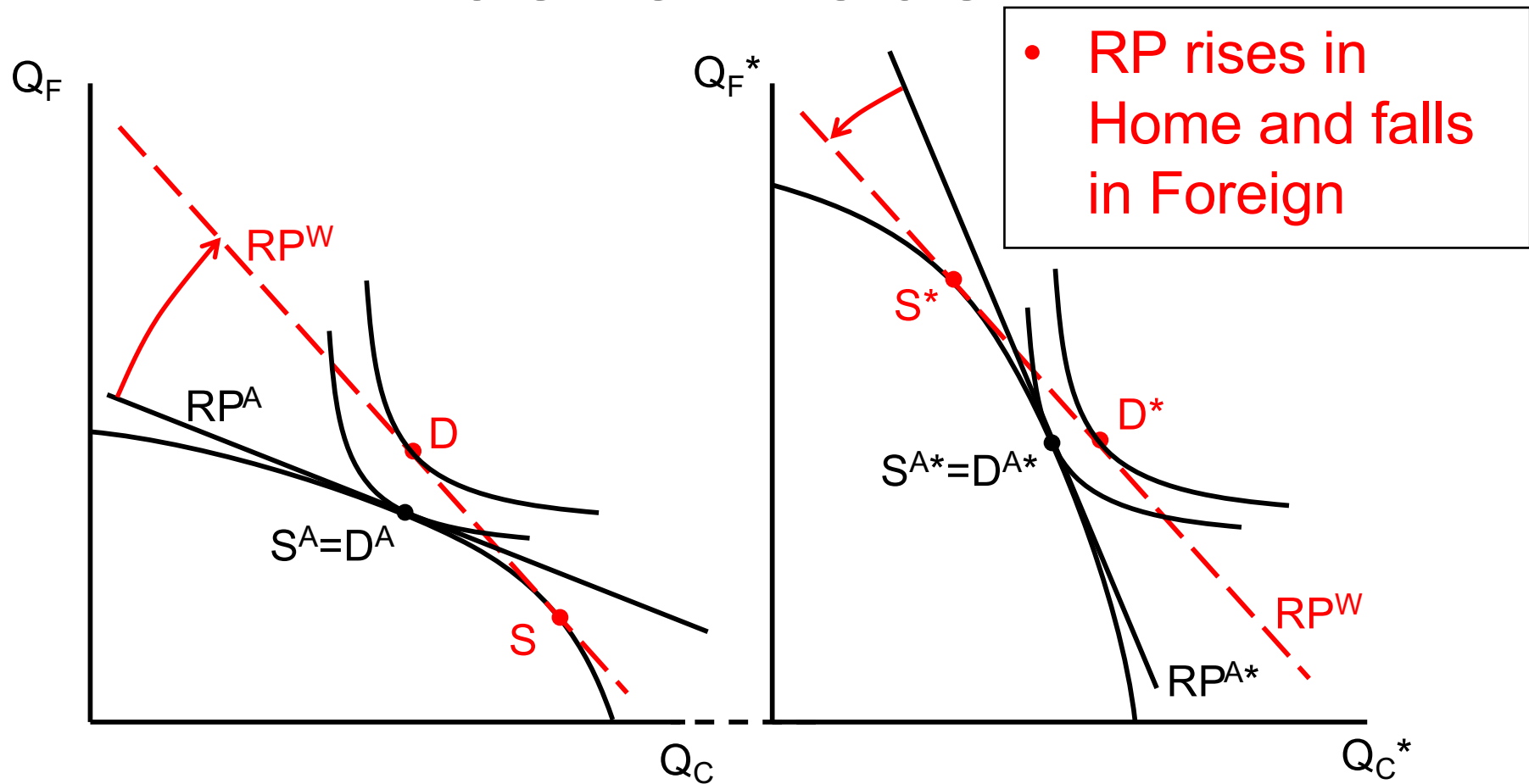
H-O Effects on Factor Prices

- 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 of that factor rises
      - Real wage of other (scarce) factor falls

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

- If one country has more of both capital 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
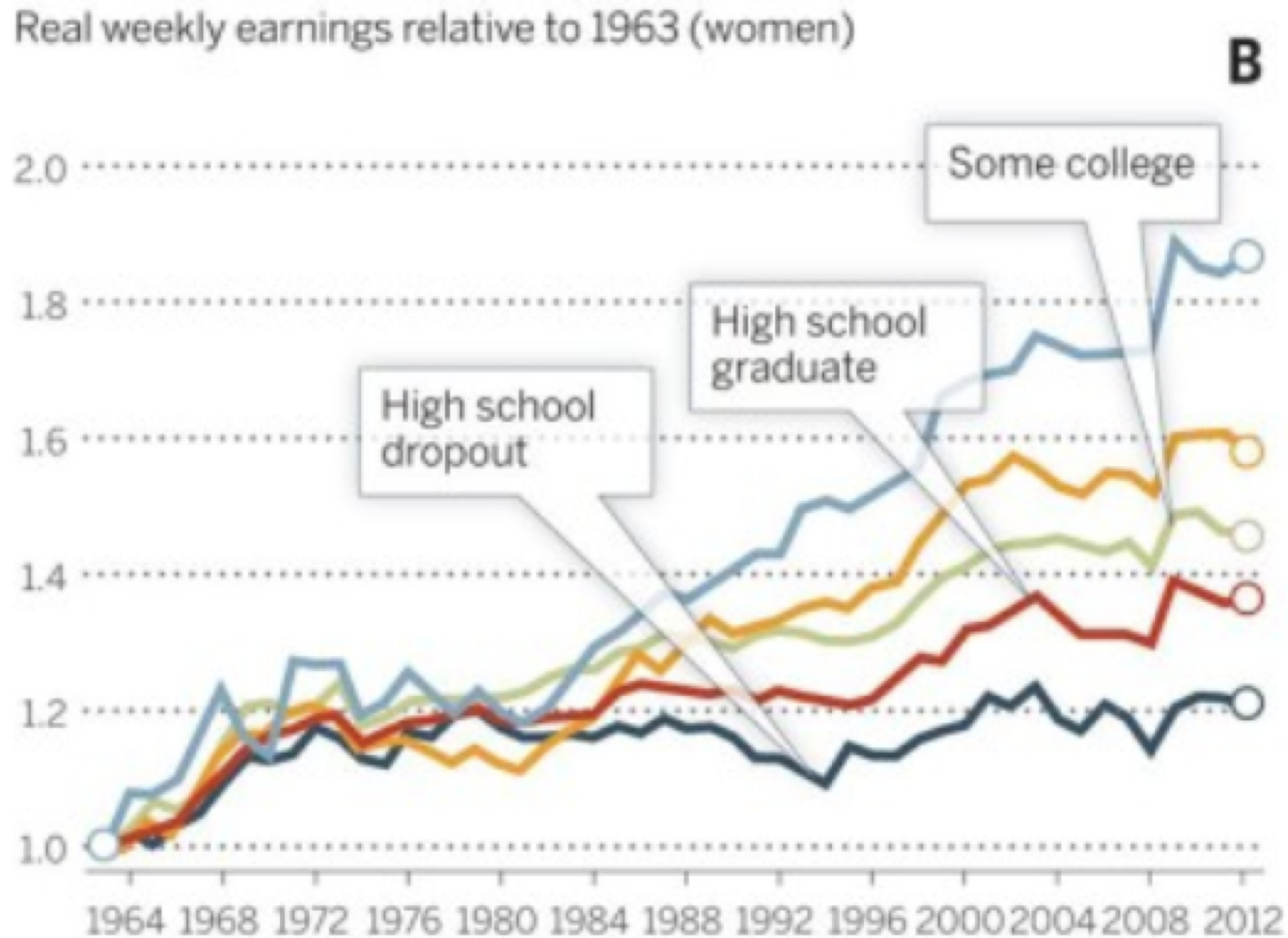
- **Trade and Wages**

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"

Changes in real wage levels of full-time U.S. workers by sex and education, 1963-2012
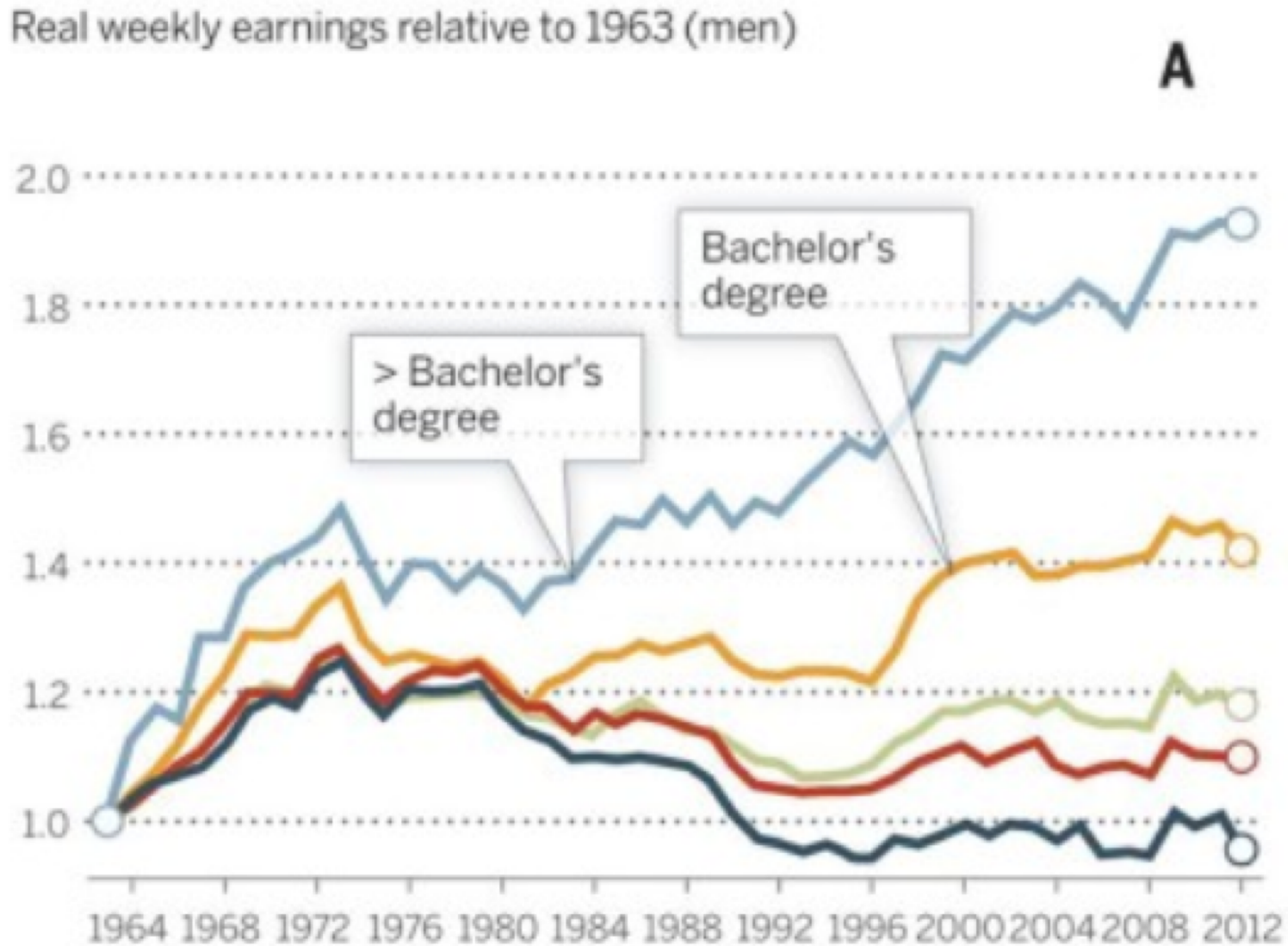
Source: Roser & Nagdy, 2013

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

Real weekly earnings relative to 1963 (women)

B

Some college

High school graduate

High school dropout

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
- Of these only the last two found 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
  - 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?