PubPol/Econ 541

Classes 15, 16

The Standard Model

by
Alan V. Deardorff
University of Michigan
2023

Pause for News

Announcements

- Paper 2
  - Due Nov 8
- Meetings with me:
  - If your group wants to meet with me by Zoom, email me with a couple of suggested times for me to select from, including on the weekend if that's what you prefer.

- Quiz:

Outline

- Relative supply
- Relative demand
- International equilibrium
  - Small country
    - Two country world
- Effects of growth
- Effects of trade barriers

The Standard Model*

- Assumes
  - Two goods, cloth C and food F
    - Outputs: Q_C, Q_F
    - Prices: P_C, P_F
  - Takes as given:
    - Production possibilities
      - Represented by Production Possibility Frontier (PPF)
    - Preferences for consumption
      - Represented by community indifference curves
      - Assumed to be "homothetic" (see below)

*Name given to this model by Krugman and Obstfeld (1991) and subsequent editions.

The Standard Model

- Also assumes (as before)
  - Homogeneous products
  - Perfect competition
  - No distortions (externalities, etc.)
  - Zero costs of trade (transport, etc.) except when we add tariffs
- Also (and not needed before)
  - Balanced trade

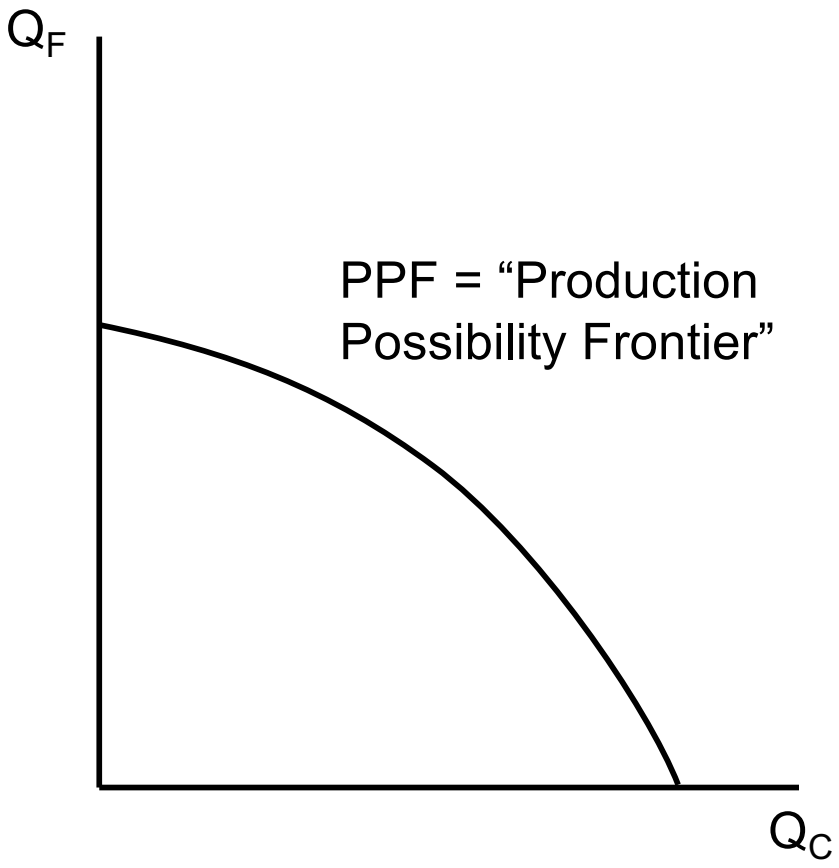
The model

- Includes as special cases
  - The Ricardian model (but linear PPF)
  - Heckscher-Ohlin Model
  - Specific factors model

Outline

- Relative supply
- Relative demand
- International equilibrium
  - Small country
  - Two country world
- Effects of growth
- Effects of trade barriers

Production Possibilities

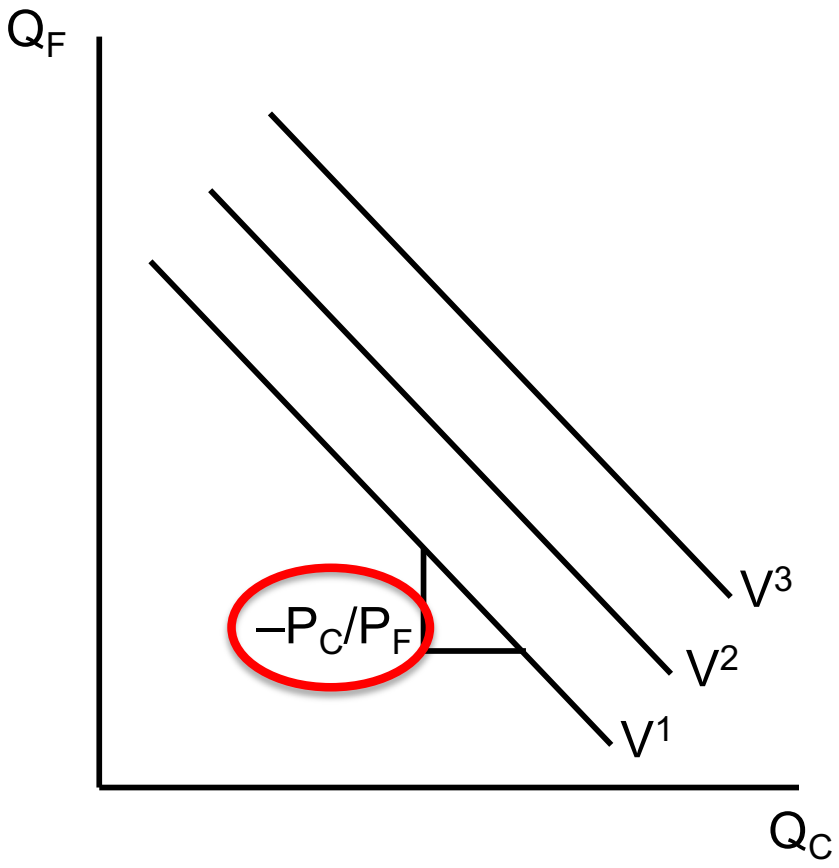


- Curvature
  - Ricardian Model: Not curved
  - Heckscher-Ohlin Model: due to industries' different factor intensities
  - Specific Factors Model: due to diminishing returns to non-specific factor

Why "Frontier"? Because it could certainly produce less,

- If it produced inefficiently
- Or if resources were not fully employed

Prices



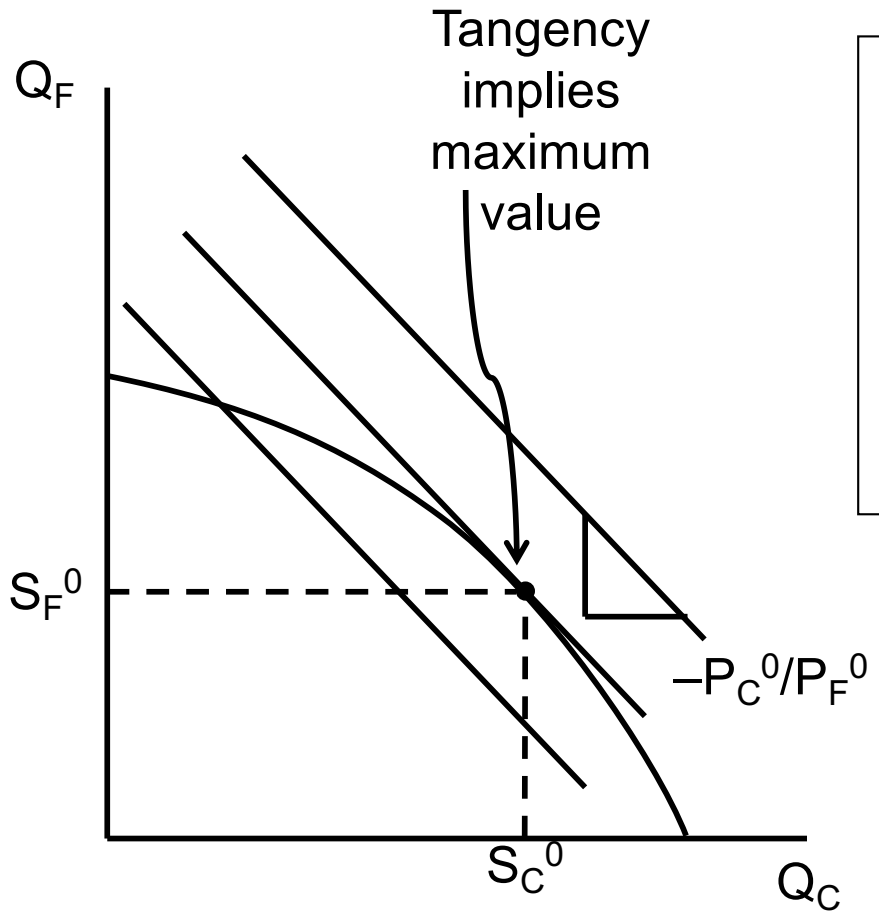
- Price lines = iso-value lines:

  $V = P_C Q_C + P_F Q_F$

- or

  $Q_F = V/P_F - (P_C/P_F)Q_C$

Equilibrium Production

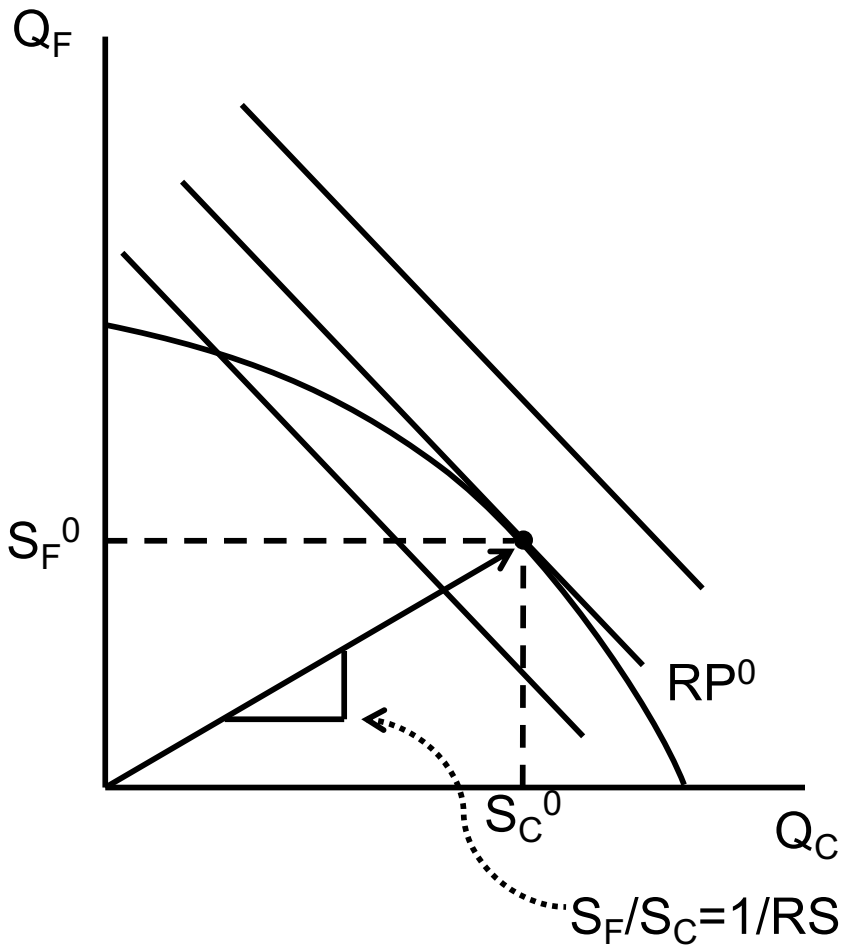


- Supplies depend on price ratio, or "relative price":

  $S_C = S_C (P_C/P_F)$

  $S_F = S_F (P_C/P_F)$

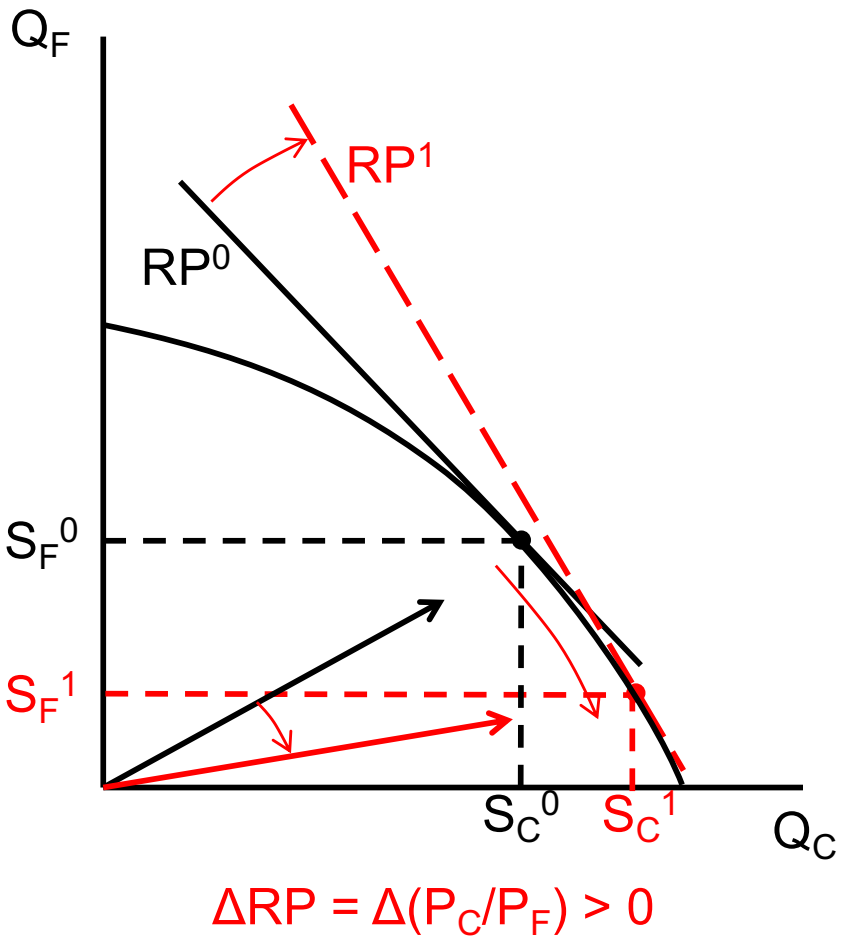
Equilibrium Production



- Thus "Relative Supply", $RS = S_C/S_F$, also depends on relative price, $RP = P_C/P_F$:

$$RS = RS(RP)$$

How Supplies Depend on Prices



- $\Delta RP = \Delta(P_C/P_F) > 0$

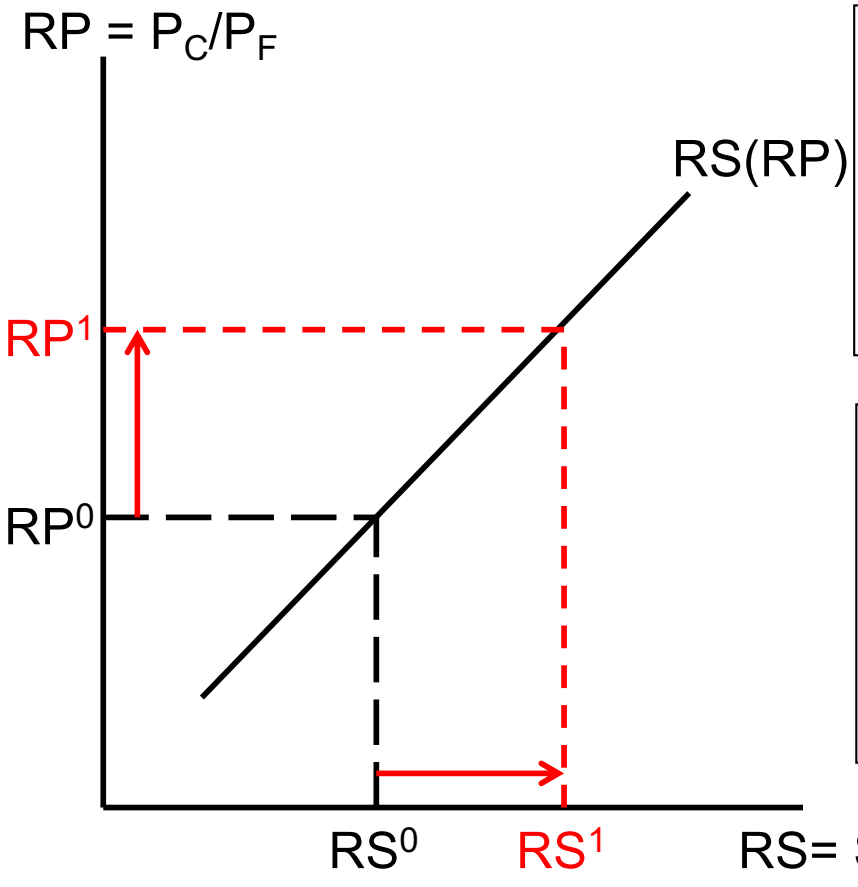
  =>

  $\Delta S_C > 0$

  $\Delta S_F < 0$

  $\Delta RS > 0$

Relative Supply

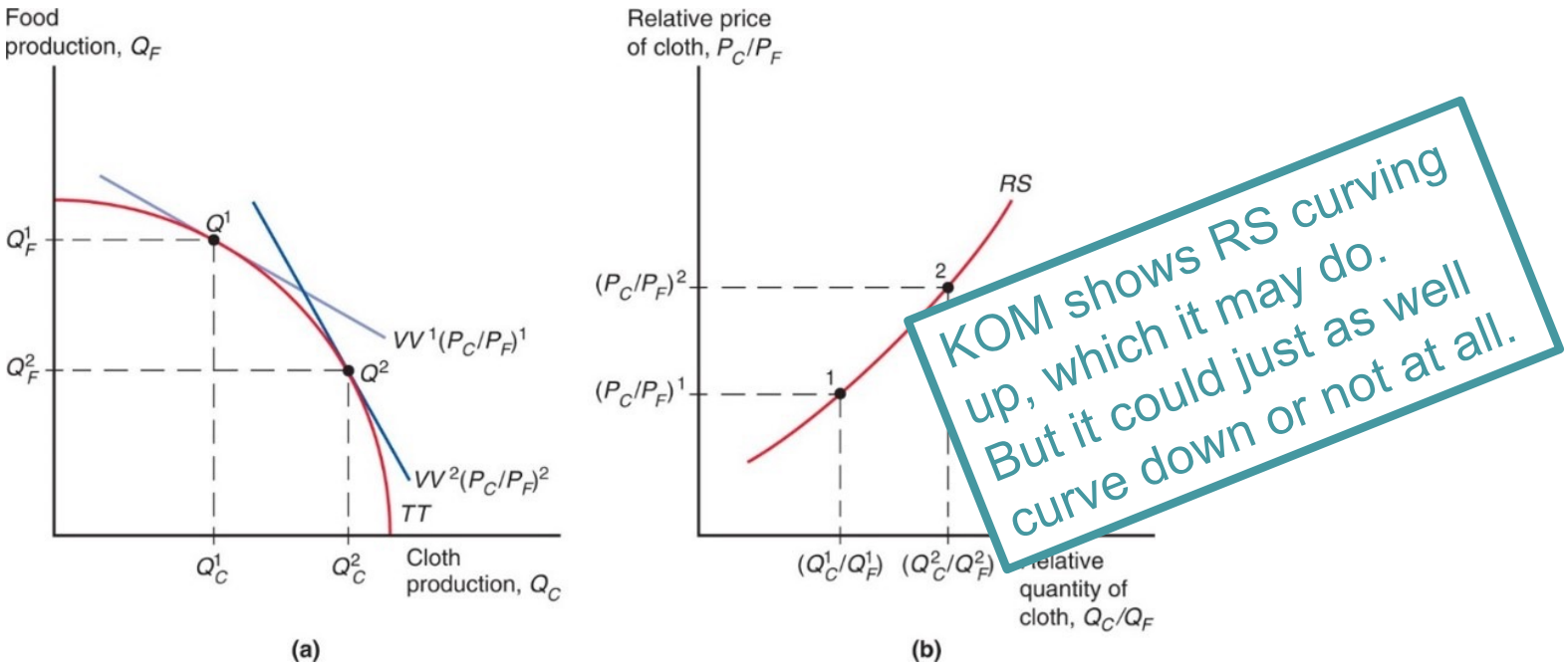


- It follows that RS as a function of RP – thus RS(RP) – is upward sloping

- Note: There is no reason for this to be a straight line. But it could curve either way.

Figure 6.2 How an Increase in the Relative Price of Cloth Affects Relative Supply

KOM



KOM shows RS curving up, which it may do. But it could just as well curve down or not at all.

In panel (a), the isovalue lines become steeper when the relative price of cloth rises. As a result, the economy produces more cloth and less food. Panel (b) shows the relative supply curve associated with the production possibilities frontier *TT.* The rise in the relative price of cloth leads to an increase in the relative production of cloth.

Pause for Discussion

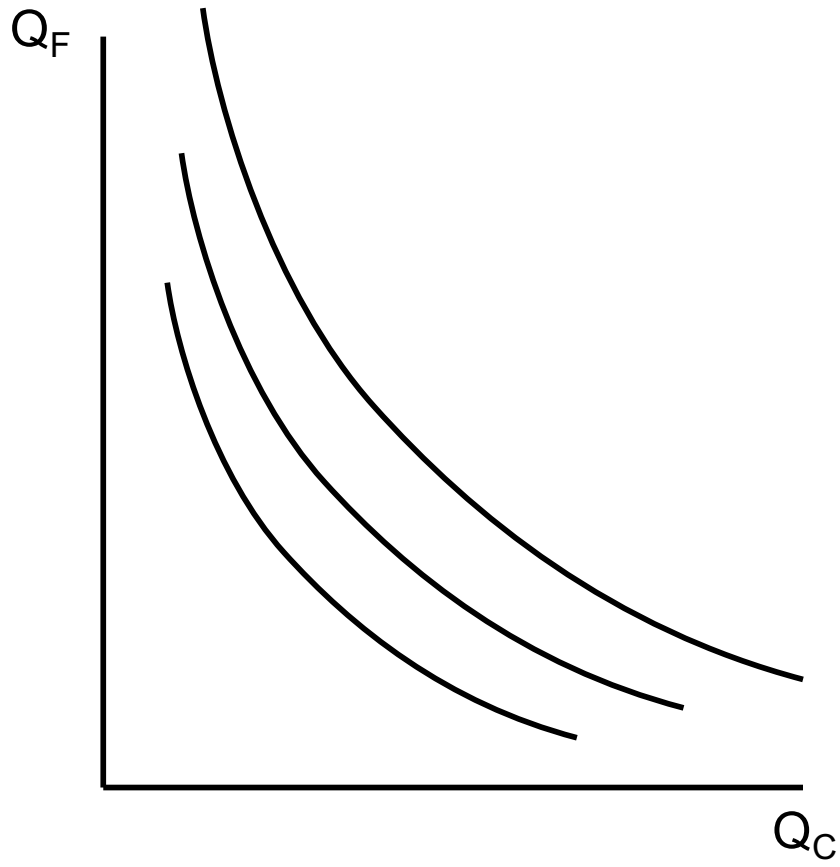
Questions (Not asked before)

- If the relative price of *C* goes up, the isovalue line gets steeper. Is there a way to see this without deriving it or remembering the equation?
- Does this model display upward sloping supply? How does it differ, in this respect, from the partial equilibrium model we have seen before?
- In partial equilibrium, supply slopes up because marginal cost rises. Is that true here?

Outline

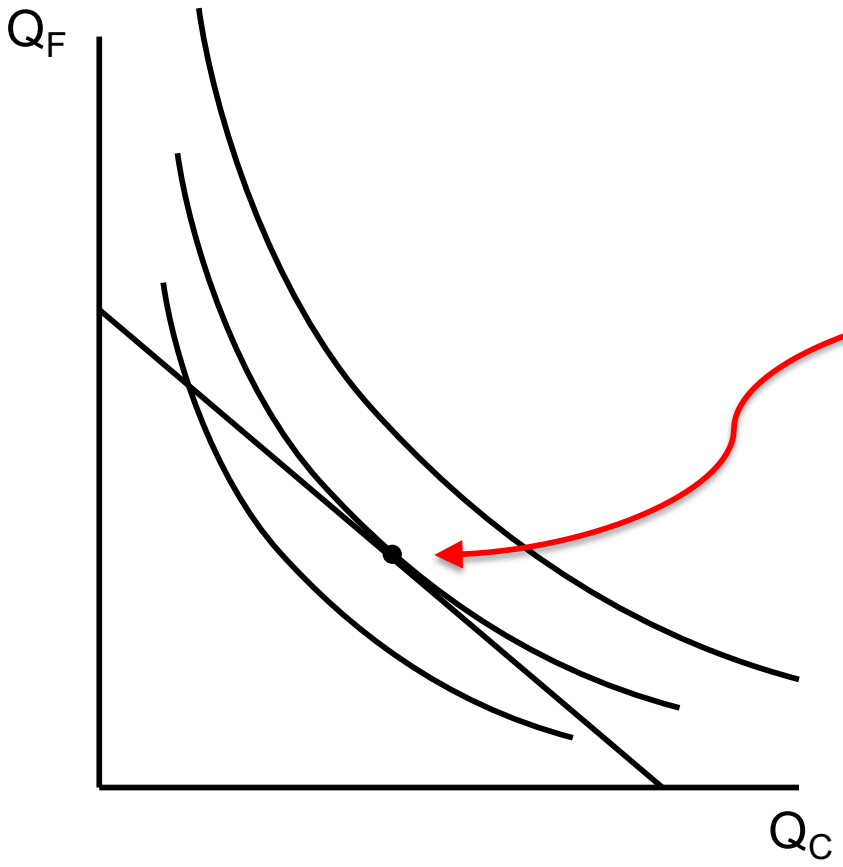
- Relative supply
- Relative demand
- International equilibrium
  - Small country
  - Two country world
- Effects of growth
- Effects of trade barriers

Preferences



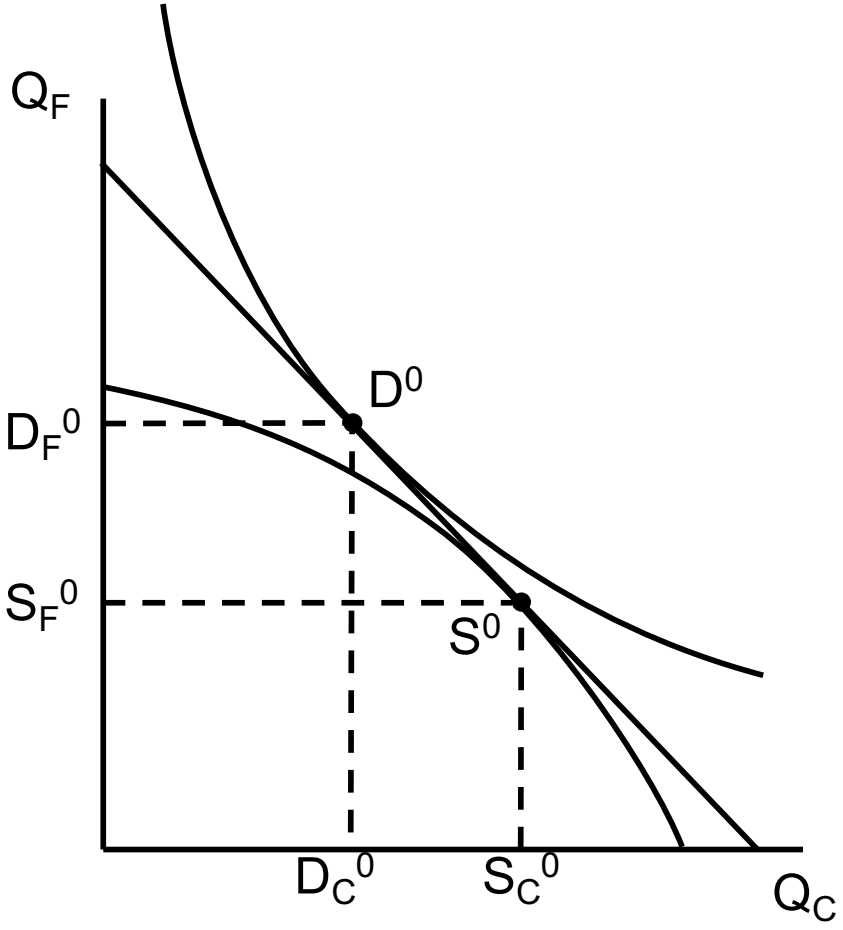
- Represented by a family of indifference curves for the whole country:
- Called "community indifference curves"
- Their shapes are like those of individual consumers in micro-econ, but these are for the whole country.

Preferences



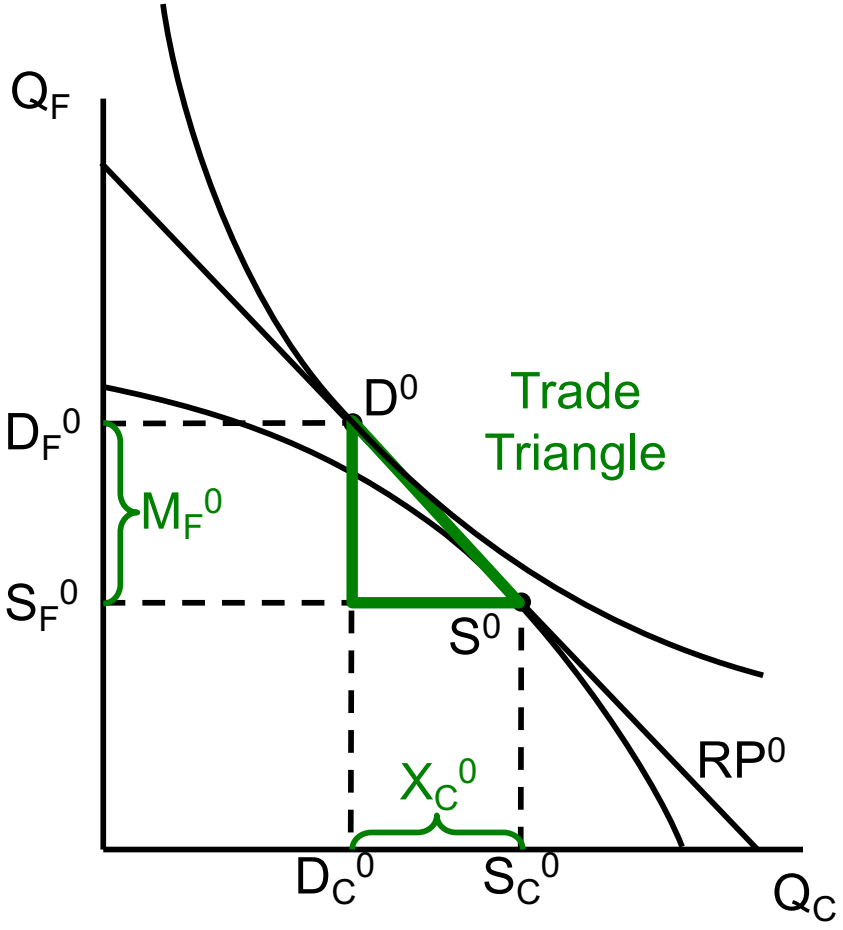
- If we knew the budget line, then we would use it to find demand, from
  - Tangency between budget line and an indifference curve
- That's the most preferred bundle of the two goods that consumers can afford.

Equilibrium Demand



- Given prices, income is the value of production.
- So the budget line is the price line tangent to the PPF.
- And demand is then given by its tangency with an indifference curve.

Trade



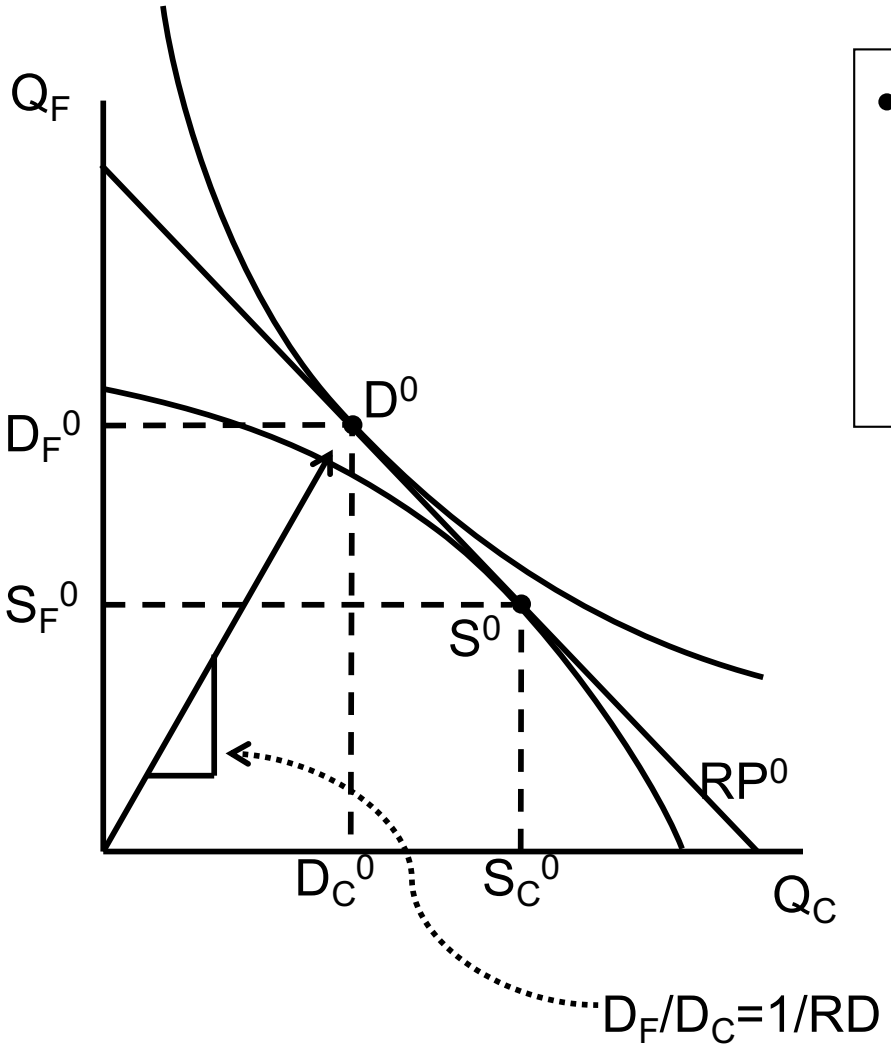
- For arbitrary prices, RP^0, demand will not equal supply
- Their difference will be trade:
- Exports:

  $S_C - D_C = X_C$
- Imports:

  $D_F - S_F = M_F$

We can use this as the complete model for the small-country case, and we will. But for the large country we'll need Relative Demand.

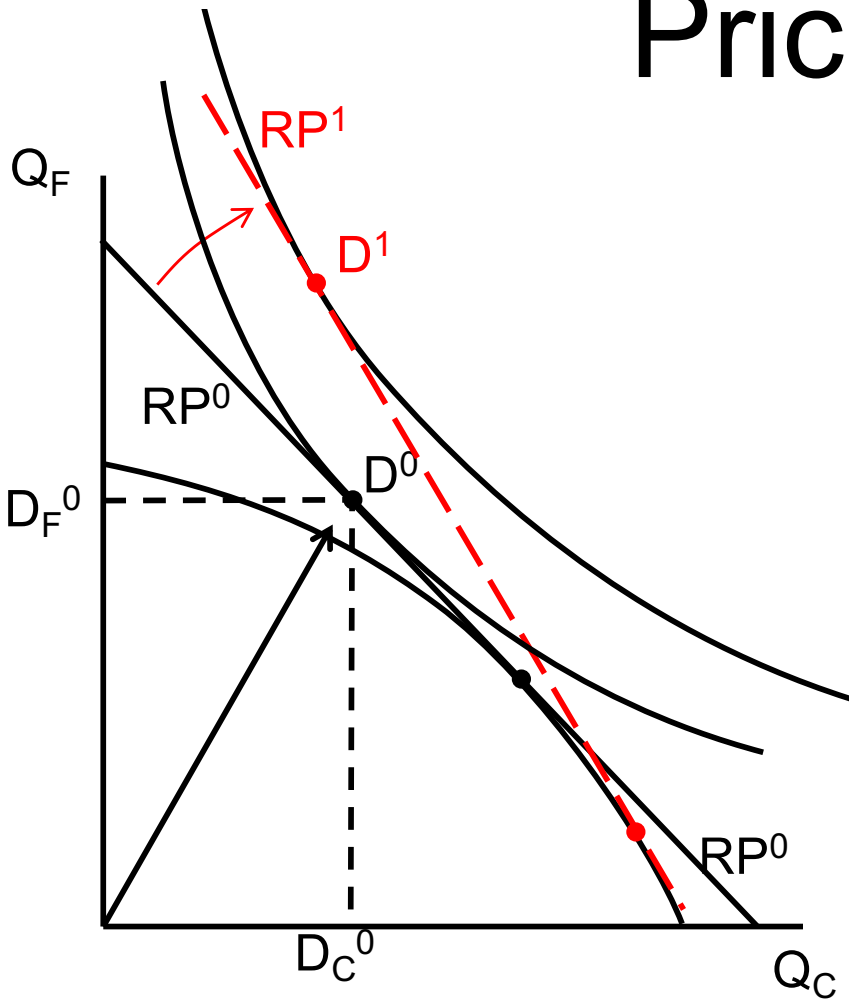
Relative Demand



- We will use this first, however, to find Relative Demand:

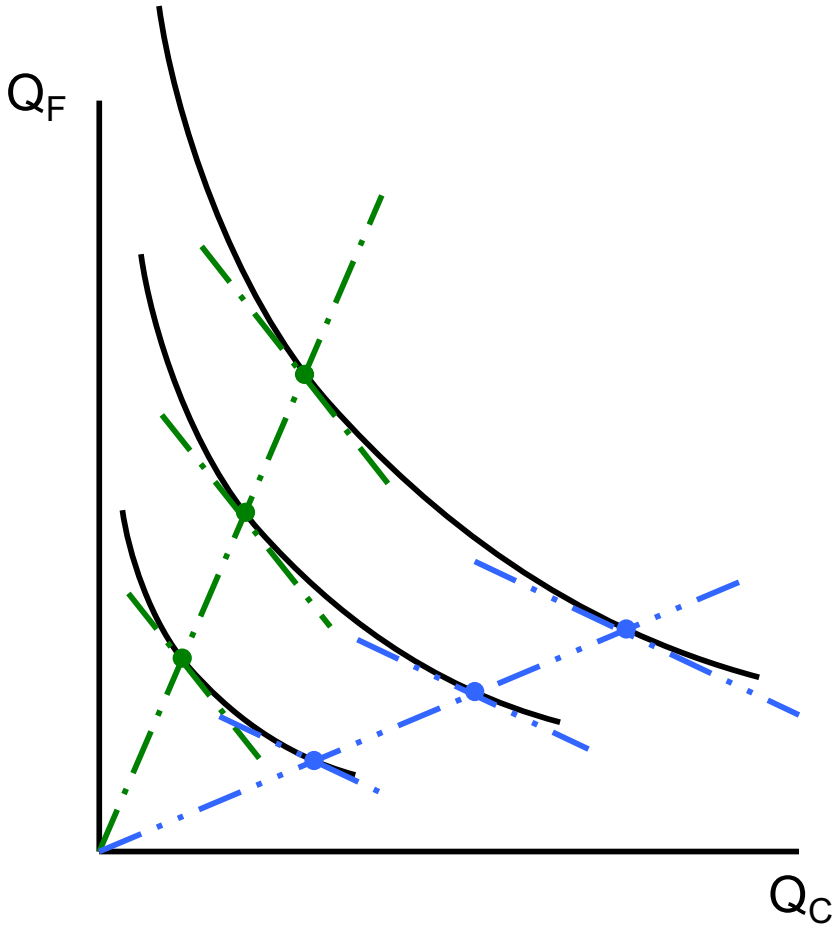
$$RD = D_C/D_F$$

How Demands Depend on Prices



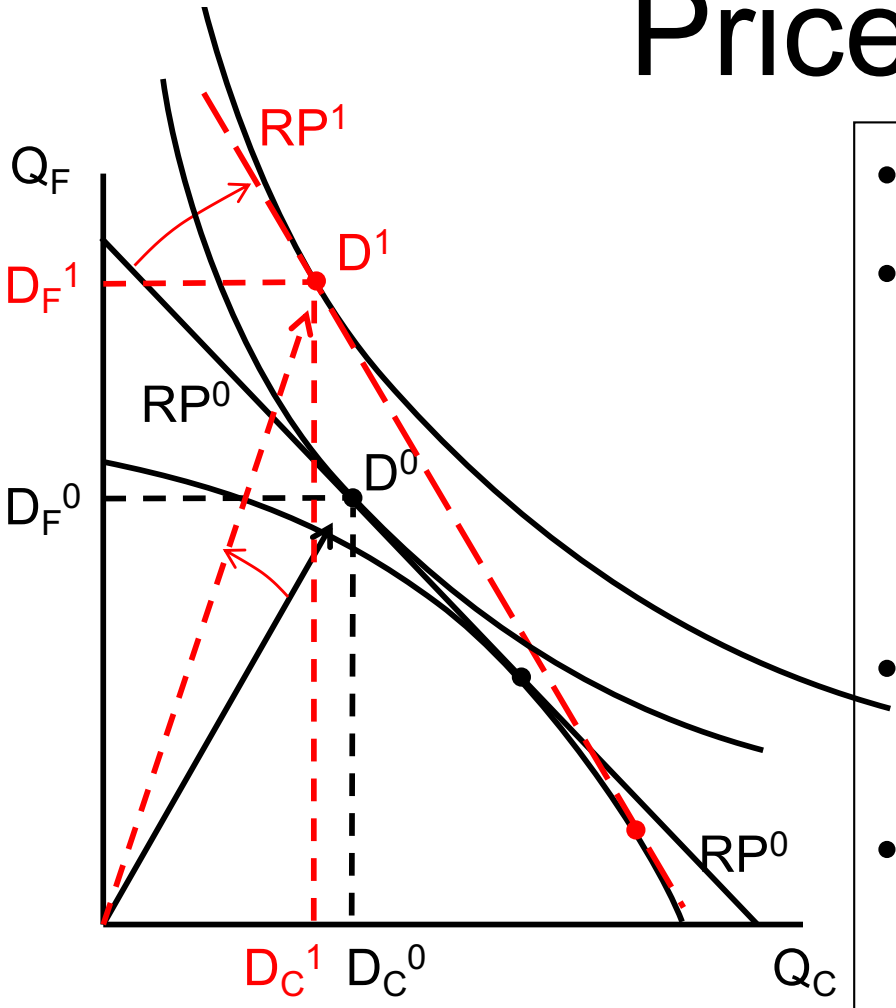
- $\Delta RP = \Delta(P_C/P_F) > 0$
  => ?
- With no assumption on preferences (indifference curves) we can say little about how prices affect demand
- (Recall "income and substitution effects" from microeconomics)

Homothetic Preferences



- So we assume: each indifference curve is a radial expansion or contraction of all others
- Thus:
  - Ratio of demands depends only on ratio of prices
  - Change in income (with prices fixed) does not change relative demand $RD = D_C/D_F$

How Demands Depend on Prices



- With homotheticity:
- $\Delta RP = \Delta(P_C/P_F) > 0$

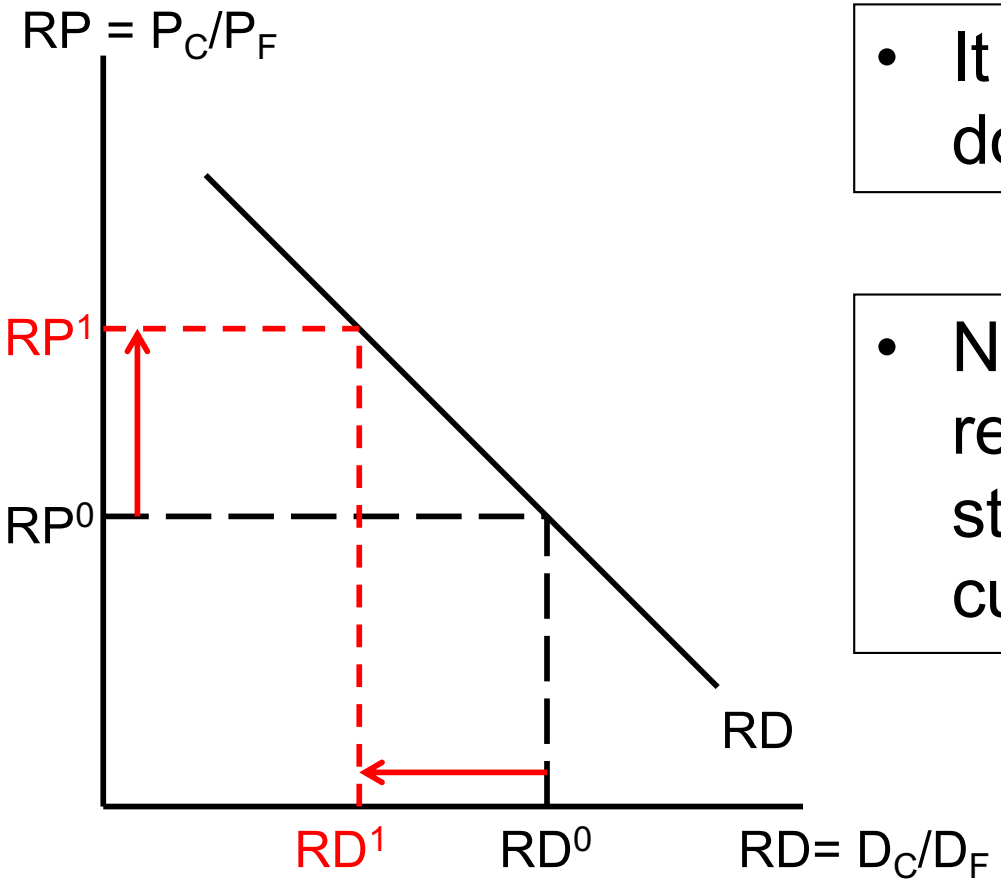
  =>

  $\Delta D_F > 0$

  $\Delta RD < 0$
- But we still don't know

  $\Delta D_C >,=,< 0$
- That's why we now work with relative supply and demand.

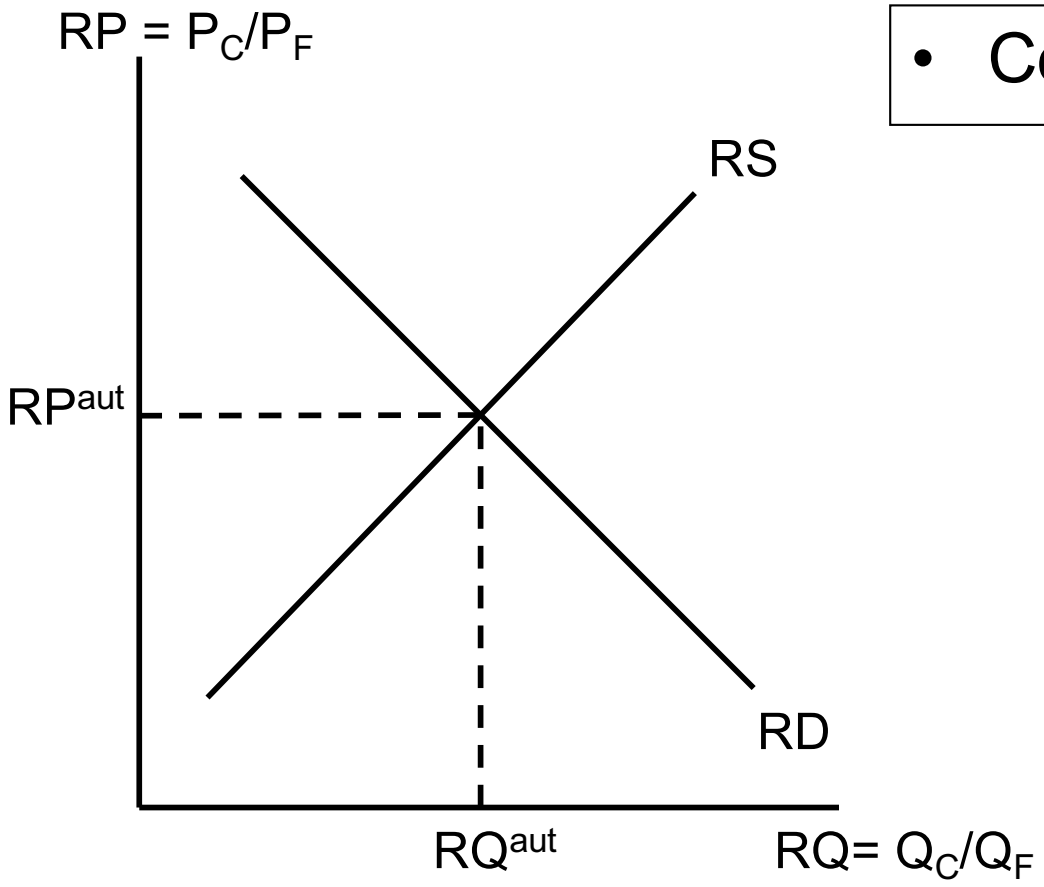
Relative Demand



- It follows that RD(RP) is downward sloping

- Note: Again, there's no reason for this to be a straight line. It could curve either way.

Autarky Equilibrium



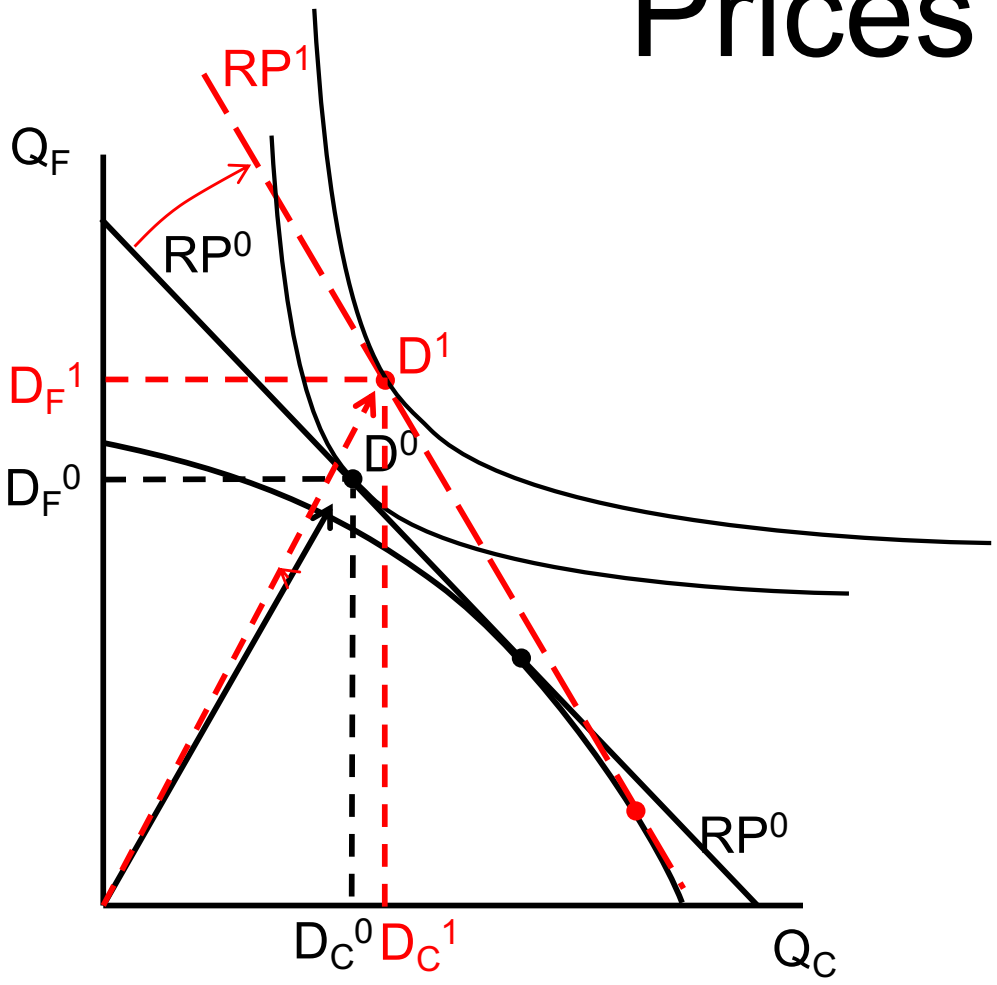
- Combine RS and RD

Pause for Discussion

Questions (Not asked before)

- Does this display downward sloping demand? How does it differ, in this respect, from the partial equilibrium model we have seen before?
- As shown above, demand for C falls when its relative price rises. How could it be otherwise?
- How will RP^{aut} and RQ^{aut} change with shifts in RS & RD? With changes in production possibilities and preferences?

How Demands May Depend on Prices



As RP rises, consumers still substitute away from cloth. But now they can buy more of both goods (the income effect), and with a tighter curvature of the indifference curves, they do, buying more cloth and more food.

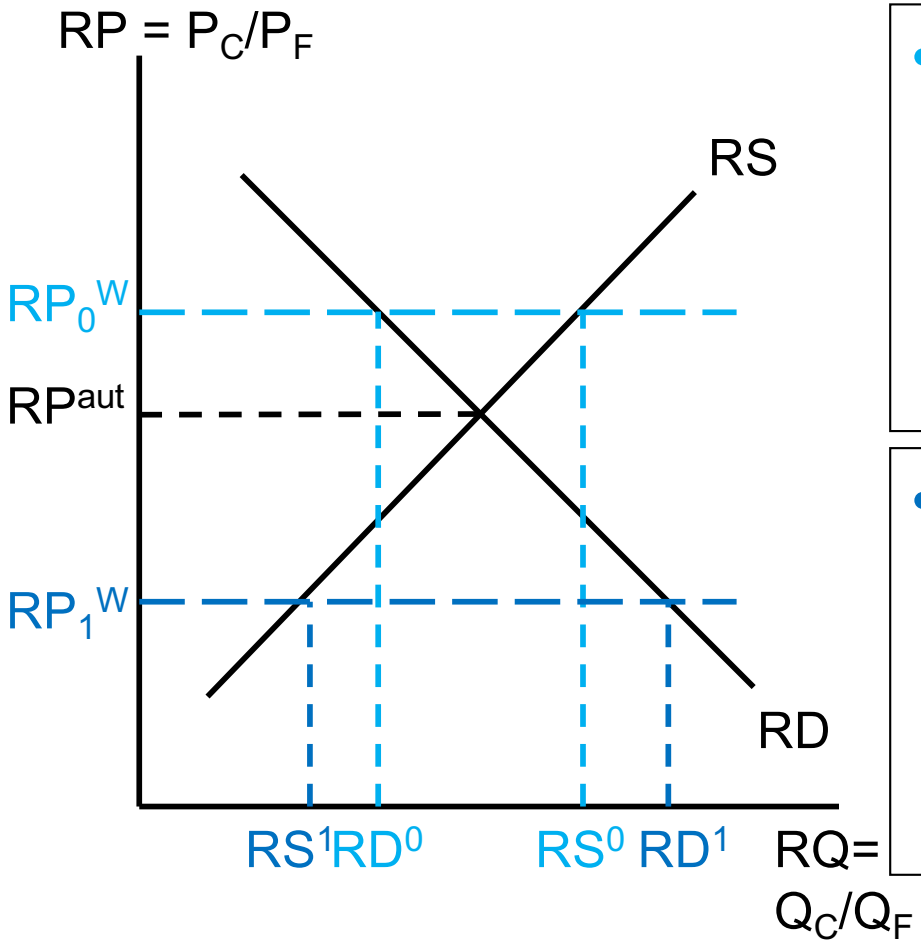
Outline

- Relative supply
- Relative demand
- International equilibrium
  - Small country
  - Two country world
- Effects of growth
- Effects of trade barriers

Small Country Trade

- Suppose that the country is too small to matter for <u>both</u> P_C and P_F in the world market. Then $RP^W = P_C^W/P_F^W$ is given

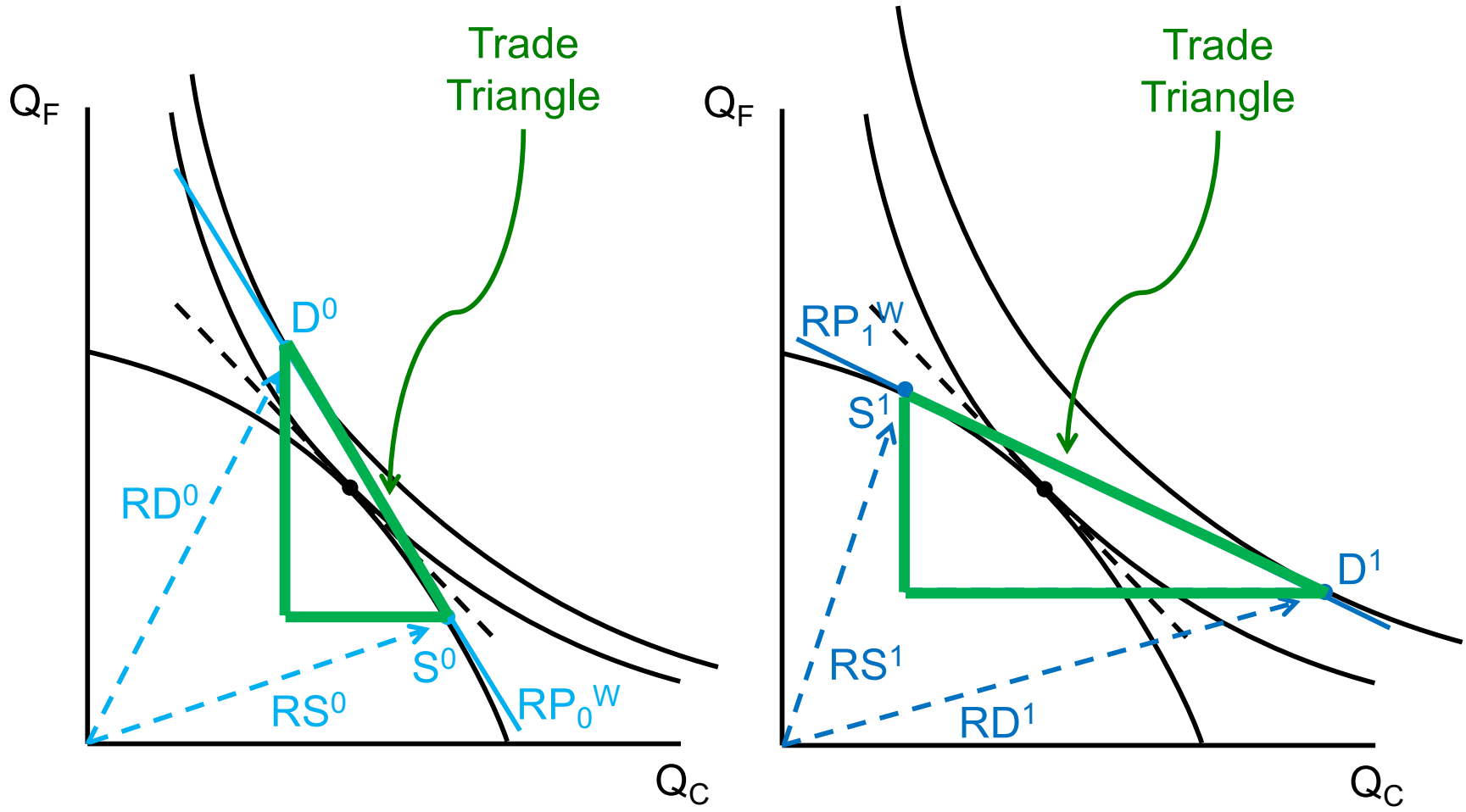
Small-Country Trade Equilibrium



- $RP_0^W > RP^{aut}$ implies
  - $RS^0 > RD^0$
  - Country
    - » Exports good C
    - » Imports good F

- $RP_1^W < RP^{aut}$ implies
  - $RS^1 < RD^1$
  - Country
    - » Exports good F
    - » Imports good C

Small-Country Trade Equilibria

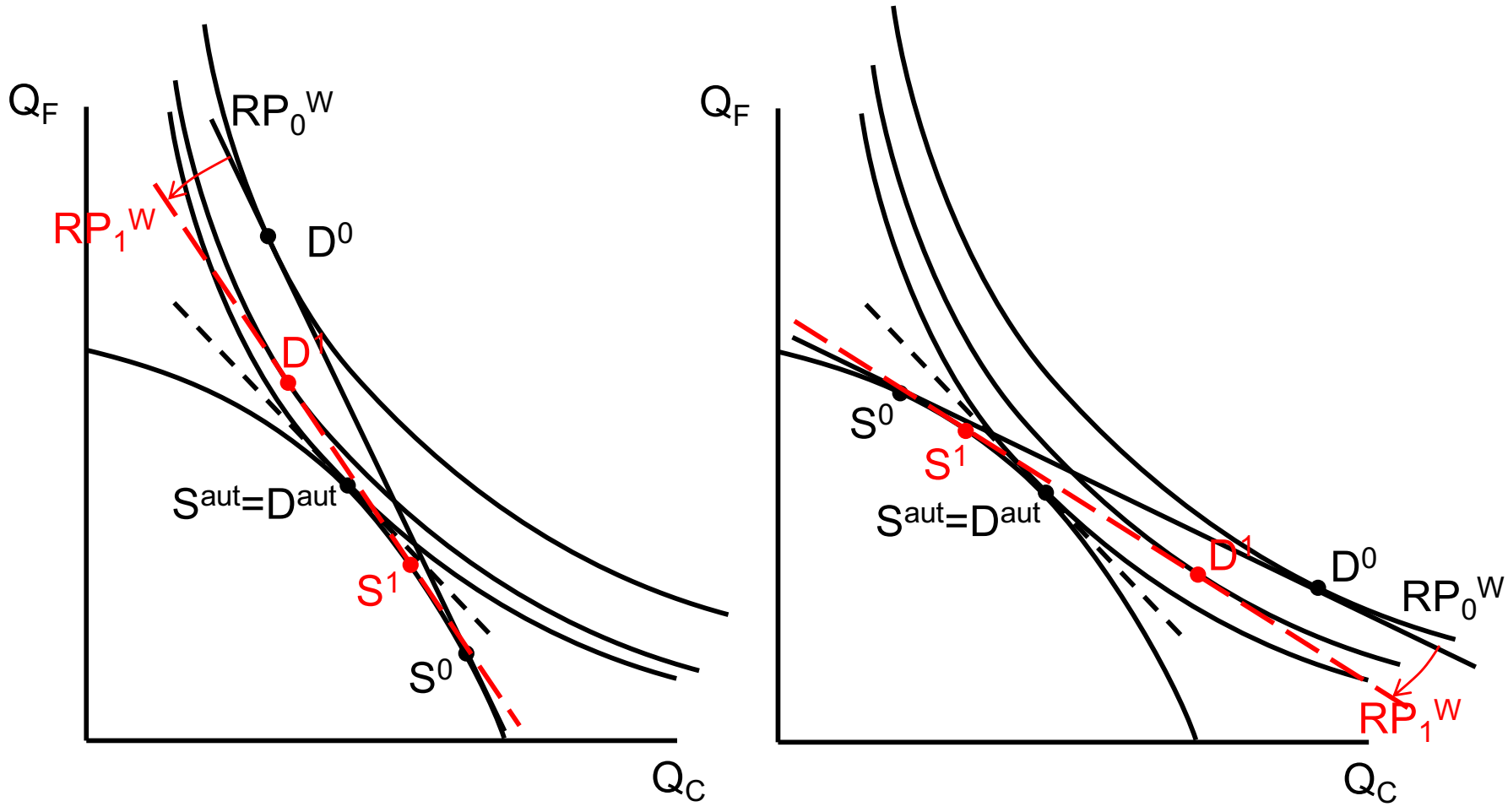


Pause for Discussion

Questions
(Not asked before)

- Looking at the figures, where can you see the "gains from trade"?
- Suppose that you knew that events in other countries were going to "worsen" your country's terms of trade.
  - How will that hurt your country?
  - Would your country therefore be better off if it did not trade at all?

Worsening of Terms of Trade



Outline

- Relative supply
- Relative demand
- International equilibrium
  - Small country
  - Two country world
- Effects of growth
- Effects of trade barriers

Two-Country World

- Additional assumption:
  - Preferences are the same in the two countries
  - Since they are also homothetic,
    - If the two countries' consumers face the same relative prices (as they will with free trade)…
    - …then they will consume the two goods in the same proportions.

World Relative Supply & Demand

- For international equilibrium, we need world relative supply and demand (of 2 countries)
- These cannot be gotten by just adding up those for the individual countries
- Instead, they are weighted averages of the separate countries

- $Q_C^W = Q_C + Q_C^*$
- $Q_F^W = Q_F + Q_F^*$

$$\Rightarrow RQ^W = \frac{Q_C + Q_C^*}{Q_F + Q_F^*}$$

$$= \frac{Q_F}{Q_F + Q_F^*}\frac{Q_C}{Q_F} + \frac{Q_F^*}{Q_F + Q_F^*}\frac{Q_C^*}{Q_F^*}$$

$$RQ^W = \beta_{QF} RQ + (1-\beta_{QF}) RQ^*$$

where

$$\beta_{QF} = \frac{Q_F}{Q_F + Q_F^*}$$

World Relative Supply & Demand

- Thus:

$$RS^W = \beta_{SF} RS + (1 - \beta_{SF}) RS^*$$

where

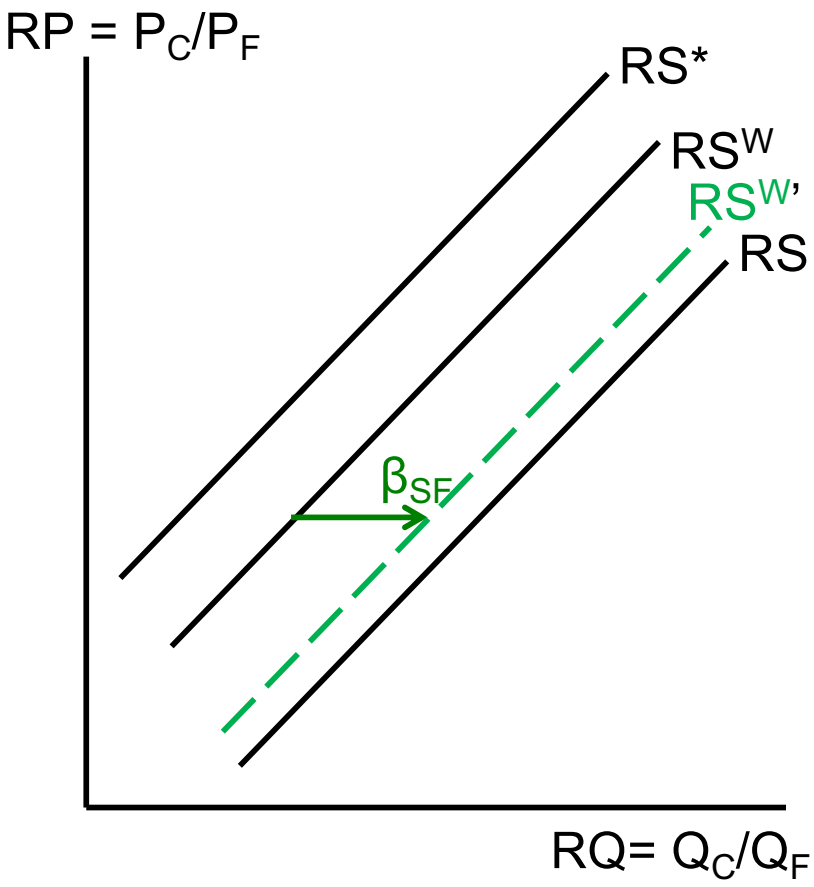
$$\beta_{SF} = \frac{S_F}{S_F + S_F^*}$$

$$RD^W = \beta_{DF} RD + (1 - \beta_{DF}) RD^*$$

where

$$\beta_{DF} = \frac{D_F}{D_F + D_F^*}$$

World Relative Supply



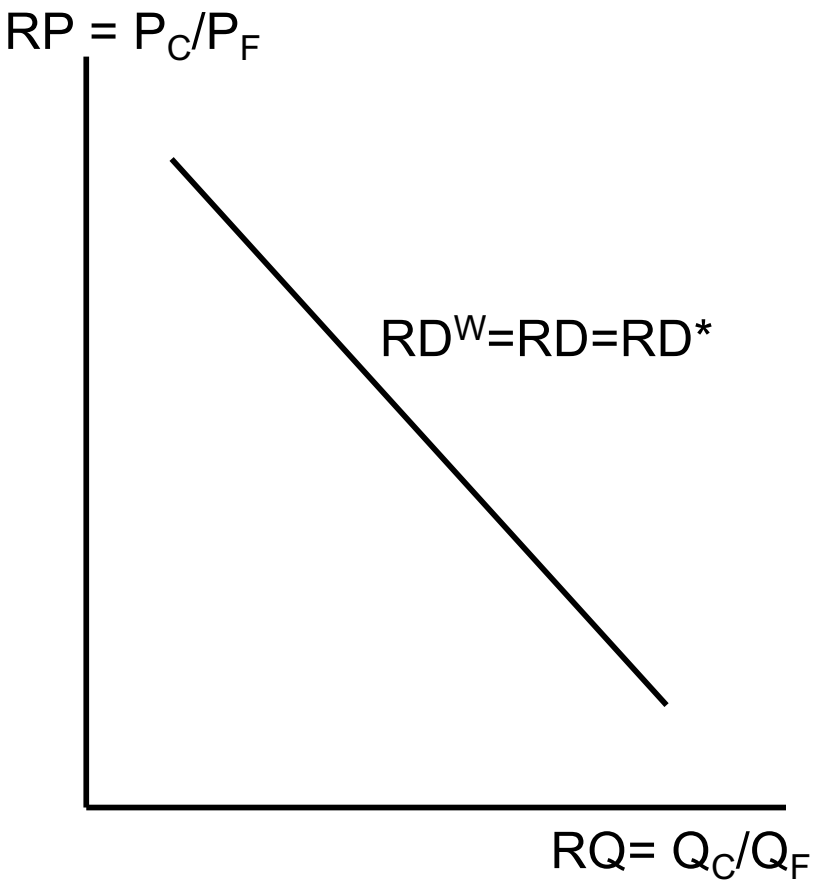
- World relative supply is a weighted average; it thus lies between the domestic and foreign relative supplies
- (Strictly speaking, these need not be straight and should not be parallel)

- The larger is the home share of supply,

$$\beta_{SF} = \frac{S_F}{S_F + S_F^*},$$

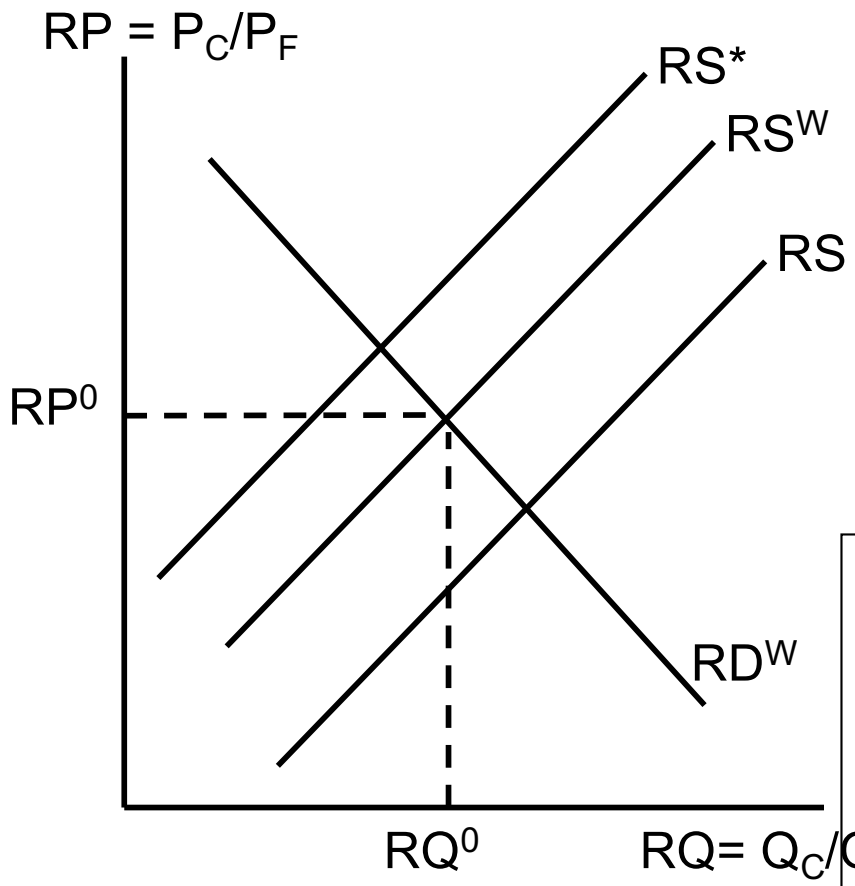
- the closer RS^W will be to home relative supply RS.

World Relative Demand



- Because preferences are identical and homothetic in the two countries, RD is the same in both.
- So world relative demand is the same as well.

International Market Equilibrium

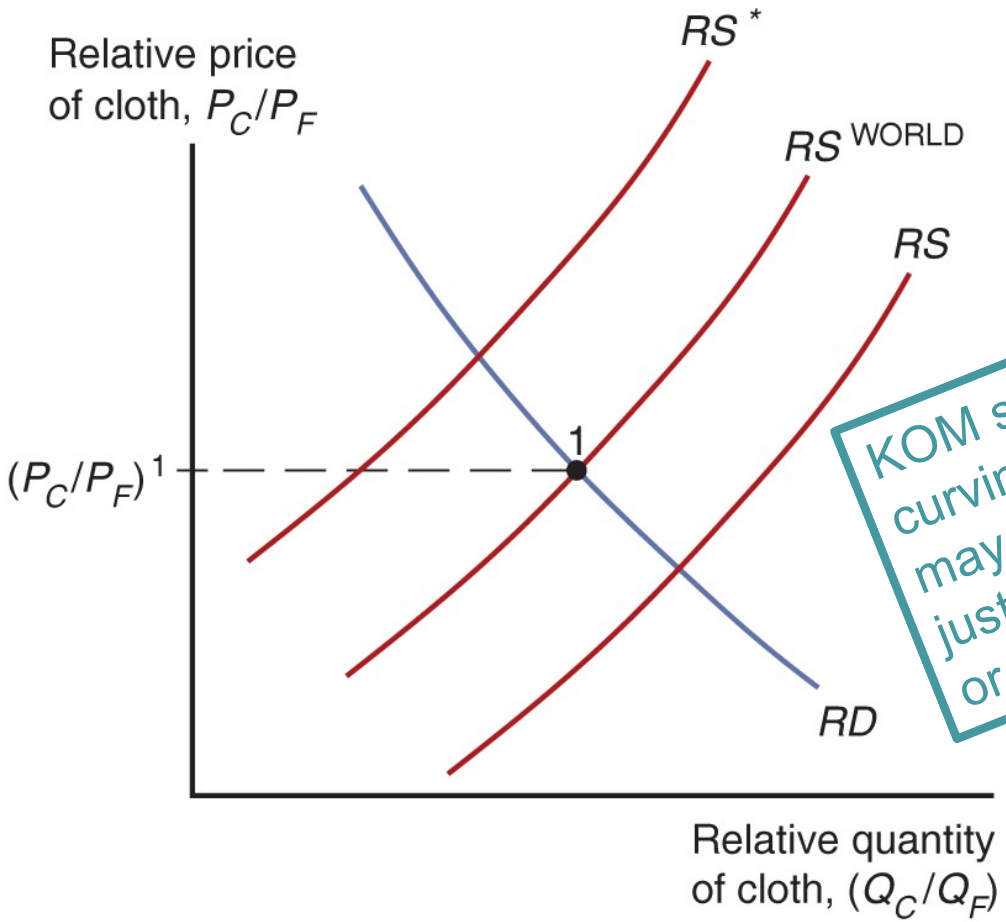


- Int'l market equilibrium is the relative price that equates world relative supply to world relative demand.

- As drawn, the home (no *) country is assumed to be the larger relative supplier of good C.
- So home exports C.

Figure 6.5a Equilibrium Relative Price with Trade and Associated Trade Flows

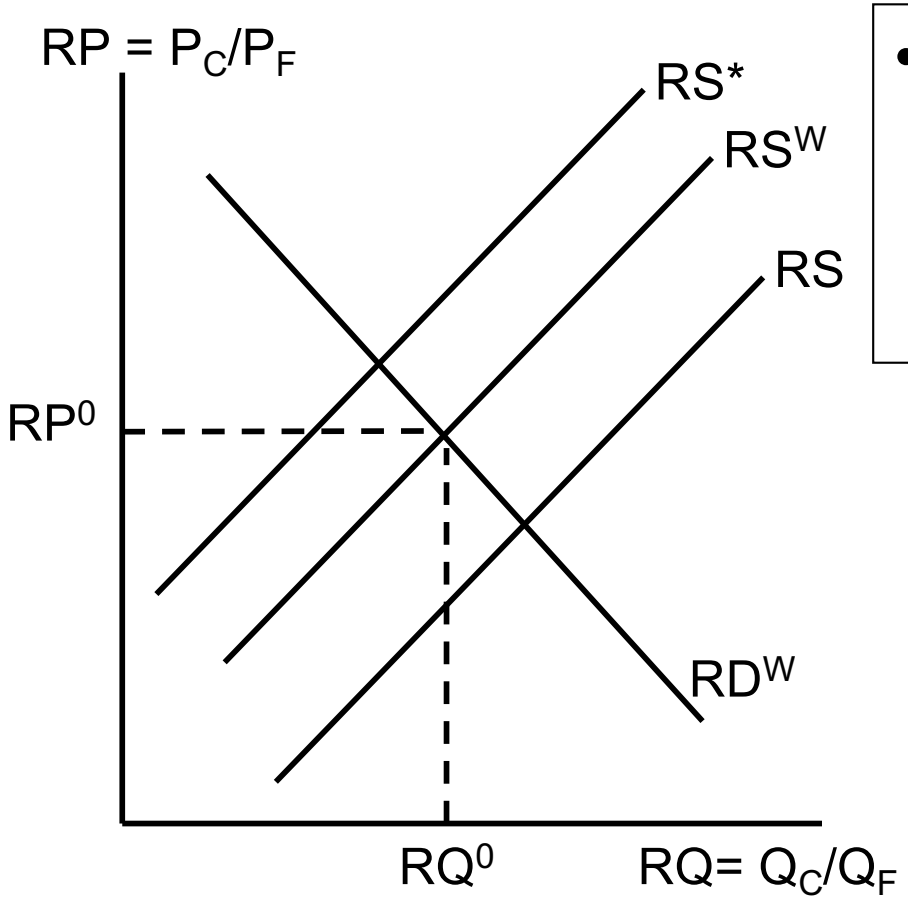
KOM



KOM shows RS's curving up, which they may do. But they could just as well curve down or not at all.

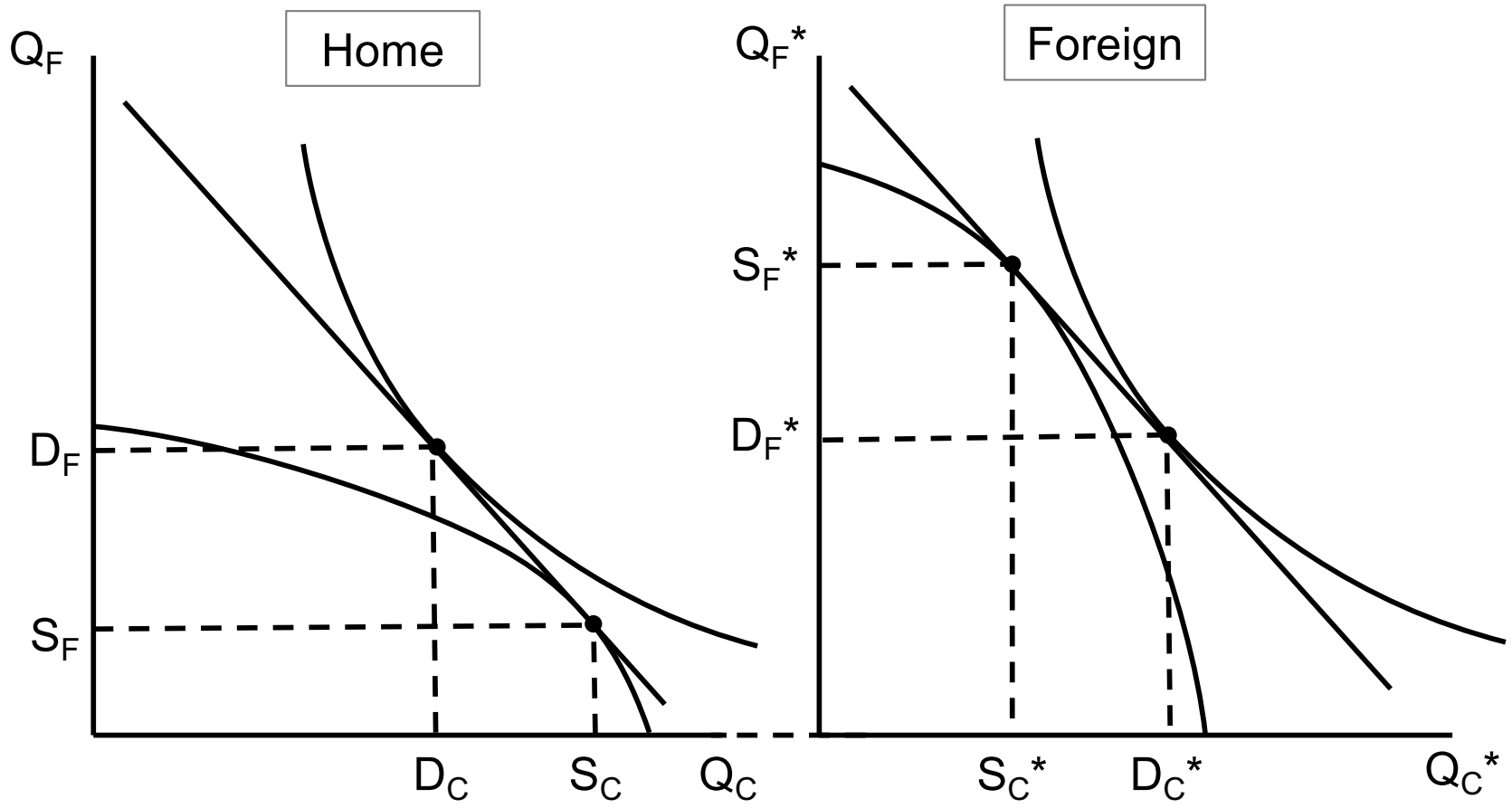
(a) Relative Supply and Demand

International Market Equilibrium

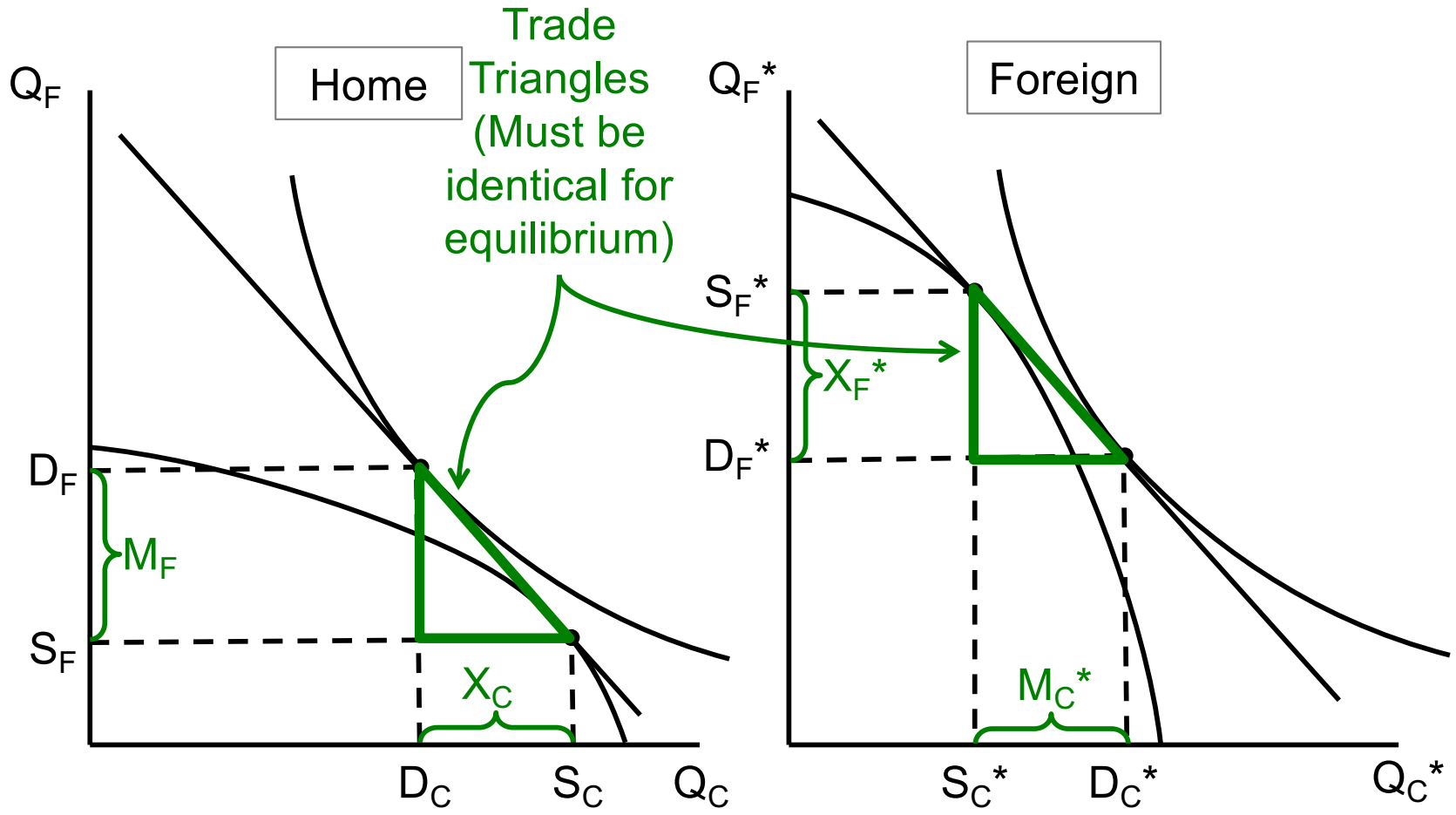


- The next slide shows production, consumption, and trade in this equilibrium

International Market Equilibrium



International Trade



Pause for Discussion

Questions on KOM, Ch. 6

- At the micro level trade arises because of differences in prices in autarky. But in the general-equilibrium Standard Model, these autarky price differences arise because of more basic differences in the countries. What is the basic difference we see here that plays that role?

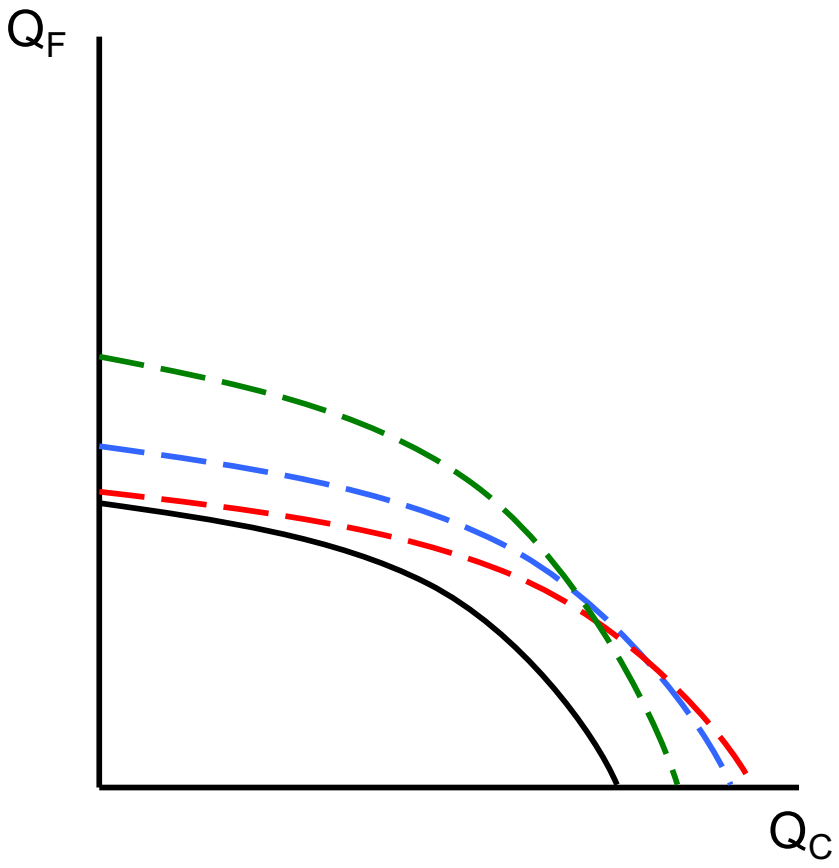
Questions on KOM, Ch. 6

- The text says “the value of an economy’s consumption equals the value of its production.” What does this mean that the text is assuming about the balance of trade?

Outline

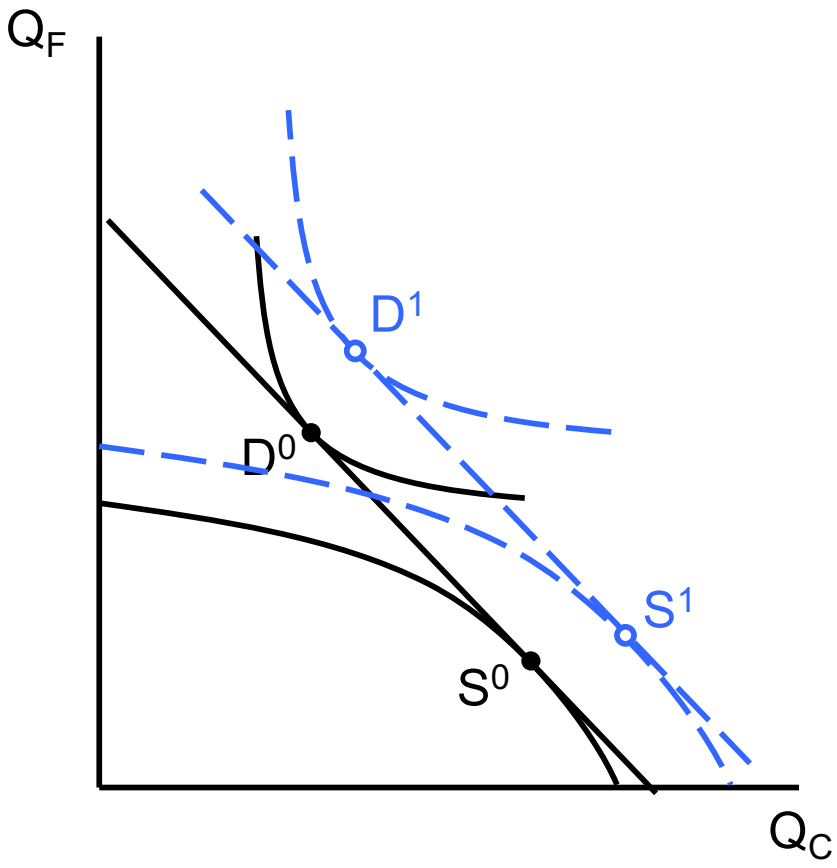
- Relative supply
- Relative demand
- International equilibrium
  - Small country
  - Two country world
- Effects of growth
- Effects of trade barriers

Growth



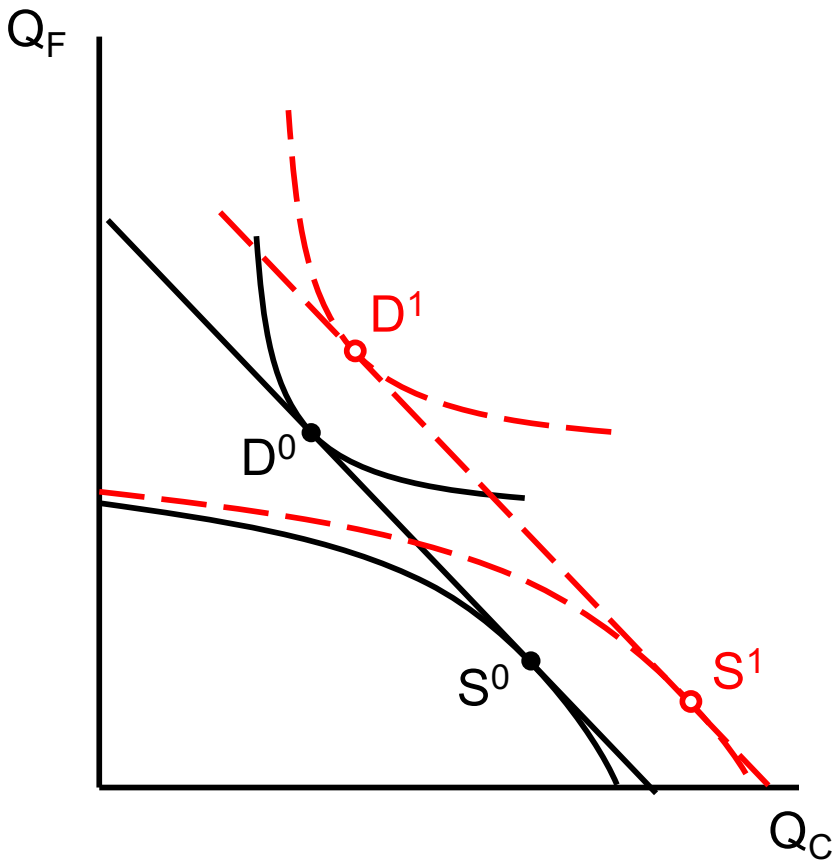
- Economic growth appears as an expansion of production possibilities
- Shifting the PPF outward
- But this can happen in several ways
- And these matter

Effects of Growth: Small Country



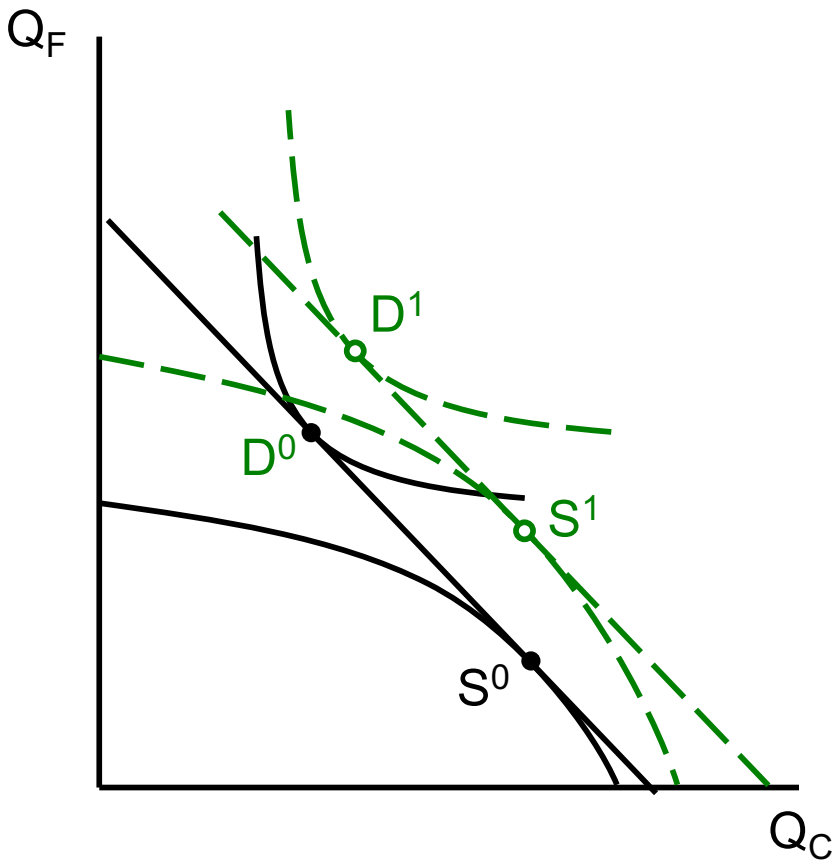
- If prices are given from world market and do not change, then growth of PPF benefits the country.
- This is true whether the growth is
  - Neutral

Effects of Growth: Small Country



- If prices are given from world market and do not change, then growth of PPF benefits the country.
- This is true whether the growth is
  - Neutral
  - Biased toward export (cloth)

Effects of Growth: Small Country



- If prices are given from world market and do not change, then growth of PPF benefits the country.
- This is true whether the growth is
  - Neutral
  - Biased toward export (cloth)
  - Biased toward import (food)

Effects of Growth: Large Country

- Growth of a large country will usually change world prices
- So the previous 3 slides no longer show the final effects of growth
- They do, however, show
  - what happens for given prices, and thus
  - tell us how world relative supply will shift

    (world relative demand will not shift, if the countries continue to have the same homothetic preferences)

Effects of Growth: Large Country

- Recall that

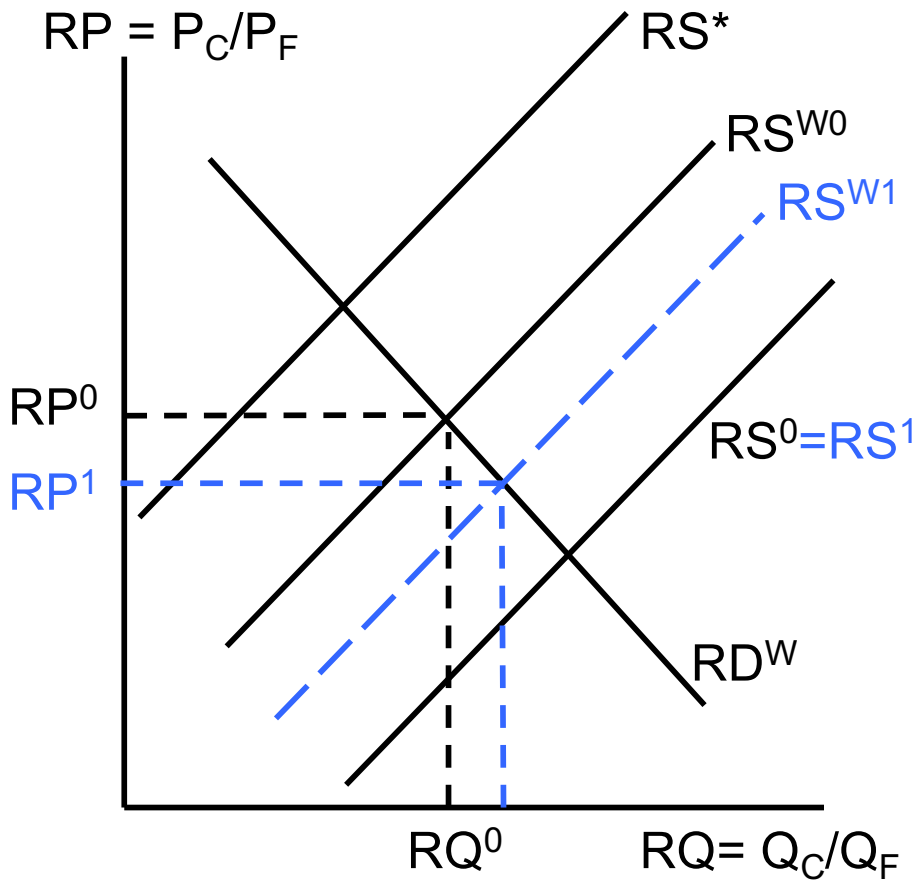
$$RS^W = \beta_{SF} RS + (1 - \beta_{SF}) RS^*$$

where

$$\beta_{SF} = \frac{S_F}{S_F + S_F^*}$$

- This will increase if either RS or β_{SF} goes up (since we've assumed RS > RS*)
- From the slides for neutral, export-biased, and import-biased growth, one or both of these must happen unless growth is strongly biased toward the imported good (food)

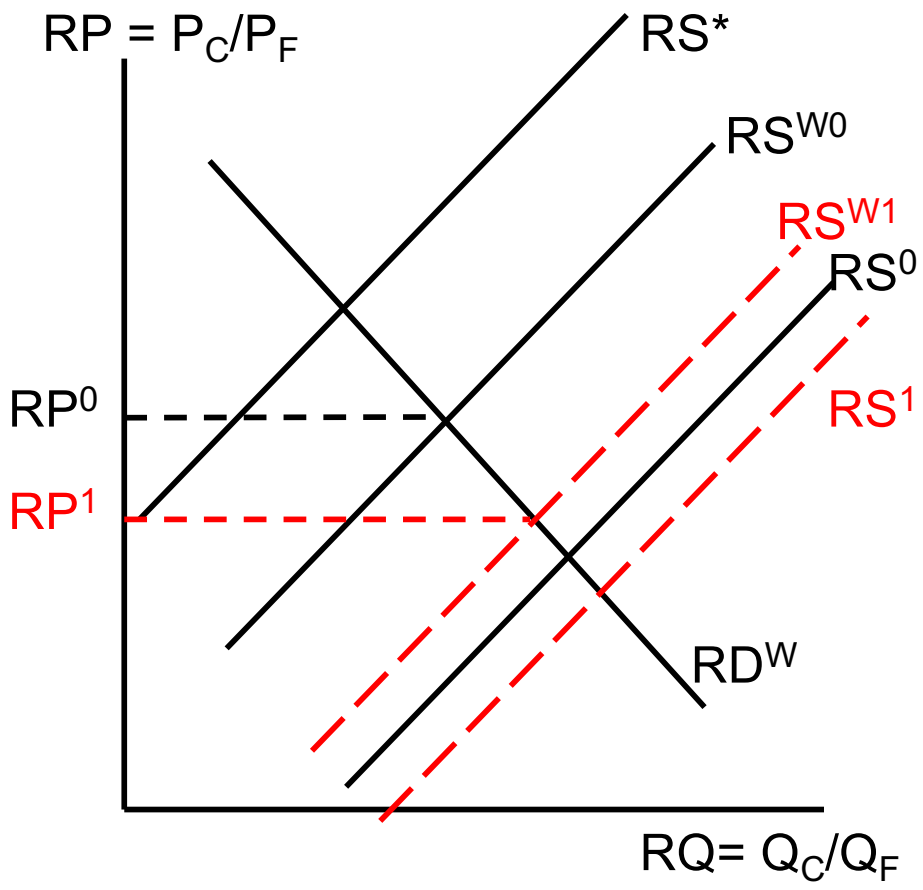
Effects of Neutral Growth on World Price: Large Country



- Large country growth, if neutral
- RS does not change
- β_{SF} rises
  - since S_F rises
- RS^W shifts right
- World relative price of cloth goes down.

Neutral Growth of Large Home Country

Effects of Export-Biased Growth on World Price: Large Country



- Large country growth, if export-biased
- Both RS and RS^W shift right because both
  - RS rises, and
  - β_{SF} rises
- World relative price of cloth goes down by more than in the neutral case.

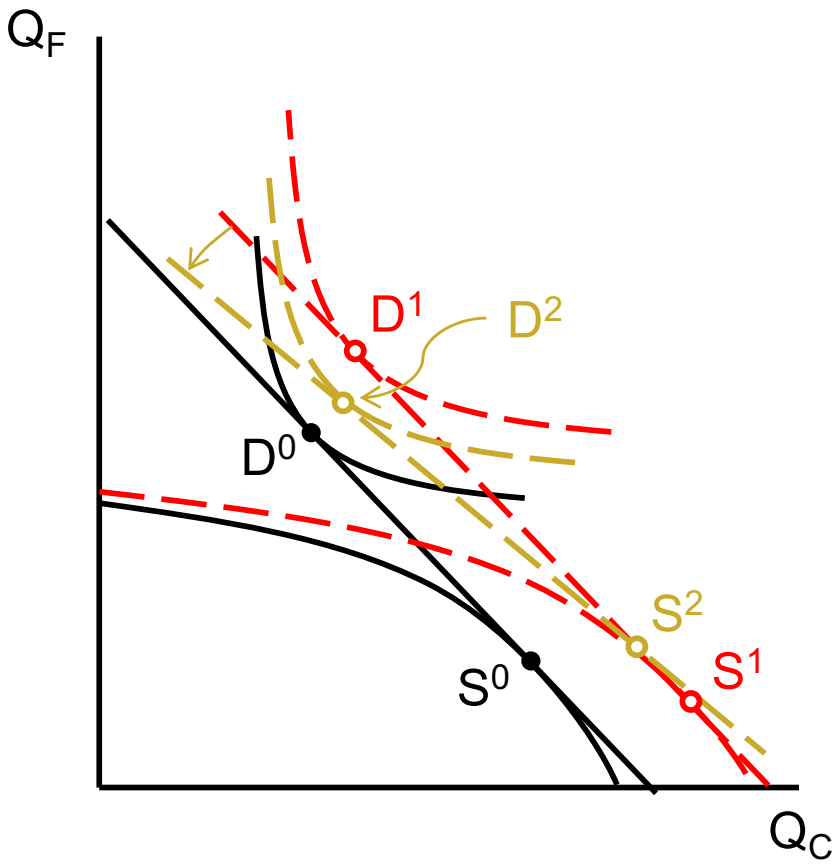
Export-biased Growth of Large Home Country

Effects of Growth: Large Country

- Since the country that has grown (Home) was exporting cloth, a fall in RP = P_C/P_F is a worsening of its Terms of Trade
- The growing country is therefore worse off than if the price had not changed
- Can it be worse off than if it had not grown at all? Yes:

The Case of Immizerizing Growth

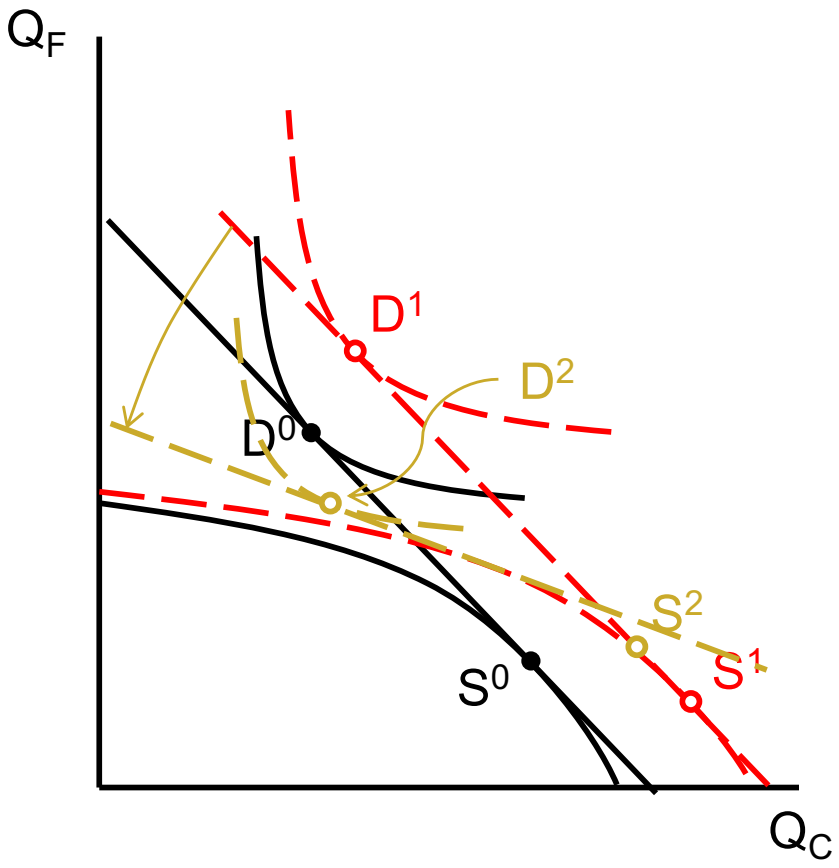
Effects of Export-biased Growth and Small Decline of T of T



- Here the fall in Terms of Trade prevents Home from reaching D^1, but it still benefits from growth by reaching D^2, since that is on a higher indifference curve than D^0.

1. Export-biased growth at unchanged prices
2. Resulting fall in Terms of Trade

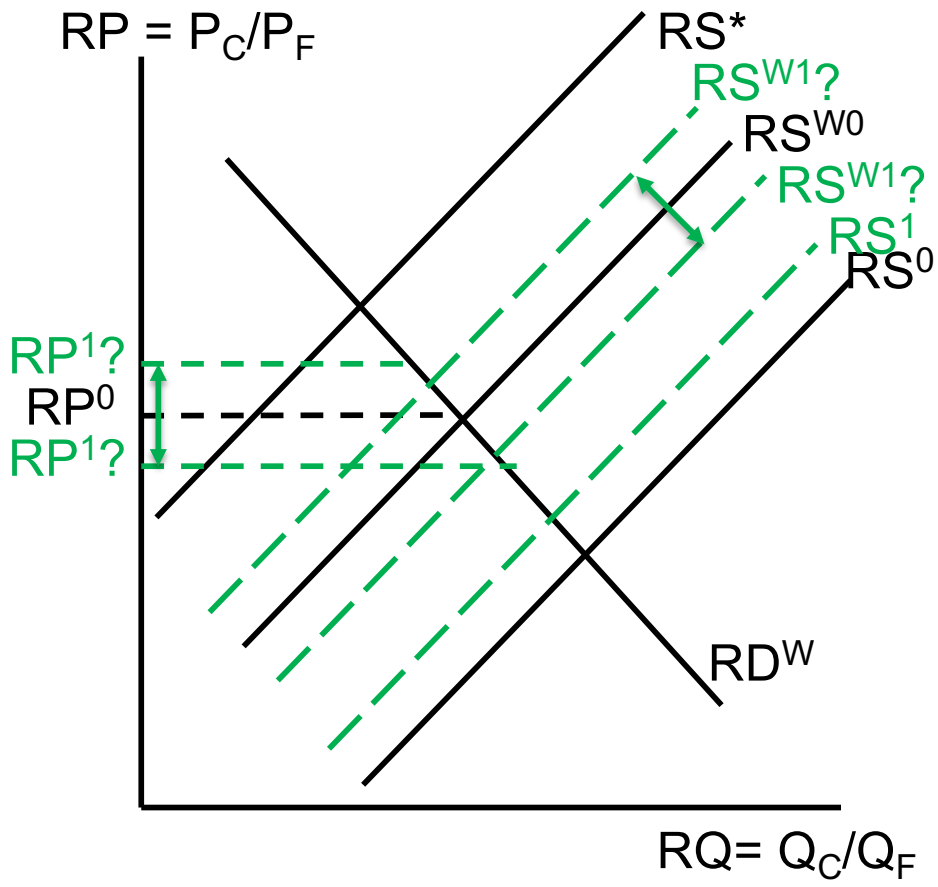
Immizerizing Growth



- Larger fall in Terms of Trade prevents Home from reaching D^0, leaving it on lower indifference curve than if it had not grown at all.

1. Export-biased growth at unchanged prices
2. Resulting fall in Terms of Trade

Effects of Import-Biased Growth on World Price: Large Country



- Large country growth, if import-biased
- RS shifts left
- RS^W may shift right or left because
  - RS falls, but
  - β_{SF} rises
- World relative price of cloth may rise or fall.

Import-biased Growth of Large Home Country

Pause for Discussion

Questions on KOM, Ch. 6

- Suppose that a country's government could choose between two policies that would both increase its GDP (at unchanged prices) by the same amount, one causing growth that is import-biased and one that is export-biased.
  - Which would be better for the country if the country were small?
  - Which would be better if it were large?

Questions on KOM, Ch. 6

- Suppose that the foreign country were to grow in a manner that is neither export-biased nor import-biased, and that therefore leaves its relative supply curve unchanged. What would happen, if anything, to world prices and to the welfare of the home country?

Outline

- Relative supply
- Relative demand
- International equilibrium
  - Small country
  - Two country world
- Effects of growth
- Effects of trade barriers

Effects of trade barriers

- A trade barrier might include
  - Import tariff
  - Import quota or other non-tariff barrier
  - Export tax
  - Quantitative export restriction

Effects of trade barriers

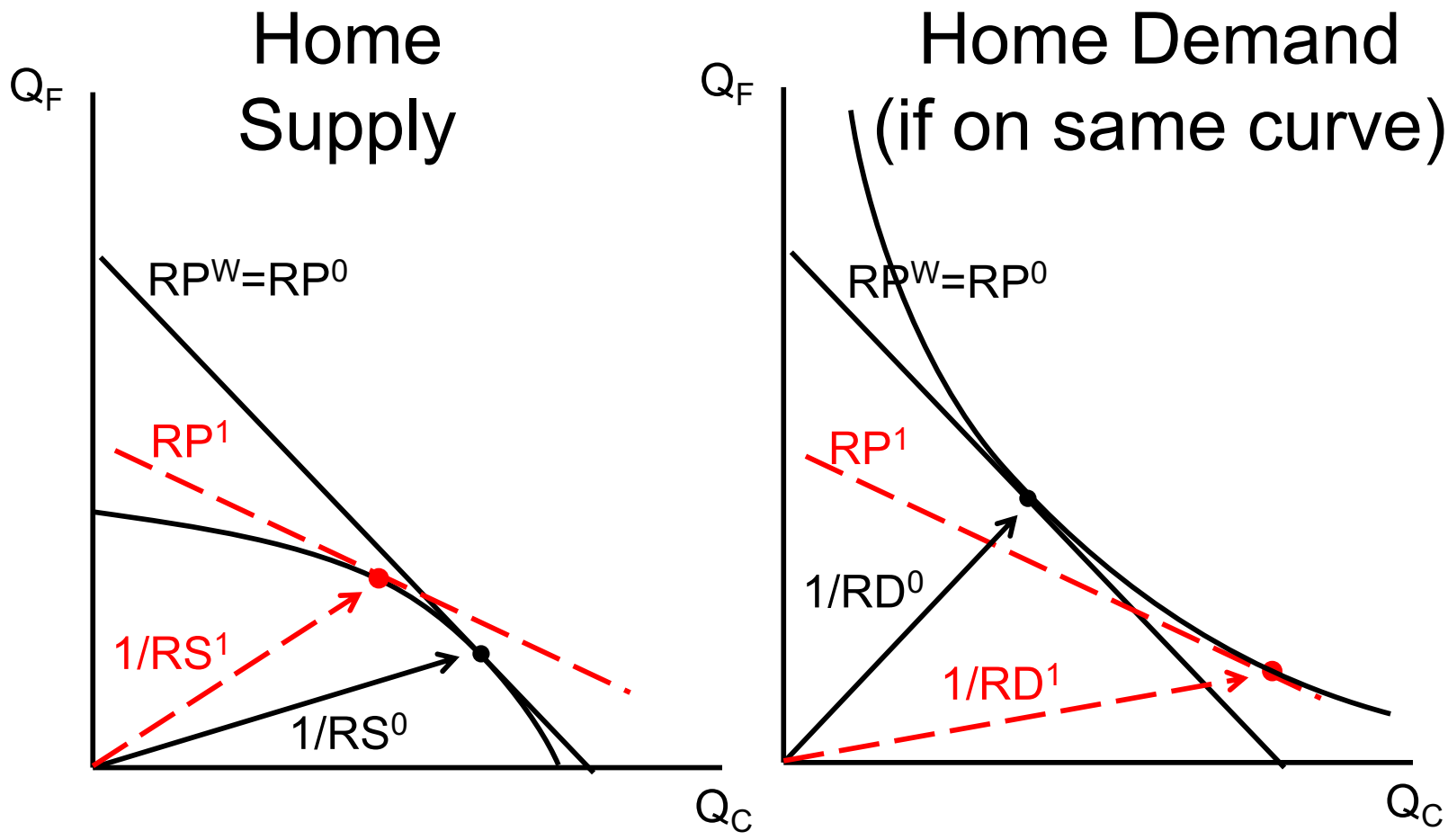
- All of these policies have the effect of raising the domestic relative price of the imported good above the world price
- In the model here, the home country exports cloth, so a trade barrier causes:

$$P_C/P_F < P_C^W/P_F^W \text{ ; i.e., } RP < RP^W$$

or in a 2-country world:

$$P_C/P_F < P_C^*/P_F^* \text{ ; i.e., } RP < RP^*$$

Trade Barriers in a Small Country



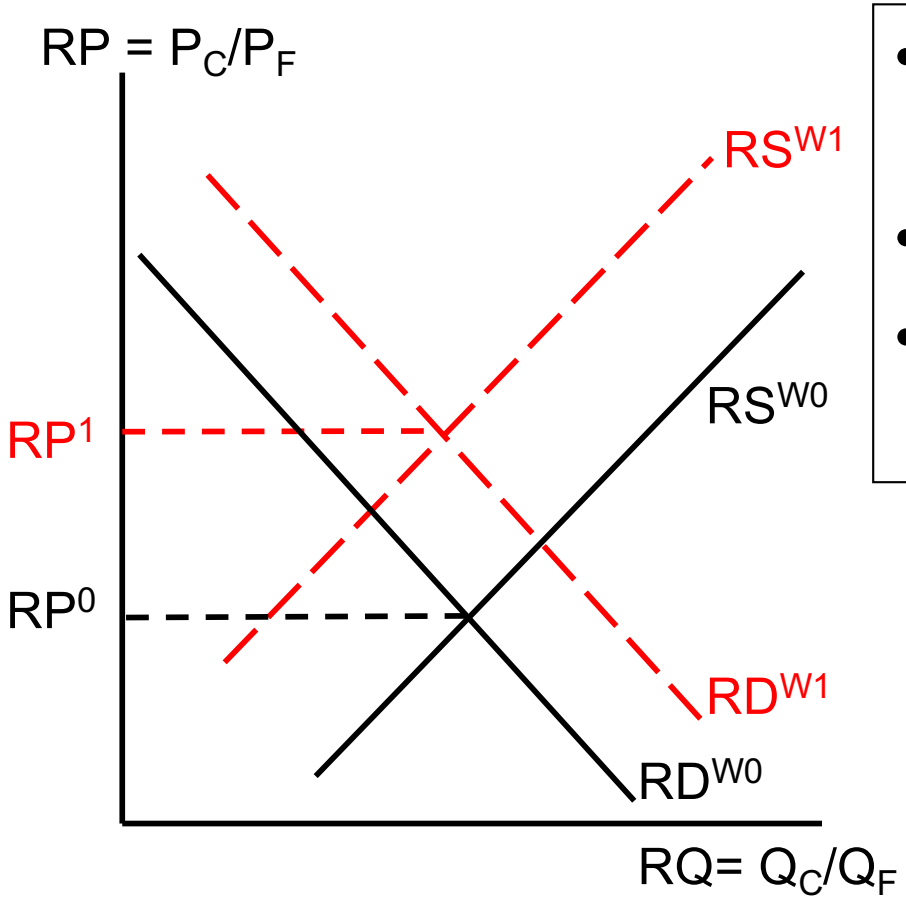
Trade Barriers in a Small Country

- Thus
  - RS shifts left
  - RD shifts right
- As Home is small, RP^W does not change
- We'll look in an addendum below at what happens inside the small country

Trade Barriers in a Large Country

- If tariff is levied by a large country:
  - Still true that
    - RS shifts left
    - RD shifts right
  - Now however, since RS^W and RD^W are weighted averages that include RS and RD, we must also have
    - RS^W shifts left
    - RD^W shifts right

Trade Barriers in a Large Country

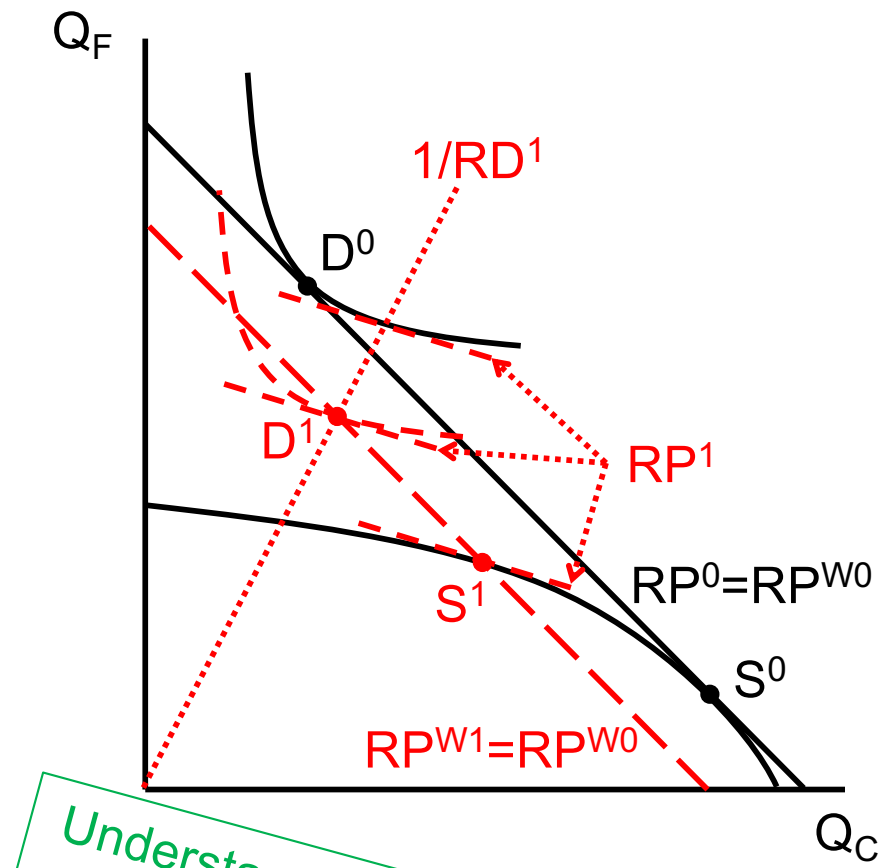


- Trade barrier by home country causes
- RP to rise
- The Terms of Trade of Home to improve.

Addendum on Tariff in General Equilibrium

- Slides above, for small country, showed
  - Production (supply) in levels
  - Consumption (demand) only as a ratio
- Reason is that levels of consumption depend on income, which includes both
  - Income from production
  - Revenue from tariffs and/or rents from NTBs
- Assume now that tariff revenue is redistributed to consumers to be spent like any other income.
- The following (not included in KOM) shows determination of production and consumption

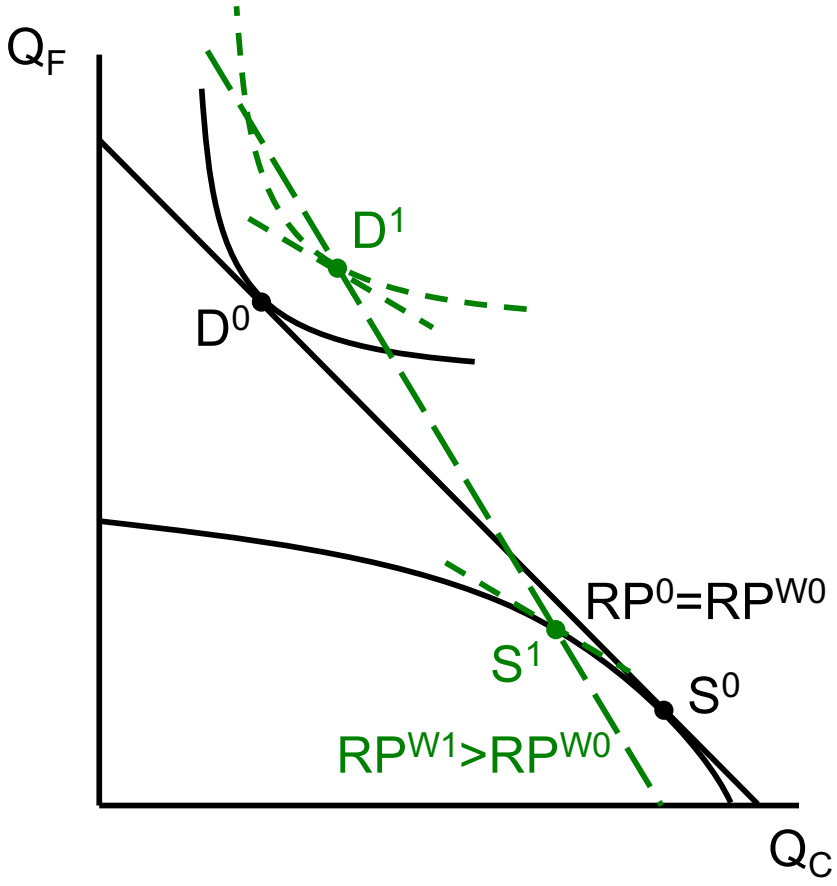
Effects of Tariff in Small Country



Understanding this is optional.

- Tariff on F raises price of F above world and thus lowers the relative price of C in the country.
- This appears as one of the parallel flatter lines RP^1.
- One determines supply, at S^1.
- Another determines relative demand, RD^1.
- D^1 then has ratio RD^1 but same value at world price RP^{W0} as S^1 (since trade is balanced).

Effects of Tariff in Large Country



- Now the reduced trade, which the tariff would have caused if prices did not change, causes the world price of cloth to rise.
- This makes it possible (but not certain) that the country will move to a higher indifference curve, as shown.

Pause for Discussion

Questions on KOM, Ch. 6

- An import tariff raises the domestic price above the world price, while an export subsidy also raises the domestic price above the world price. Why, then, does the model say that the effects of these two policies are opposite?
- The textbook examines cases of an import tariff and of an export subsidy. What would be the effects of an import subsidy, or an export tax?

Questions on Bernhofen & Brown, "…nineteenth century Japan"

- Why is it usually hard to observe the effects of trade?
- Why did the case of Japan provide a natural experiment for observing the effects of trade?
- What did the researchers observe about trade in Japan that confirmed theory of comparative advantage?
- How large were the gains from trade?