The Standard Trade Model

Krugman Ch.6
International Economics
Namun Cho

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Topics

- Ch.5
  - The Empirical Evidence on the Heckscher-Ohlin Model
- Ch.6
  - A Standard Model of a Trading Economy
  - Tariffs and Export Subsides: Simultaneous Shifts in Relative Supply (RS) and Relative Demand (RD)
  - International Borrowing and Lending

Empirical Evidence on the Heckscher-Ohlin Model

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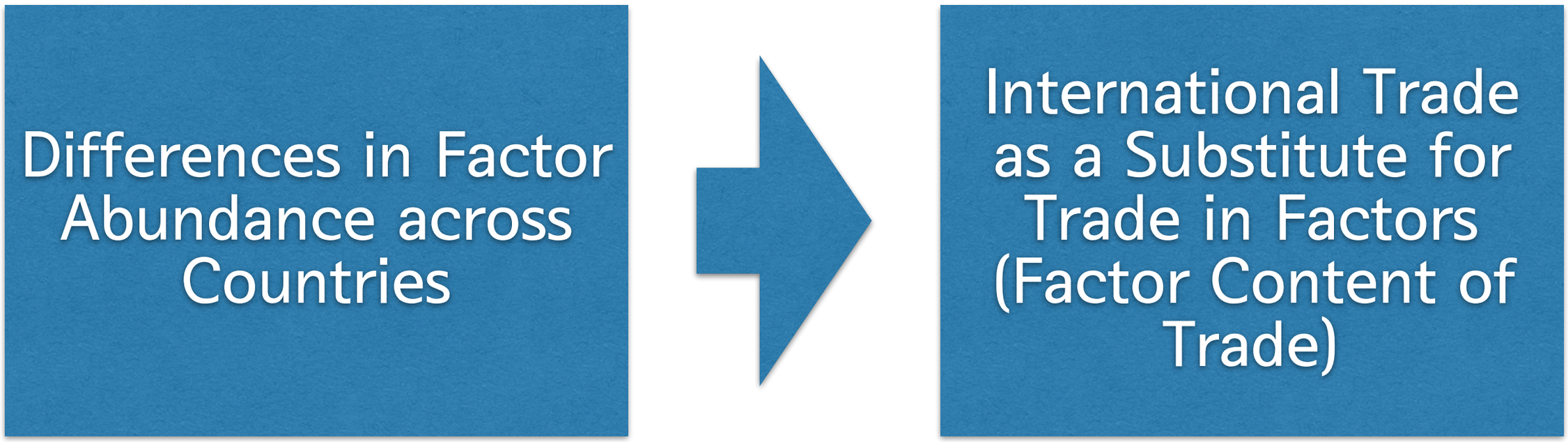
The Essence of the Heckscher-Ohlin Model



Direction:

Abundant Country → Scarce Country

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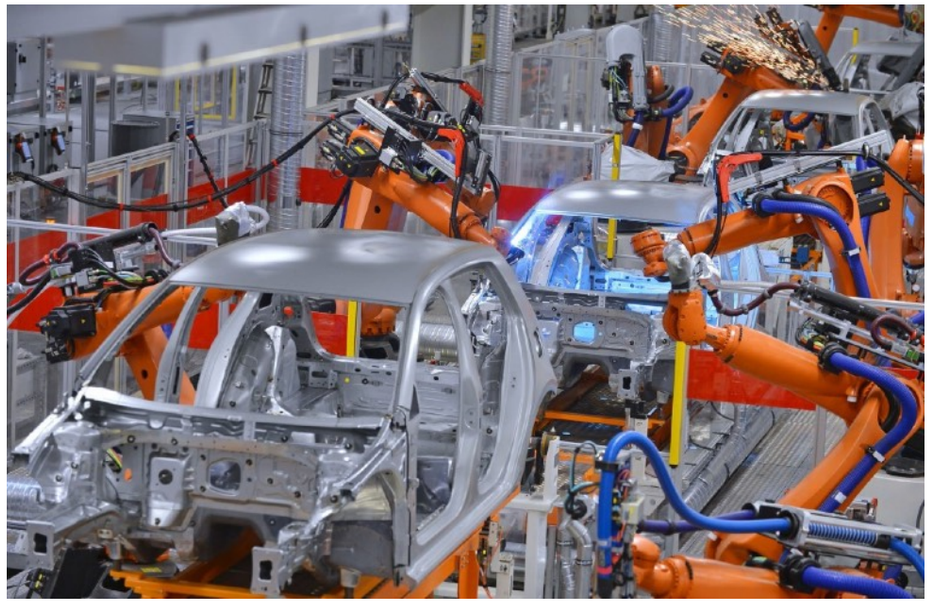
Factor Embodied in Final Product



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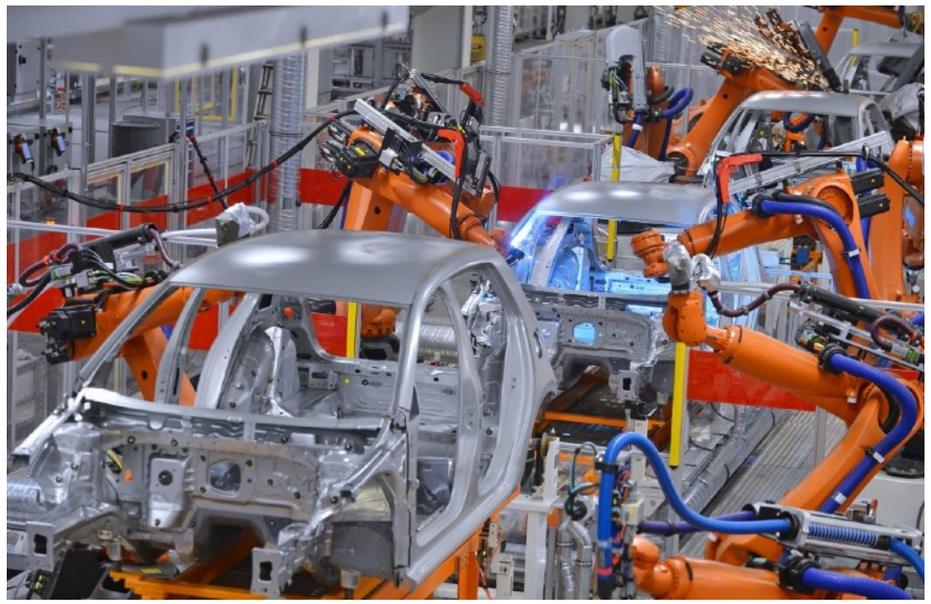

Capital

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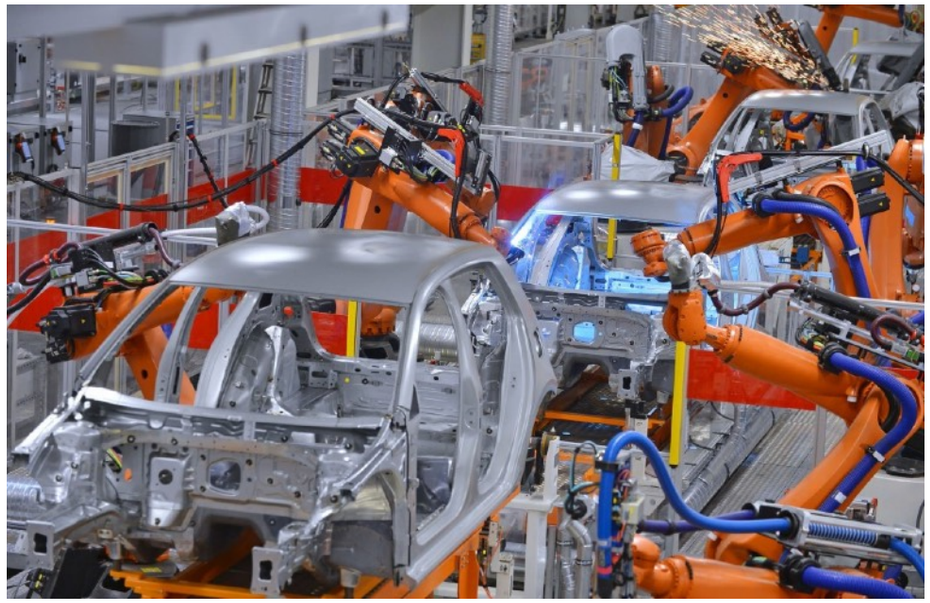
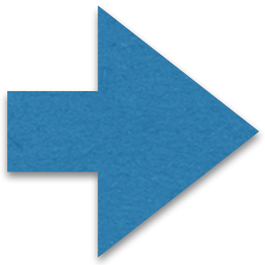
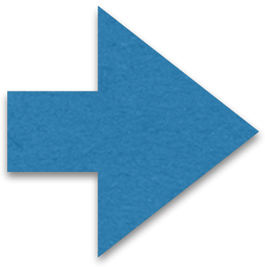
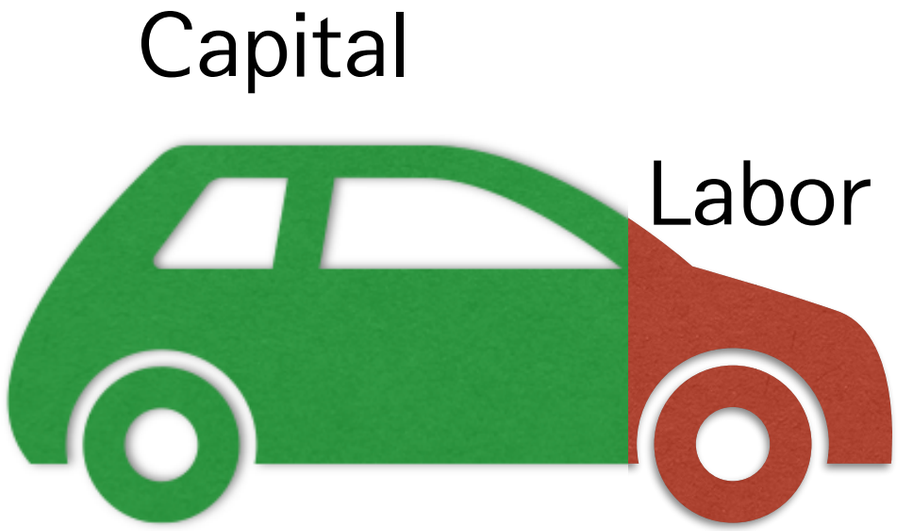
Factor Embodied in Final Product









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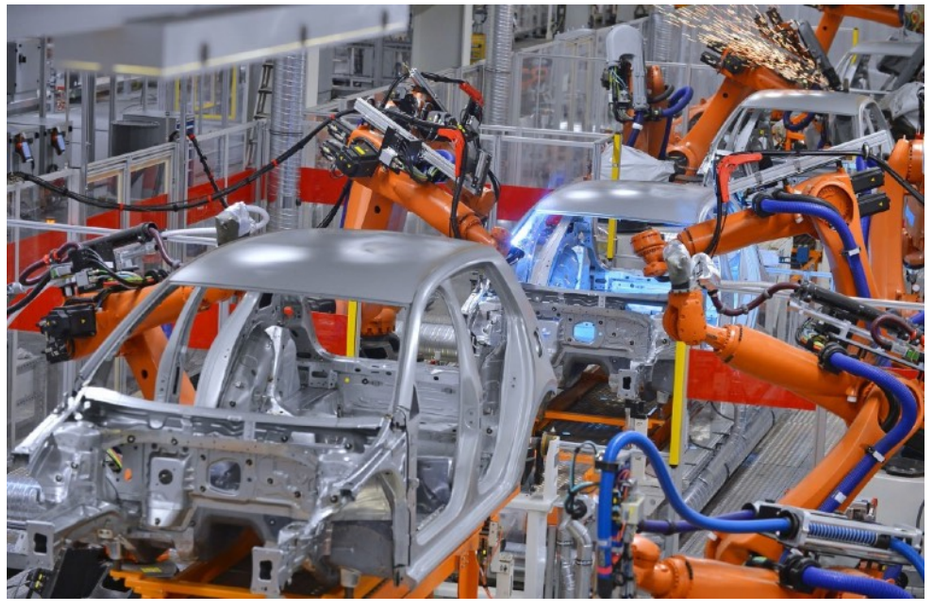

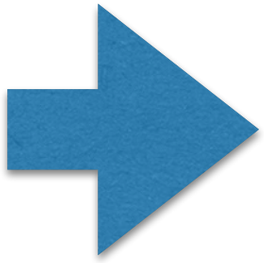

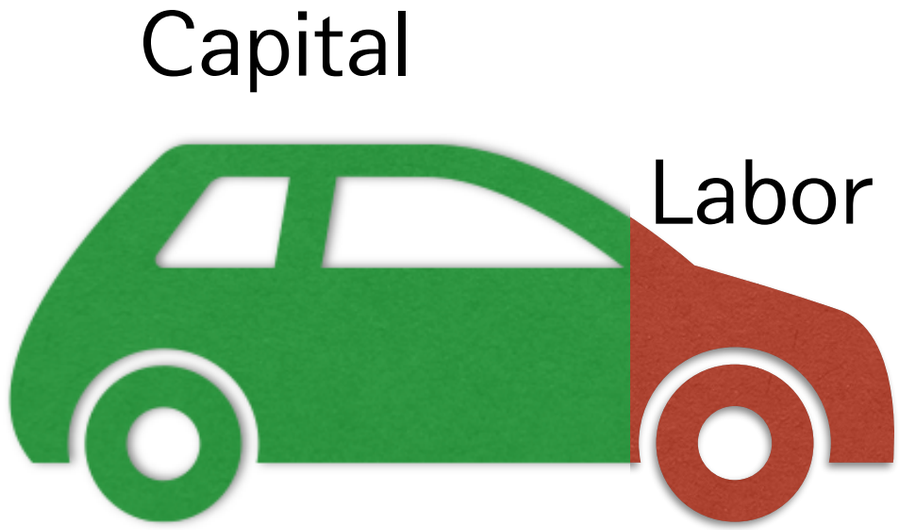

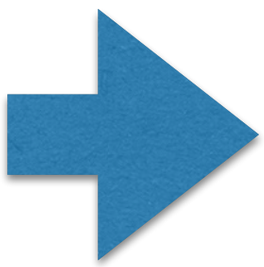

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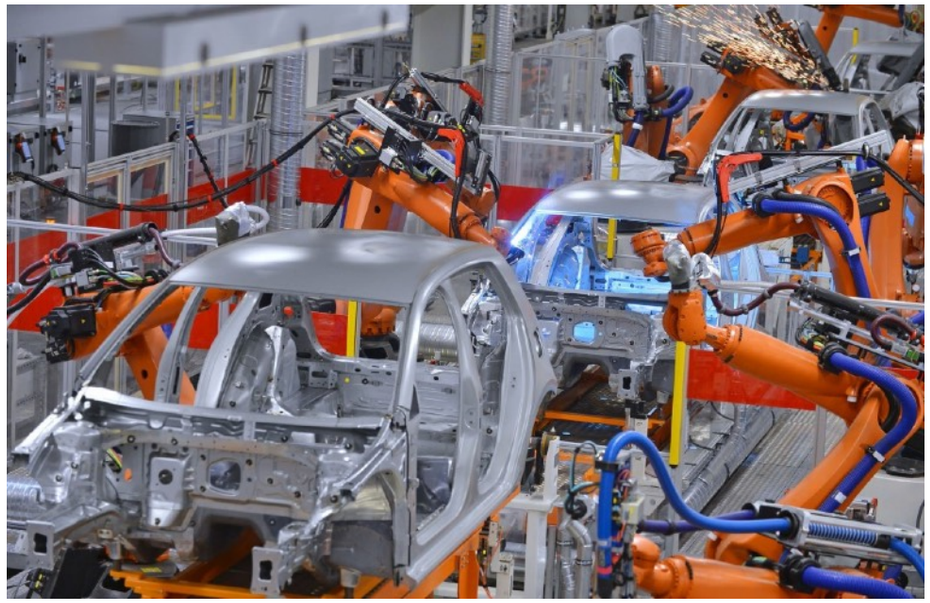

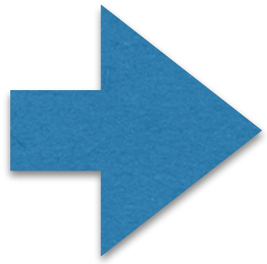

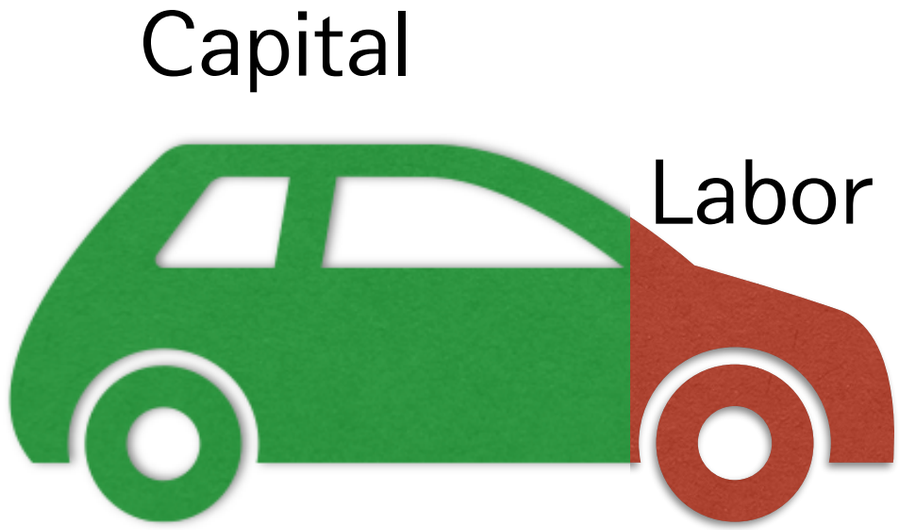

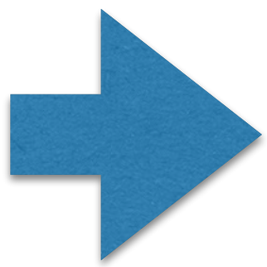

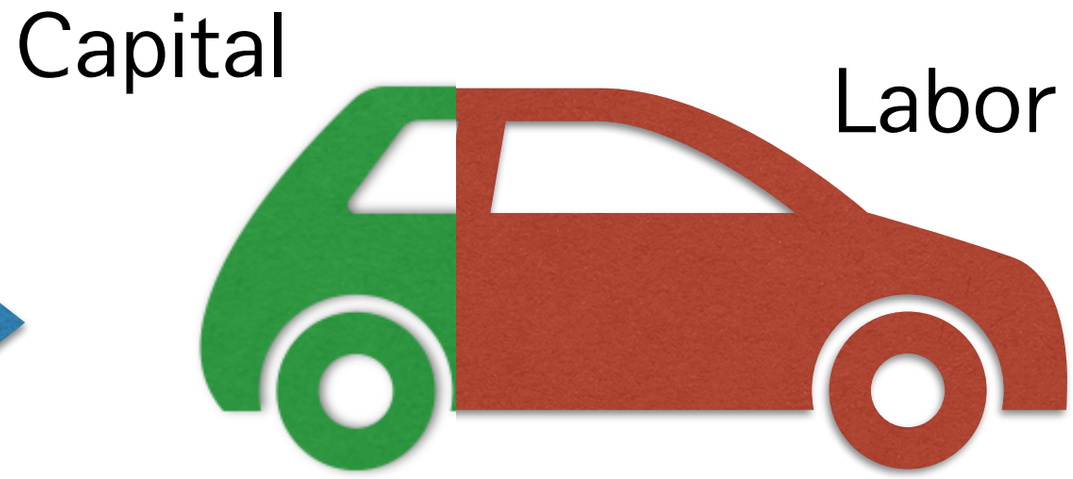

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Factor Content of Trade: Tests on US Data

- United States
  - Capital Intensive economy: High K/L
- Expectations from H-O model:
  - US will export capital-intensive goods
  - US will import labor-intensive goods

Leontief Paradox

TABLE 5-2 **Factor Content of U.S. Exports and Imports for 1962**

	Imports	Exports
Capital per million dollars	$2,132,000	$1,876,000
Labor (person-years) per million dollars	119	131
Capital-labor ratio (dollars per worker)	$17,916	$14,321
Average years of education per worker	9.9	10.1
Proportion of engineers and scientists in work force	0.0189	0.0255

Source: Robert Baldwin, "Determinants of the Commodity Structure of U.S. Trade," *American Economic Review* 61 (March 1971), pp. 126–145.

- From the 1962 US data, we can see
  - US will export capital-intensive goods: FALSE
  - US will import labor-intensive goods: FALSE

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Factor Content of Trade: Tests on Global Data

- Bowen et al., (1987)
  - Harry P. Bowen, Edward E. Leamer, and Leo Sveikauskas, "Multicountry, Multifactor Tests of the Factor Abundance Theory," *American Economic Review* 77 (December 1987), pp. 791-809.
  - 27 countries, 12 factors of production
  - Tested Heckscher-Ohlin (H-O) model prediction by the sign test for the direction of the factor content

Determining Abundance (Bowen et al., 1987)

- Criterion to determine factor abidance
- A := [factor endowment] / [world factor endowment]
  - share of world factor endowment
- B := [GDP] / [world GDP]
  - share of world GDP
- Sign := Sign(A-B)
- Sign>0: A > B ⇒ abundant, Sign<0: A < B ⇒ scarce
- Example (USA)
  - A: labor share = 5%, B: GDP share = 25% ⇒ Sign <0 ⇒ Labor is scarce

Global Test Result

- POOR PREDICTION
- Same direction: 61%
  - Abundant (Sign > 0) + Exporter
  - Scarce (Sign <0) + Importer
- Opposite direction: 39%
  - Abundant (Sign > 0) + Importer
  - Scarce (Sign < 0) + Exporter

The Case of Missing Trade

- Trefler (1995):
  - Factor trade was substantially smaller than the Heckscher-Ohlin model predicts
  - Allowing for technology differences across countries can resolve the predictive success
- Missing T'rade :=
[Observed Trade] / [Predicted Trade]

Effective Labor Supply

- Labor having high productivity can produce more products ⇒ Relatively low labor demand
- It can explain why observed labor factor demand is relatively smaller than model prediction

A Better Empirical Fit for the Factor Content of Trade

- Three assumptions of H-O model:
    1. Common technologies across countries
    2. Countries produce the same set of goods
    3. Costless trade equalizes goods prices
- Davis and Weinstein (2001) test again after dropping some of assumptions

Result

TABLE 5-4 A Better Empirical Fit for the Factor Content of Trade

	Assumptions Dropped*			
	None	Drop (1)	Drop (1)–(2)	Drop (1)–(3)
Predictive Success (sign test)	0.32	0.50	0.86	0.91
Missing Trade (observed/ predicted)	0.0005	0.008	0.19	0.69

*Assumptions: (1) common technologies across countries; (2) countries produce the same set of goods; and (3) costless trade equalizes goods prices.

Source: Donald R. Davis and David Weinstein, "An Account of Global Factor Trade," *American Economic Review* (2001), pp. 1423–1453.

- We should reformulate H-O model

Patterns of Exports between Developed and Developing Countries

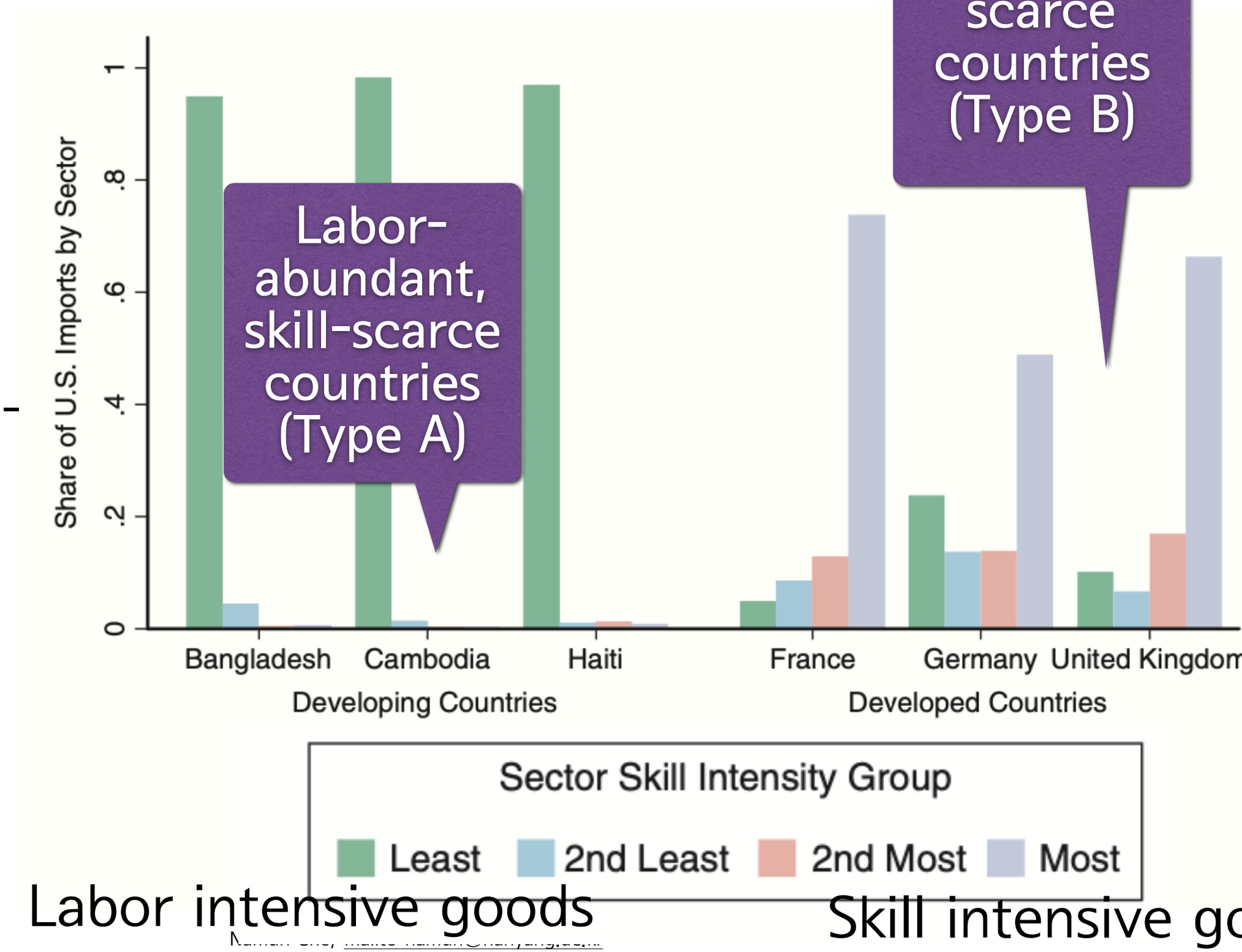
- Recall H-O Theorem (2x2x2 version).
- Two-good, two-factor, two-country version:
  - "The country that is abundant in a factor exports the good whose production is intensive in that factor"

Romalis (2004)

- To test this theorem, Romalis (2004) did
  - Comparison exports between:
    - Labor-abundant, skill-scarce countries (Type A) versus skill-abundant, labor-scarce countries (Type B)
- Hypothesis:
  - Type A exports labor-intensive goods
  - Type B exports skill-intensive goods

Test Result (1)

- Supports the H-O theorem

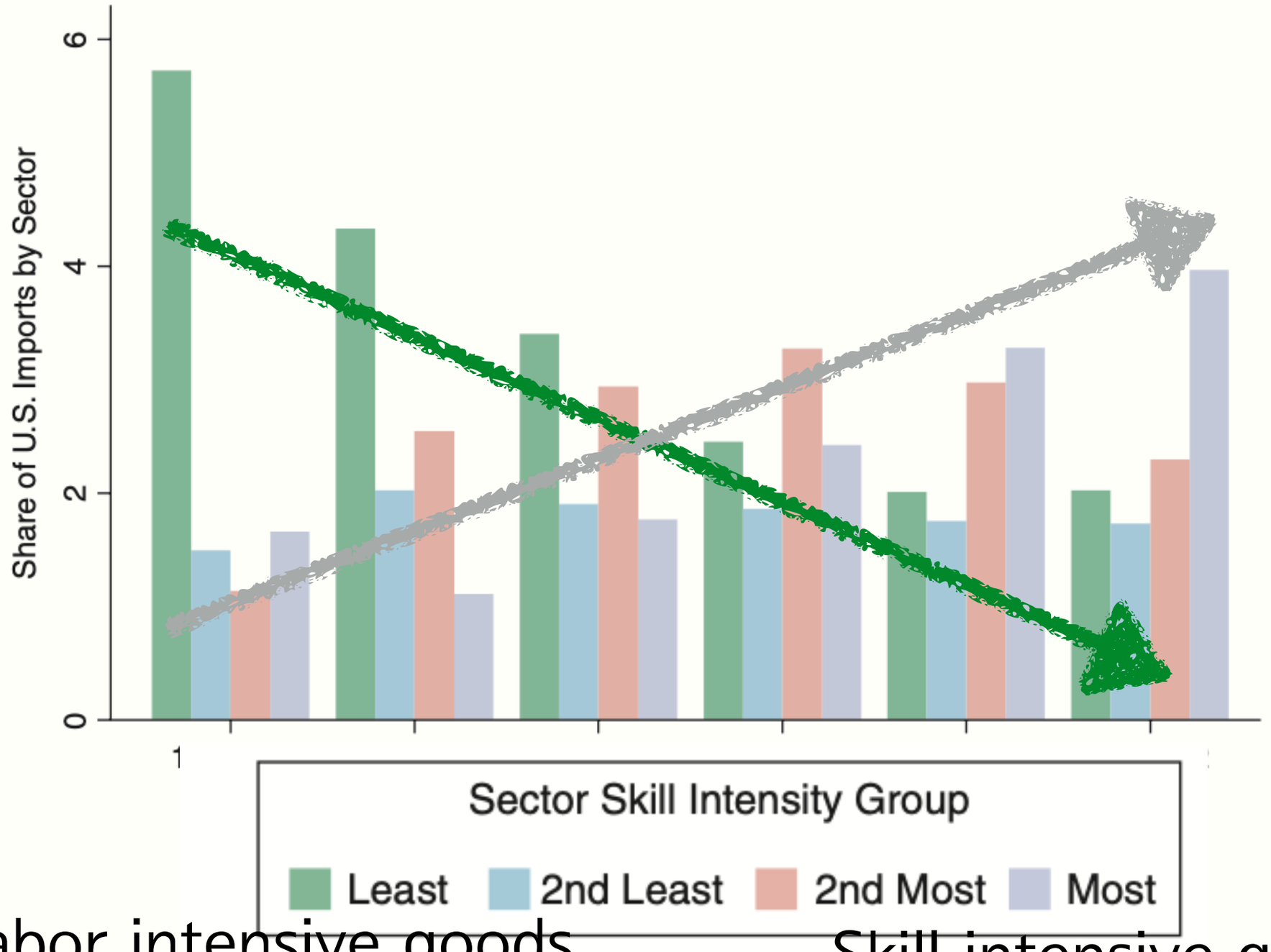


Labor intensive goods

Skill intensive go

Chinese Exports Pattern (to US): 1983-2012

- China
  - Labor intensity
    ↓
  - Skill intensity
    ↑
- Supports H-O theorem



Labor intensive goods

Skill intensive go

Implications of the Tests

- Pure H-O model shows poor prediction
- Less restrictive H-O model fits well
- H-O model is vital for understanding the effects of trade
  - Especially on the income distribution

The Standard Trade Model

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Topics

- A Standard Model of a Trading Economy
- Tariffs and Export Subsides: Simultaneous Shifts in RS and RD
- International Borrowing and Lending

Standard Model of a Trading Economy: Big Picture

Ricardian Model (Ch3)

Specific Factors Model (Ch4)

Heckscher-Ohlin Model (Ch5)

Standard Model of a Trading Economy (Ch6)

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Model Comparison

	Determinants of Trade	Income Distribution
Ricardian Model	Allocation of single resource (labor) between sectors	Not Available
Specific Factors Model	Multiple factors, Some factors are specific	Captures short-run consequences of trade
Heckscher-Ohlin Model	Multiple mobile factors, Abundance matters	Captures long-run consequences of trade

Common Features of Three Models

- Production capacity of an economy can be summarized by its production possibility frontier (PPF), and differences in PPFs make them trade
- Production possibilities (PP) determine a country's relative supply schedule
- World equilibrium is determined by world relative demand (RD) and a world relative supply (RS) schedule that lies between the national RS schedules

A Standard Model of a Trading Economy

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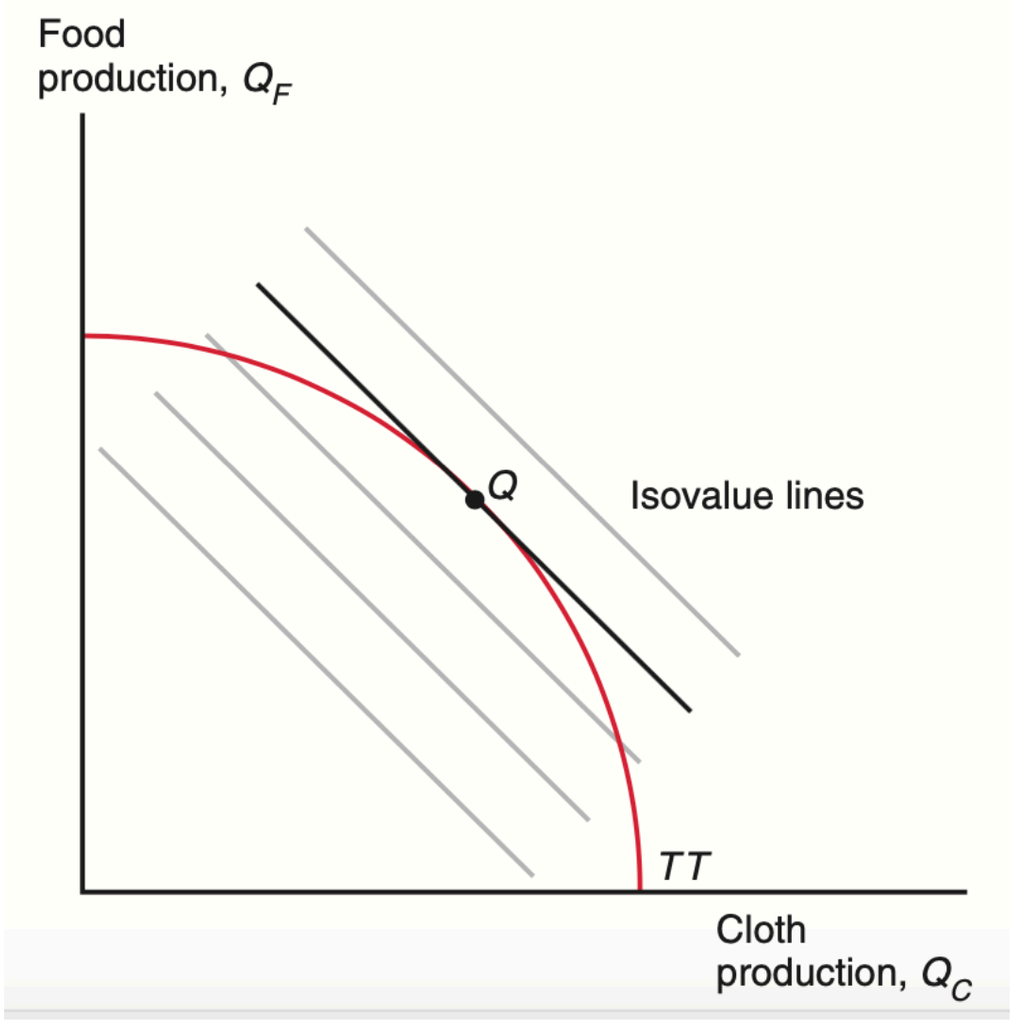
Standard Trade Model (STM): Key Relationship

- PPF and RS curve
  - PPF: Production Possibility Frontier
  - RS: Relative Supply
- RP and RD
  - RP: Relative Price, RD: Relative Demand
- World RS and World RD → World Equilibrium
- Terms of Trade := Export Price / Import Price

STM: Basic Settings

- Two goods: food (F) and cloth (C)
- Two countries: home (H) and foreign (F)
- Smooth concave decreasing PPF
  - Implies most efficient production (Q) can be determined by relative price (RP): P_C/P_F
  - RP: slope of isovalue line



Big Picture

- Sketching Relative Supply (RS) curve
- Sketching Relative Demand (RD) curve

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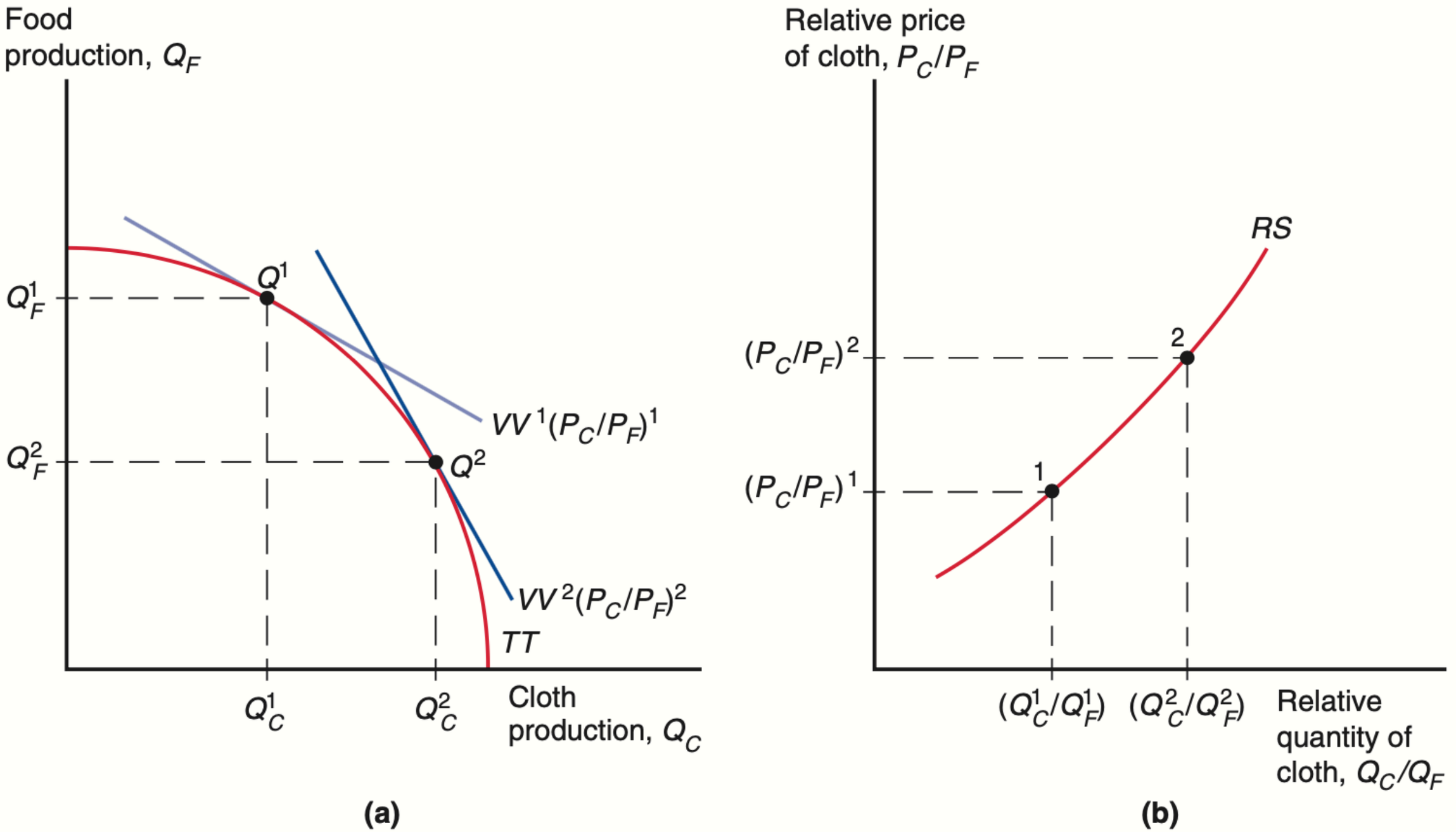
Relative Supply (RS) curve



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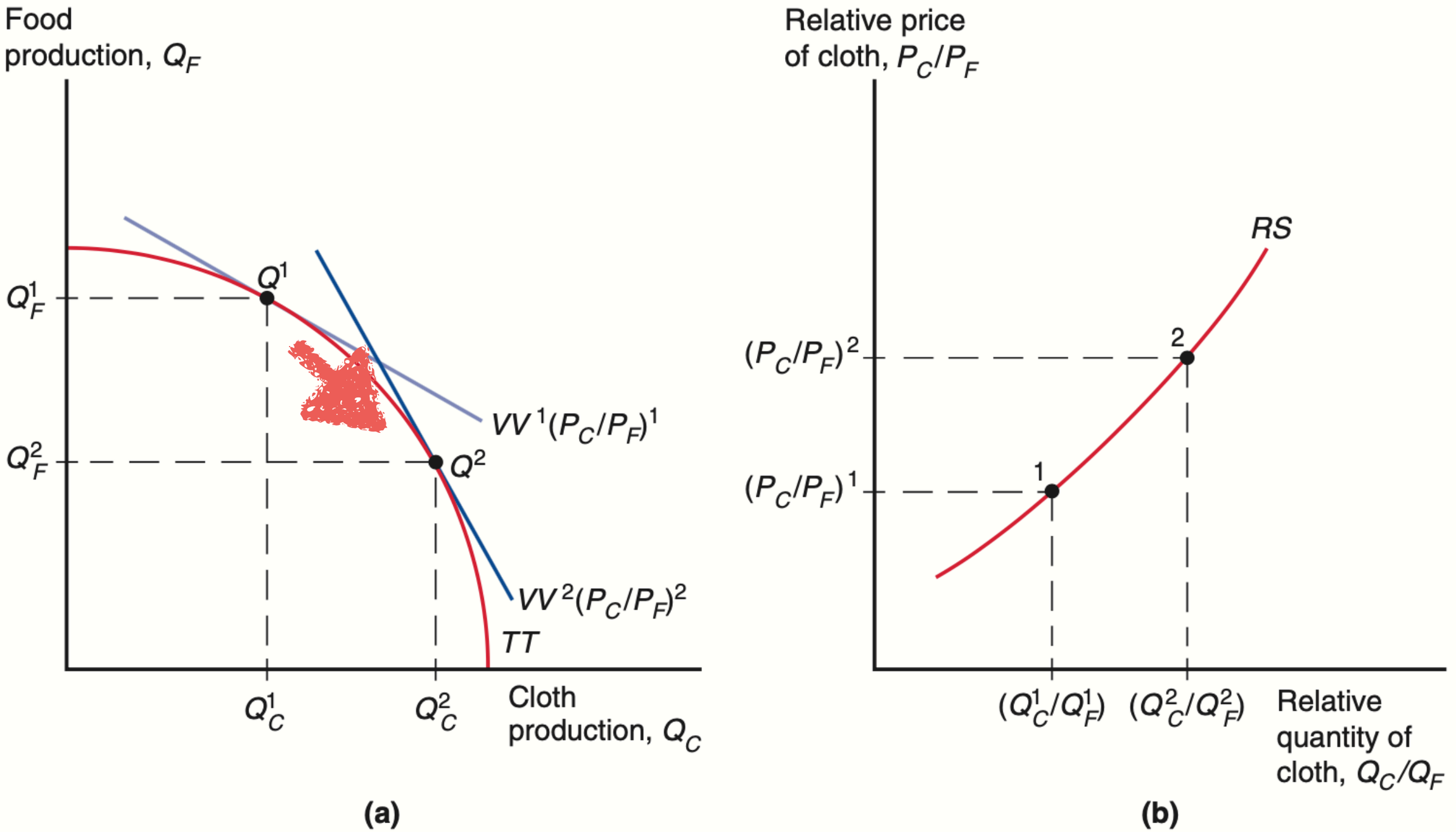

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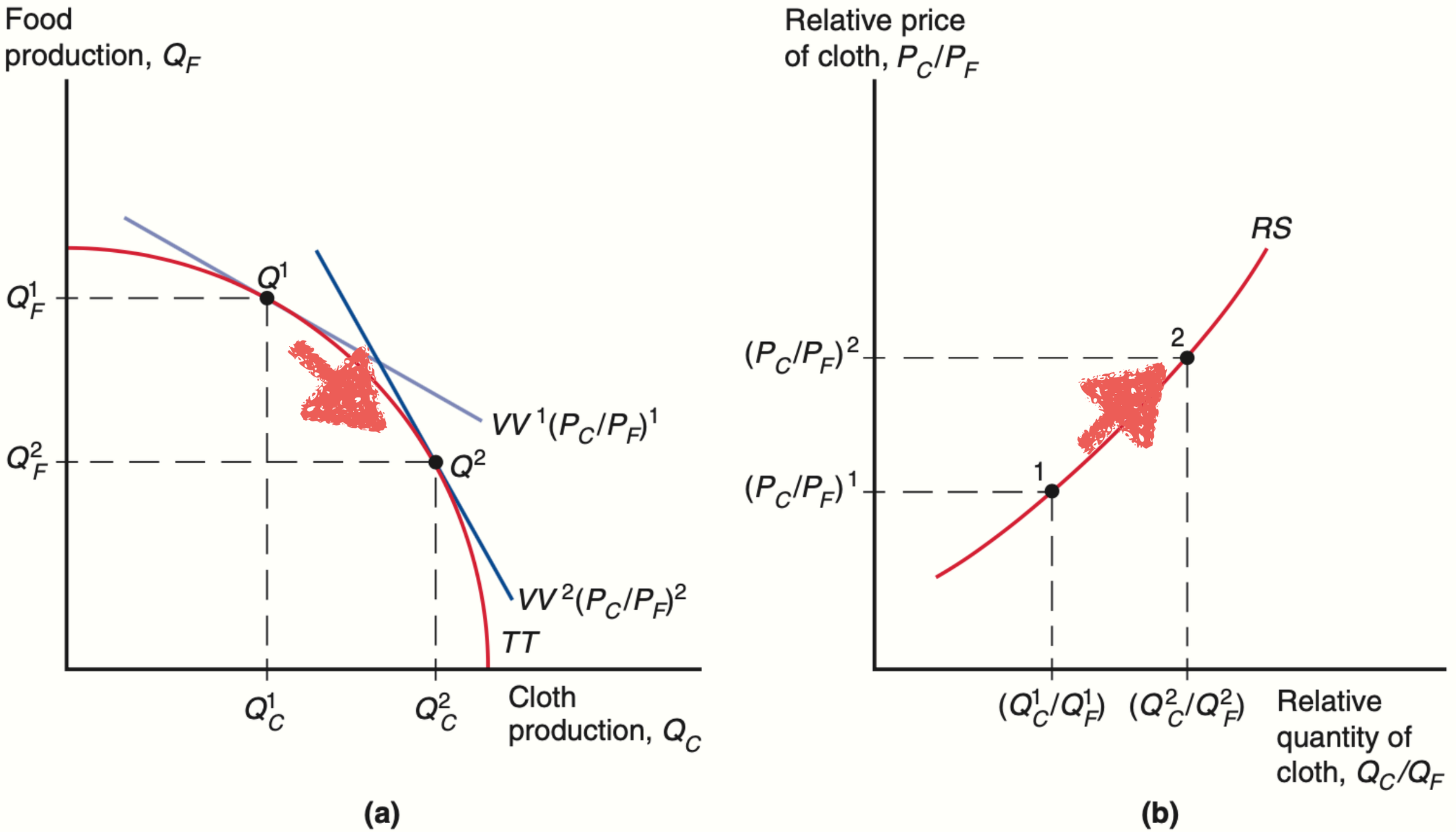
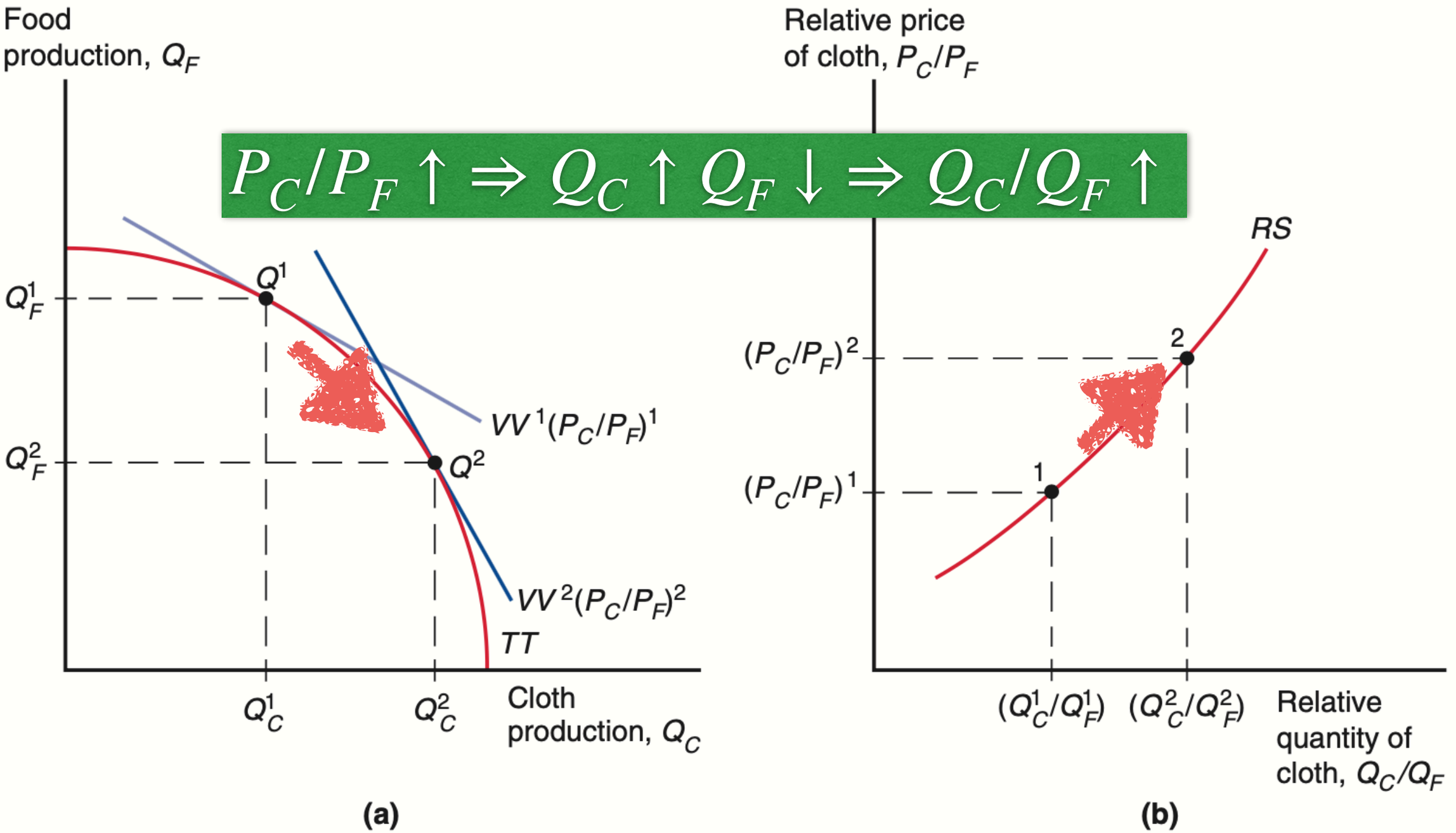


Relative Supply (RS) curve

$$P_C/P_F \uparrow \Rightarrow Q_C \uparrow \; Q_F \downarrow \Rightarrow Q_C/Q_F \uparrow$$



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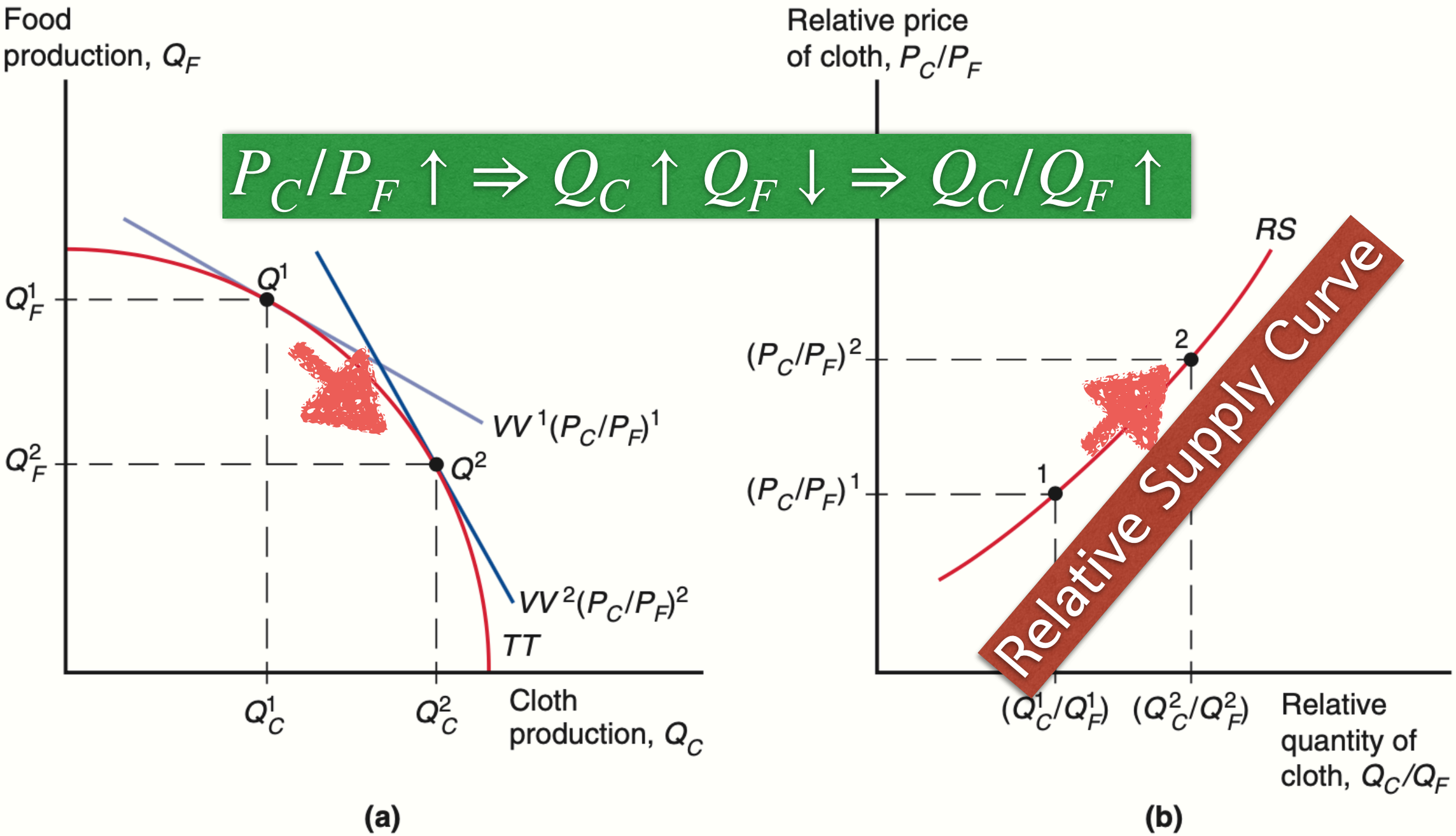


Finding Relative Demand (RD) curve

- Should be on the same isovalue line
- Find the demand quantity from indifferent curve
- Change RP (P_C/P_F) and find resulting RQ (Q_C/Q_F) $\rightarrow$ RD curve

RD: Should be on the same isovalue line

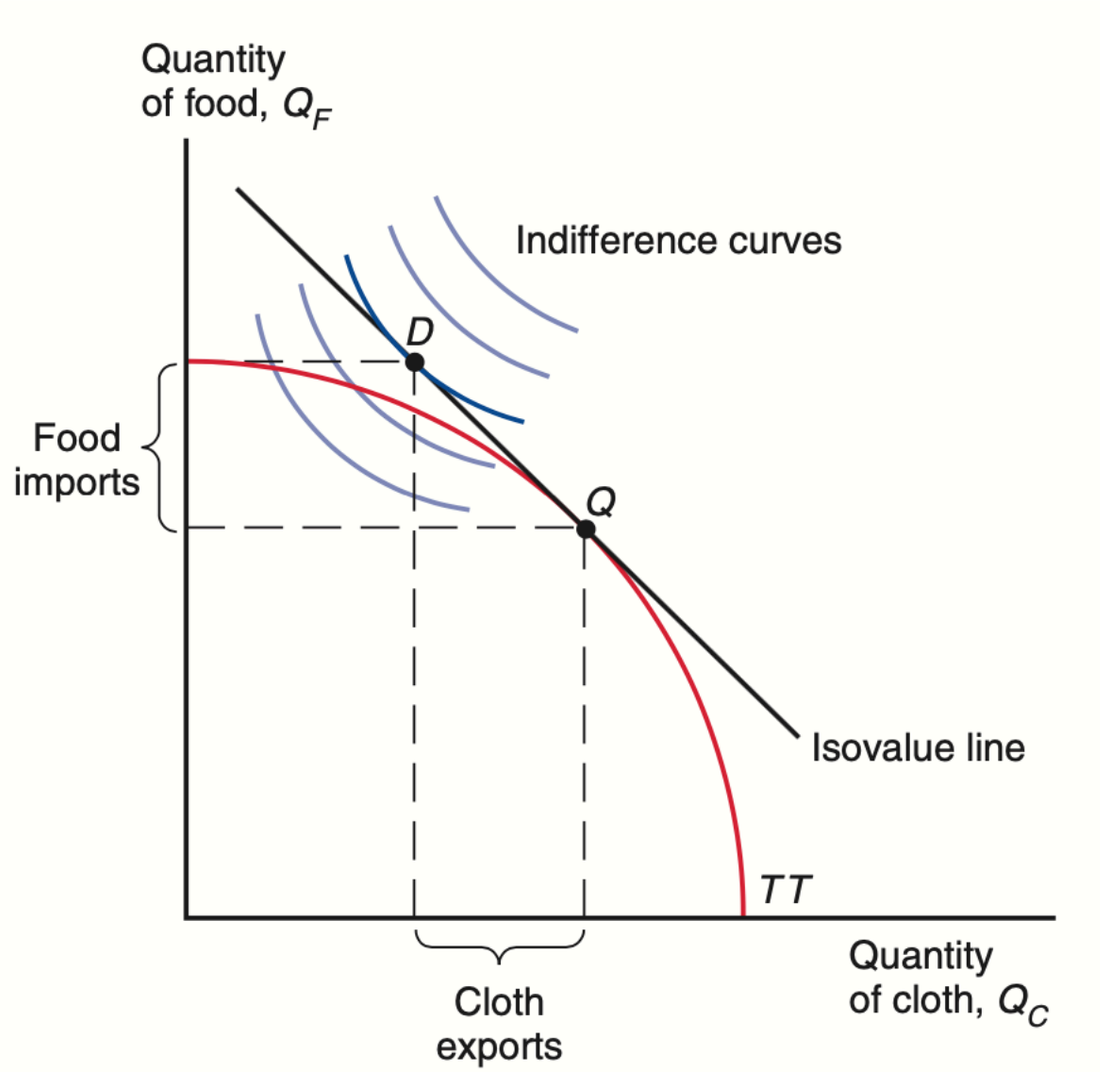
- The value of an economy's consumption equals the value of its production
  - $P_C Q_C + P_F Q_F = P_C D_C + P_F D_F = V$
  - Q: Supply quantity, D: Demand quantity
- Above equation implies production and consumption should lie on the same isovalue line (Condition 1)

RD: Find the demand quantity from indifference curve

- Indifference curve: A set of combinations of goods that leave the individual equally well off (taste of consumers)
- Properties of indifference curve (ID)
  - Downward sloping (ID-1)
  - Farther indifference curve has higher level of welfare (ID-2)
  - Convex: slope gets flatter (ID-3)

Condition 1 + ID

- Condition 1: Demand and Supply should be lie on the same isovalue line
- ID-2: Farther indifference curve shows better welfare



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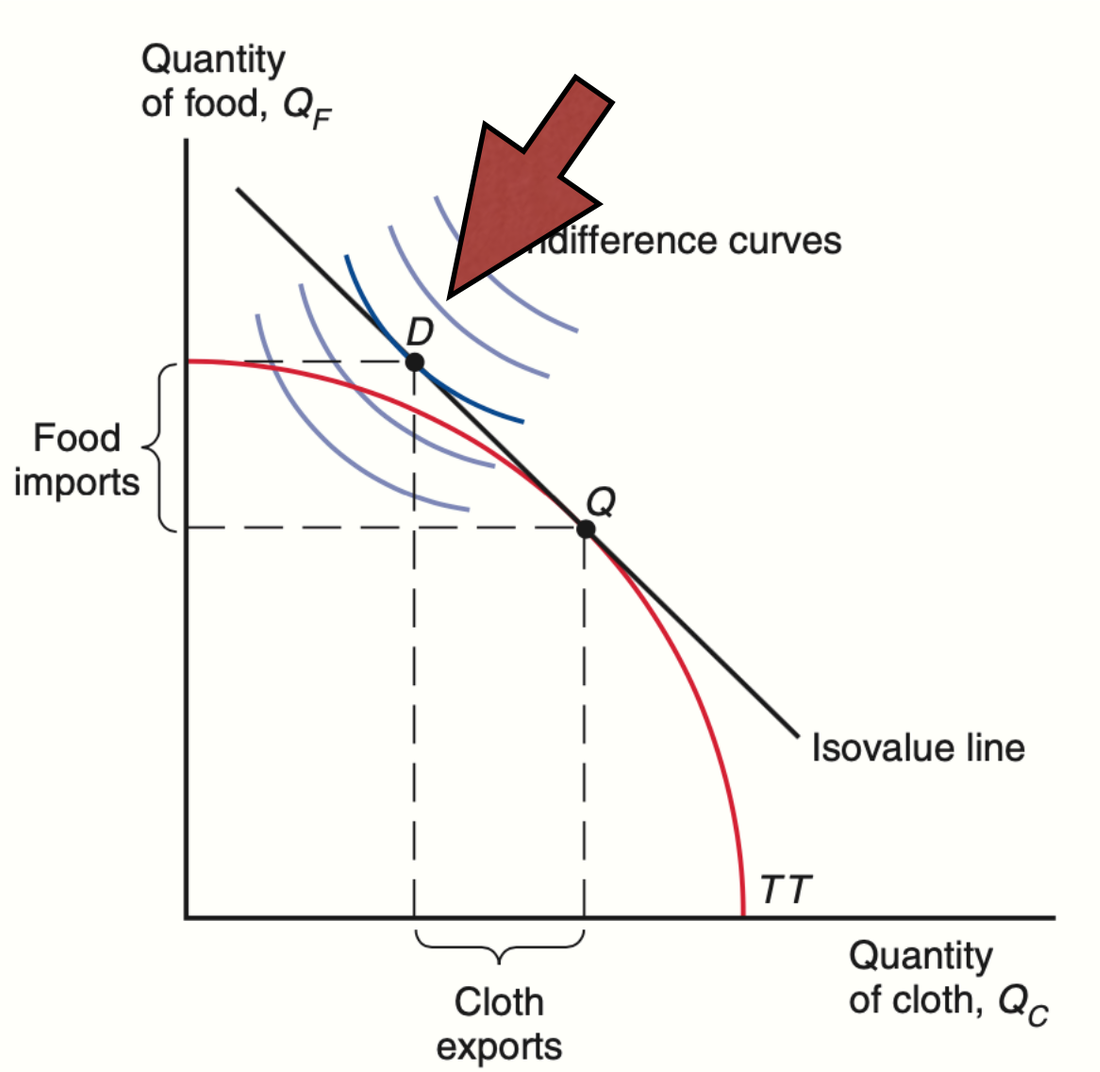

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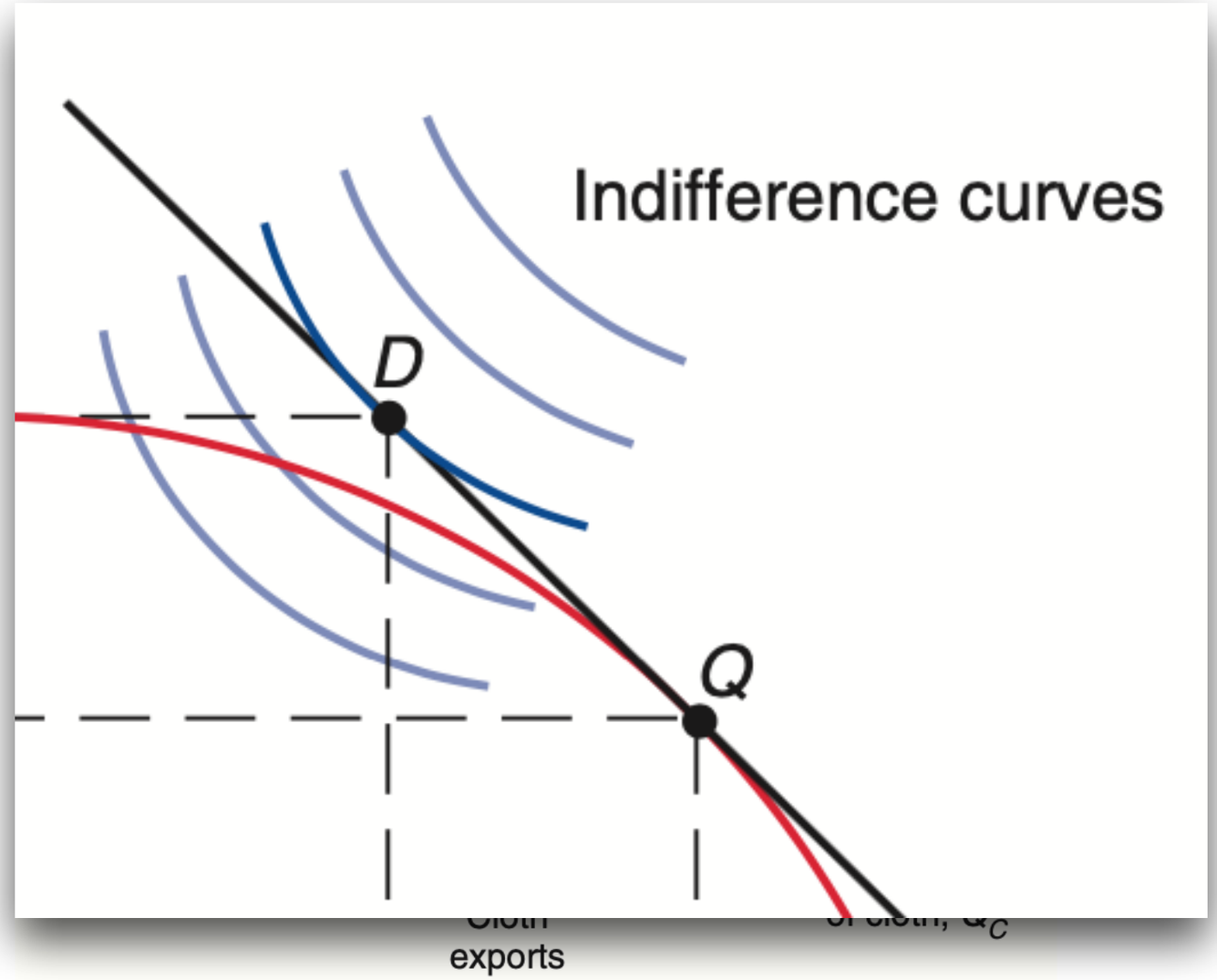

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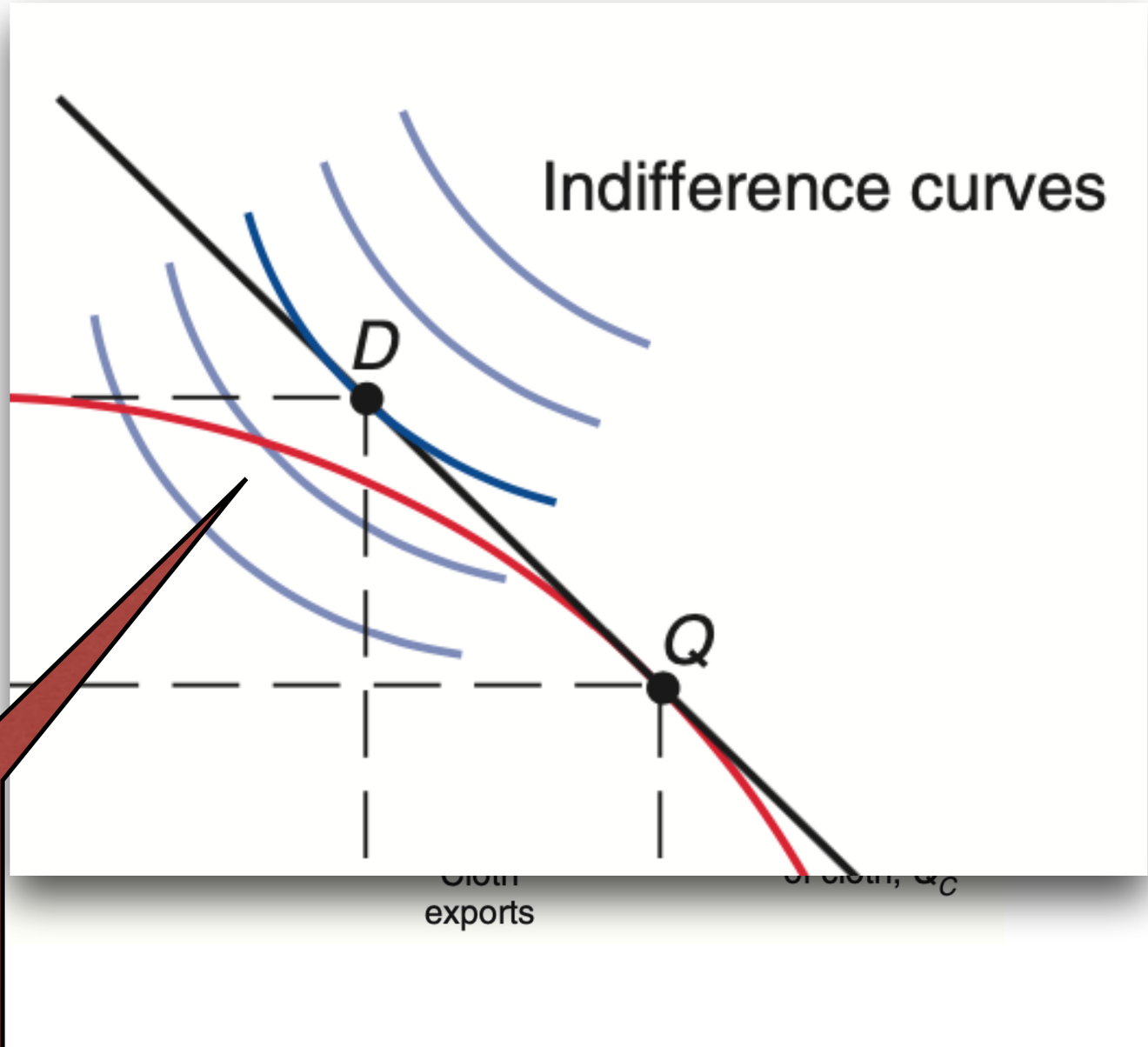

Feasible but not Efficient Indifference Curve

Condit

Desirable but not Feasible Indifference Curve

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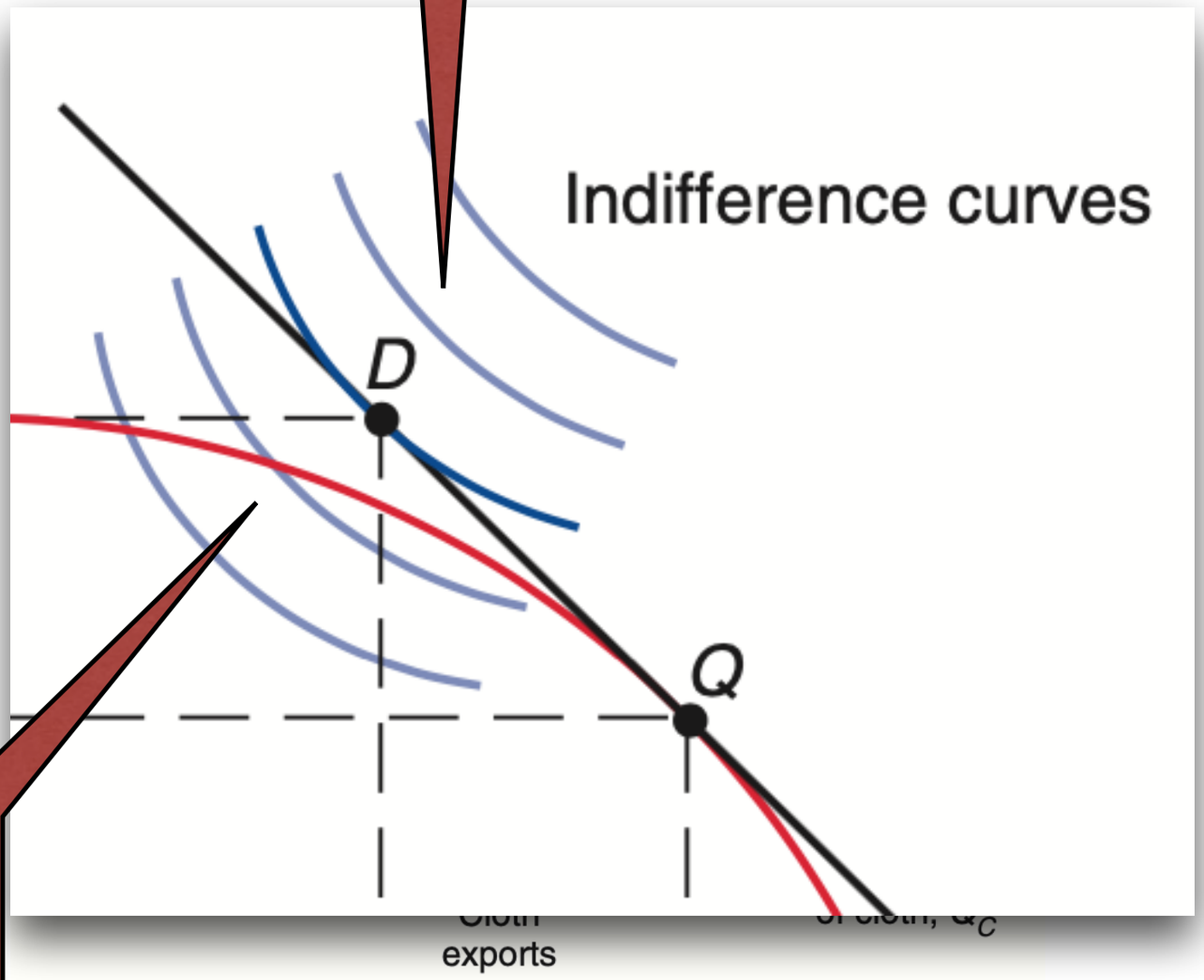

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Desirable but not Feasible Indifference Curve

Feasible and the Most Efficient Indifference Curve

the same isovalue line

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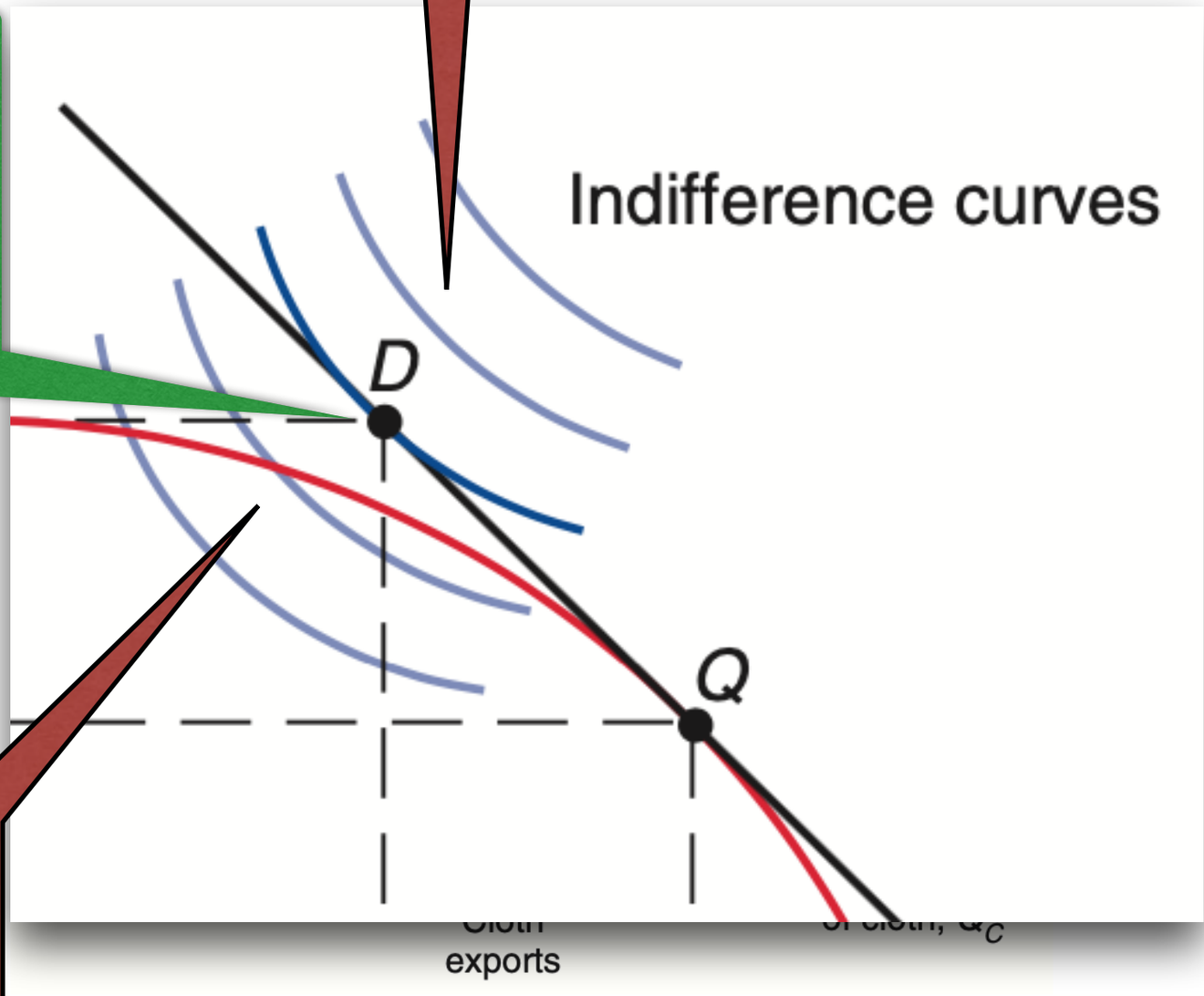
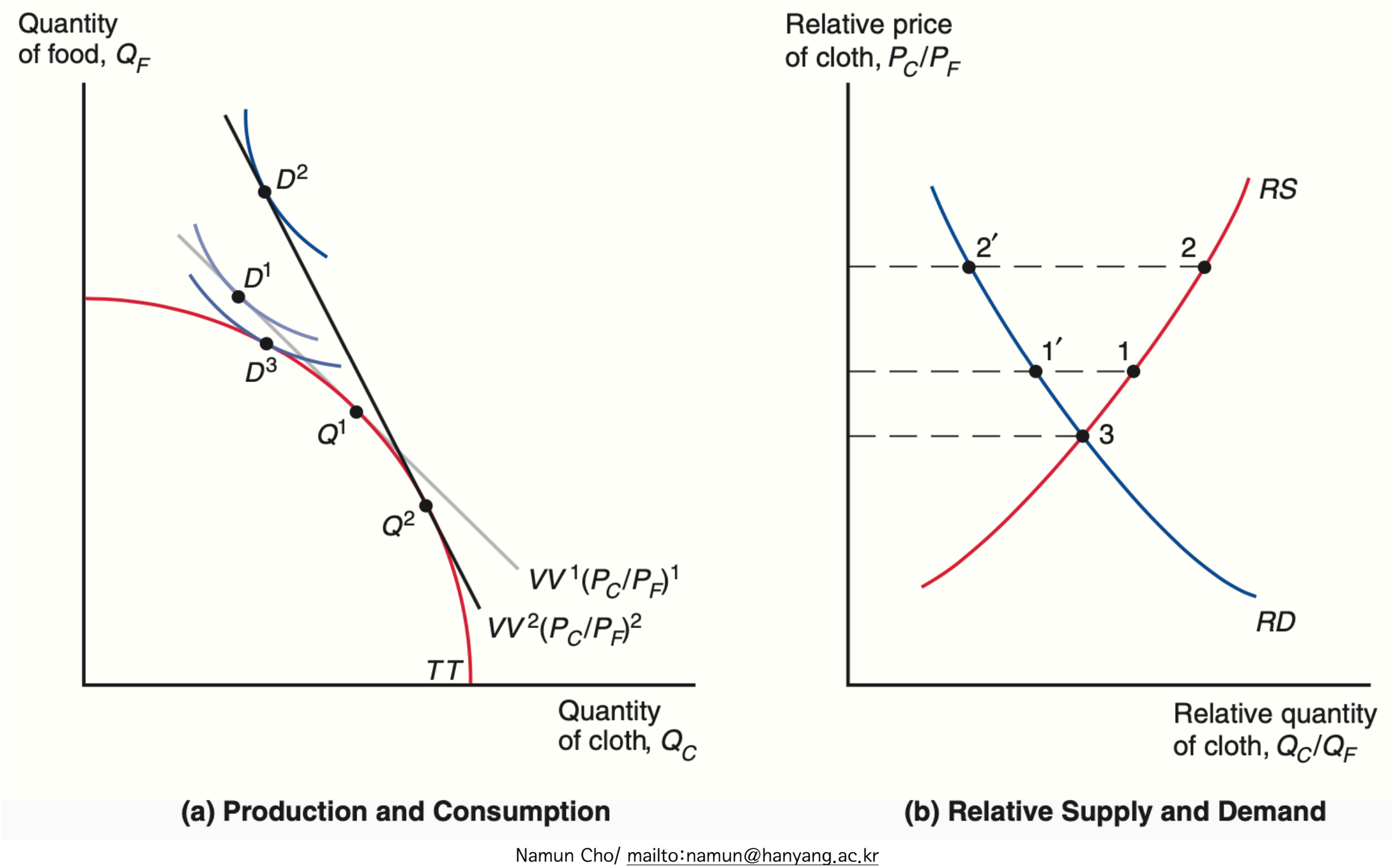


Feasible but not Efficient Indifference Curve

Change RP and Find Resulting RQ → RD curve



(a) Production and Consumption **(b) Relative Supply and Demand**

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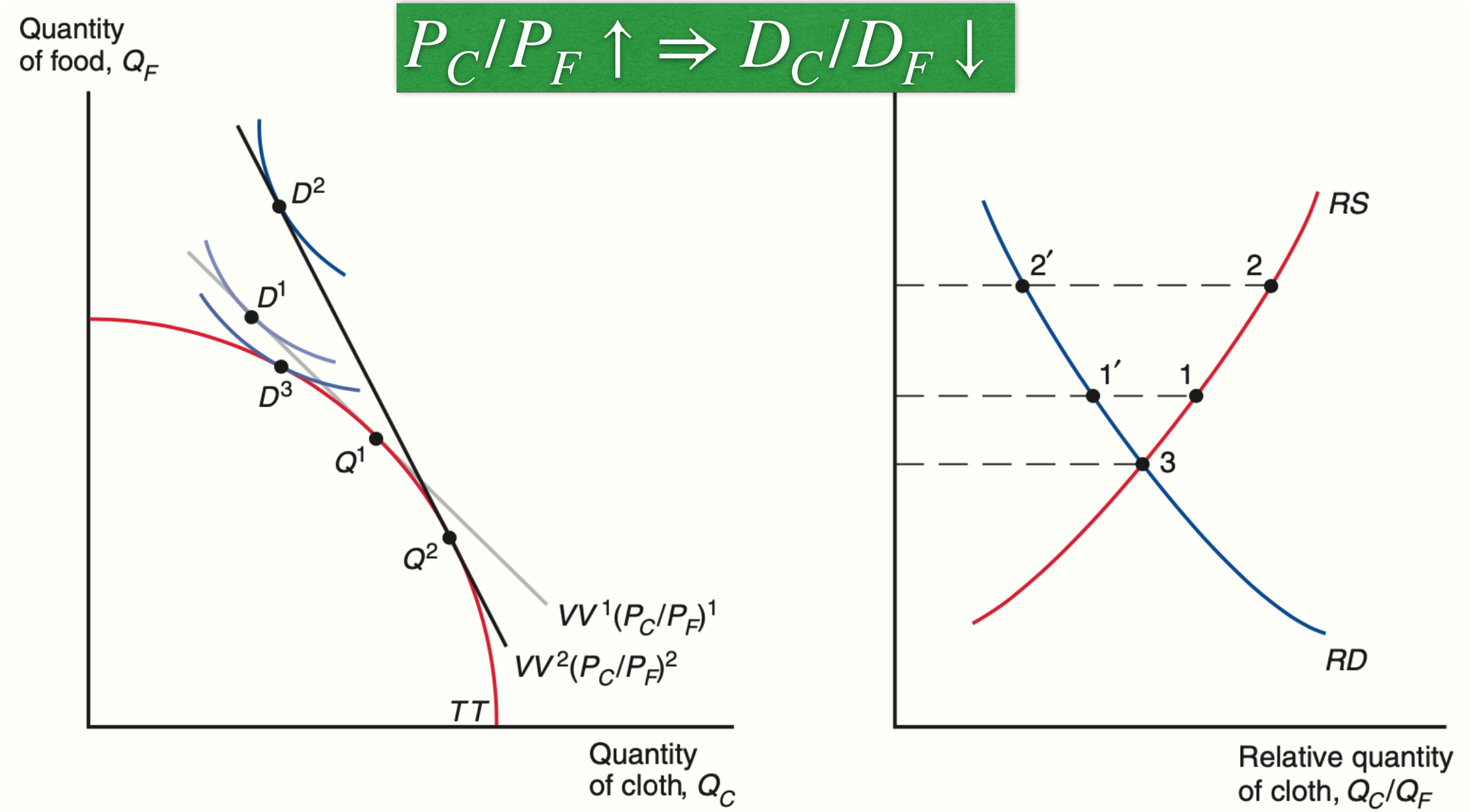

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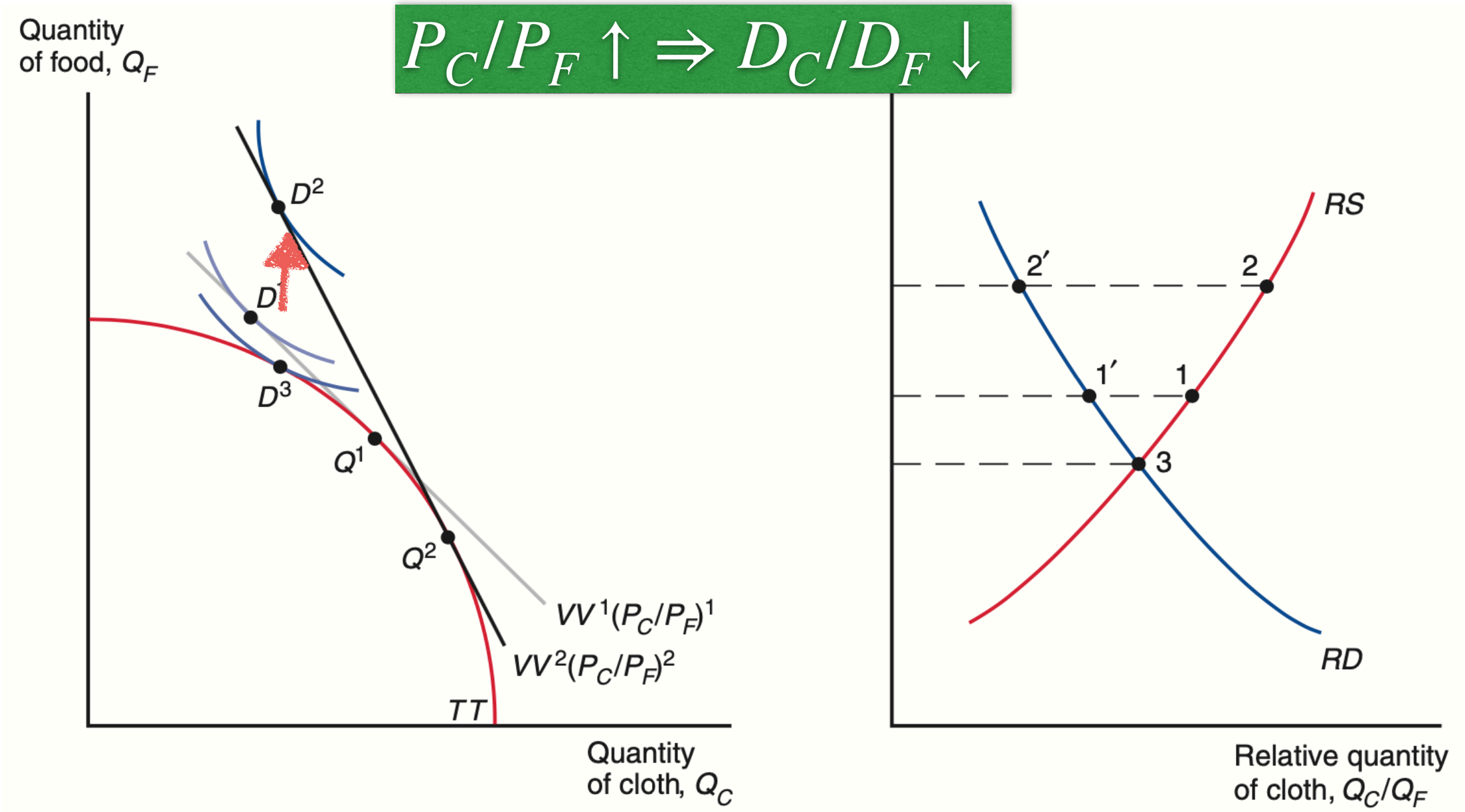

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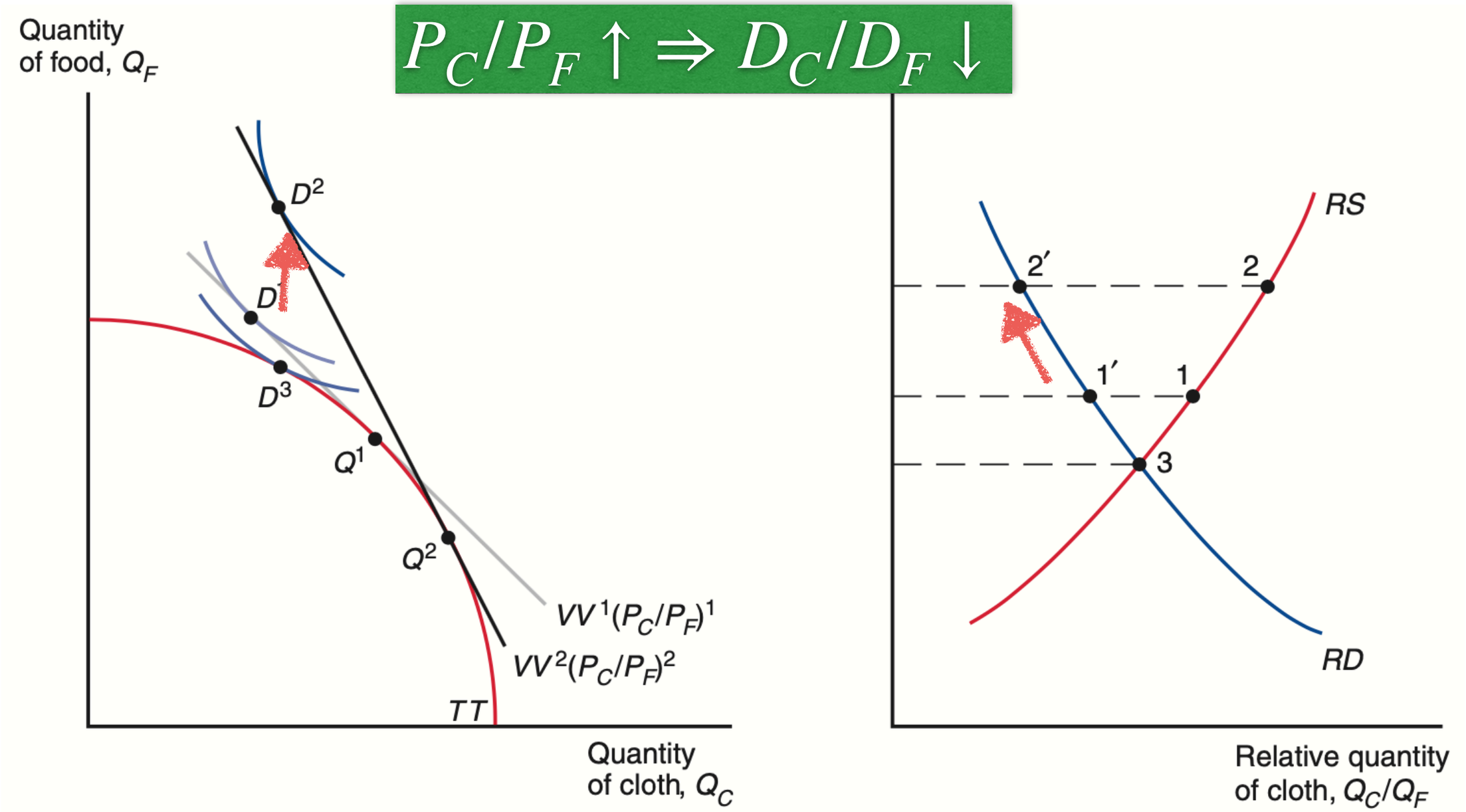
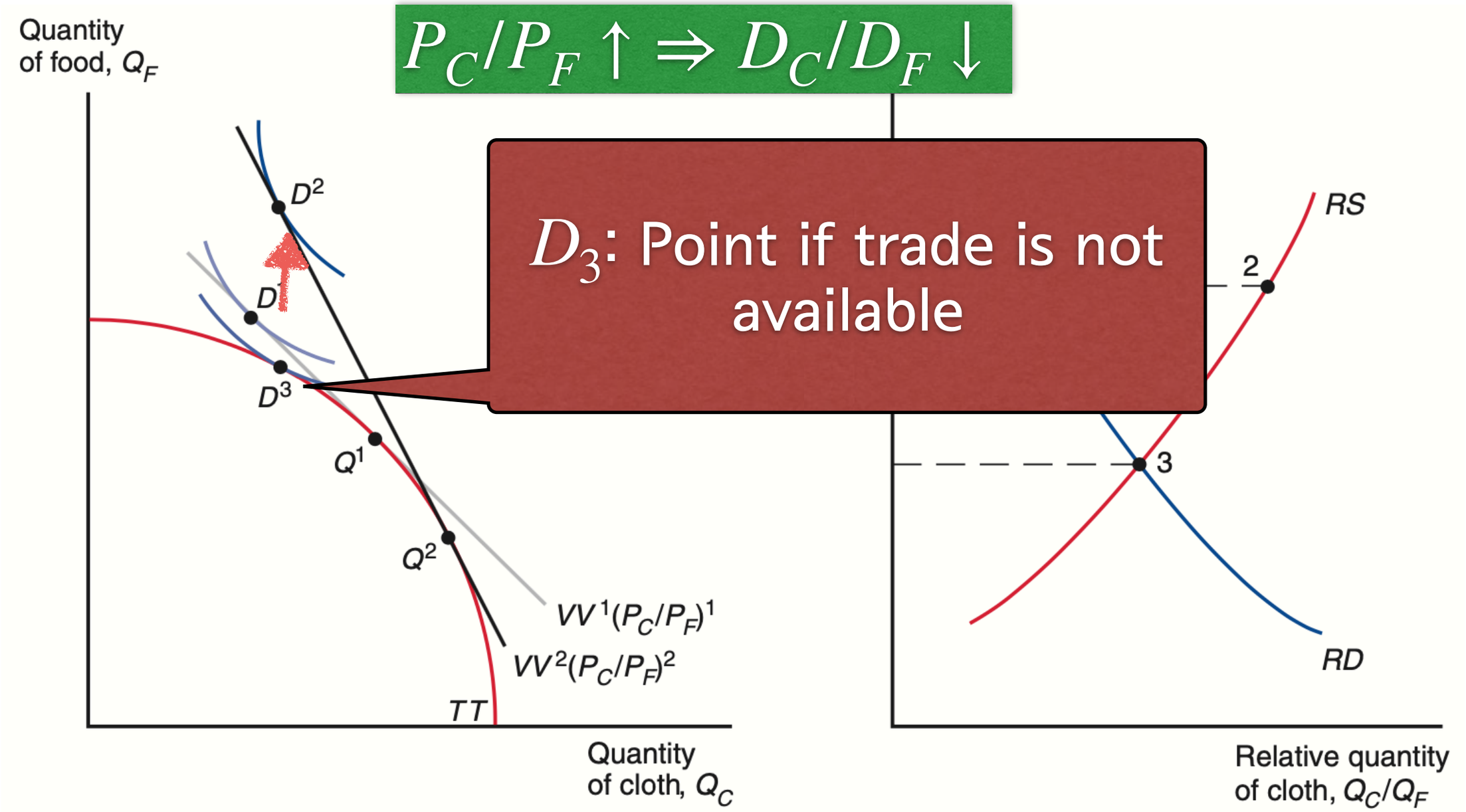


(a) Production and Consumption **(b) Relative Supply and Demand**

Change RP and Find Resulting RQ → RD curve

$P_C/P_F \uparrow \Rightarrow D_C/D_F \downarrow$

D_3: Point if trade is not available



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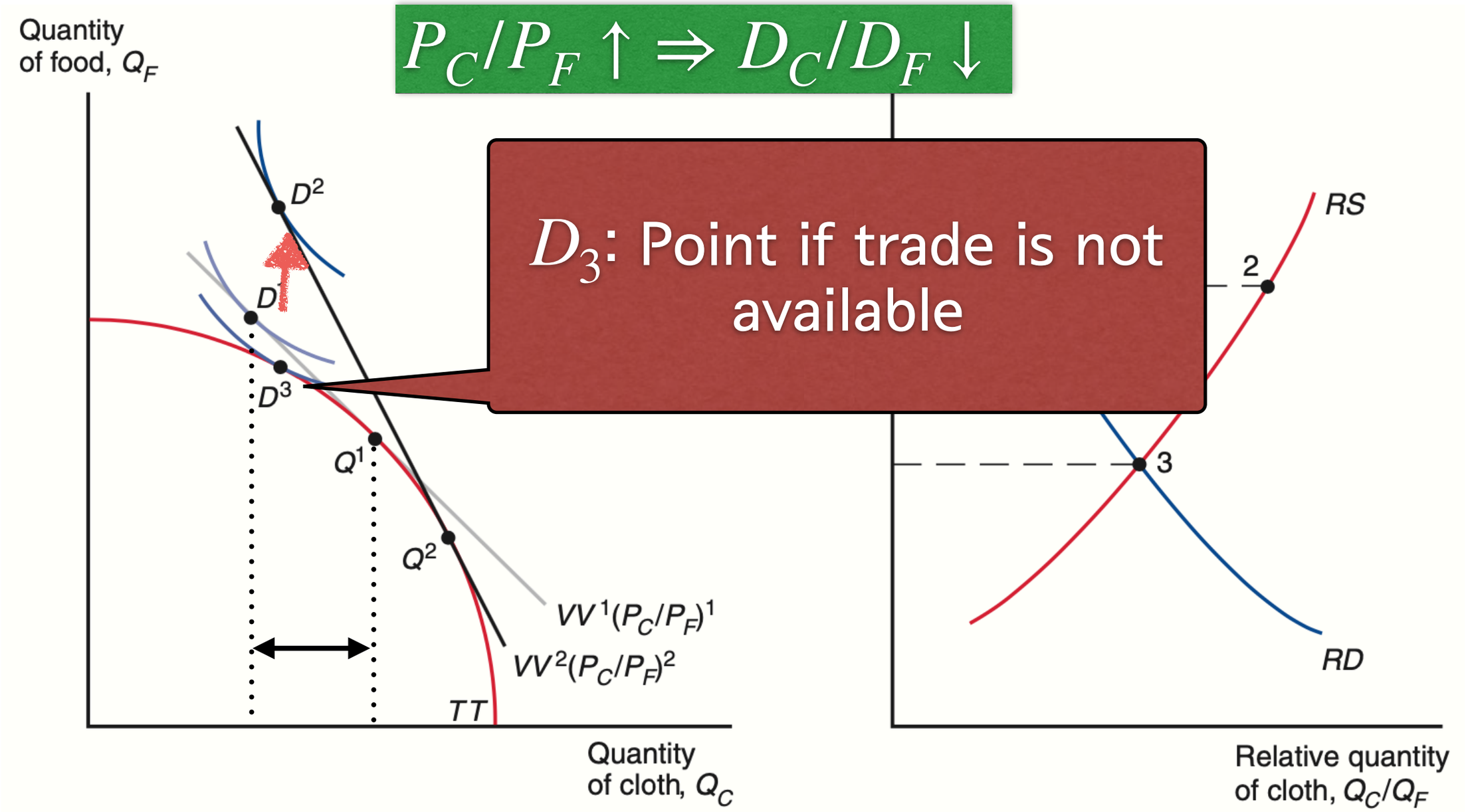

(a) Production and Consumption **(b) Relative Supply and Demand**

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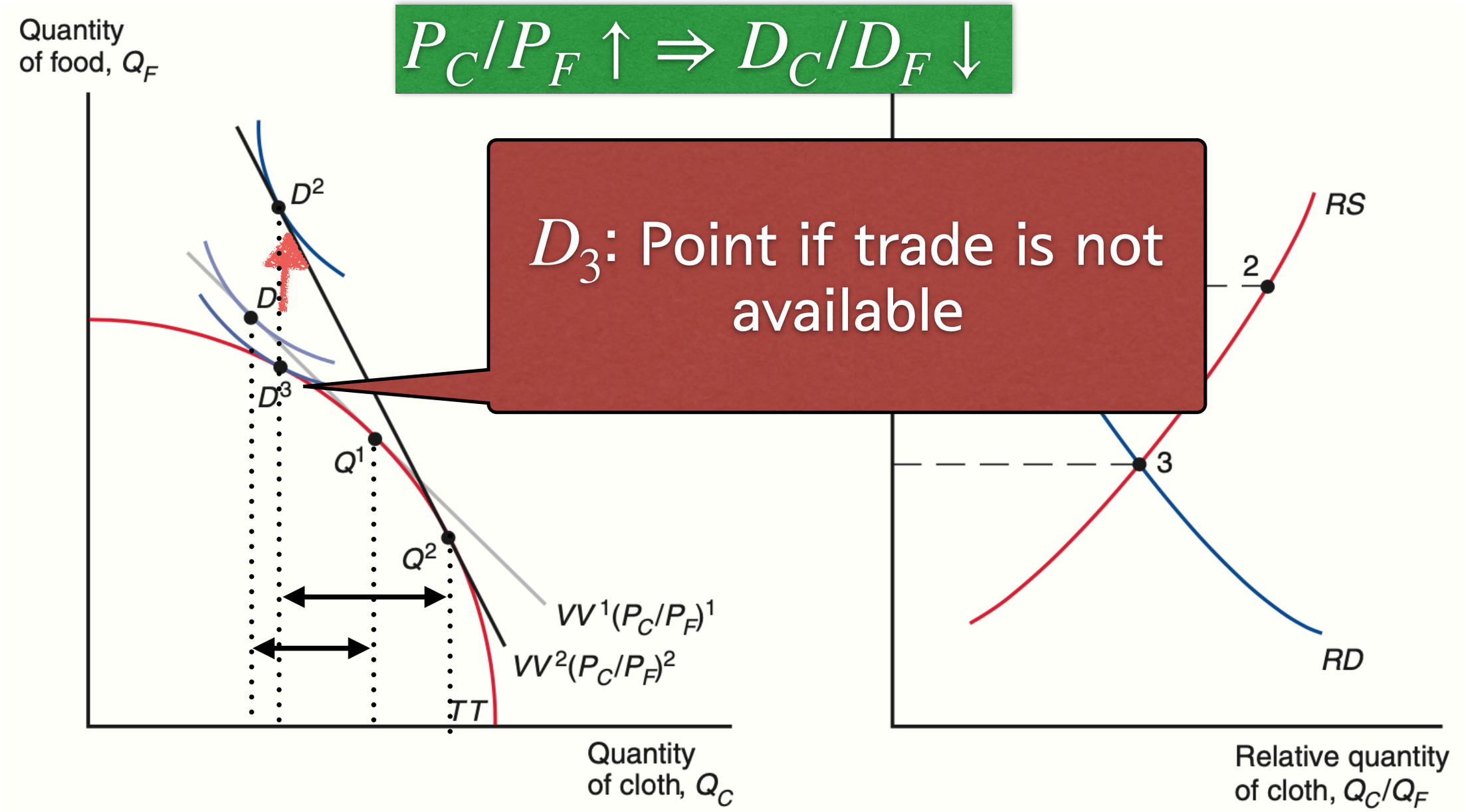

(a) Production and Consumption **(b) Relative Supply and Demand**

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Welfare Effect of Changes in Terms of Trade

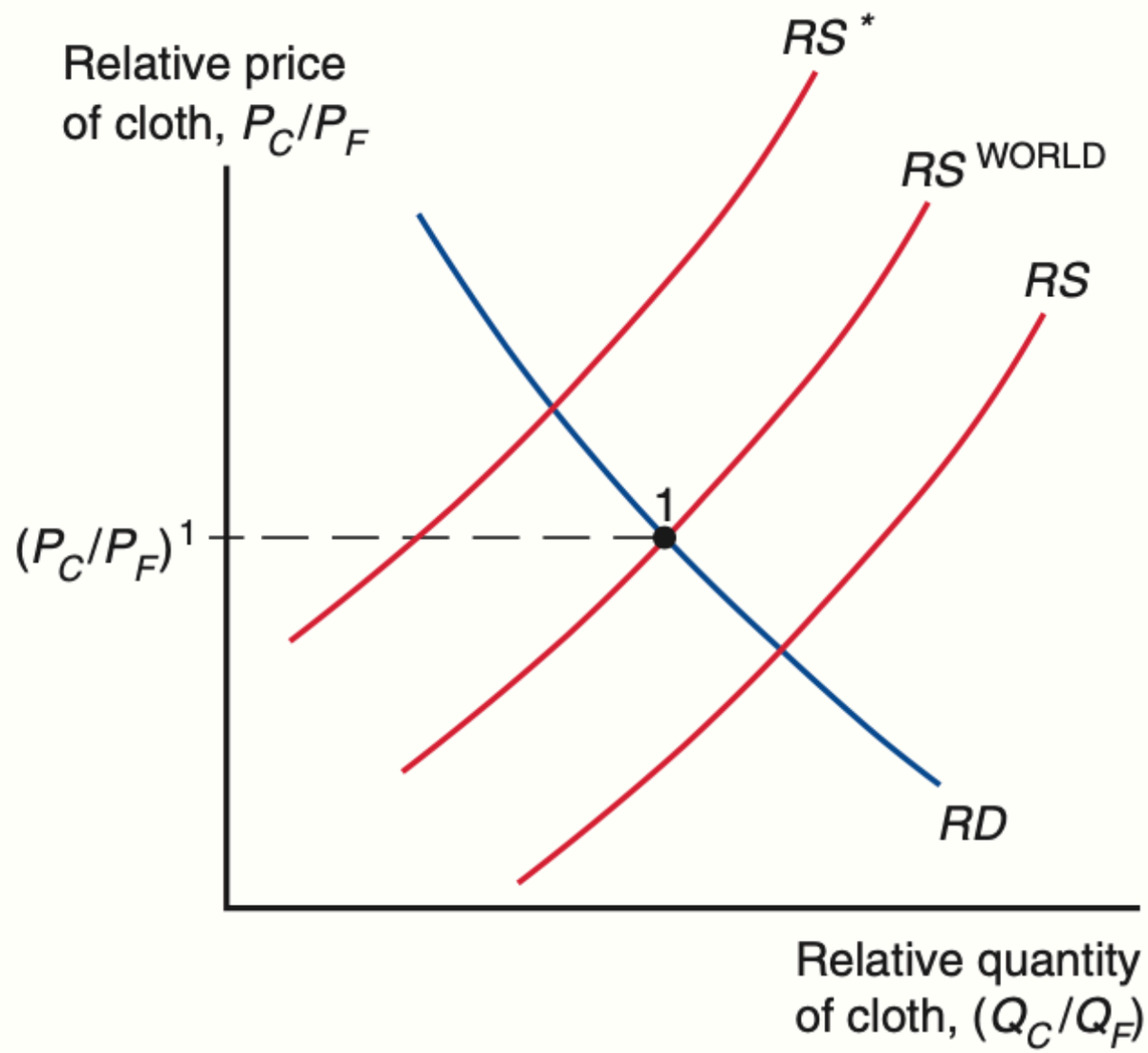
- Terms of Trade := [Price of the good a country initially exports] / [Price of the good the country initially imports]
- Terms of Trade $\uparrow \Rightarrow$ Welfare $\uparrow$
- Terms of Trade $\downarrow \Rightarrow$ Welfare $\downarrow$
  - However, the changes can never decrease the country's welfare below its welfare level in the absence of trade (D_3)

Determining Relative Price (RP)

- Home's terms of trade := P_C/P_F
  - Exporter of cloth
  - Importer of food
- Foreign's terms of trade := P_F/P_C
  - Exporter of food
  - Importer of cloth

Determinant of Terms of Trade

- Exporter and Importer is determined from each countries' production capabilities.
  - Relative Supply (RS) curve
- Additional assumption: Same preference (taste)
  - It implies same Relative Demand (RD) curve



(a) Relative Supply and Demand

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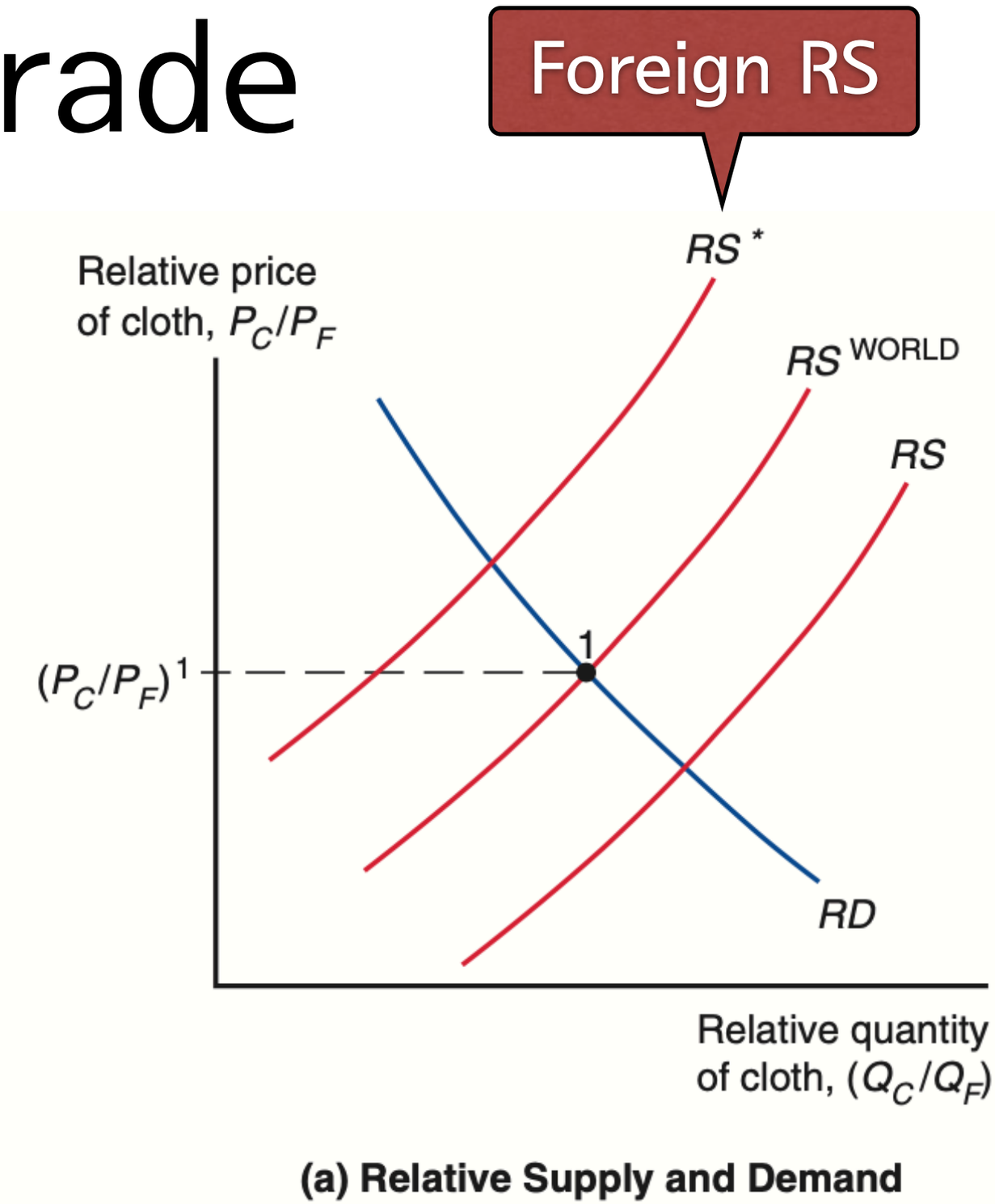

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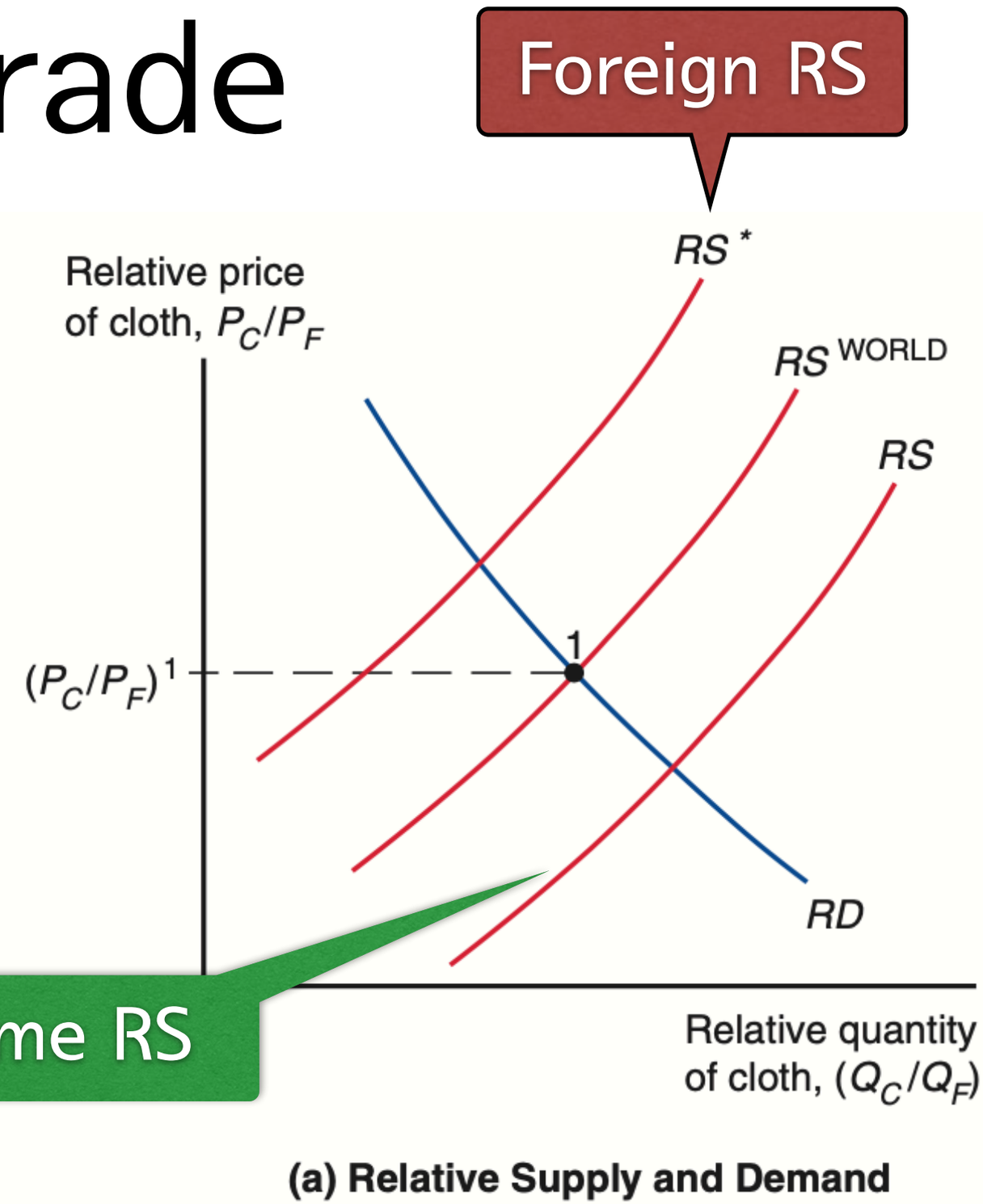

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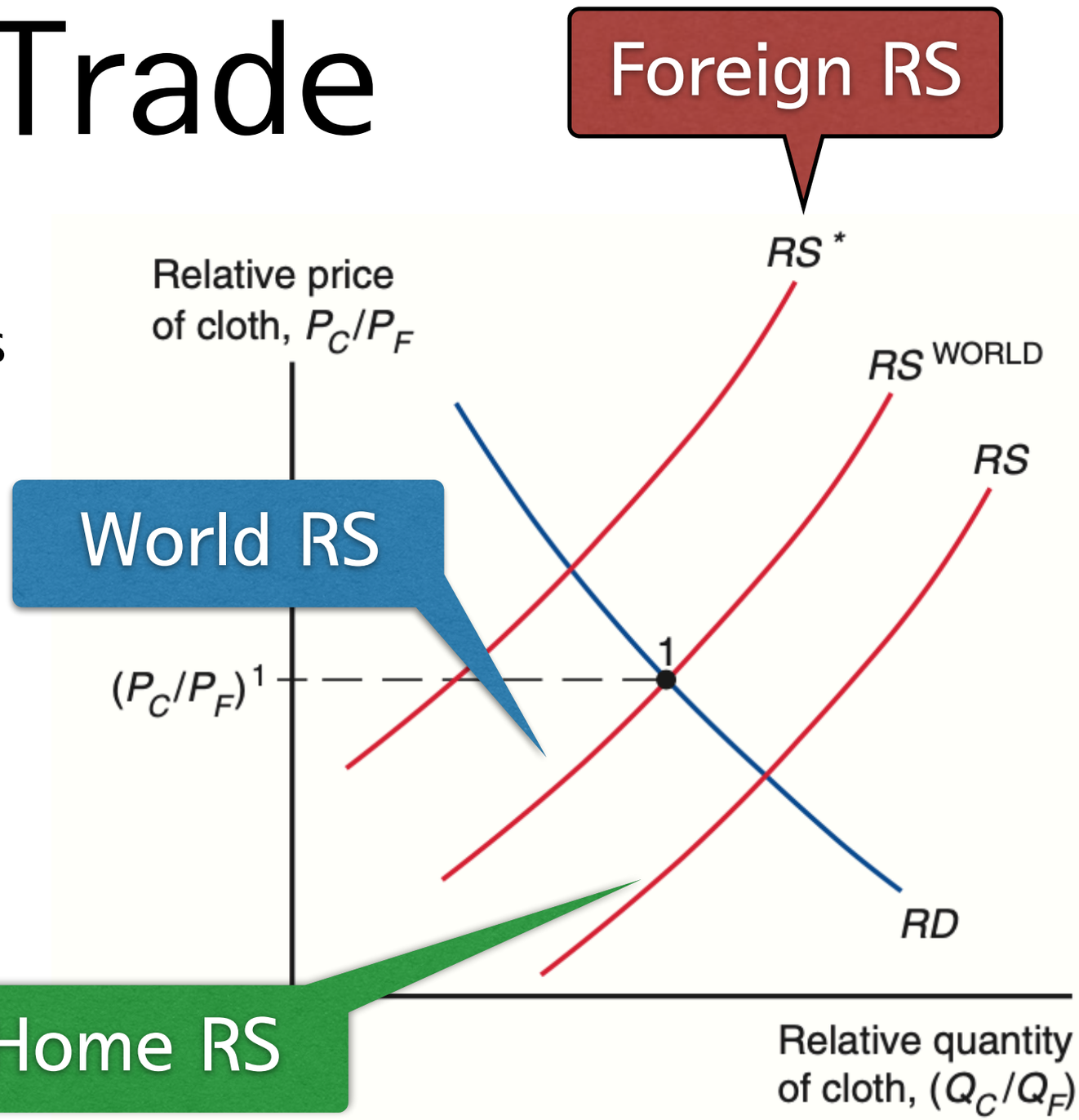
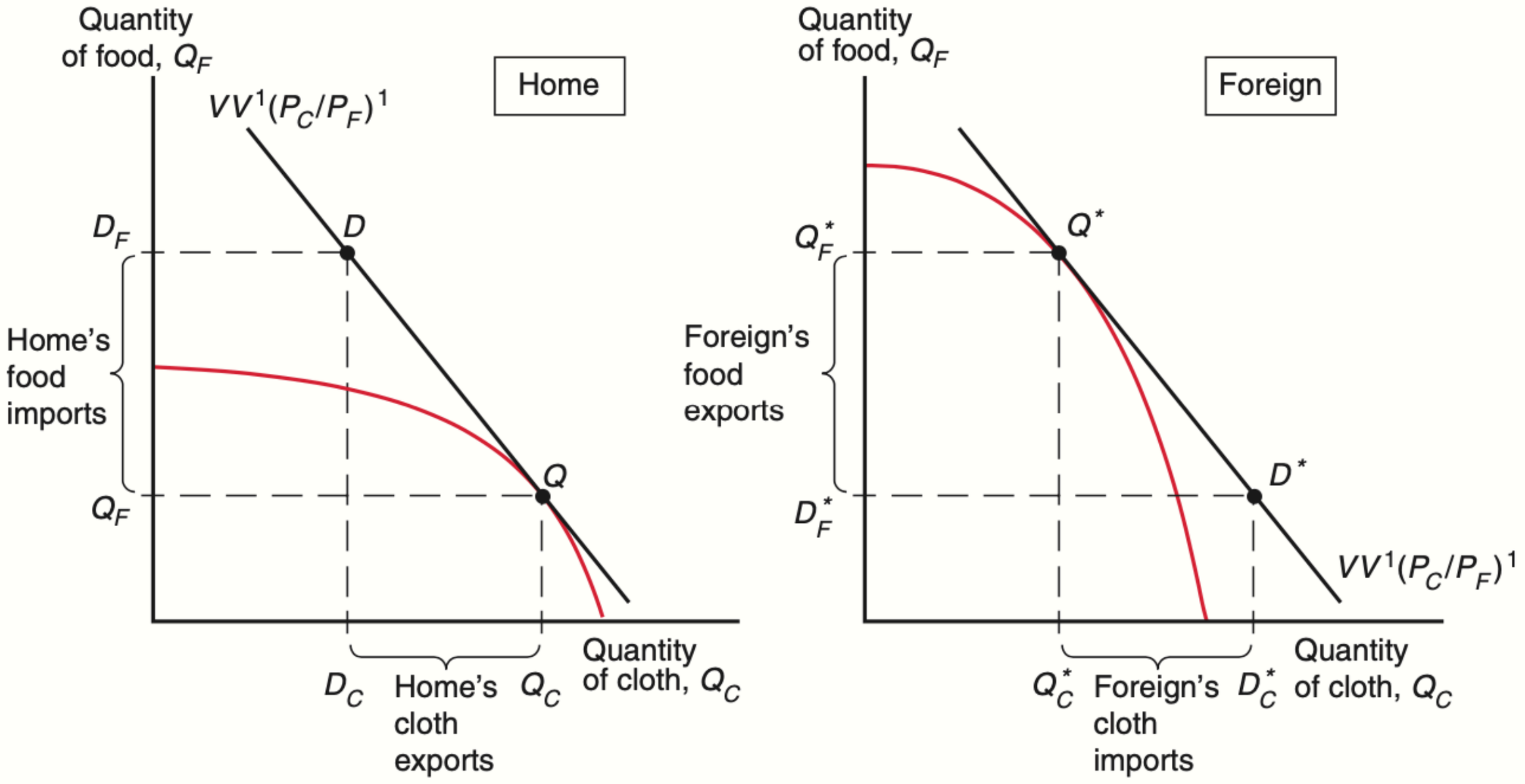


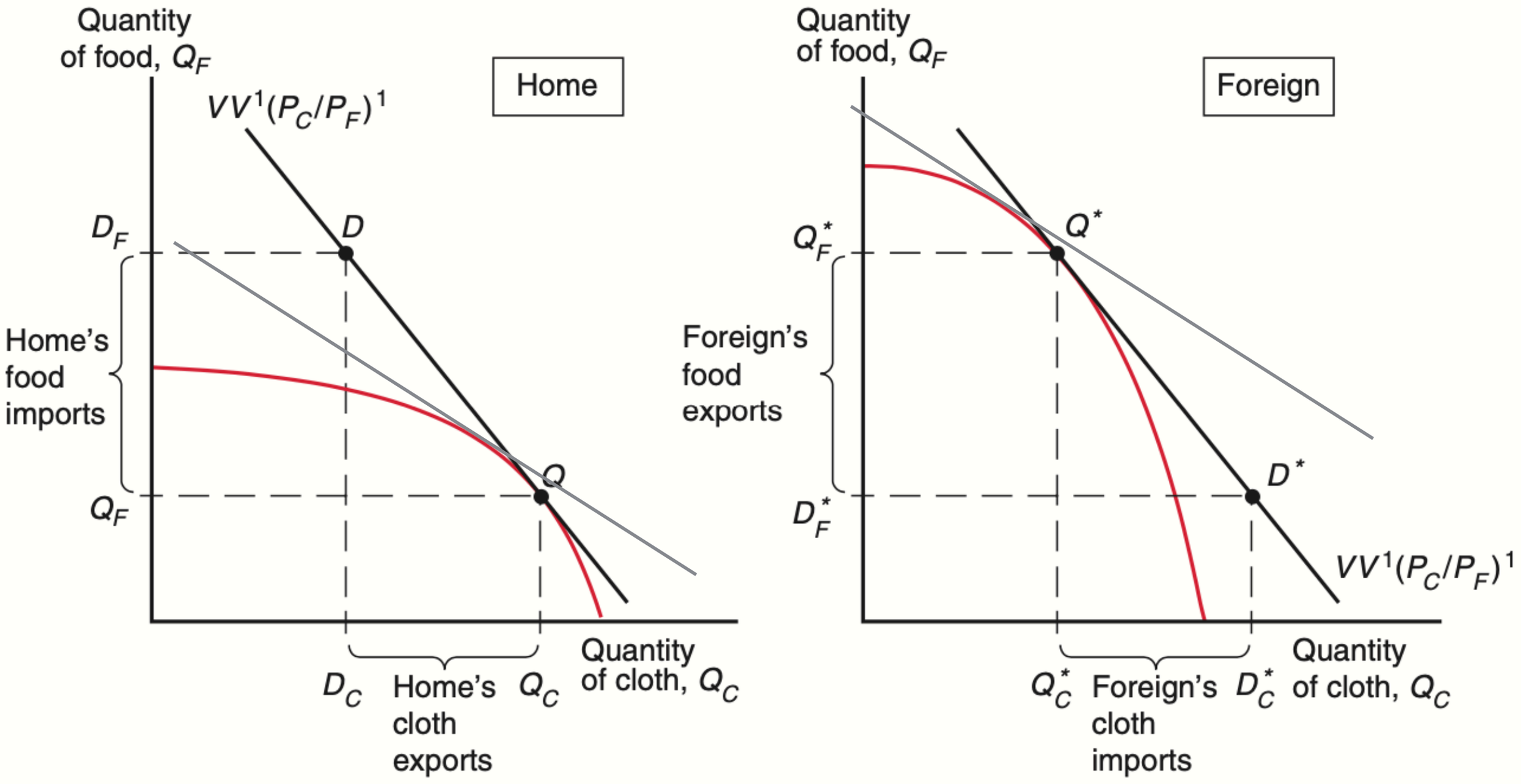
(a) Relative Supply and Demand

Equilibrium RP



(b) Production, Consumption, and Trade

Equilibrium RP



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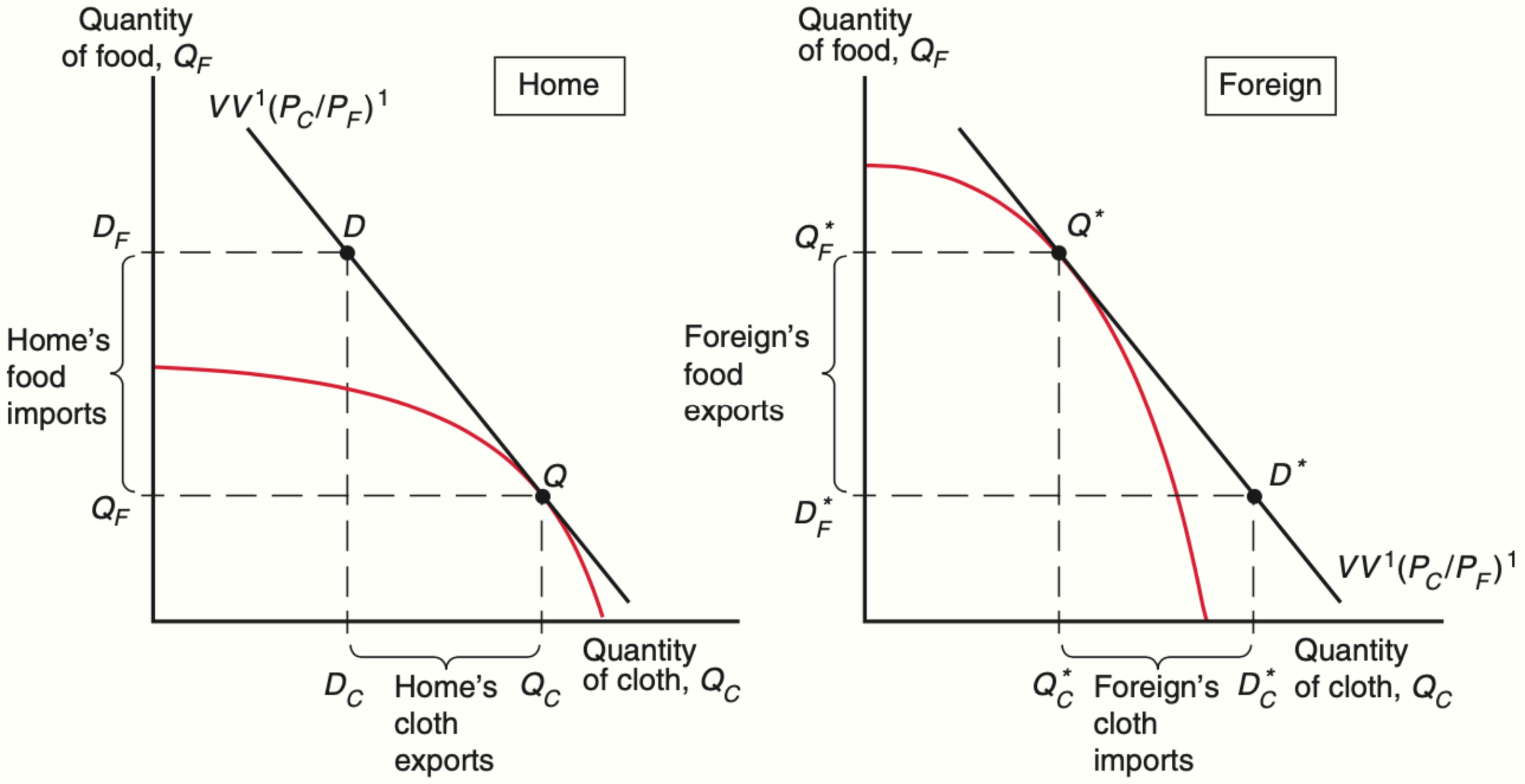

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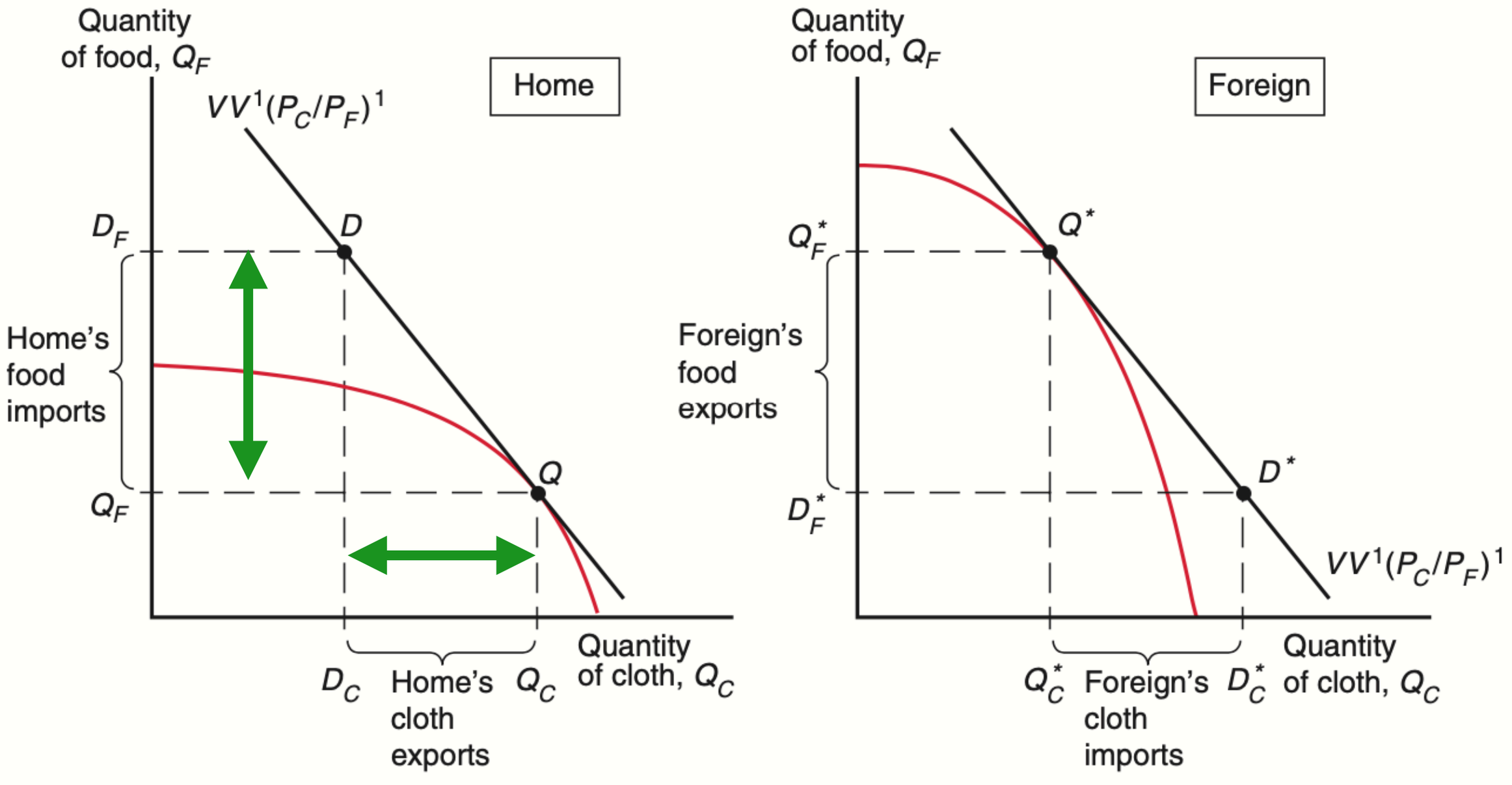
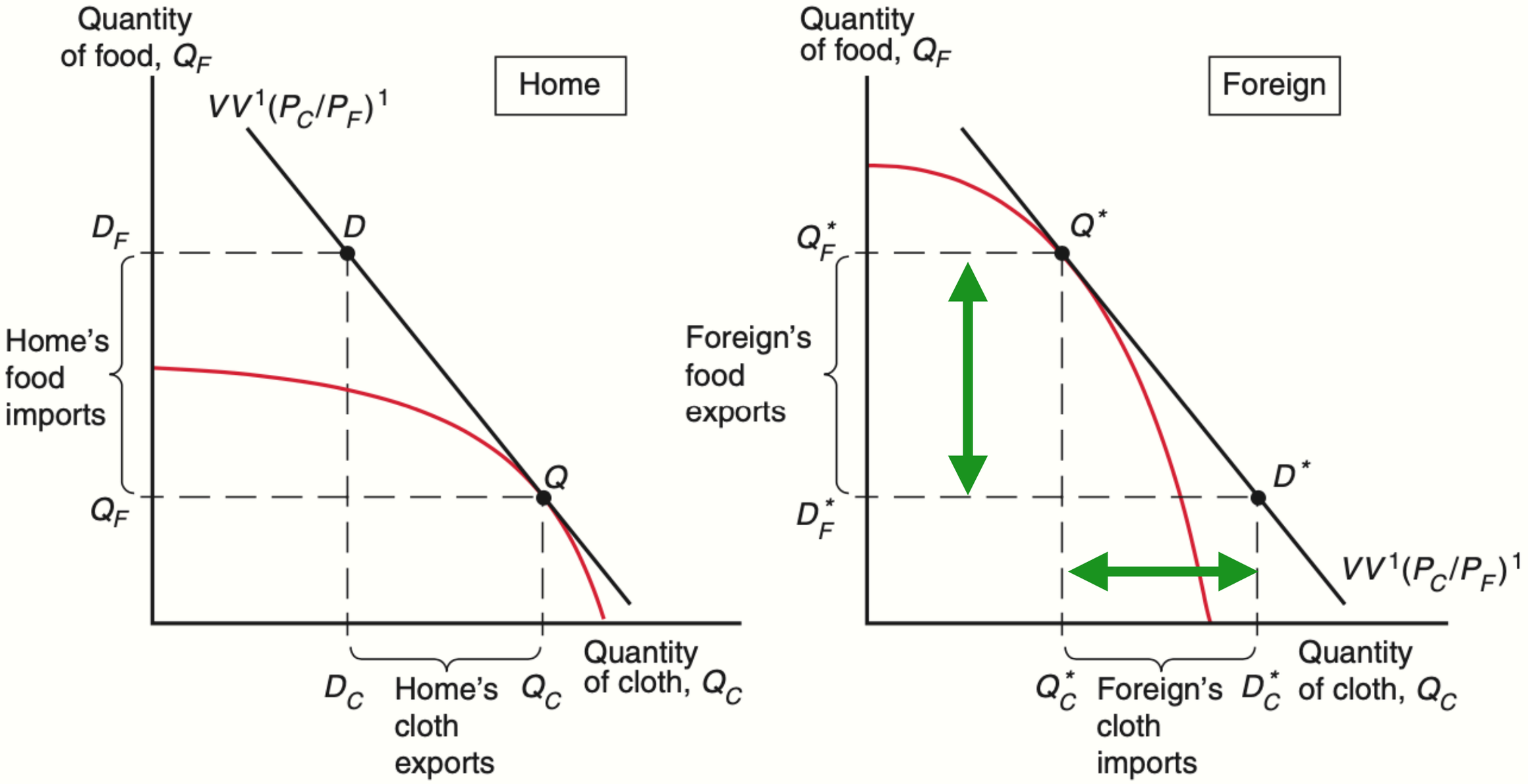


(b) Production, Consumption, and Trade

Equilibrium RP



(b) Production, Consumption, and Trade

The Effects of Economic Growth

- Economic Growth ⇒ RS shift
- Economic Growth ⇒ PPF expansion
- World RS and the Terms of Trade
- International Effects of Growth

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Questions

- Is economic growth in other countries good or bad for our nation?
  - Good: It can mean larger markets for out exports and lower price of our imports
  - Bad: It can mean increased competition for our exporters and domestic producers
- Is growth in a country more or less valuable when that nations part of closely integrated world economy?
  - Good: It can be more valuable because that country can sell more products to the world market
  - Bad: The benefits of growth may be passed on to foreigners in the form of lower prices

Questions

By STM, we can answer these questions

- Is economic growth in other countries good or bad for our nation?
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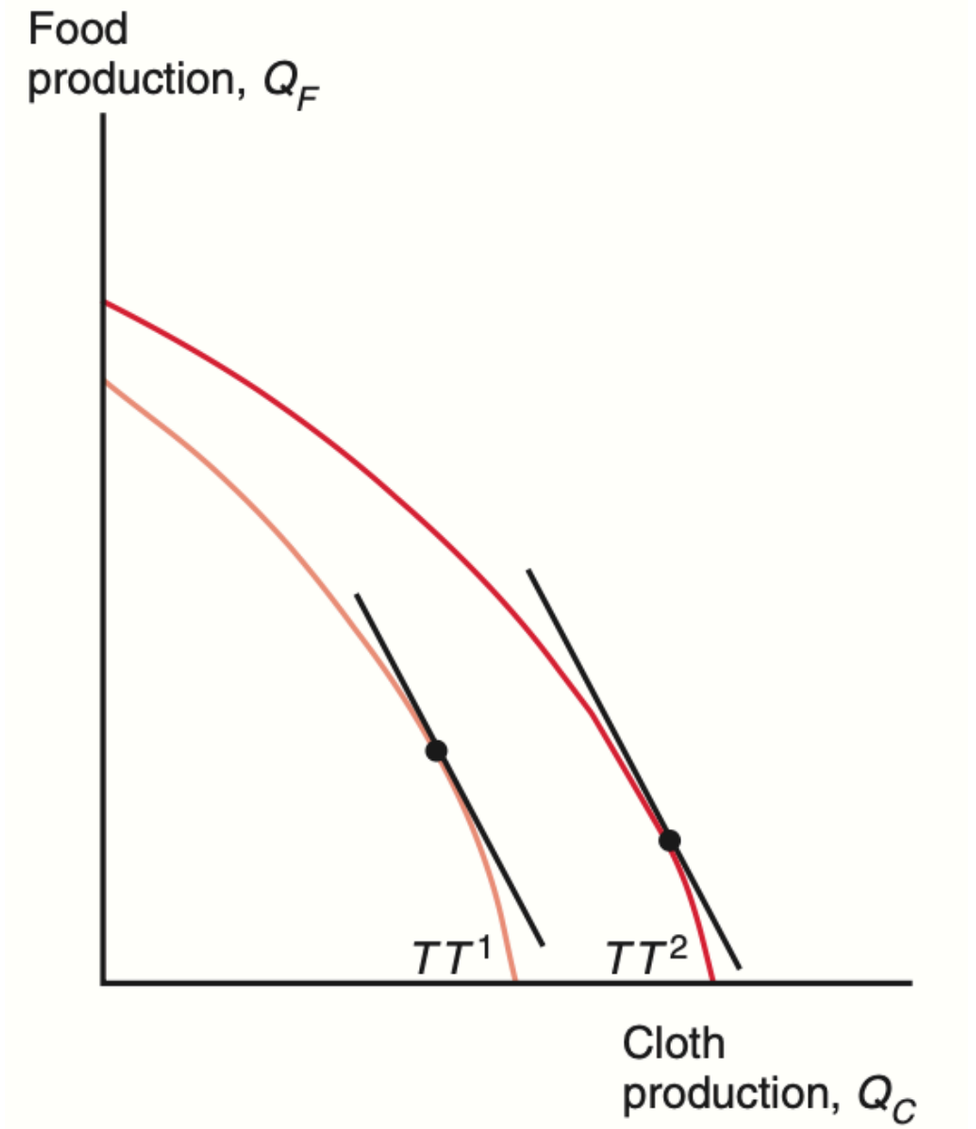
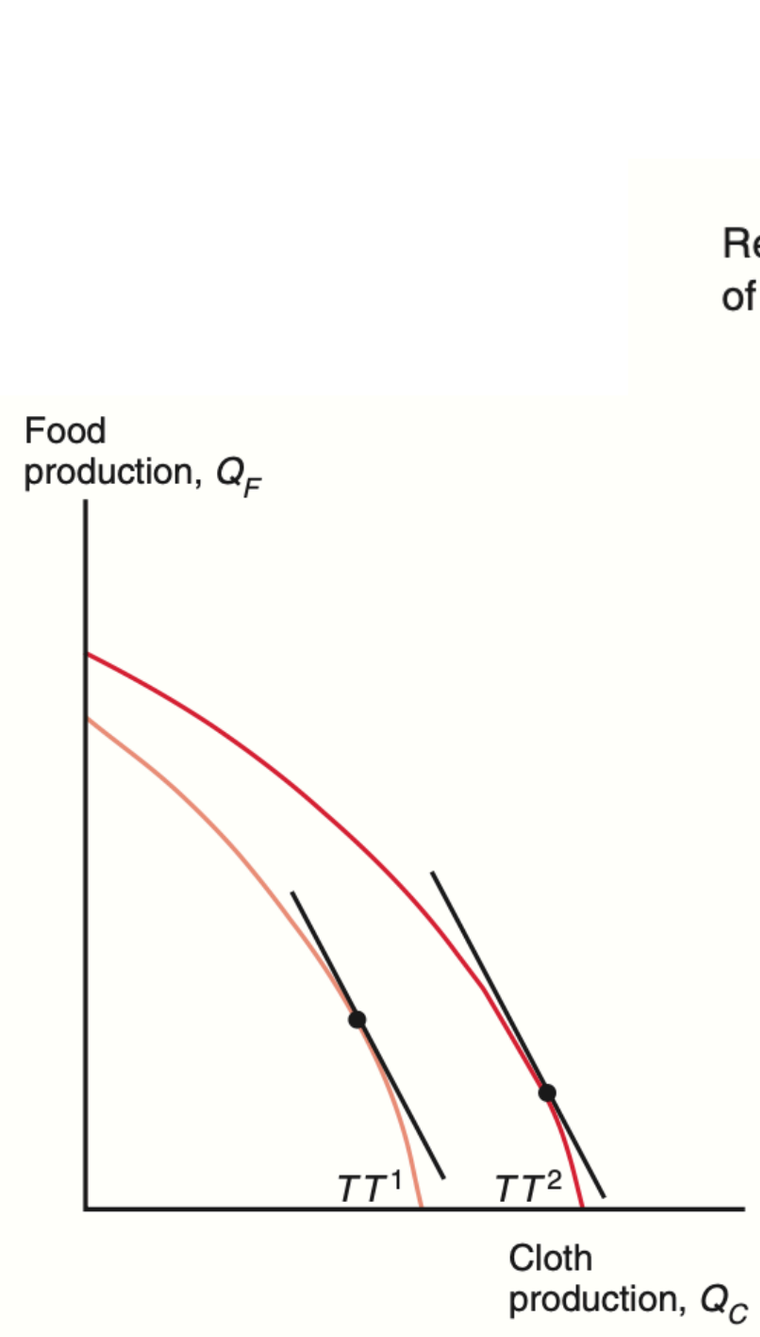
Growth and the Production Possibility Frontier (PPF)

- Economic Growth = Outward shift of PPF
- Biased growth: PPF shifts out more than one direction than in the other
  - Ricardian model (Ch3)
  - H-O model (Ch5)



(a) Growth biased toward cloth

Biased Growth
⇒ RS shift



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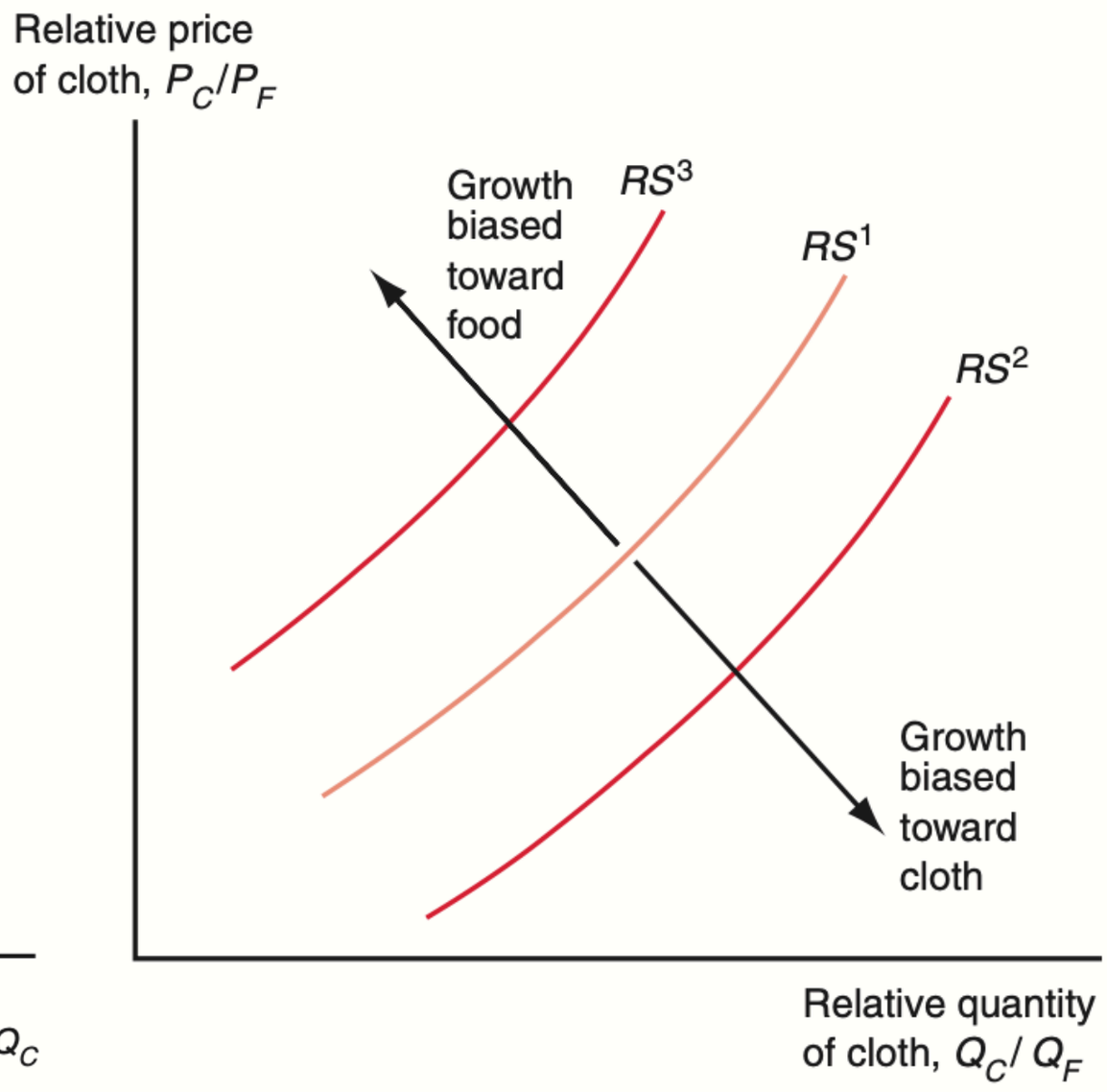
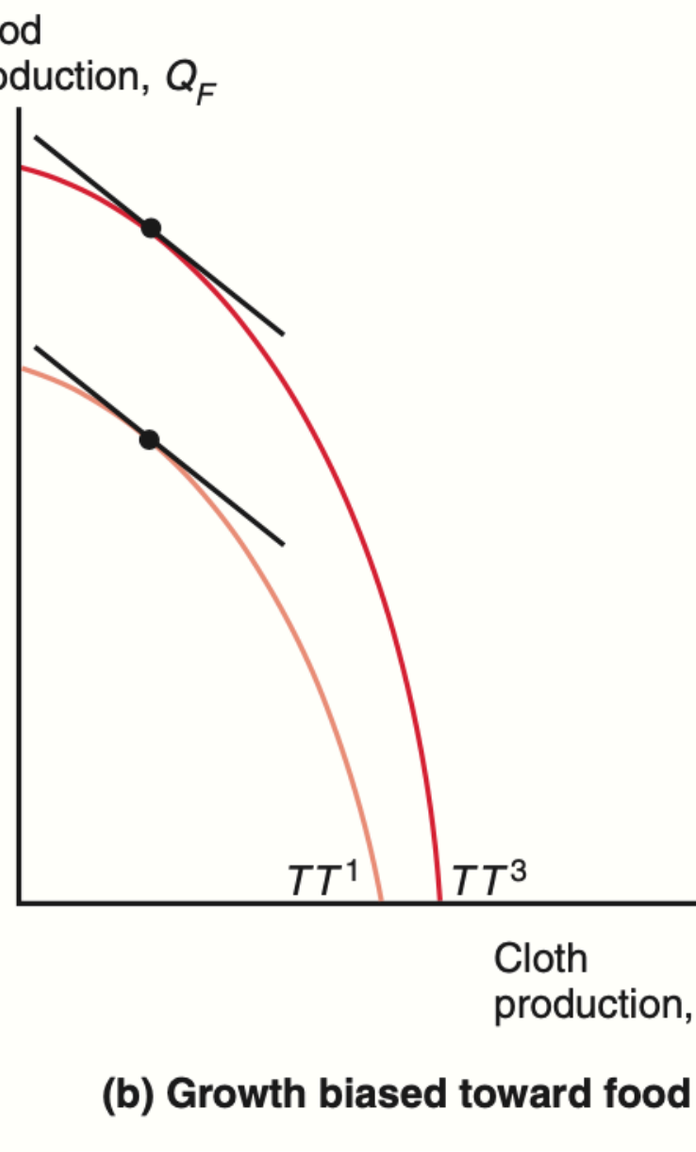
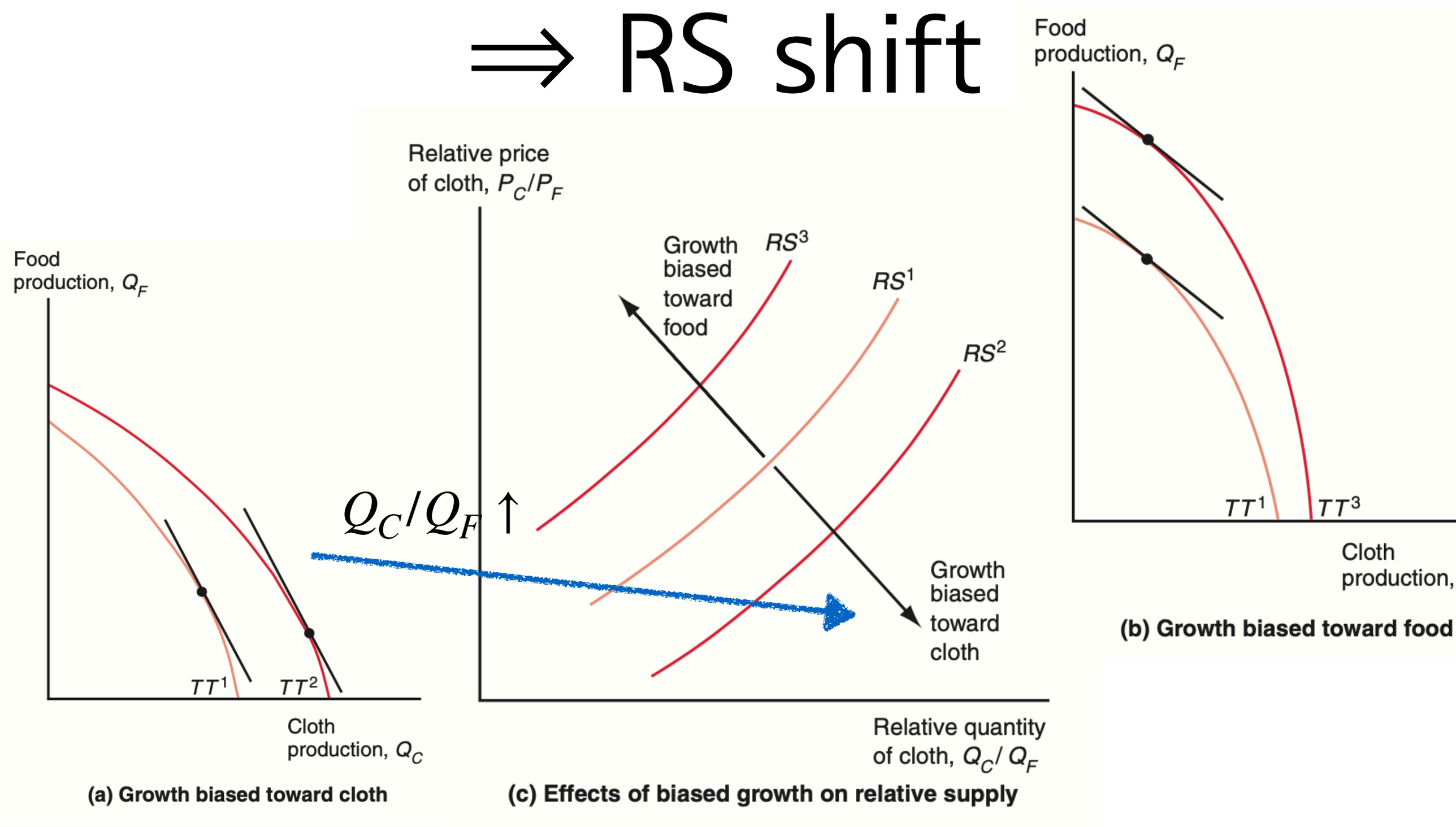


(c) Effects of biased growth on relative supply



(b) Growth biased toward food

Biased Growth
⇒ RS shift

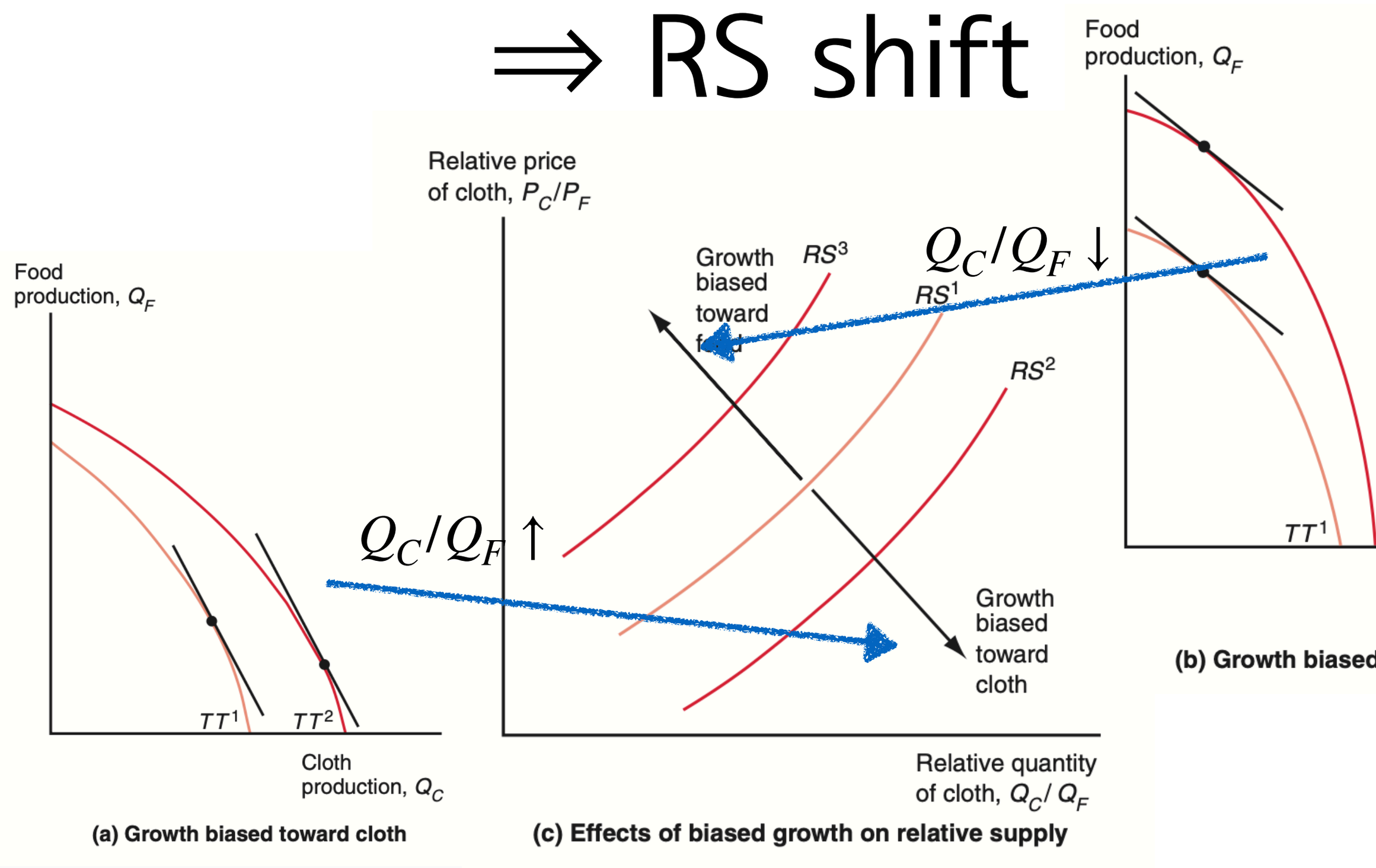


(a) Growth biased toward cloth

(c) Effects of biased growth on relative supply

(b) Growth biased toward food

Biased Growth
$\Rightarrow$ RS shift



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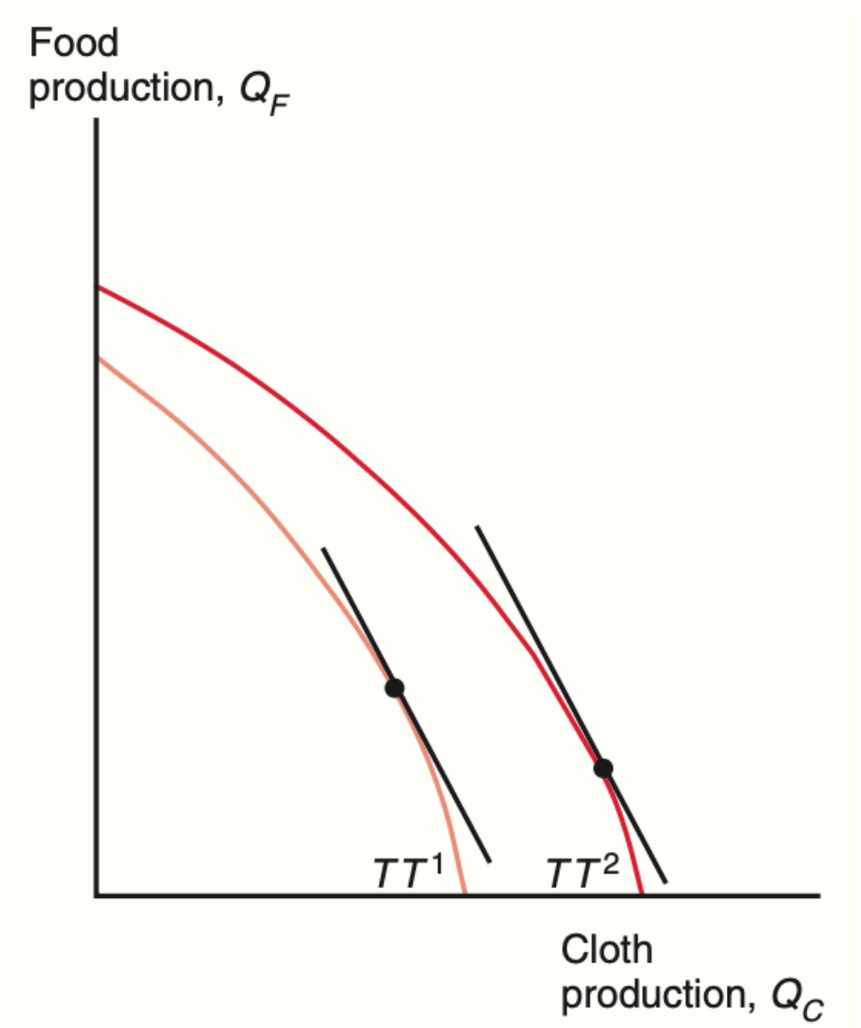
Two Types of Biased Growth

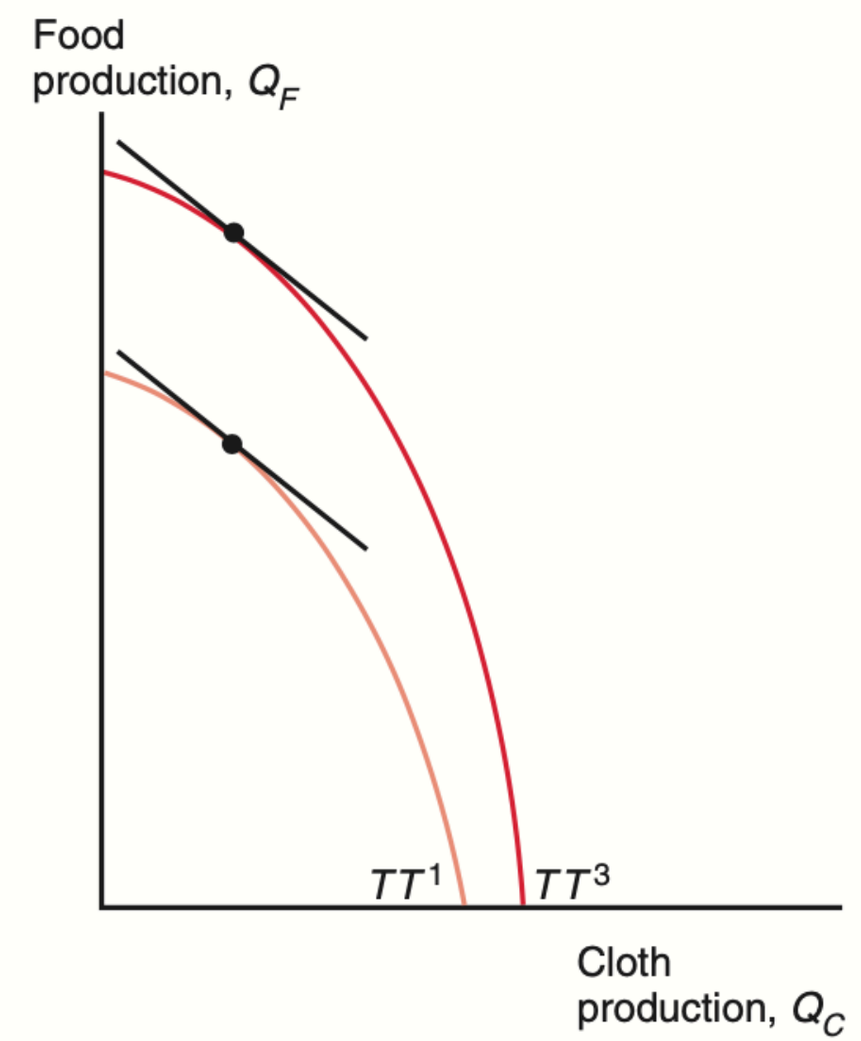
- Export-biased growth:
  - Growth that disproportionately expands a country's production possibilities in the direction of the good it EXPORTs
- Import-biased growth:
  - Growth biased toward the good a country IMPORTs

For Home Country: (cloth exporter, food importer)



(a) Growth biased toward cloth

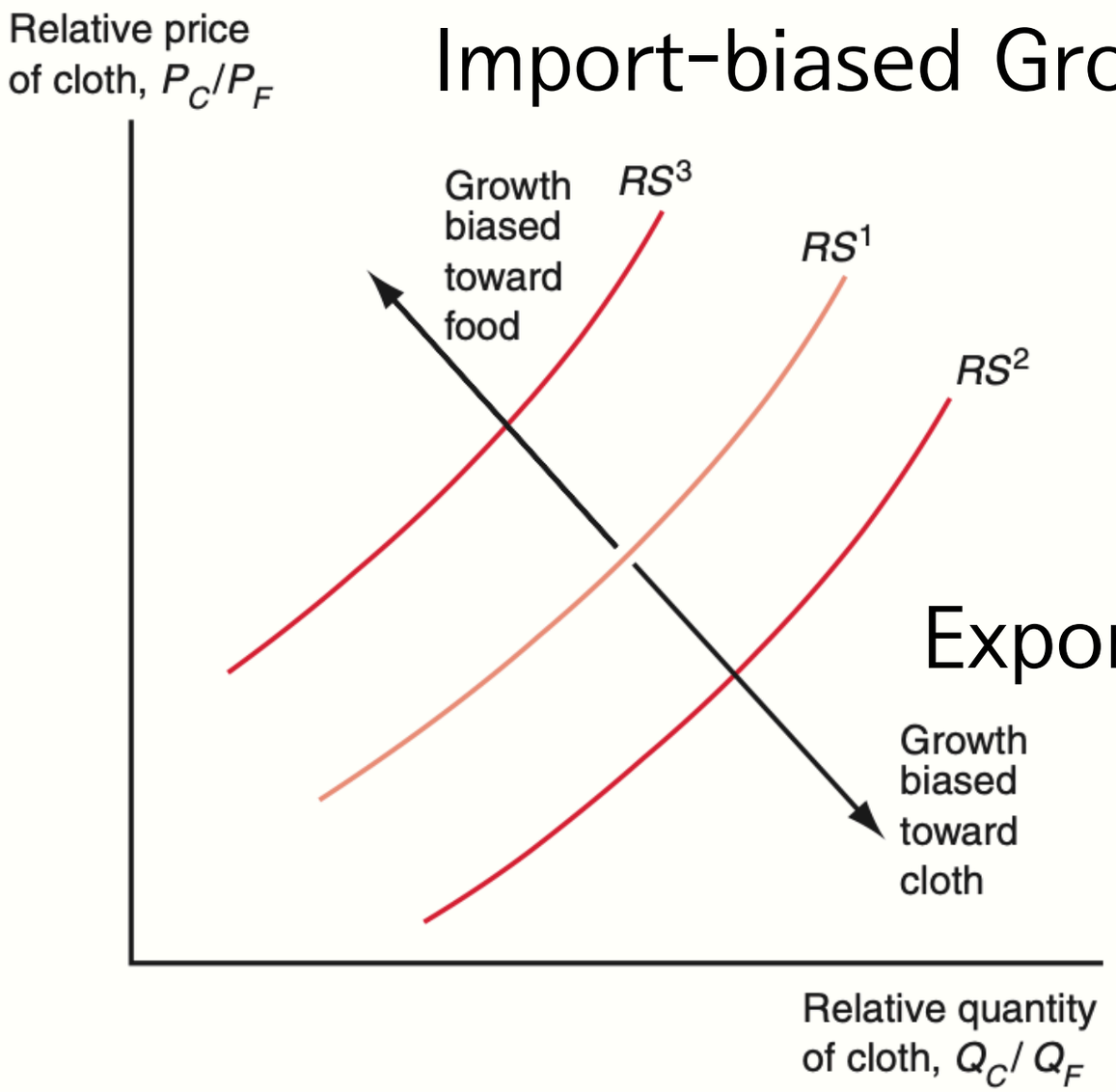
Export-biased Growth



(b) Growth biased toward food

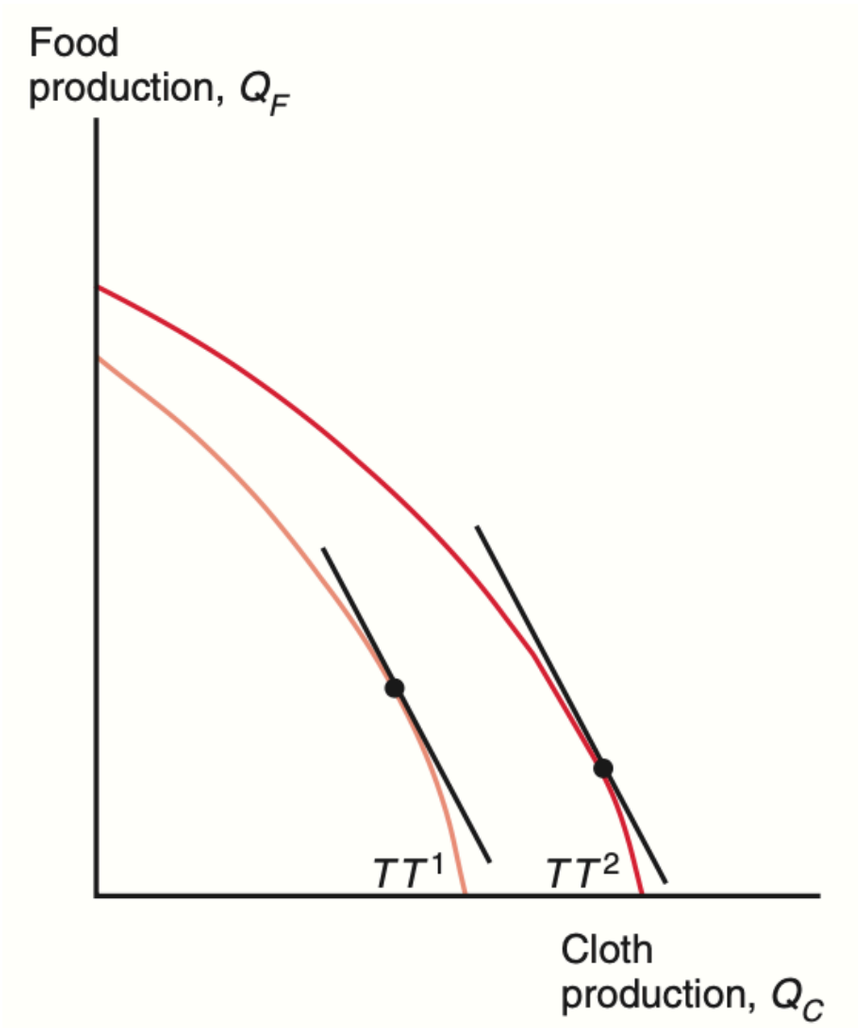
Import-biased Growth

For Home Country: (cloth exporter, food importer)



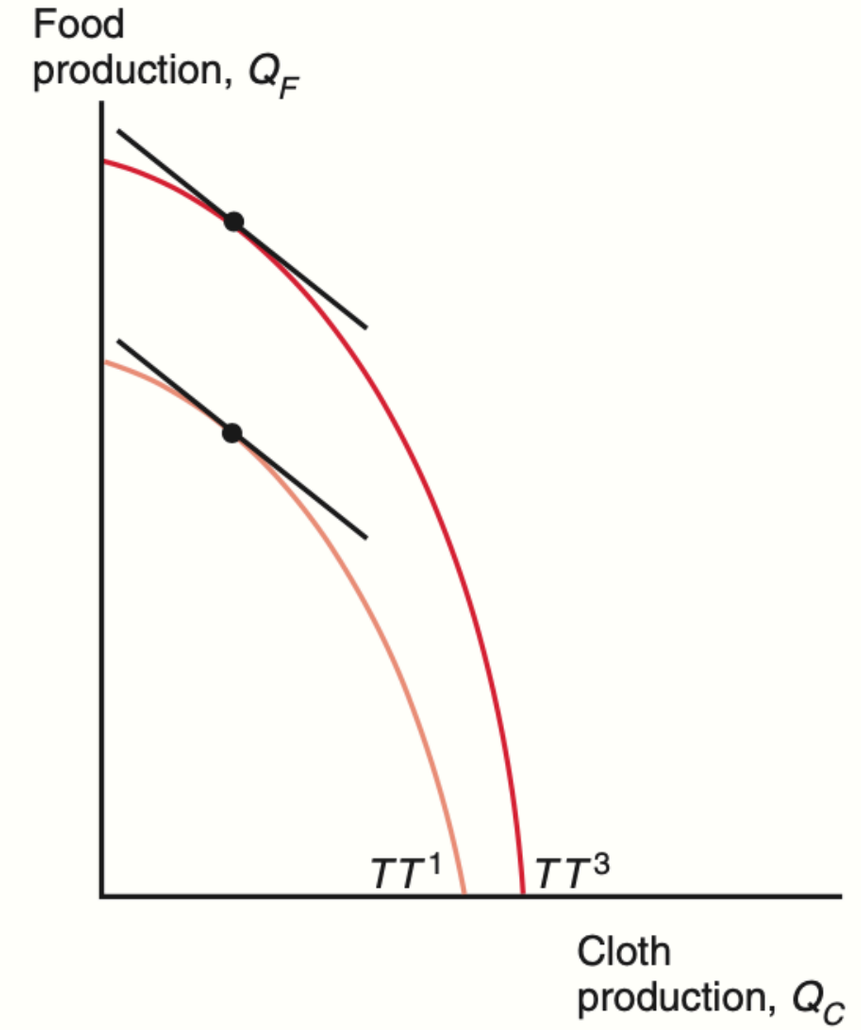
(c) Effects of biased growth on relative supply

For Foreign Country: (food exporter, cloth importer)



(a) Growth biased toward cloth

Import-biased Growth

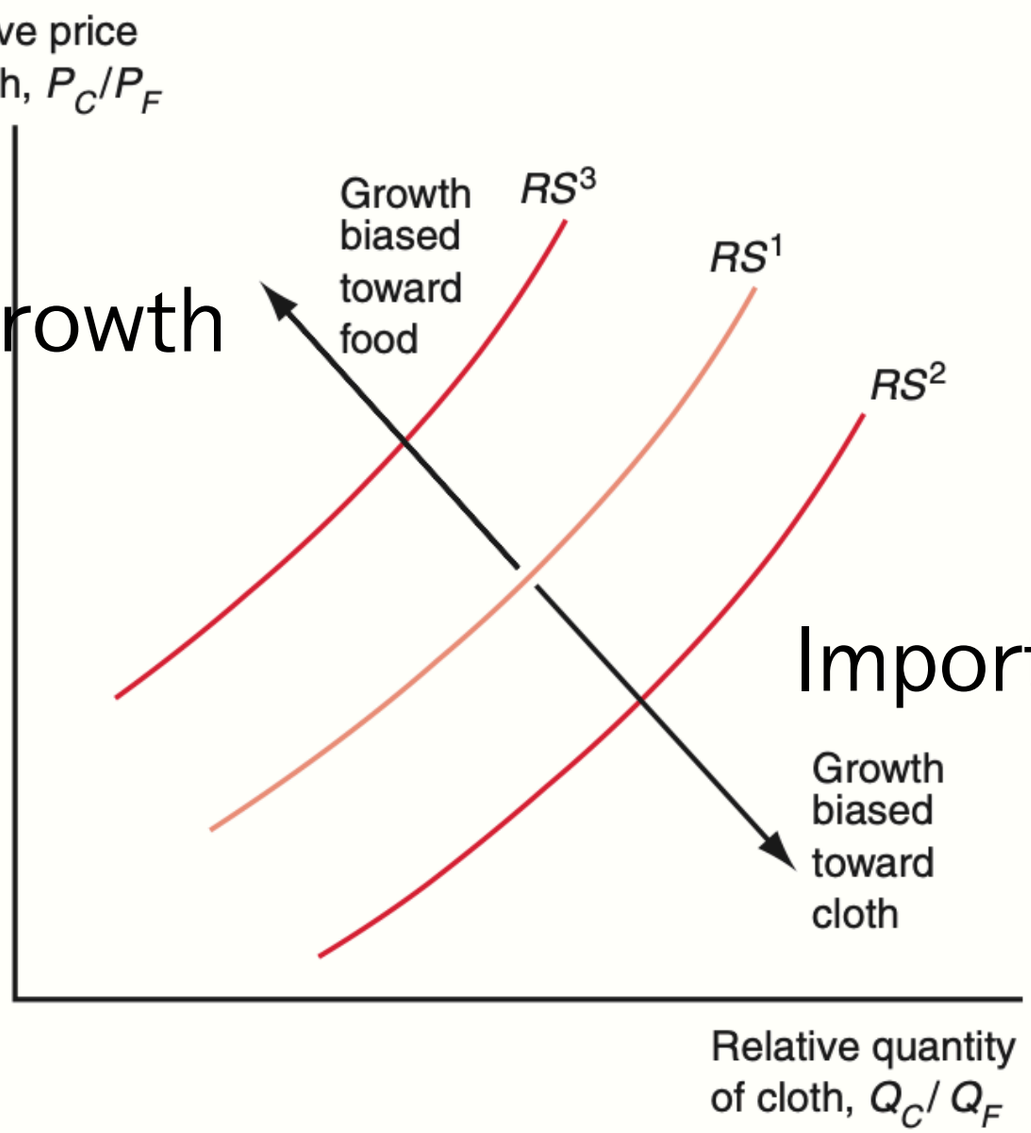


(b) Growth biased toward food

Export-biased Growth

For Foreign Country: (food exporter, cloth importer)

Export-biased Growth

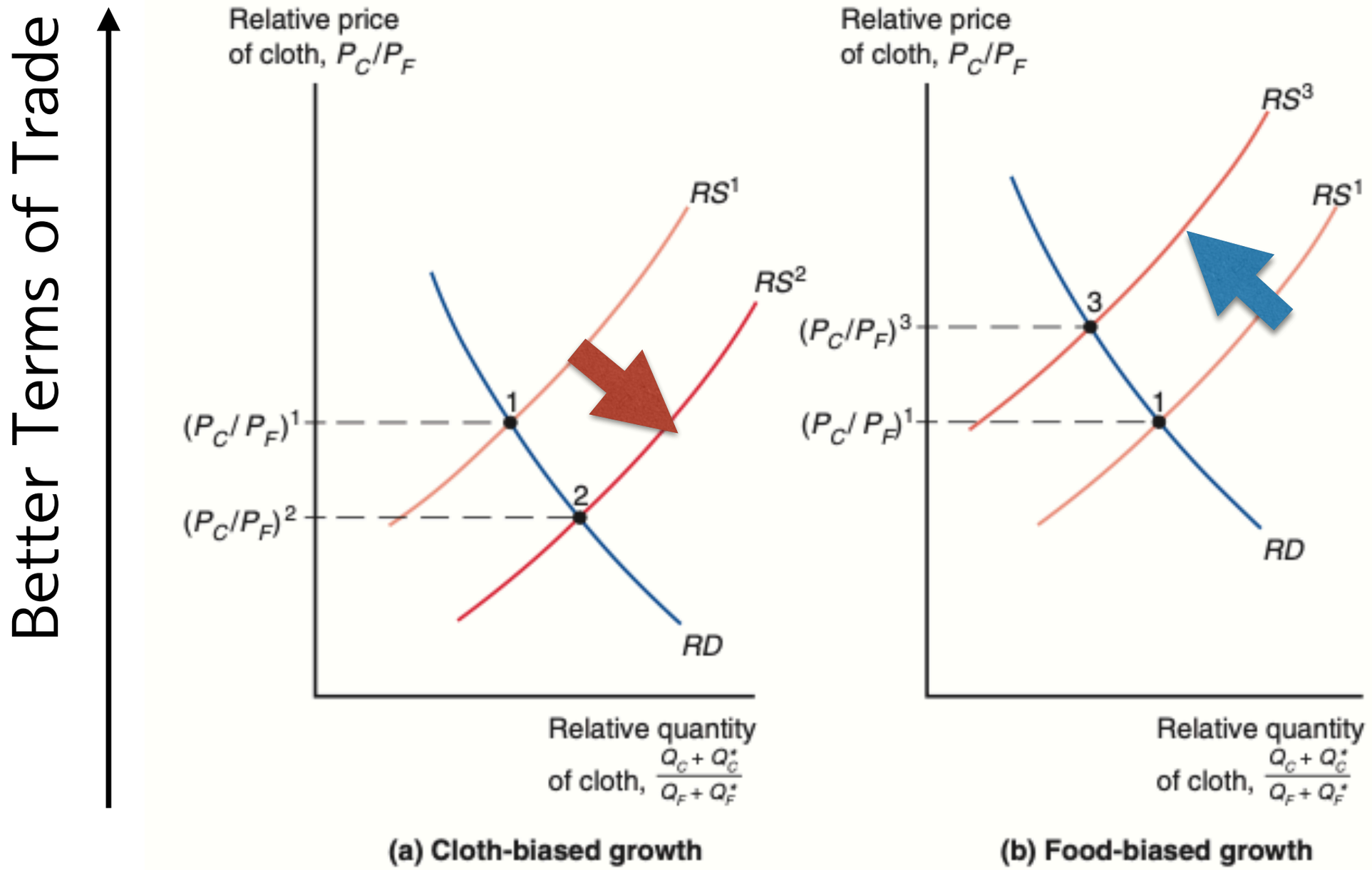


Import-biased Growth

(c) Effects of biased growth on relative supply

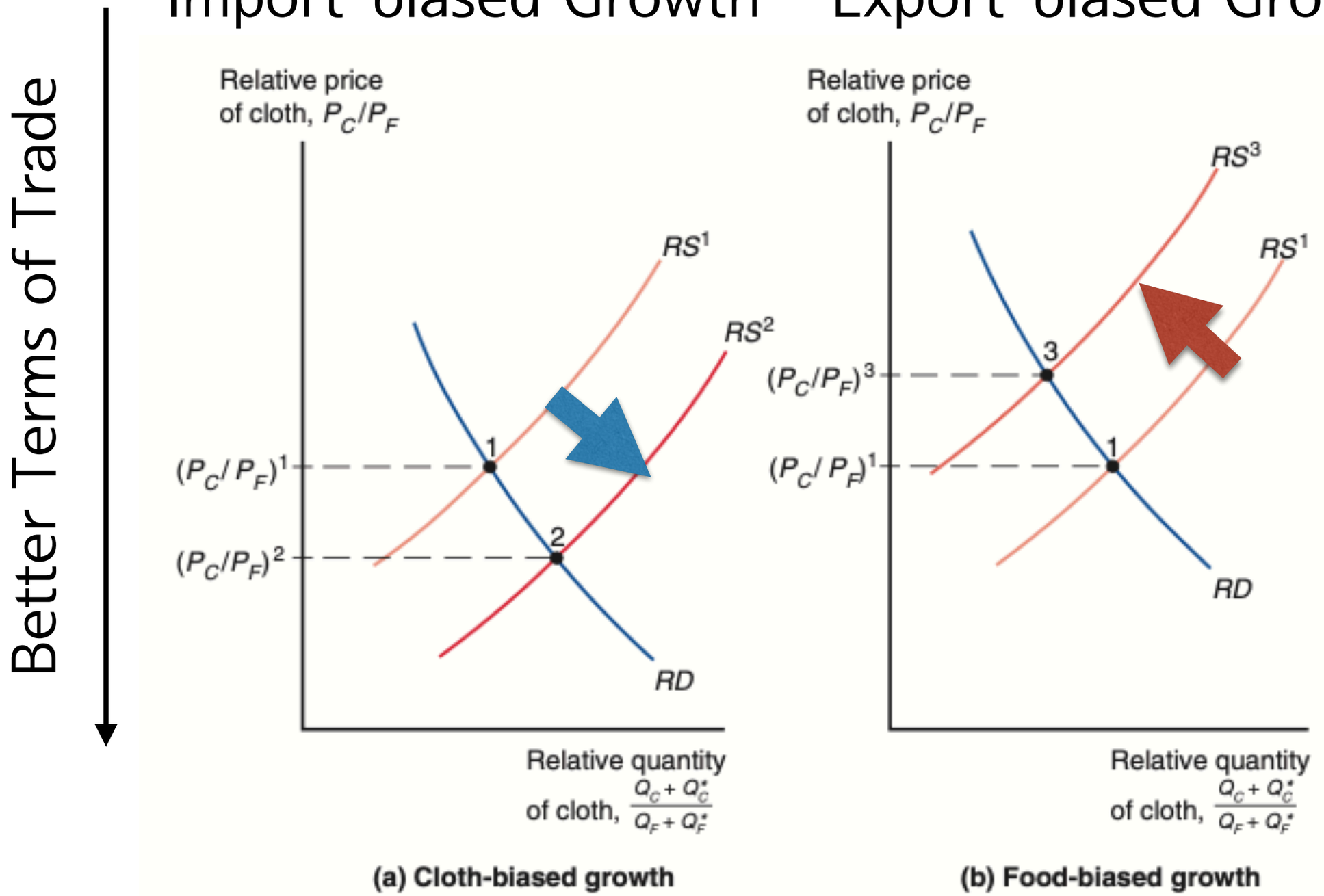
Growth and World RS (Home)

Export-biased Growth Import-biased Growth



Growth and World RS (Foreign)

Import-biased Growth Export-biased Growth



World RS and the Terms of Trade

- Export-based growth tends to worsen a growing country's terms of trade, to the benefit of the rest of the world.
- Import-biased growth tens to improve a growing country's terms of trade at the rest of the world's expense.

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International Effects of Economic Growth

- Is growth in the rest of the world good or bad for our country?
- Does the fact that our country is part of a trading world economy increase or decrease the benefits of growth?

Answers

- Export-biased growth in the rest of the world
  - Good for us: terms of trade ↑
- Import-biased growth in the rest of the world
  - Bad for us: terms of trade ↓
- Export-biased growth in our country
  - Terms of trade ↓ (reduce benefit)
- Import-biased growth in our country
  - Terms of trade ↑ (secondary benefit)

Immiserizing Growth

- Bhagwati (1958).
- Export-biased growth by poor nation can self-defeating if:
  - [Benefit of growth] < [Cost of terms of trade from export-biased growth]
- Above condition is extreme: Immiserizing growth can occur when RS and RD curve is very steep

Tariffs and Export Subsides

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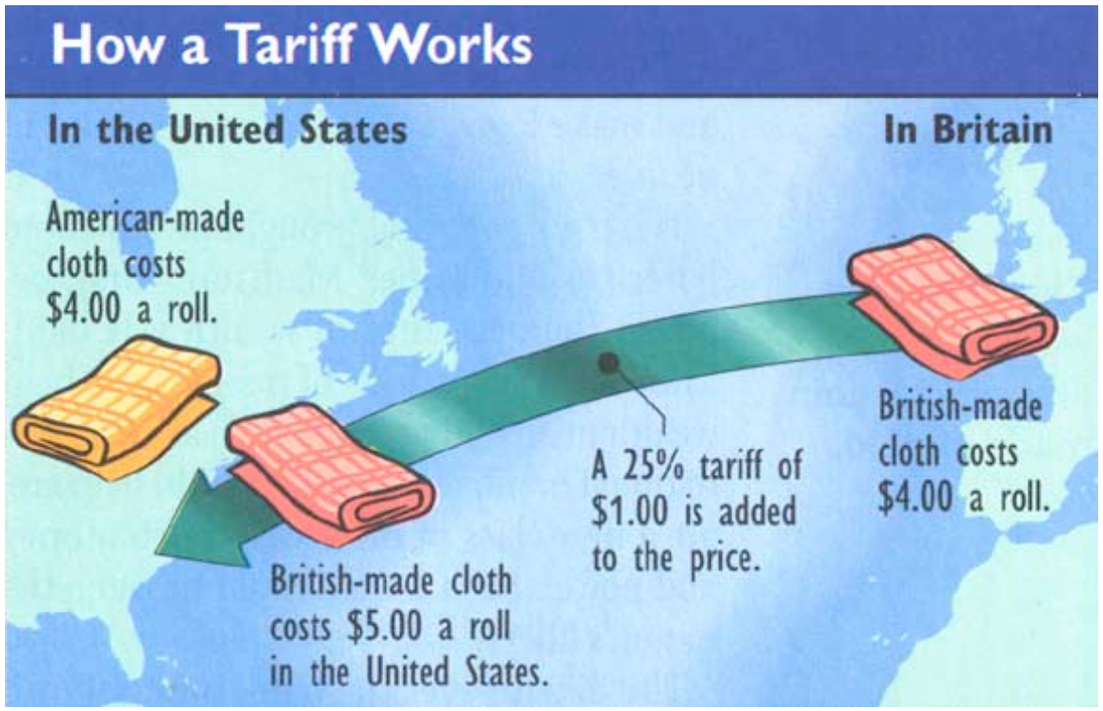
Import Tariff and Export Subsidy

- Import tariffs:
  - Taxes levied on imports
- Export subsidies:
  - Payments given to domestic producers who sell a good abroad
- Motivation:
  - Improving income distribution
  - Promoting crucial industries
  - Achieving the balance of payment



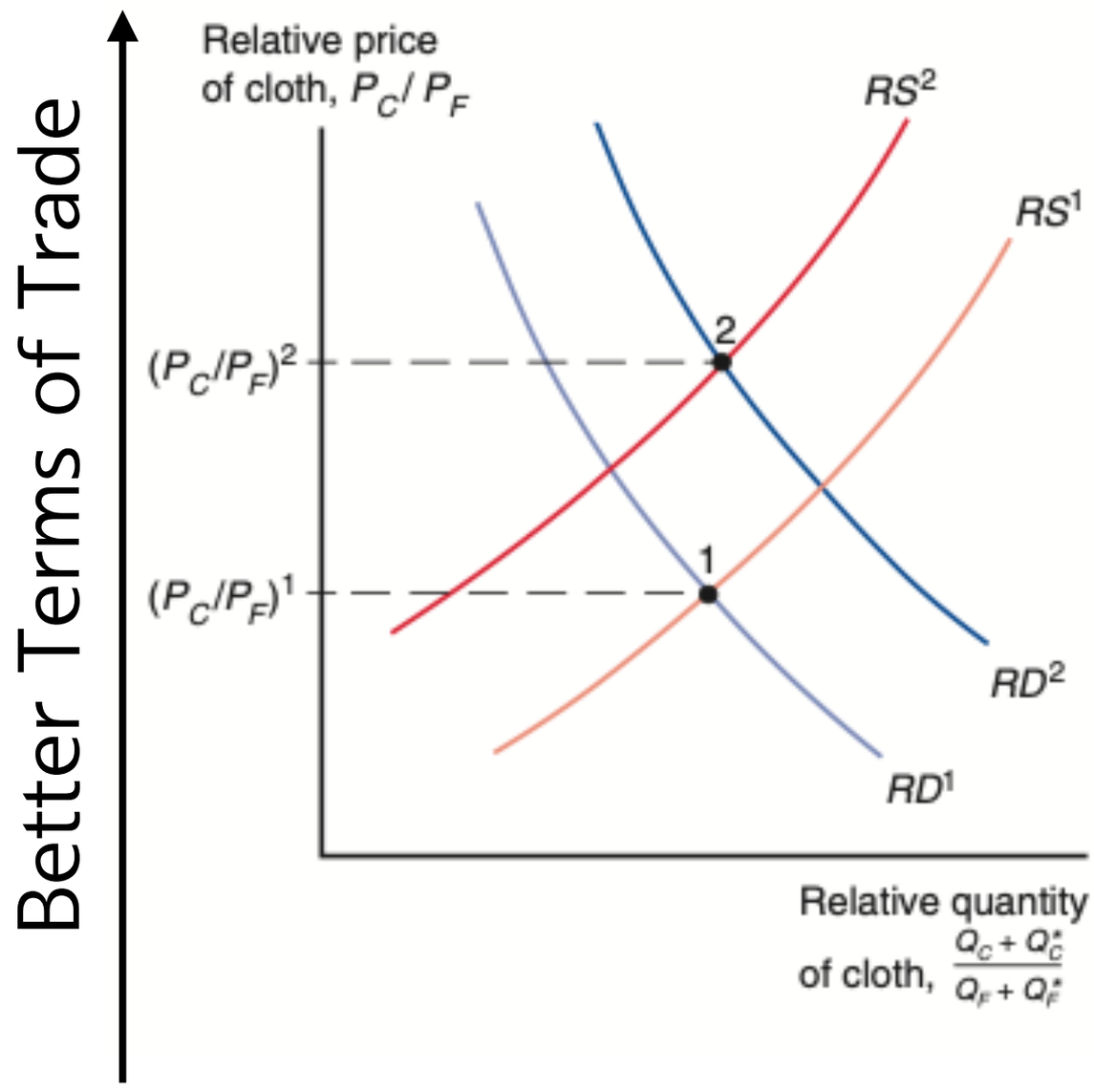
http://www.mrvanduyne.com/jackson/html/tariff.htm

RD, RS Effects of a Tariff

- When there is no tariff or subsidy:
  - External (world) Price = Internal (domestic) Price
- But if there is a tariff:
  - External (world) Price + tariff > Internal (domestic) Price

Effects of a Food Tariff on the Terms of Trade

- Food tariff make
  - $P_C/P_F(domestic) < P_C/P_F(world)$
- Supply side:
  - cloth production ↓
  - food production ↑
  - RS1 → RS2: Negative shift
- Demand side:
  - cloth consumption ↑
  - food consumption ↓
  - RD1 → RD2: Positive shift
- Result: Terms of trade ↑
  - At foreign's expense

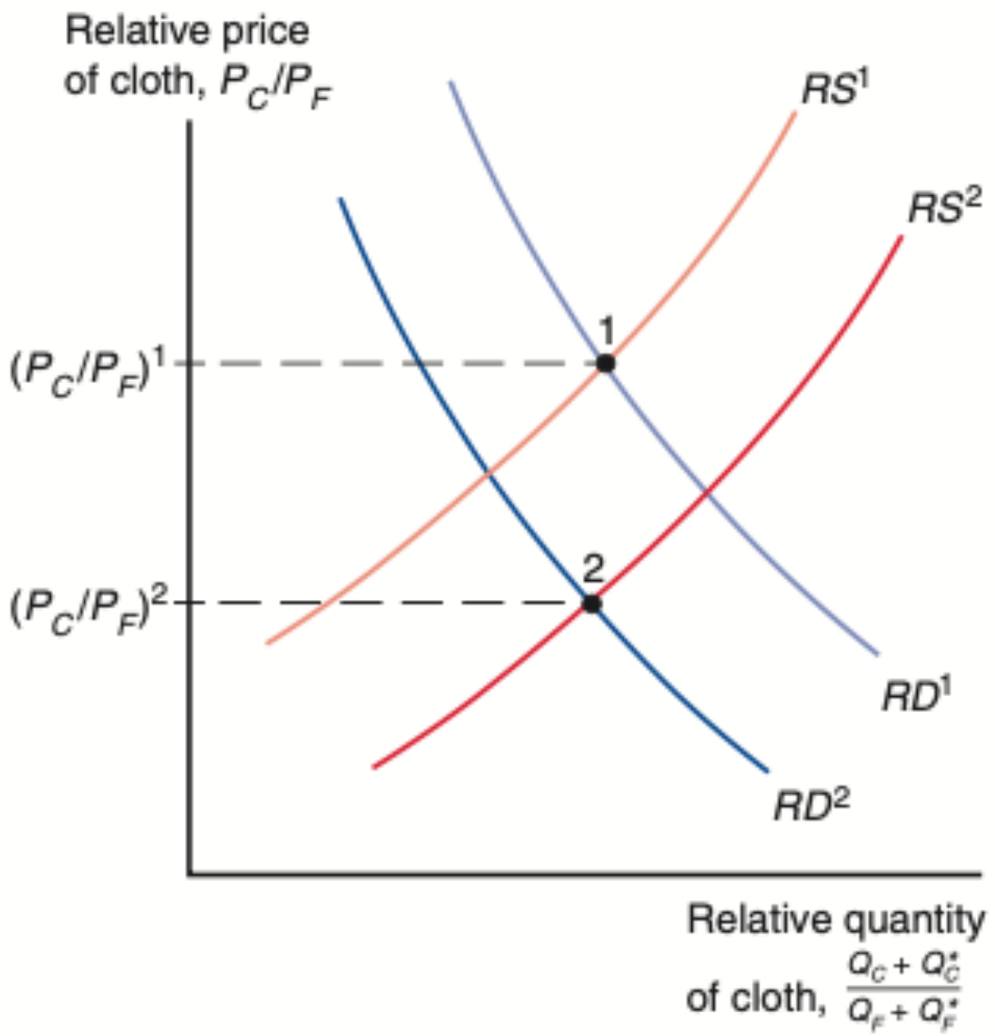


Extent of Terms of Trade

- Small country cannot have much effect on relative prices: small effect
- Huge country can have much effect on relative prices: large effect

Effect of an Export Subsidy

- Effect of opposite direction
  - RS ↑
  - RD ↓



Implications of Terms of Trade Effect

- Tariff ⇒ improved terms of trade ⇒ at foreign's expense ⇒ Hurt the rest of the world
- Effect on Home's welfare:
  - Terms of trade ↑ : benefits home
  - Induce the distortion if it is too high
    - ⇒ Optimum tariff

The Effects of an Export Subsidy

- Foreign's terms of trade improve at Home's expense
- Home loses from terms of trade
- Home loses from the distorting effects of its policy
- Motivation: national interest

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International Borrowing and Lending

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Intertemporal Trade

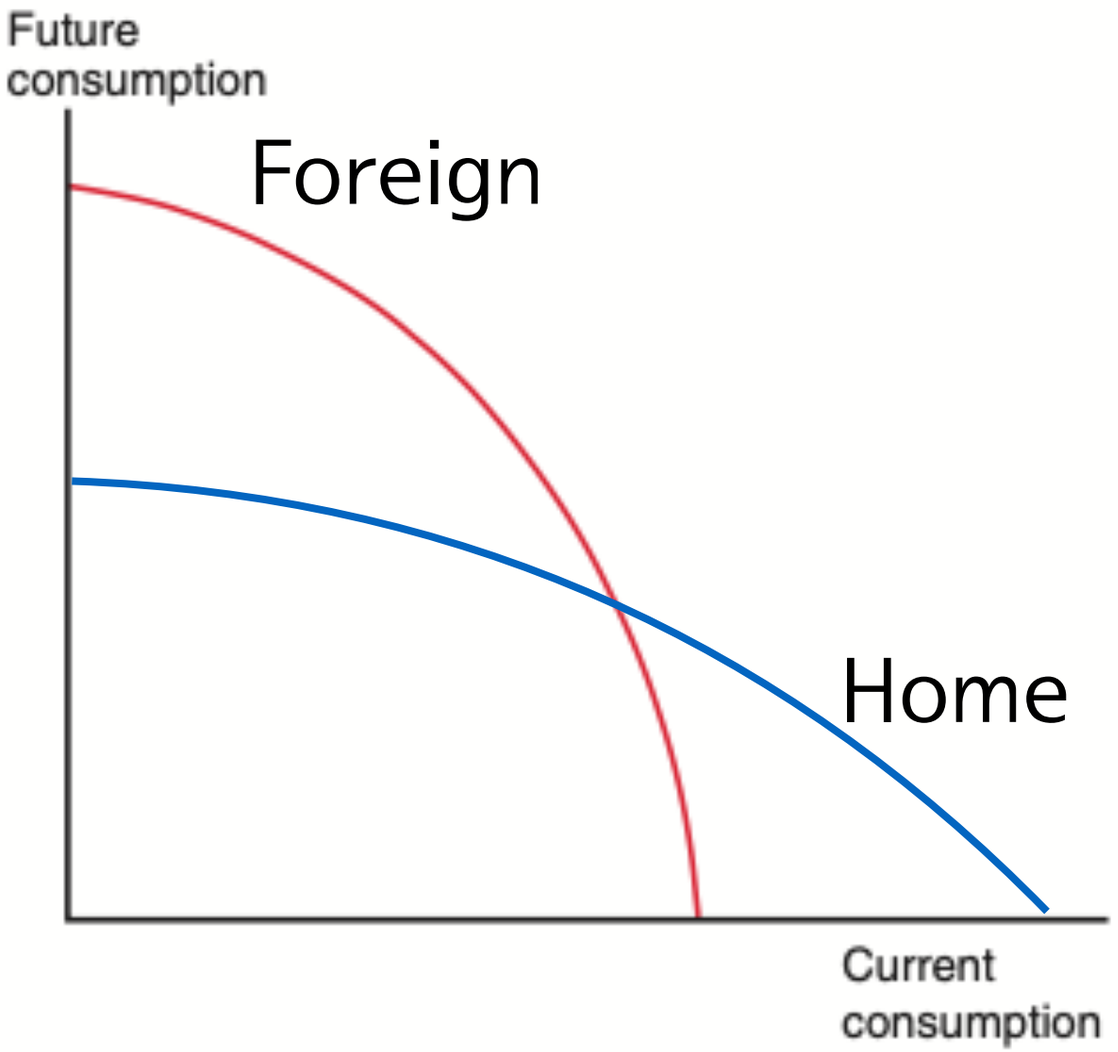
- Trade between countries that occurs over time: international borrowing and lending
- Exchanging goods today in return for some goods in the future

Intertemporal Production Possibilities and Trade

- Trade-off between consumption now and consumption in the future:
  - Economies usually do not consume all of their current output
  - Part of their output takes the form of investment (in machines, buildings, and other forms of productive capital)
- Current consumption ↔ Future consumption

Intertemporal PPF

- Intertemporal PPF can different among countries
- Assumption
  - Home's PP is biased toward current consumption
  - Foreign's PP is biased toward future consumption

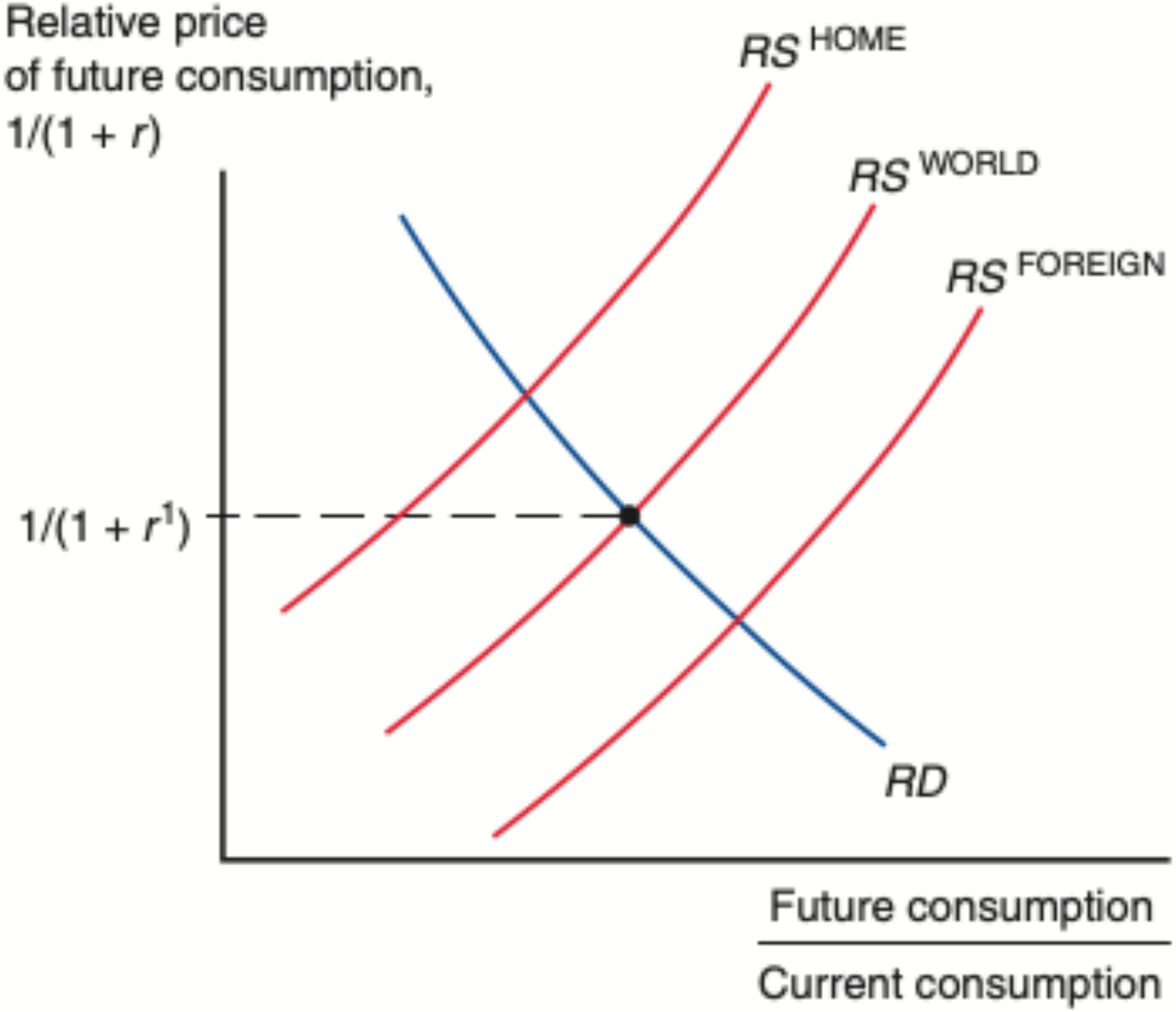


Real Interest Rate

- Suppose that lending/borrowing is done in "real" term
  - It is not financial. (= It is not about money)
- Trading over time, or to consume in the future,
  - Borrow GOODs now
  - Repay the GOODs in the future
- Repaying quantity should be larger than borrowing quantity: Real interest rate r

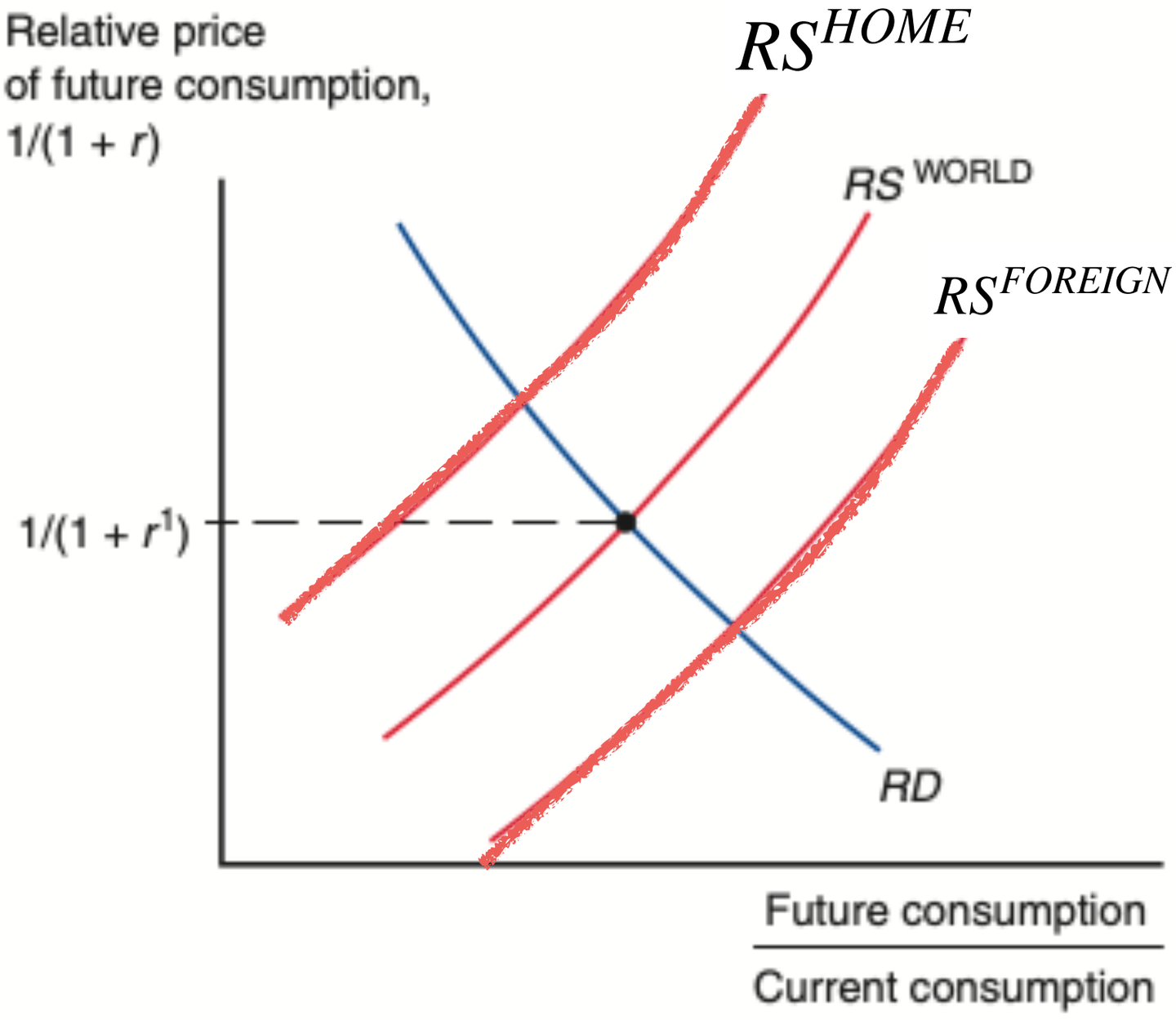
Real Interest Rate

- Repaying Quantity = (1+r) Borrowing Quantity
- The relative price of future consumption: Borrowing / Repaying = 1/(1+r)
- Price of future consumption 1/(1+r) ↑ ⇒ Investment ↑ (Supply)
- World real interest rate determined from world supply of future consumption



Exporting/Importing Current Consumption

- Exporting current consumption = Lending = Importing future consumption
- Importing current consumption = Borrowing = Exporting future consumption
- In this case, Home will lend goods to Foreign



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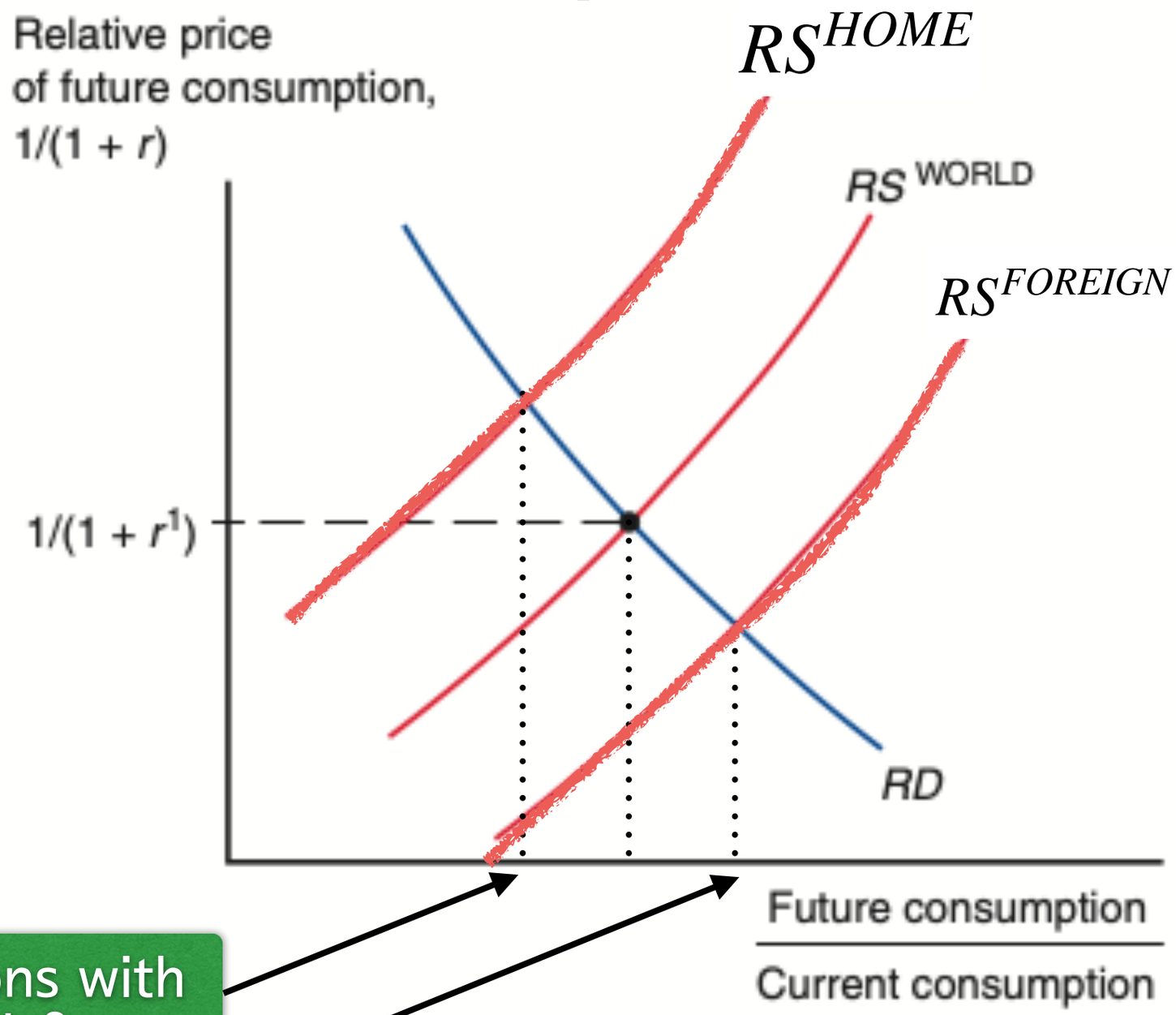

Relative Consumptions with no intertemporal & international trade

Exporting/Importing Current Consumption

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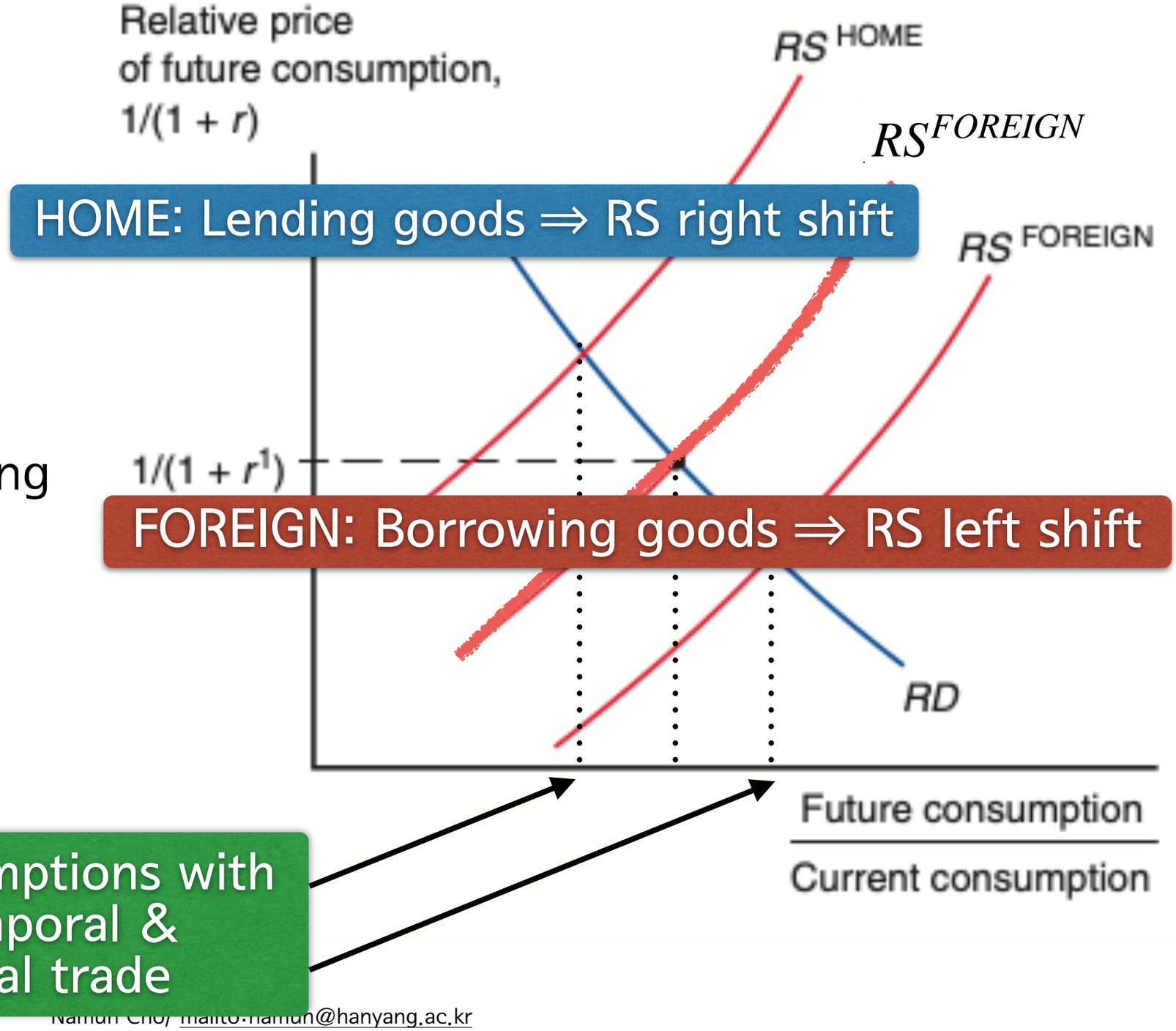
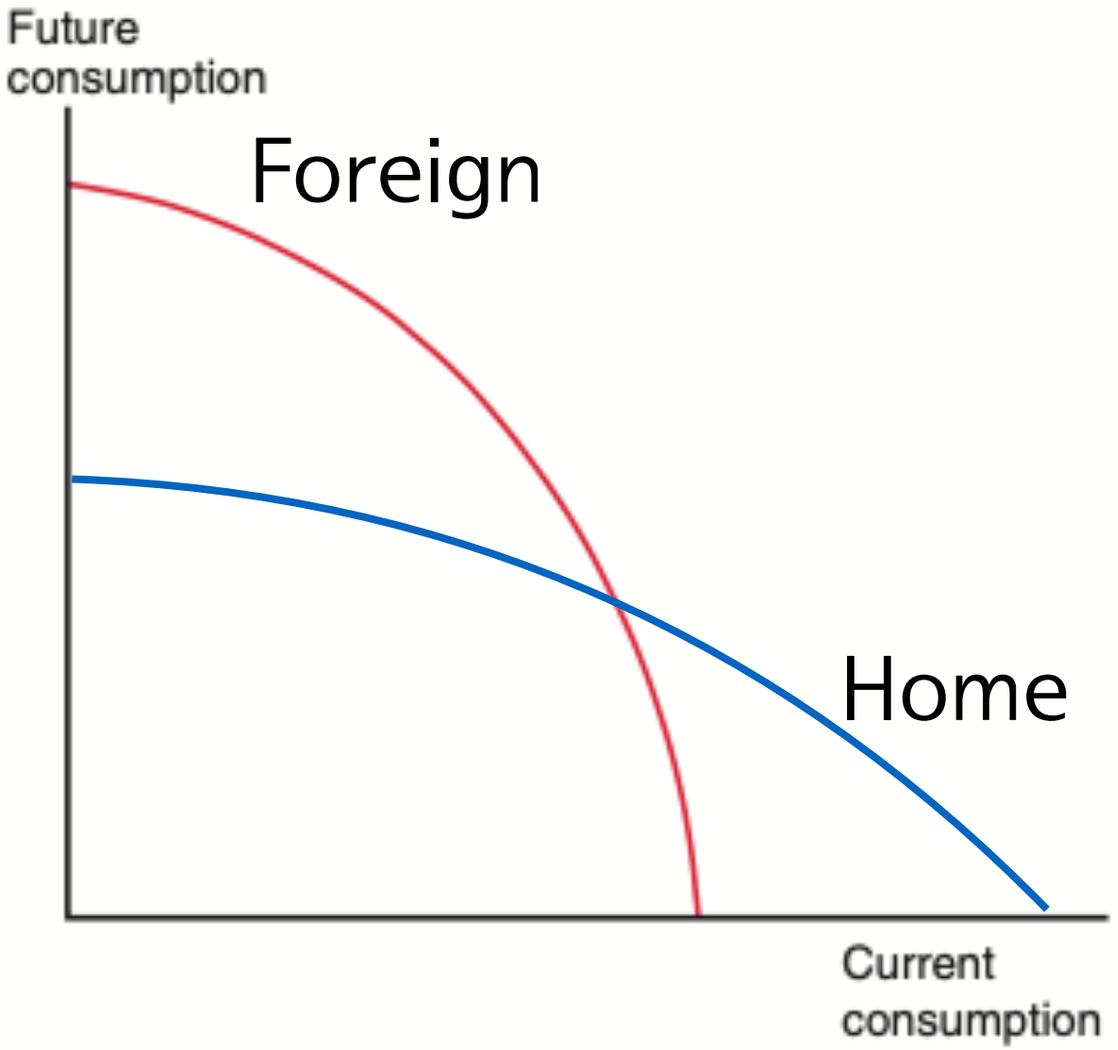


Relative Consumptions with no intertemporal & international trade

Intertemporal Comparative Advantage

- What does it mean if a country's intertemporal production possibilities are biased toward current position?
  - In our example, Home country is biased toward current position



Intertemporal Comparative Advantage

- A country that has a comparative advantage in future production of consumption goods:
  - It would have a low relative price of future consumption if there is no international borrowing
- It implies a HIGH real interest rate
  - = High return on investment like producing capital goods, construction, etc.
  - Developing country

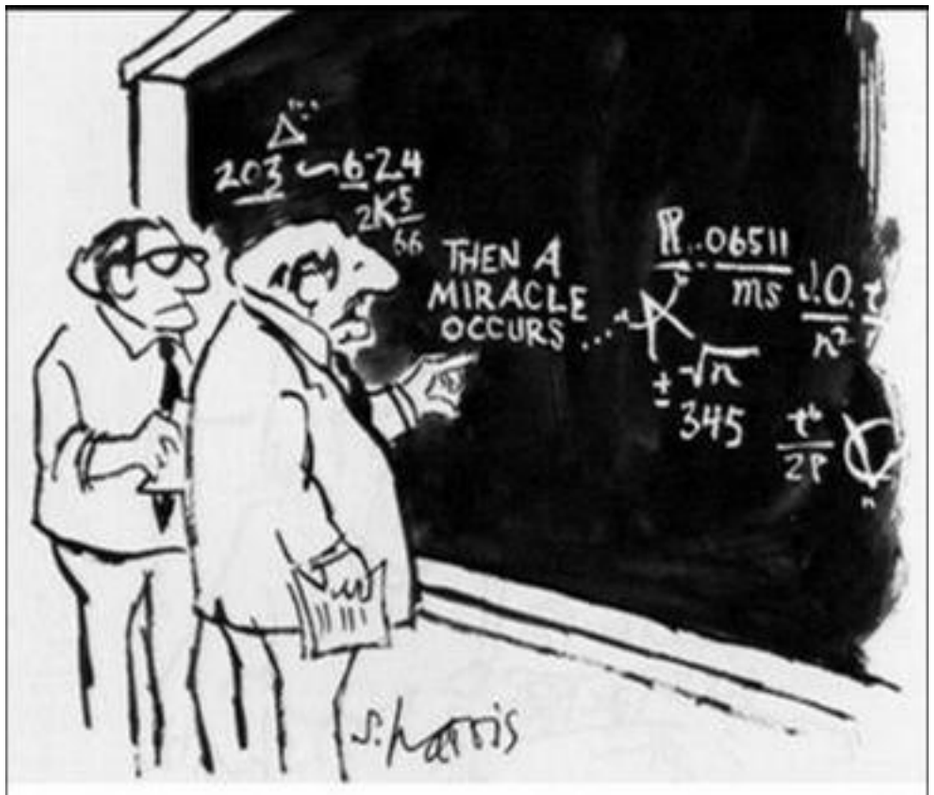
Intertemporal CA: Opposite Case

- A country that has a comparative advantage in current production of consumption goods:
  - It would have a low relative price of current consumption if there is no international lending
- It implies a LOW real interest rate
  - = Low return on investment like producing capital goods, construction, etc.
  - Mature country

Next Topic

- External Economies of Scale and the International Location of Production
- Krugman Ch. 7

Thank you!



"I think you should be more explicit here in step two."

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