- Brief summary of reasons to trade and specialize
- Brief history of Ricardian model
- **Ricardian model:**
  - PPF
  - Autarky equilibrium
  - Export patterns
  - Wages
  - International prices
  - Equilibrium with international trade
  - Gains from trade in the Ricardian model

1 Reasons for Trade

Reasons countries trade with each other include:

- Differences in the technology used in each country
- Differences in the total amount of resources (including labor, capital, and land)
- Differences in tastes
- Imperfect competition, product differentiation

1 Reasons for Trade

Reasons countries trade *more* with some countries than others include:

- Proximity of countries to each other
- Low communication/coordination costs
- Low bilateral tariffs and FTA, etc.

1 Reasons for Trade

Resources

- Natural resources (e.g. land and minerals)
  - Includes energy resources (e.g. coal, petroleum)
- Labor resources (by skill level)
- Capital (machinery and structures)

Vocabulary:

Resources = "Factors of production"

= "Endowments"

1 Reasons for Trade

Technology? Two aspects:

- Absolute advantage

  When a country has the best technology for producing a good.

- Comparative Advantage

  A country has a comparative advantage in producing those goods that it produces best *compared with* how well it produces other goods.

1 Reasons for Trade

Comparative Advantage

May depend both on technics and resources

While Napa has a comparative advantage in growing regular grapes, Canada now has a comparative advantage in making “ice wine”

1 Reasons for Trade

Leads to different models:

- **Ricardian model** focuses on differences in technology (chap 2)
- **Heckscher-Ohlin model** (chap 4-5) focuses on differences in endowments
- **Specific-factor model** (chap 3) is a mixture of the two models
- **Krugman model** (chap 6) focuses product differentiation (product-level specialization)

David Ricardo (1772-1823) and Mercantilism

Mercantilism:

- exporting is "good": generates gold and silver for the national treasury
- Importing is "bad" because it drained gold and silver

→ Mercantilists were in favor of high tariffs to obtain low imports and high exports.

→ This theory does **not** account for general-equilibrium effects

Instead, Ricardo shows that countries can benefit from ***balanced*** *international trade without having tariffs.*

P. Krugman: why teach Ricardo?

- Old model, but still highly relevant today!

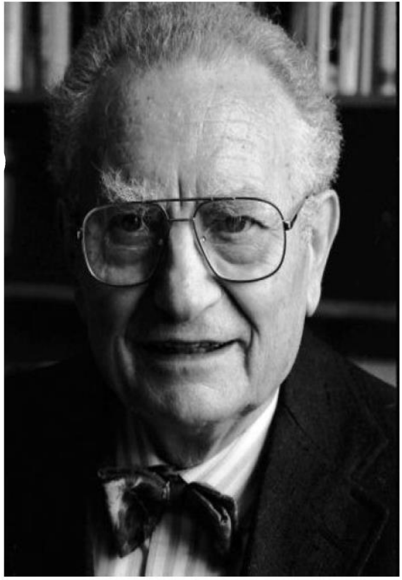
  (actually more than Krugman's model!)

- Most "simple" model to illustrate effect of trade

  (simple yet subtle and not obvious)

[PS: Paul Krugman was an economist specialized in Trade (Nobel in 2008) before becoming a *New York Times* columnist]

P. Samuelson about comparative advantage:



"That it is logically true need not be argued before a mathematician; that it is not trivial is attested by the thousands of important and intelligent men who have never been able to grasp the doctrine for themselves or to believe it after it was explained to them."

Paul Samuelson, Nobel Prize Laureate in 1970

[That was a response to a mathematician: "Name me one proposition in all of the social sciences which is both true and non-trivial."]

2 Ricardian Model Setup

Two goods:

- Wheat (a major exports of the U.S. and Europe)
- Cloth (major import)

For now:

- No land, no capital
- Both goods are produced with labor alone.

Notes: See chapter 3 & 4 for model with Capital and Land

2 Ricardian Model Setup

We also assume perfect competition

And perfect labor markets:

- Labor is mobile across sectors
- But immobile across countries (no migration)

Notes:

See chapter 3 for imperfect mobility across sectors,

See chapters 6 and 9 for imperfect competition.

2 Ricardian Model Setup

The Home Country

One input: Labor

Assume there are **L= 25** workers in Home.

In Home, one worker can produce:

- 4 bushels of wheat, so $\boldsymbol{MPL_W = 4}$.
- 2 yards of cloth, so $\boldsymbol{MPL_C = 2}$

Reminder: The ***"marginal product of labor"*** (MPL) is the extra output obtained by using one more unit of labor.

2 Ricardian Model Setup

The Home Country

Home Production Possibilities Frontier

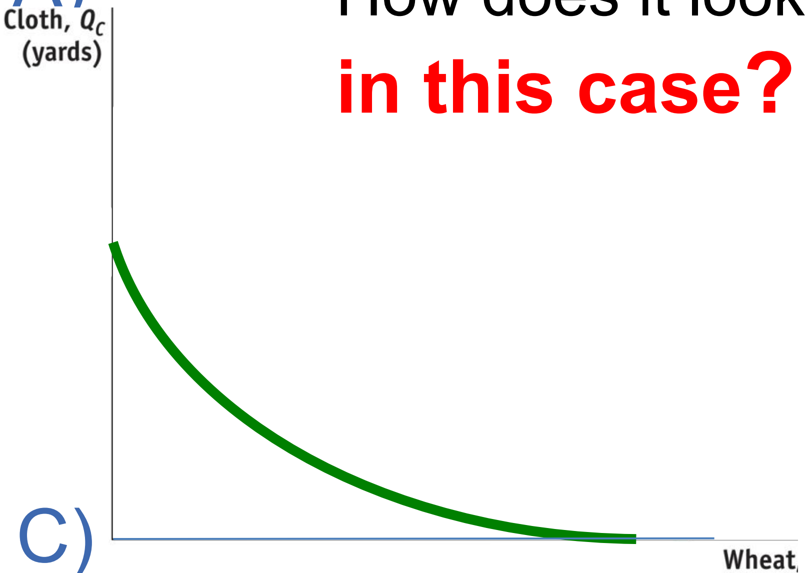
How does the PPF look like **in this case?**

$\mathbf{L= 25}$; $\boldsymbol{MPL_W = 4}$; $\boldsymbol{MPL_C = 2}$

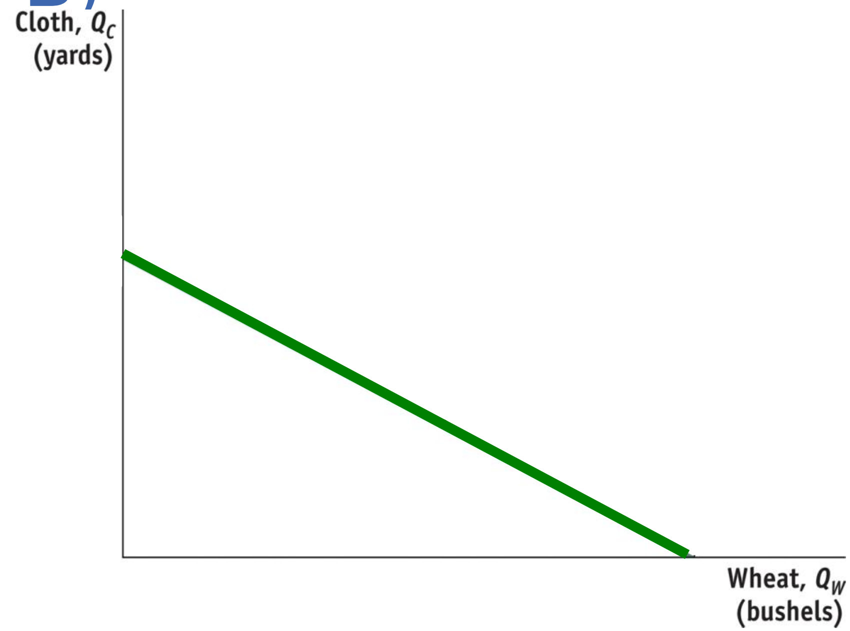
How does it look like

in this case?

A)

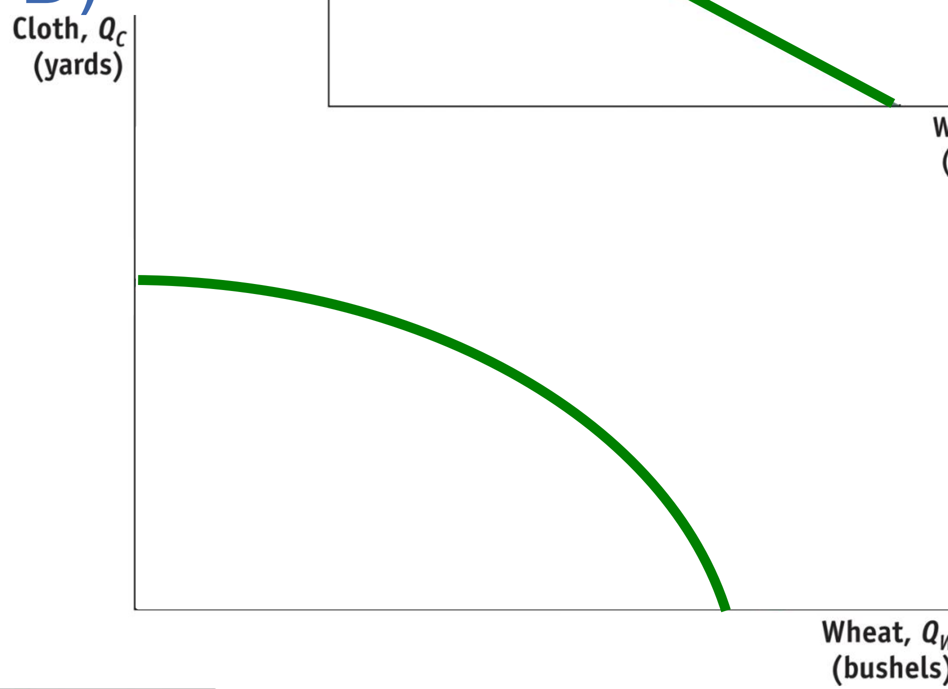


B)



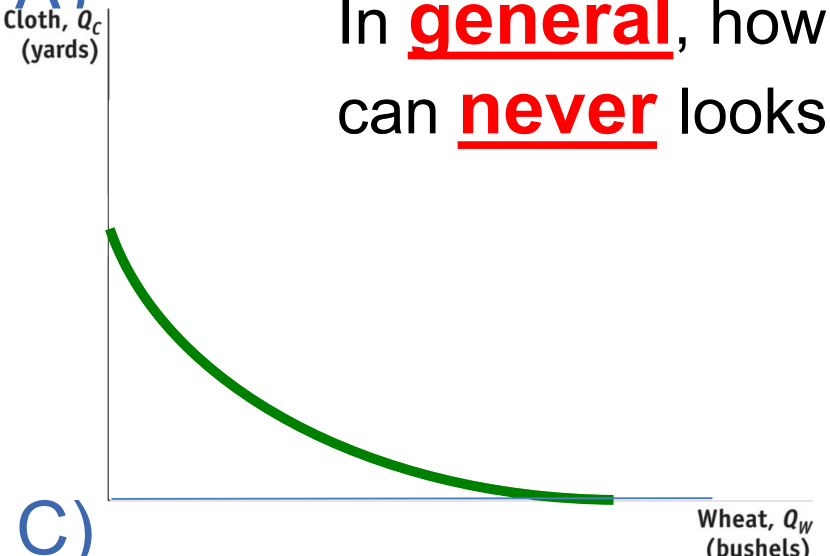
C)

D)



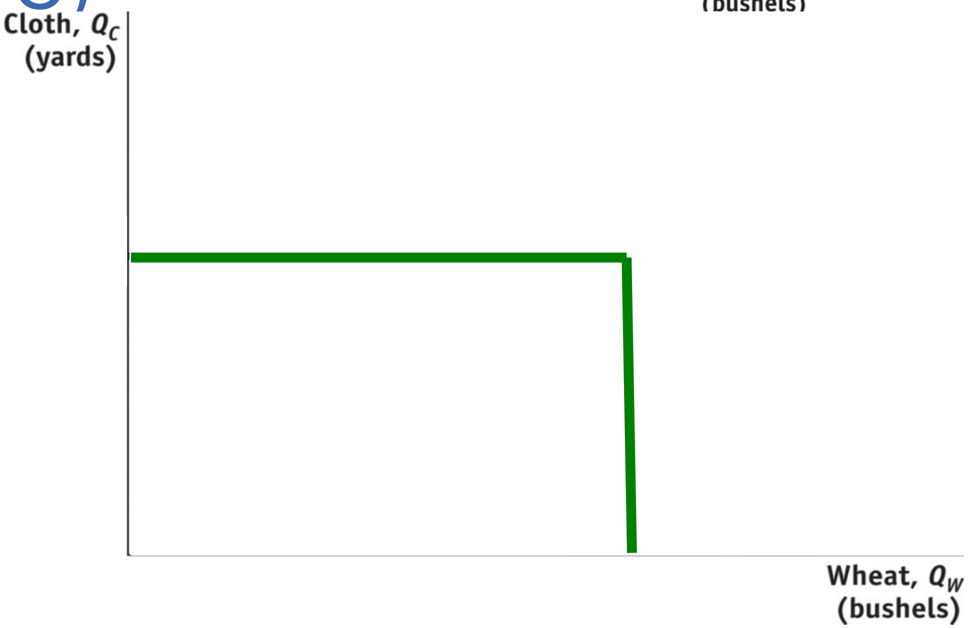
In **general**, how a PPF can **never** looks like?

A)

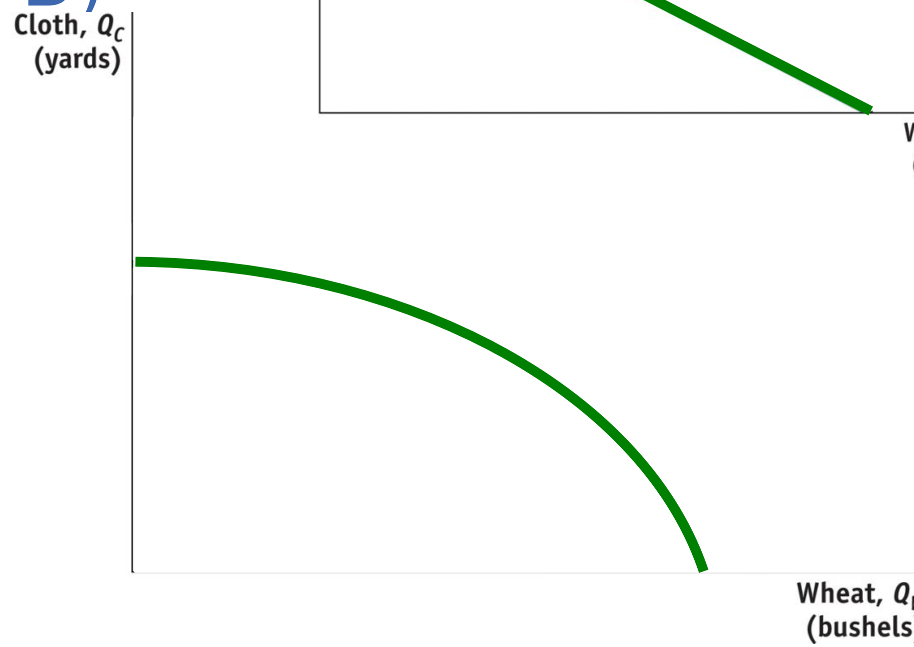


B)

C)



D)



E) All these PPF could exist, in theory

Answers:

Answers:

It is possible to find a production function for all four cases: A), B), C) and D)

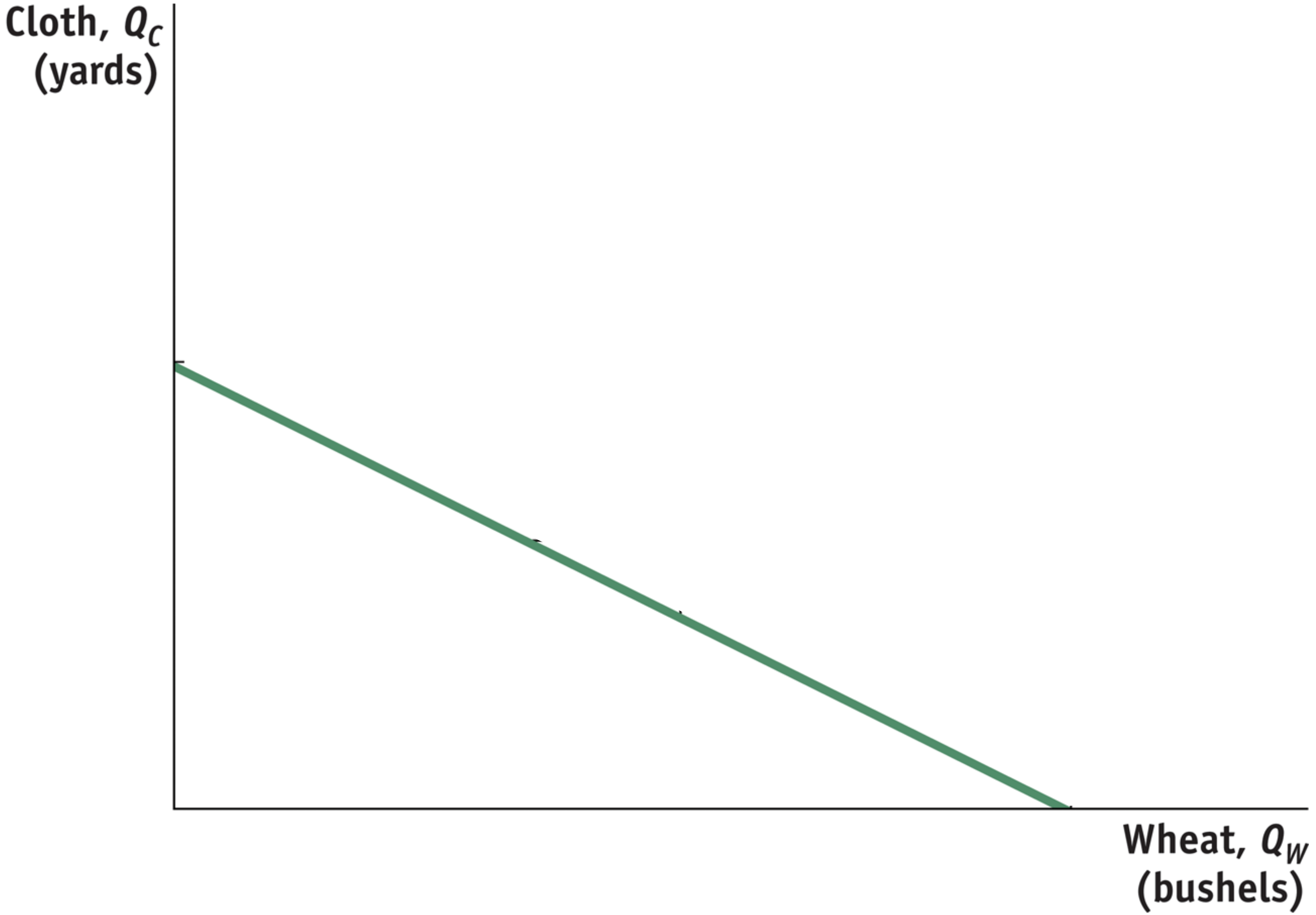
A) = weirdest: requires increasing returns to scale by industry

But if we impose:

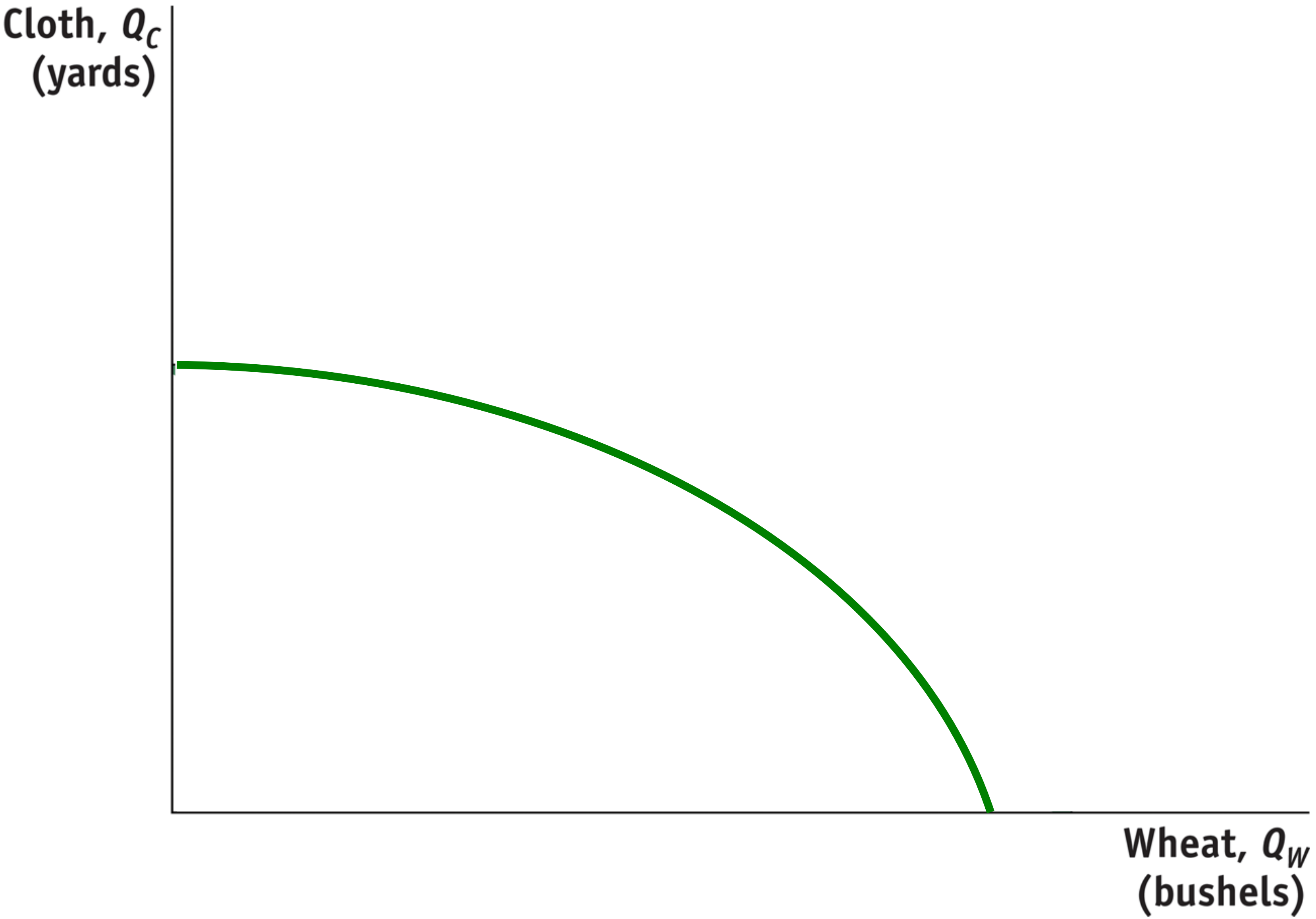
- Only one factor
- Constant returns to scale
- Perfect competition

→ Then it has to be linear as in **B)**

In a Ricardian model:



With more than 1 factor, as in chapter 3 and 4:



2 Ricardian Model Setup

The Home Country

Home Production Possibilities Frontier

$\mathbf{L = 25}$; $\boldsymbol{MPL_W = 4}$; $\boldsymbol{MPL_C = 2}$

- If all the workers were employed in wheat, the country could produce Qw = 100 bushels.

2 Ricardian Model Setup

The Home Country

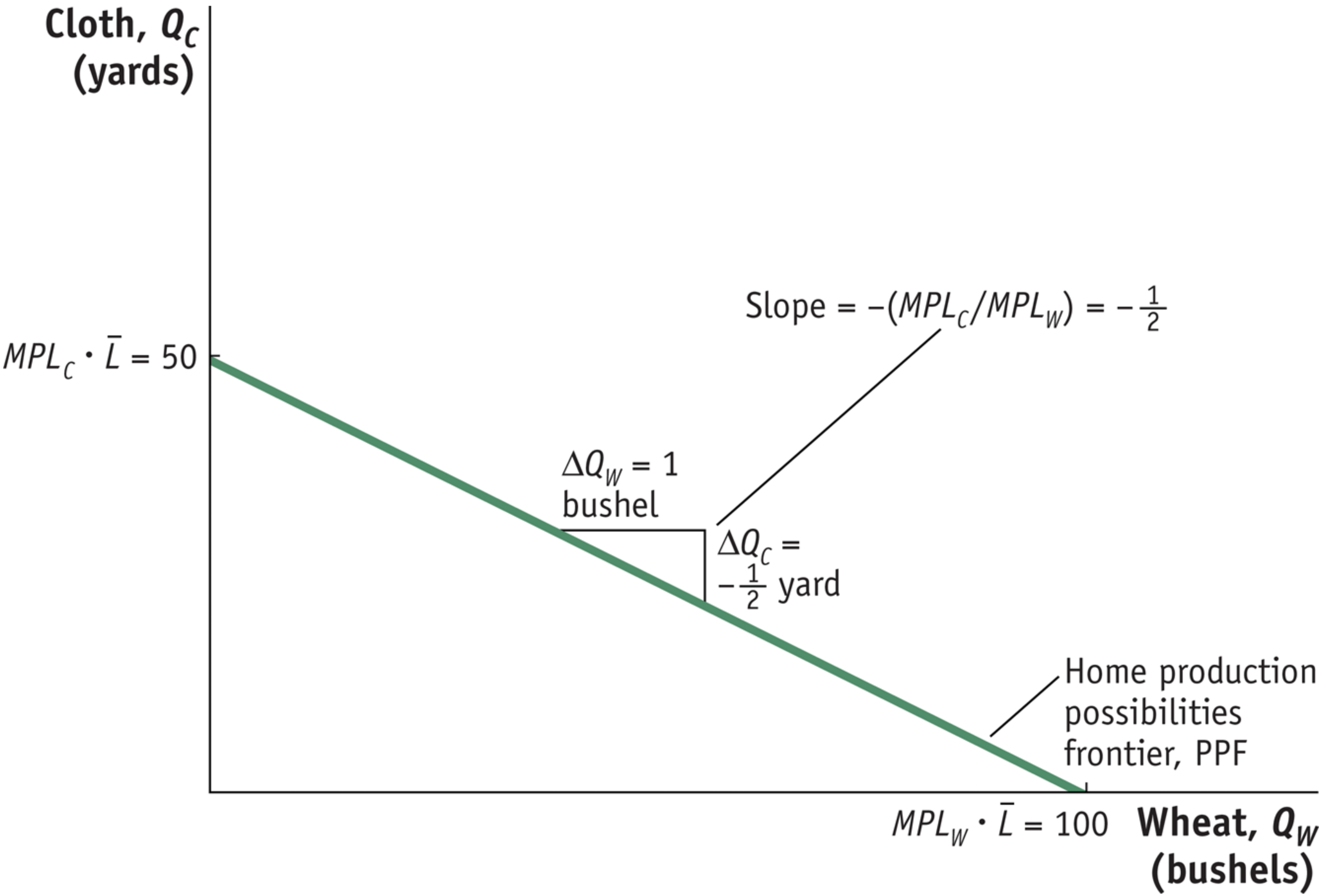
Home Production Possibilities Frontier

$\mathbf{L= 25}$; $\boldsymbol{MPL_W = 4}$; $\boldsymbol{MPL_C = 2}$

- If all the workers were employed in wheat, the country could produce Qw = 100 bushels.

- If they were all employed in cloth they could produce Qc = 50 yards.

Home Production Possibilities Frontier



2 Ricardian Model Setup

The Home Country

Home Production Possibilities Frontier

Slope of the PPF = - MPL_C / MPL_W

= amount of cloth that must be given up to obtain one more unit of wheat.

= "opportunity cost" of wheat

2 Ricardian Model Setup

DEMAND SIDE: Home Indifference Curves

- All points on an indifference curve have the same level of utility:

  = combinations of two goods that you can consume and be equally satisfied.

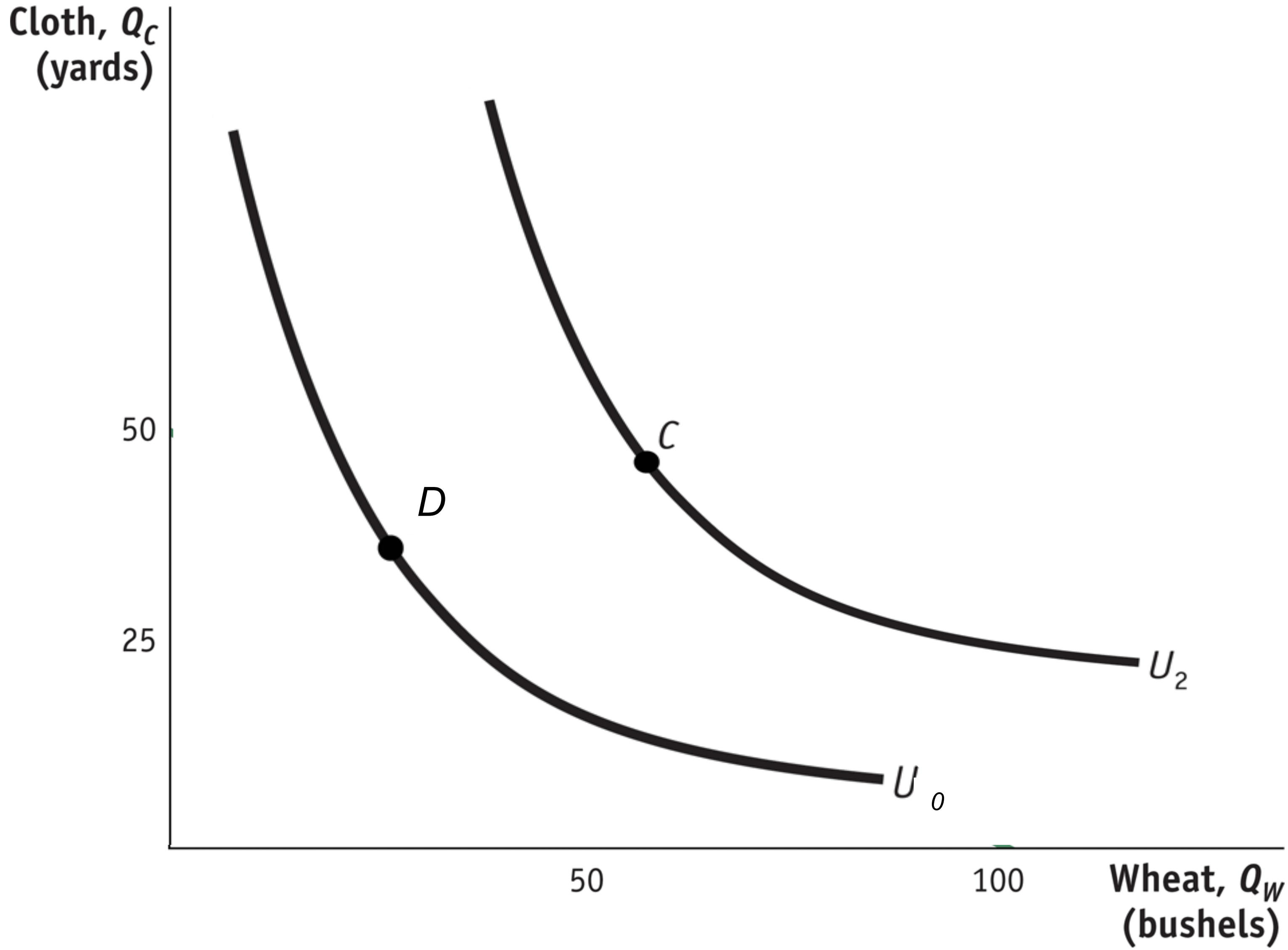
- Points on higher indifference curves have higher utility.

- **MRS**:

"Marginal rate of substitution" = Marginal U_W / Marginal U_C

= - slope of indifference curve

Home Indifference Curves

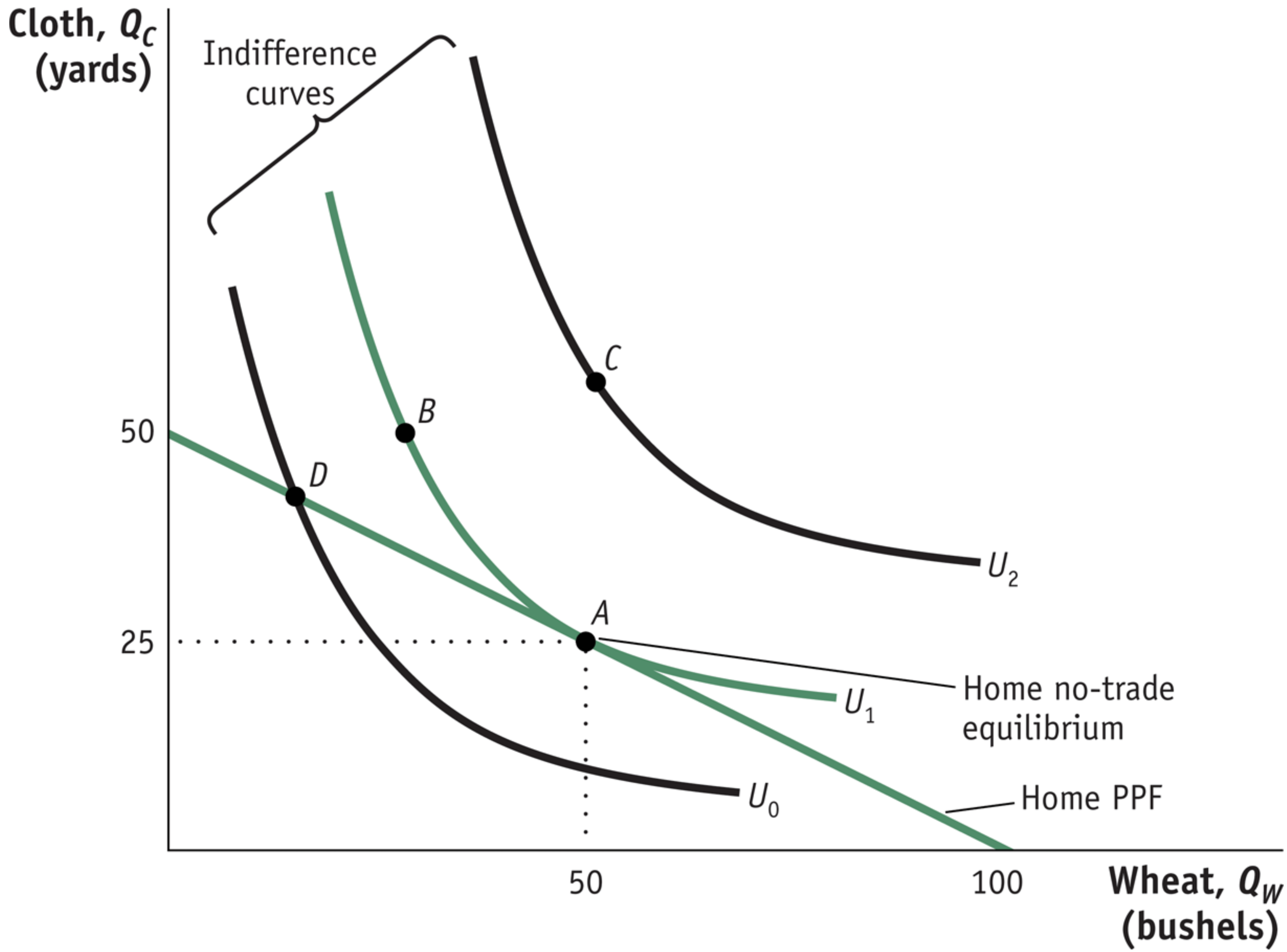


Questions about Indifference Curves:

Q: How do you interpret the slope of an indifference curve?

Q: Why are they convex?

Home Indifference Curves



2 Ricardian Model Setup

Home Indifference Curves

- Point A is the no-trade equilibrium, or equilibrium under "Autarky"

2 Ricardian Model Setup

Question

What is the equilibrium relative price of wheat in Home?

2 Ricardian Model Setup

The Home Country

Wages

For each industry:

- Workers hired to the point at which the hourly wage equals the value of one more hour of production.

  … Which also equals the amount of goods produced in that hour (MPL) times the price of the good.

- HENCE: wage $w = P \cdot MPL$

2 Ricardian Model Setup

The Home Country

Wages

- Moreover, wages should be equal across industries…

(Q: why?)

Which condition is NOT necessary to obtain that wages are the same across the two industries?

[*implies that the other three are necessary conditions!*]

A) Workers are perfectly mobile across industries

B) Perfect competition: prices equal marginal costs

C) The two industries hire the same type of workers

D) All three conditions are necessary

Which condition is NOT necessary to obtain that wages are the same across the two industries?

[*implies that the other three are necessary conditions!*]

Answer:

B) Perfect competition: prices equal marginal costs

Perfect competition on goods markets is not required to have equality in wages across industries.

But we do need A) and C). About C): if one industry uses more skilled workers, it will tend to have higher wages.

2 Ricardian Model Setup

The Home Country

Wages

- Wages should be equal across industries, hence:

$$P_W \bullet MPL_W = P_C \bullet MPL_C$$

By rearranging terms, we see that

$$P_W/P_C = MPL_C/MPL_W$$

➔ Relative price = slope of PPF

(check by yourself: = slope of budget line in autarky!)

2 Ricardian Model Setup

The Foreign Country

(Q: What differs from the Home country?)

2 Ricardian Model Setup

The Foreign Country

Different technology:

- Assume a Foreign worker can produce one bushel of wheat or one yard of cloth:
  $MPL^*_W = 1$, $MPL^*_C = 1$

- Assume there are 100 workers available in Foreign.

2 Ricardian Model Setup

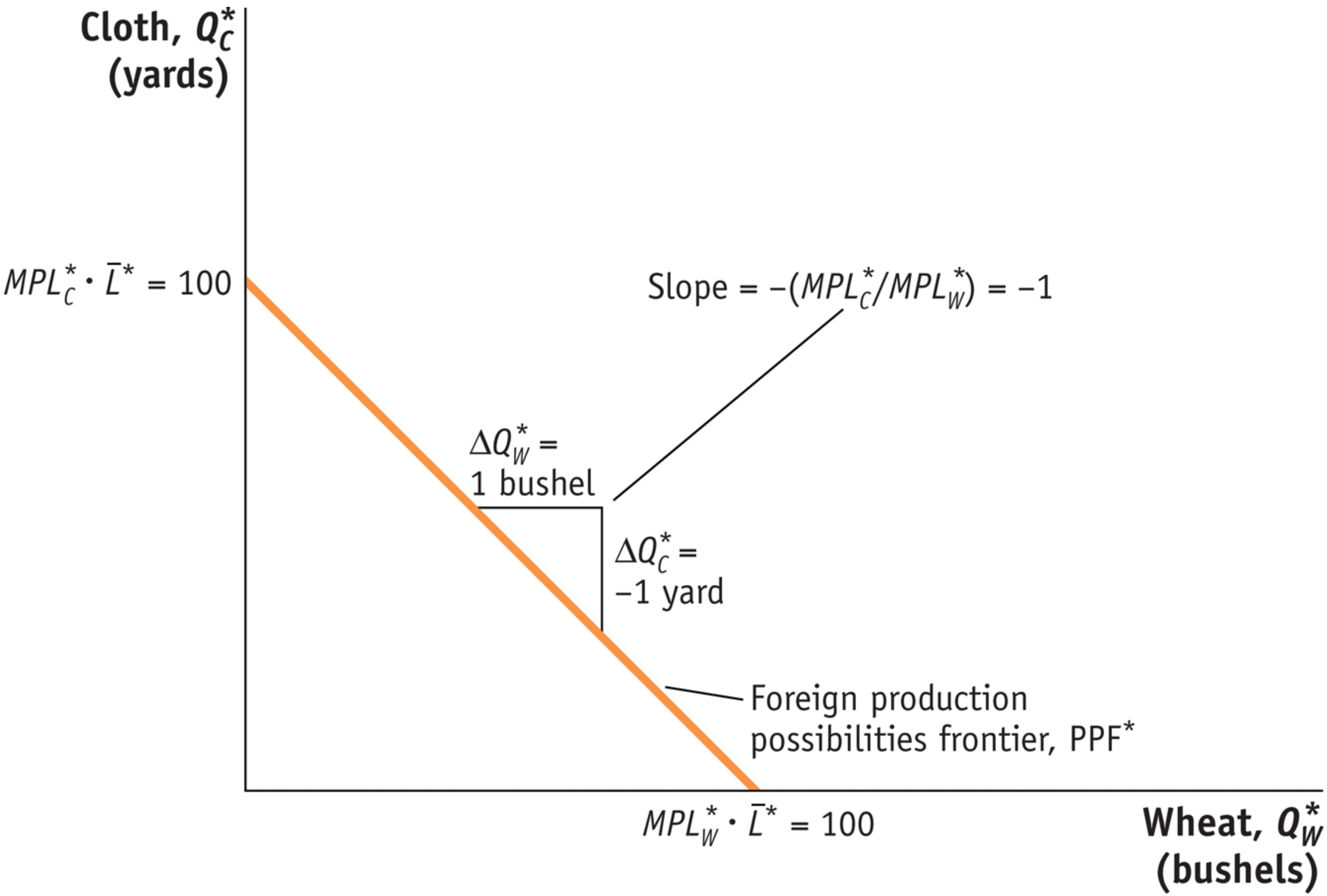
The Foreign Country

Production possibility frontier:

- Also a line
- Just need two points:
    - If all workers were employed in wheat they could produce 100 bushels.
    - If all workers were employed in cloth they could produce 100 yards.

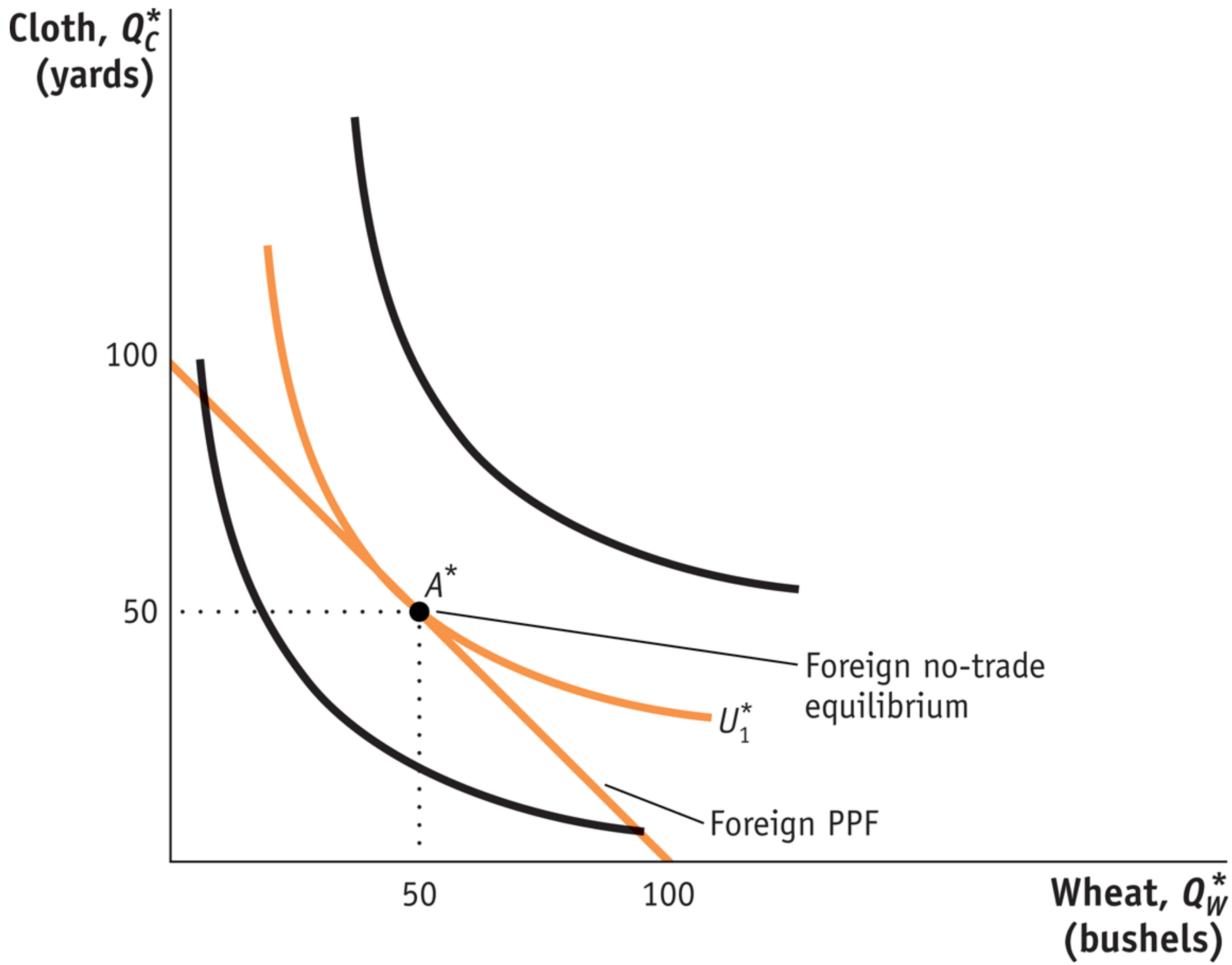
2 Ricardian Model Setup

Foreign Production Possibilities Frontier



2 Ricardian Model Setup

Foreign Indifference Curves



3 Patterns of International Trade

International Trade

Q: What happens when goods are traded between Home and Foreign?

3 Patterns of International Trade

International Trade

- With no trade, relative price of wheat is ½ in Home and 1 in Foreign
- Imagine that YOU find a way to trade, but only you can do this. How do you get rich?

3 Patterns of International Trade

International Trade

- With no trade, relative price of wheat is ½ in Home and 1 in Foreign
- Imagine that YOU find a way to trade, but only you can do this. How do you get rich?

Imagine you start with one unit of cloth in Home.

1) Exchange it for Wheat and get 2 units of Wheat
2) Take Wheat to Foreign, exchange it for 2 units of Cloth
3) Come back Home and repeat steps 1, 2, 3.

Note: this is what we call “ARBITRAGE”

3 Patterns of International Trade

International Trade

- With no trade, relative price of wheat is ½ in Home and 1 in Foreign

- What you are doing here is exporting Wheat from Home and exporting Cloth from Foreign

- There is a general principle here: trade according to <u>comparative advantage</u>!

2 Ricardian Model Setup

“Comparative Advantage” and opportunity cost

	Cloth (1 Yard)	Wheat (1 Bushel)
Home	2 Bushels of Wheat	½ Yard of Cloth
Foreign	1 Bushel of Wheat	1 Yard of Cloth

A country has a C.A. in a good when it has a lower opportunity cost of producing than another country.

- Foreign has a C.A. in producing cloth.
- Home has a C.A. in producing wheat.

In general, which one is true?

A) A country can have a comparative advantage in both industries. It depends on the patterns of technology.

B) There is always an industry in which a country has a comparative advantage, while another country has a comparative advantage in the other industry.

Answer: B)

- Pick any partner country (*) and pick any two goods, A and B. Then we are in either case:
  - Case 1: $MPL_A / MPL_B > MPL^*_A / MPL^*_B$

    → Home has a comparative advantage in A
  - Case 2: $MPL_A / MPL_B < MPL^*_A / MPL^*_B$

    → Home has a comparative advantage in B

3 Patterns of International Trade

Towards an International Trade Equilibrium

- As Home exports Wheat, quantity of Wheat sold at Home decreases.
  → The price of Wheat at Home increases.

- More Wheat goes into Foreign's market.
  → The price of Wheat in Foreign falls.

- As Foreign exports Cloth, quantity sold in Foreign falls:
  → The price in Foreign for Cloth rises
  → The price of Cloth at Home falls.

3 Patterns of International Trade

International Trade Equilibrium

(Q: When does it stop?)

3 Patterns of International Trade

International Trade Equilibrium

“Free-trade equilibrium”:

when the relative price of wheat/cloth is the same in the two countries

3 Patterns of International Trade

International Trade Equilibrium

"Free-trade equilibrium":

when the relative price of wheat/cloth is the same in the two countries

We need to solve for:

- the relative price of wheat/cloth at equilibrium
- production and consumption in Home and Foreign

3 Patterns of International Trade

International Trade Equilibrium

The relative price of wheat in the free-trade equilibrium will be between the autarky price in the two countries.

For now, we will assume the free-trade price of P_W/P_C is between the price of ½ in Home and 1 in F.

We now take this price as given and see how trade changes production and trade in each country

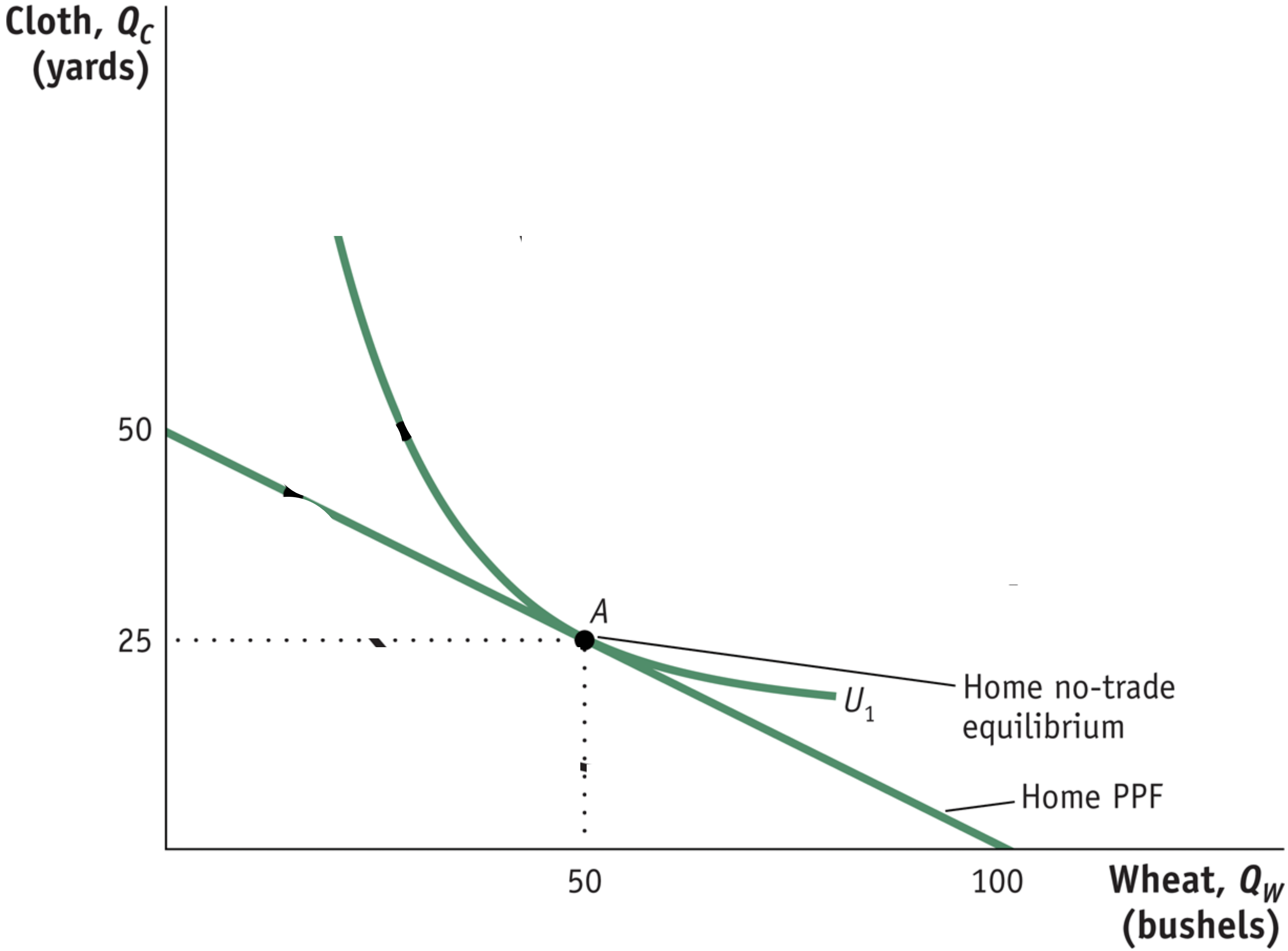
(later we will solve for this price)

Now, with free trade:

Q: Where does Home produce, on the PPF?

Q: How many yards of Cloth or bushels of Wheat can Home purchase?

Autarky:



Cloth, Q_C (yards)
50
25
A
Home no-trade equilibrium
U_1
Home PPF
50
100
Wheat, Q_W (bushels)

3 Patterns of International Trade

International Trade Equilibrium

When a worker switch from Cloth to Wheat…

- Loss = $P_C \, . \, MPL_C$
- Gain = $P_W \, . \, MPL_W$
- Gain > Loss?

3 Patterns of International Trade

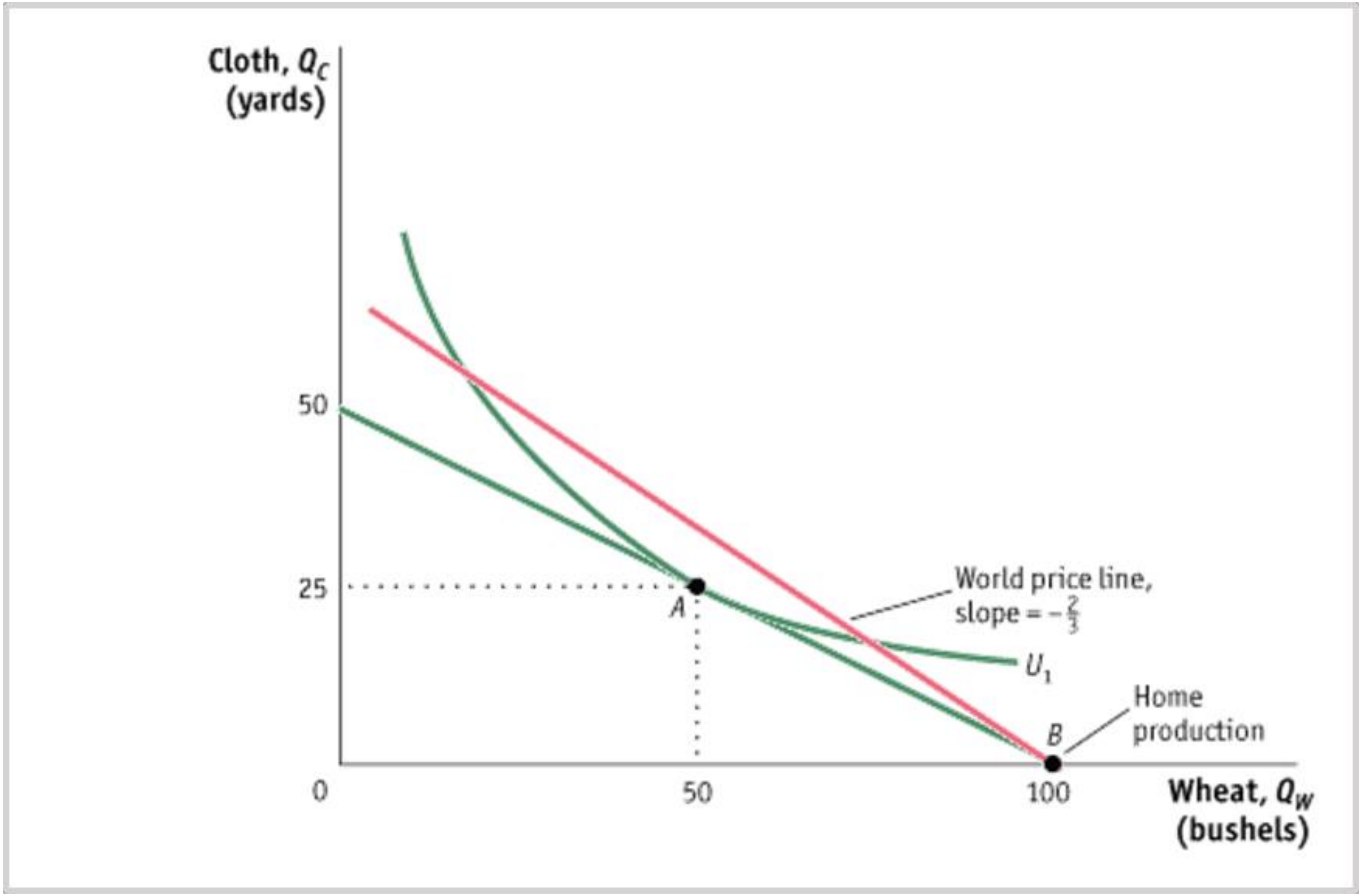
International Trade Equilibrium

When a worker switch from Cloth to Wheat…

- Loss = P_C . MPL_C
- Gain = P_W . MPL_W
- Gain > Loss?

Yes, net gain is positive because $P_W/P_C > MPL_C/MPL_W$
Hence, now, all workers should move to the What industry

International Trade Equilibrium



3 Patterns of International Trade

International Trade Equilibrium

Home: why the Cloth industry disappears

- Labor market perspective:

With a higher relative price in the Wheat industry, workers who move can earn a higher wage in the Wheat industry.

3 Patterns of International Trade

International Trade Equilibrium

Home: why the Cloth industry disappears

- Labor market perspective:

With a higher relative price in the Wheat industry, workers who move can earn a higher wage in the Wheat industry.

- Firms' perspective:

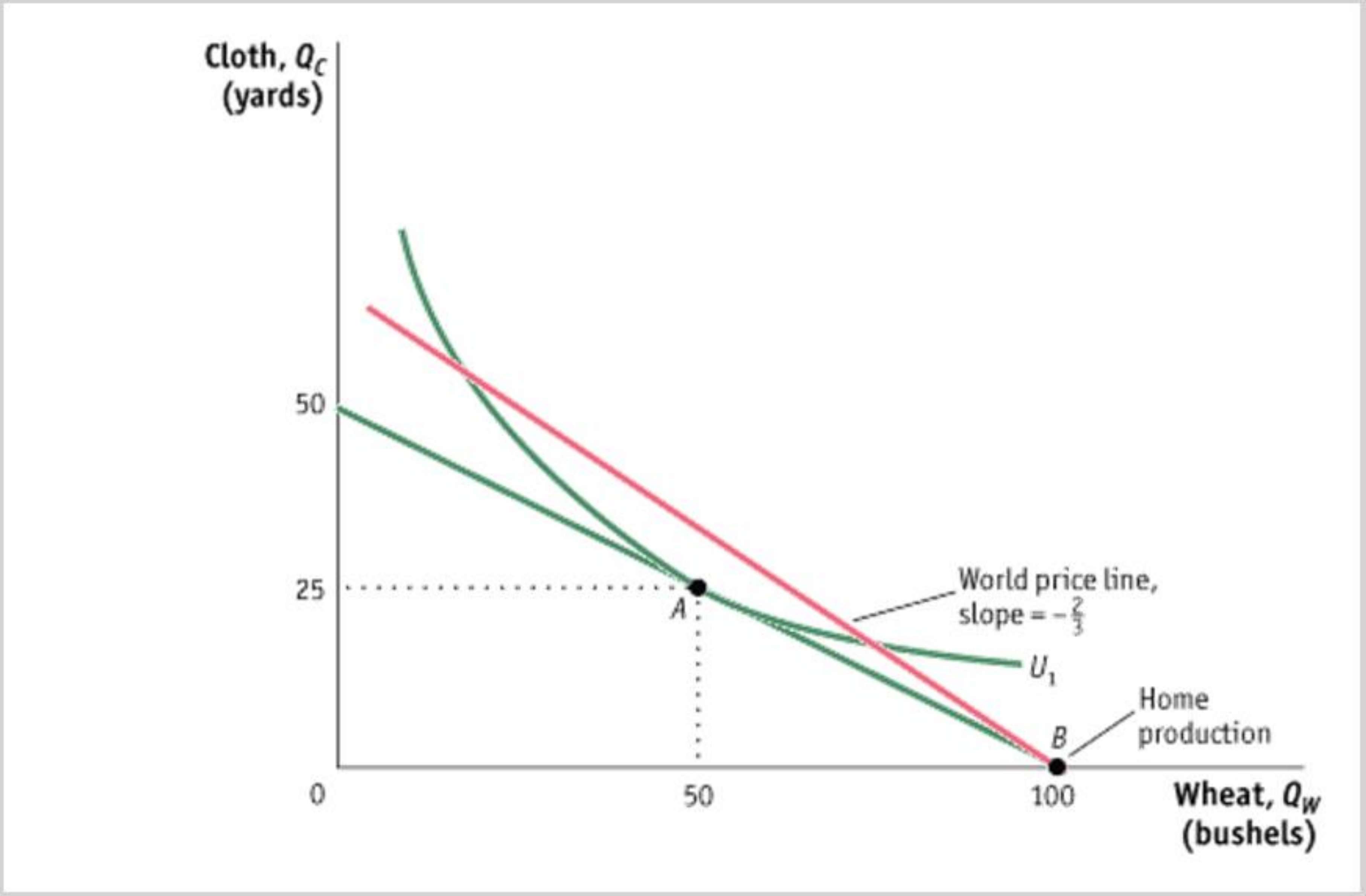
If wages are the same in both industries, perfect competition implies zero profits in the Wheat industry and *negative profits* in the Cloth industry.

Now, with free trade:

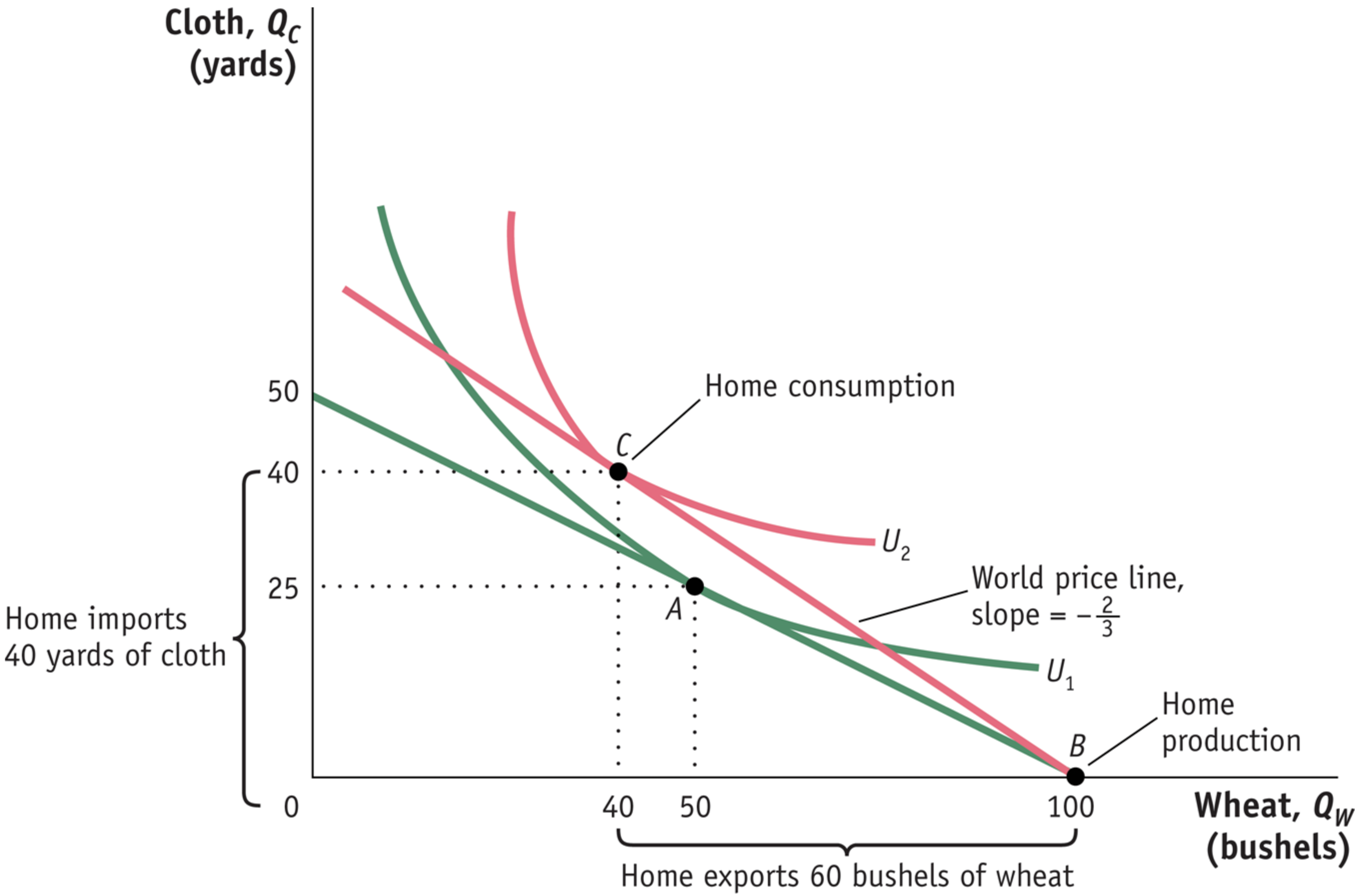
Q: New budget line?

Q: new consumption basket?

International Trade Equilibrium



International Trade Equilibrium



3 Patterns of International Trade

International Trade Equilibrium

The Home country can reach a higher utility level:

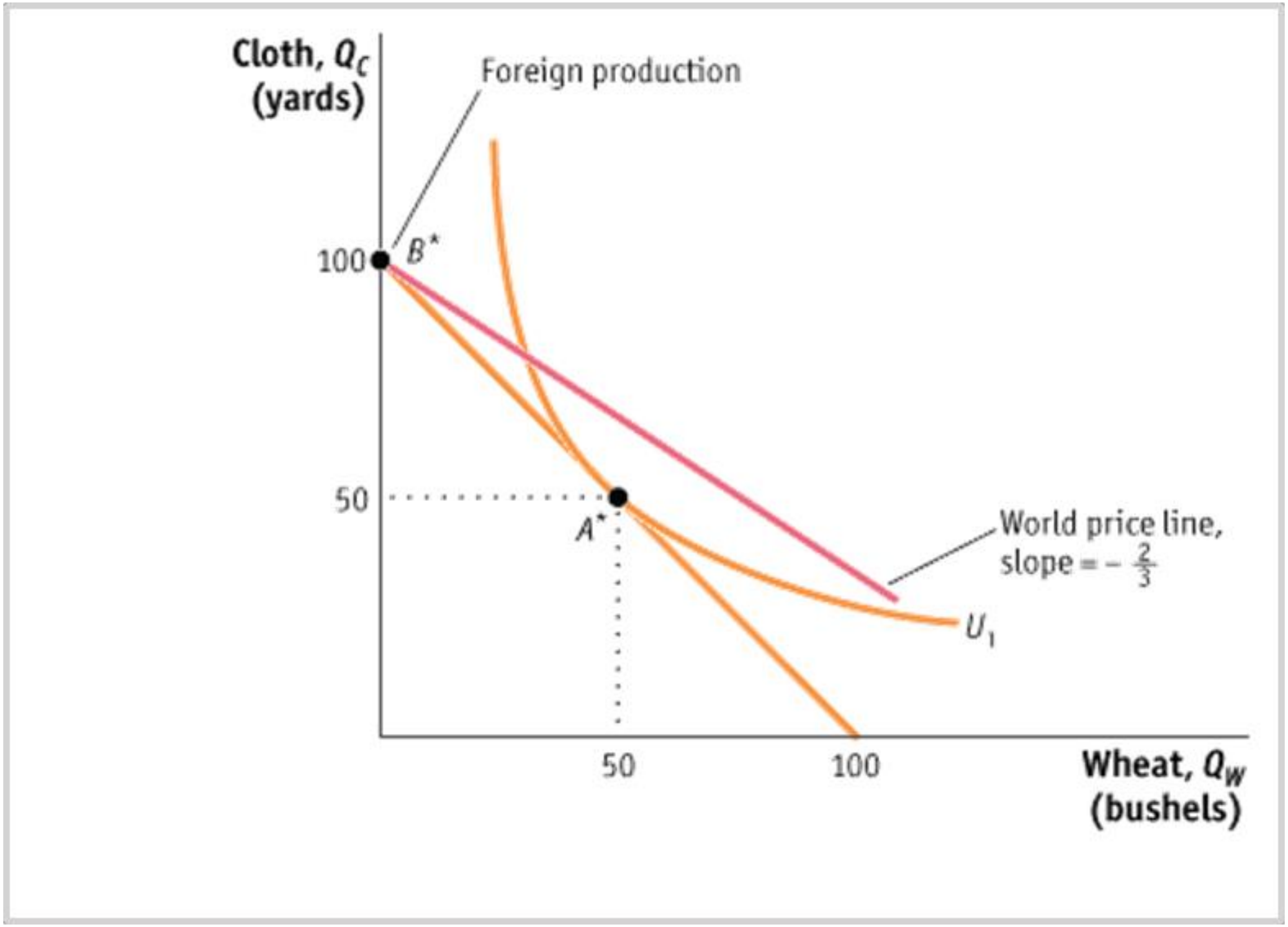
→ Positive gains from trade

What about Foreign country?

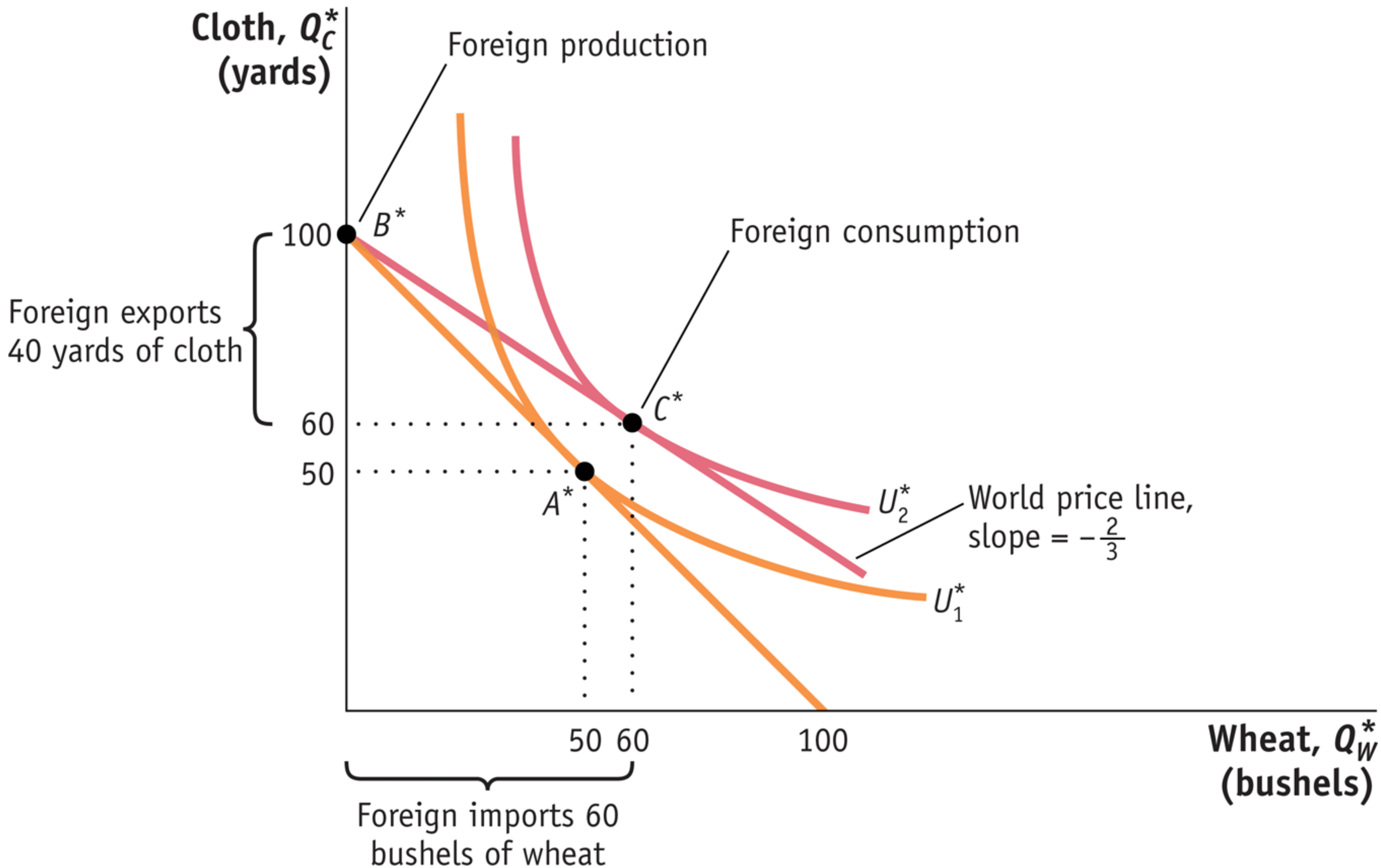
Do both countries gain from trade?

Mercantilist point of view: one has to loose. Is it true here?

International Trade Equilibrium



International Trade Equilibrium



3 Patterns of International Trade

SUMMARY: patterns of Trade and Gains from Trade

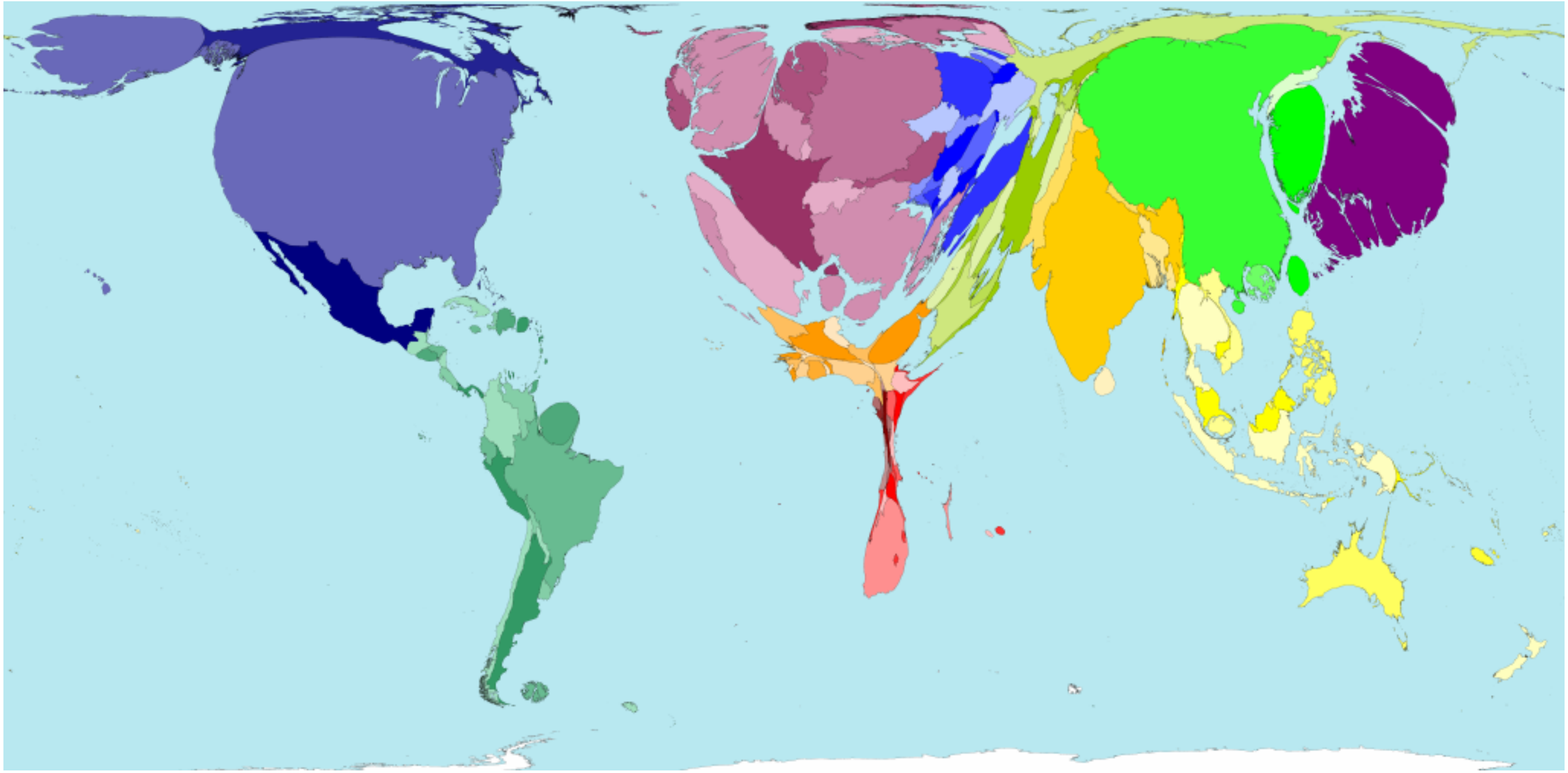
- Each country is exporting the good for which it has the comparative advantage.
  - This confirms that the pattern of trade is determined by comparative advantage.
  - This is the first lesson of the Ricardian model.

- There are gains from trade for both countries.
  - This is the second lesson of the Ricardian model.

3 Patterns of International Trade

Data: Do countries specialize?

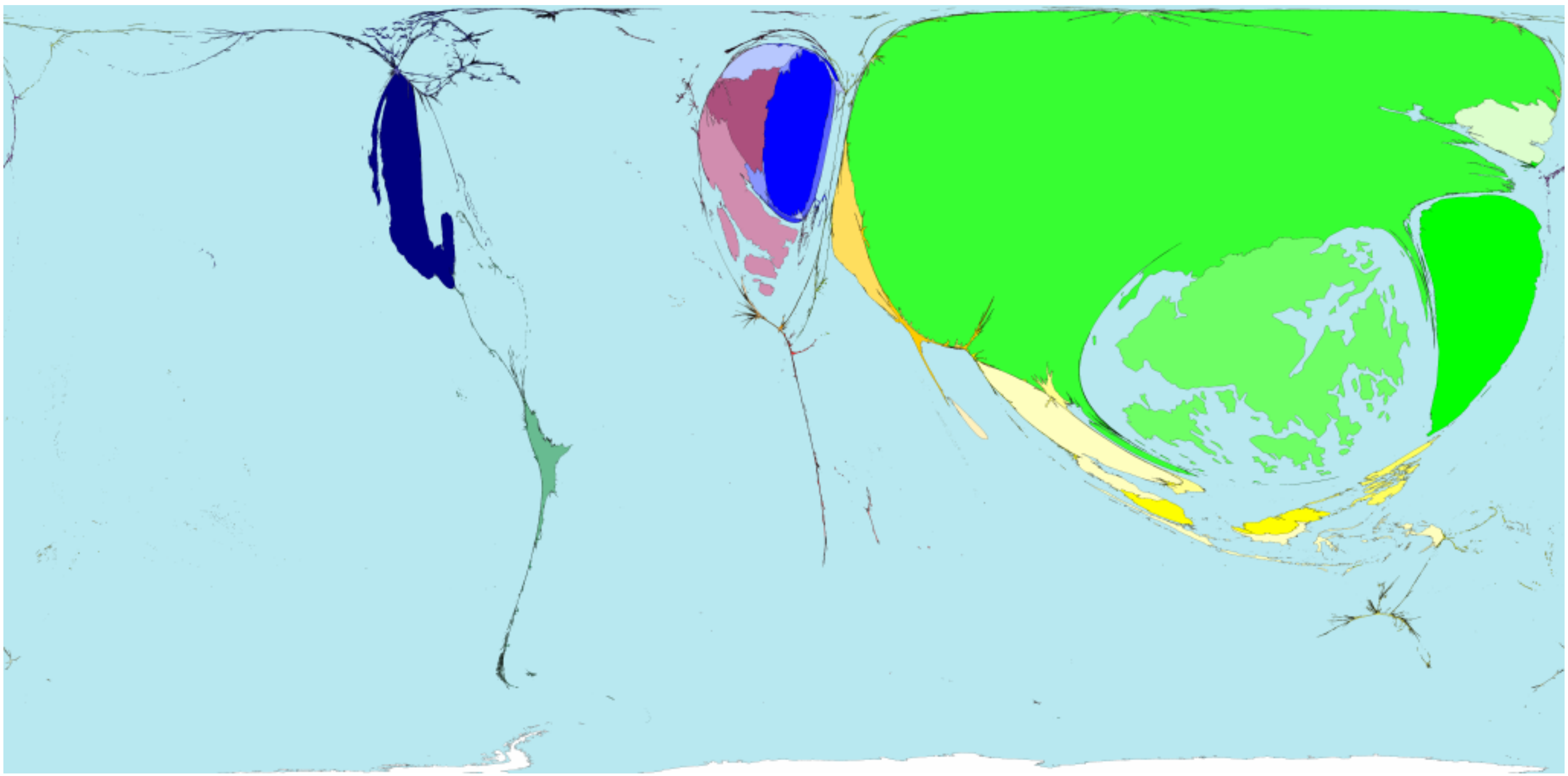
GDP in 2002



3 Patterns of International Trade

Data: Do countries specialize?

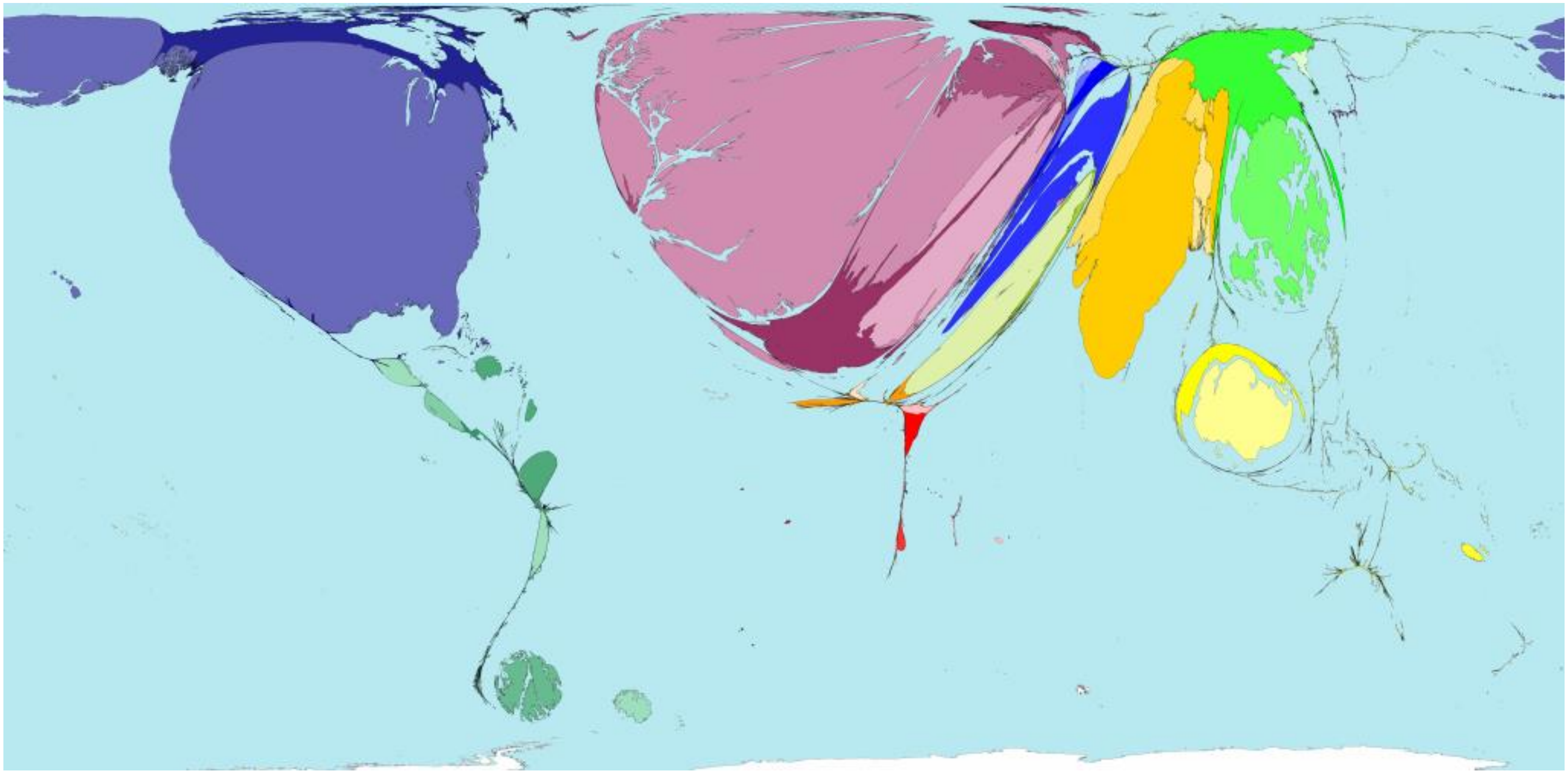
Toy export



3 Patterns of International Trade

Data: Do countries specialize?

Services export



3 Patterns of International Trade

Data: Do countries specialize?

Oil export