Trade
The Ricardian Model

Outline

- Trade
  - The growth of trade
  - The problem of trade restrictions
- Two models of trade
  - Ricardo (technology)
  - Hecksher-Olin (endowments)
- David Ricardo and the Free Trade argument
  - Absolute advantage
  - Comparative advantage
- Beyond the static model
  - Other advantages to trade

Trade and Growth

- In the post WWII period there have been several episodes where trade and growth have been closely tied
  - Resurgence of Europe
    - German GDP<value of exports +imports
  - Resurgence of Japan
    - Important role of consumer goods industry
  - Rise of Asian Tigers
  - Rise of China and India
- In all cases exports rise faster than income
- US is a bit of an exception
  - Trade is important but small in total output
  - Very important in agriculture
- More recently major debate about the role of trade deficits
  - US has not had a commodity trade surplus in nearly 30 years.

Barriers to trade

- Suppose that your costs are higher than those of another country.
- You might want to protect your workers by raising taxes on imports.
- You could even ban imports
- Or argue that there are safety concerns...
- The arguments are extremely old...but the arguments in favor of free trade a not quite so old.

How to think about trade

- Why do people trade?
  - Because they are different
- Demand sources of differences
  - But then why not produce what you want
- Supply sources of differences
  - Technology
  - Endowments
  - Both involve costs

Trade and units

- Individual
  - Talent is usually task specific
  - Skills and specialization
- Firm
  - Make or buy decisions and the boundary of the firm
- Region
  - California may be good at movies (sunshine) but not in steel (not much steel)
- Country
  - Same idea

David Ricardo's world

- Why should England and Portugal have free trade?
  - Relevant items for trade alcohol and cotton cloth
- Portugal is good at making wine and bad at making cotton cloth
- England is good at cotton bad at wine (and alternative alcohol)
- So it makes sense to trade
- Ricardo's surprising claim
  - Even if Portugal is worse at making both it still wants to trade with England.

A model

- Let England have L_e units of labor and Portugal have L_e units of labor. The wage is normalized at 1.
- Let production technology be linear in Labor
  - $F_{we}(L)=a_{we}L$ $C_{we}(X)=X/a_{we}$
  - $F_{wp}(L)=a_{wp}L$ $C_{wp}(X)=X/a_{wp}$
  - $F_{ce}(L)=a_{ce}L$ $C_{ce}(X)=X/a_{ce}$
  - $F_{cp}(L)=a_{cp}L$ $C_{cp}(X)=X/a_{cp}$
- Preferences
  - $U(C,W)=C^\alpha W^{1-\alpha}$
  - That gives us simple demands $C_p = \alpha I/p_{cp}$
  - Incomes are L_p and L_e (because wage is 1)

Autarky equilbrium

- Assume competition => P=MC
- Portugal
  - $C_{cp}(X) = X/a_{cp}$ => $MC_{cp} = p_{cp} = 1/a_{cp}$
  - $C_{wp}(X) = X/a_{wp}$ => $MC_{wp} = p_{wp} = 1/a_{wp}$
  - demands $C_p = \alpha I/p_{cp}$ and $W_p = (1-\alpha)I/p_{wp}$
  - $C_p = a_{cp}\alpha L_p$ and $W_p = a_{wp}(1-\alpha)L_p$
- England
  - $C_{ce}(X) = X/a_{ce}$ => $MC = 1/a_{ce}$
  - $C_{we}(X) = X/a_{we}$ => $MC = 1/a_{we}$
  - demands $C_e = \alpha I/p_{ce}$ and $W_e = (1-\alpha)I/p_{we}$
  - $C_e = a_{ce}\alpha L_e$ and $W_e = a_{we}(1-\alpha)L_e$

The autarky equilibrium (England)

Wine

$a_{we} L_e/$

$a_{we}(1-\alpha)L_e$

Cotton

$a_{ce}\alpha L_e$

$a_{ce}L_e$
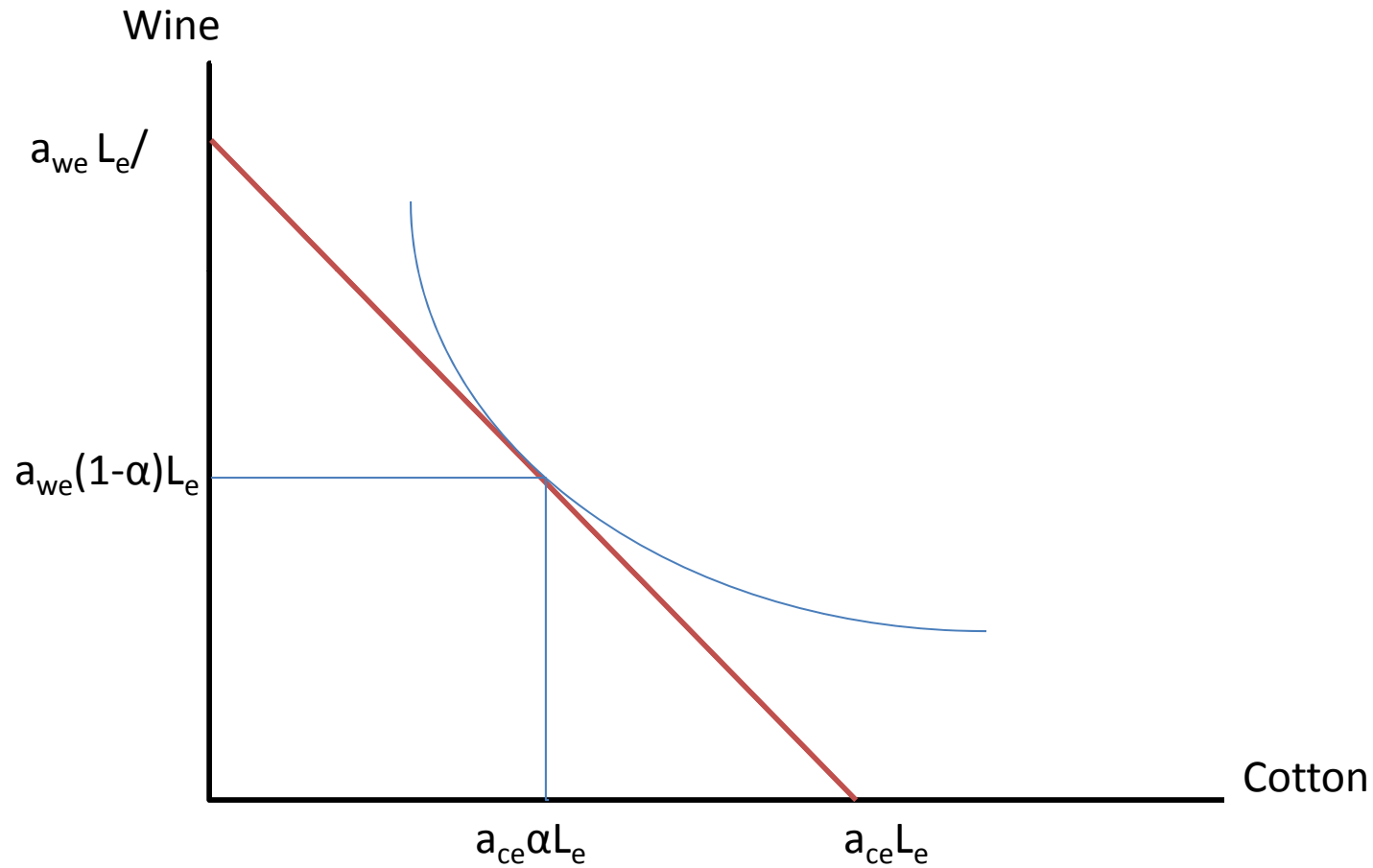
Autarky

- If $a_{we} = a_{wp}$ and $a_{ce} = a_{cp}$
- Then no gains to trade
- Because everything is the same and there are no gains from specialization (costs are linear)
- So we need to break this tie
- Assume that $a_{we} < a_{wp}$ and $a_{ce} > a_{cp}$
- England is bad at wine and good at cotton. Portugal the reverse
- That means each country has an absolute **advantage**
  - Its is the lowest cost producer of something
- Now trade makes sense

Trade

- Assume there are no trade costs
- So now each country would like to specialize in its own product and buy the other.
- Then
  - $MC_w = p_w = 1/a_{wp}$ and $MC_c = p_c = 1/a_{wc}$
  - demands $C_e = \alpha L_e/p_c$ and $C_p = \alpha L_p/p_c$ total demand is thus $C = a_{ce} \alpha(L_e + L_p)$ $W = a_{wp}(1-\alpha)(L_e + L_p)$
  - But $C = a_{ce} L_e$ and $W = a_{wp} L_p$
  - Or $\alpha(L_e + L_p) = L_e$ and $(1-\alpha)(L_e + L_p) = L_p$
    - $L_p = (1-\alpha)/\alpha \, L_e$
  - These hold as knife edge conditions (for every combination of costs and preferences, there is a unique relative size of partners that solves the problem).
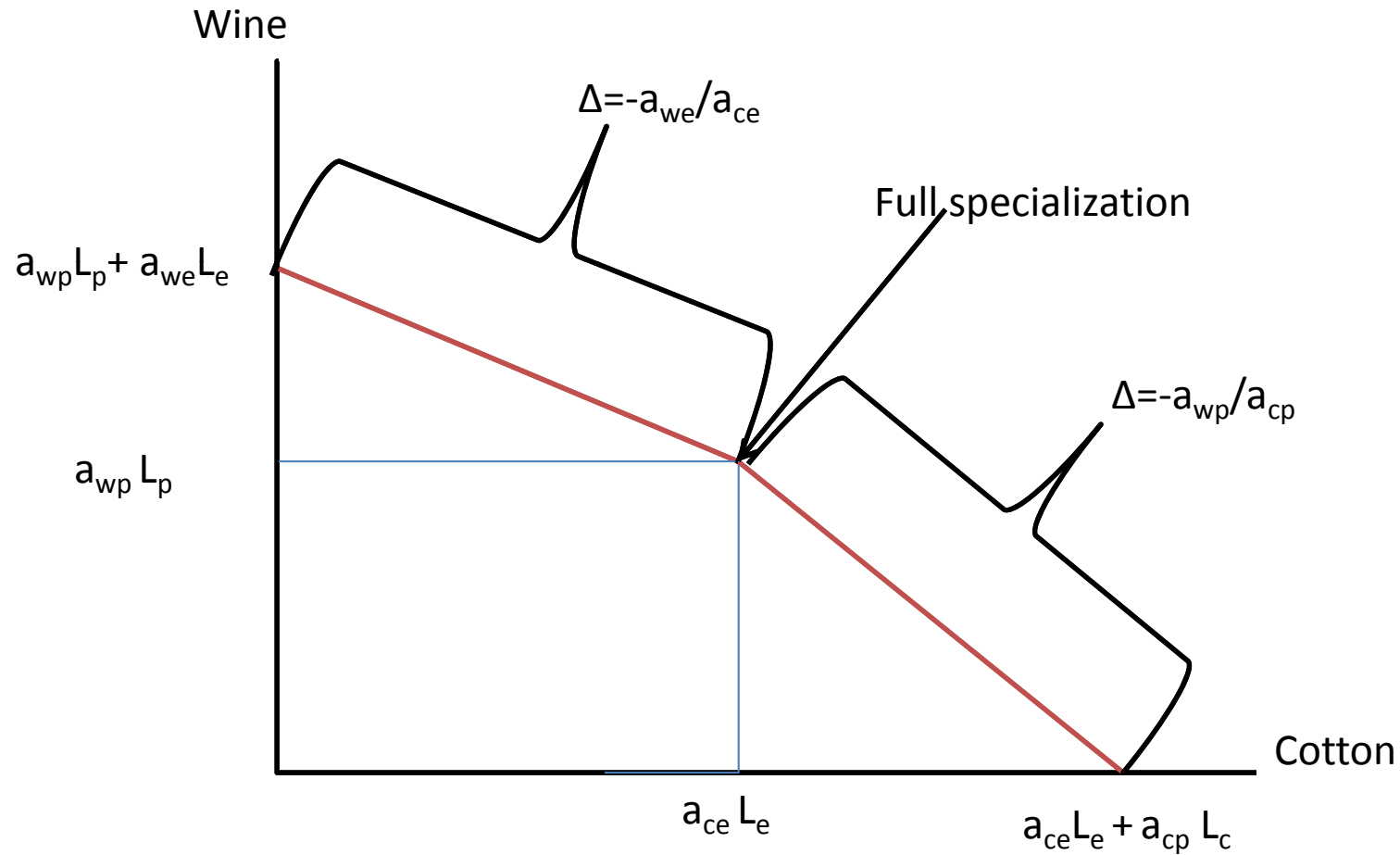
If full specialization

- $L_p = (1-\alpha)/\alpha L_e$
- Both countries gain
  - $C_p = a_{ce}\alpha L_p > a_{cp}\alpha L_p,$
  - $W_p = a_{wp}(1-\alpha)L_p$
  - $W_e = a_{wp}(1-\alpha)L_p > a_{we}(1-\alpha)L_p$
  - $C_e = a_{ce}\alpha L_e,$
- Gains are in product where you are not very good

Trade

- Suppose $L_p < (1-\alpha)/\alpha \, L_e$
  - That says that all workers in Portugal will make wine, while some workers in England will make wine and others will produce cotton if we use $p_w = 1/a_{wp}$ and $p_c = 1/a_{ce}$
  - But if England is unspecialized the right prices are
  - $p_w = 1/a_{we}$ and $p_c = 1/a_{ce}$
- What is the equilibrium? Well England goes back to its own consumption and Portugal produces only wine and buys its coton from England

The trade equilibrium
Absolute advantage

Wine

$\Delta=-a_{we}/a_{ce}$

Full specialization

$a_{wp}L_p+ a_{we}L_e$

$\Delta=-a_{wp}/a_{cp}$

$a_{wp} L_p$

Cotton

$a_{ce} L_e$

$a_{ce}L_e + a_{cp} L_c$

Partial specialization

- $L_p < (1-\alpha)/\alpha L_e \Rightarrow$ price ratio is a_{we}/a_{ce}
  - Now Portugal is fully specialized in wine and it sells part of its output to Britain
  - It produces $a_{wp}L_p$ given British prices its income $I_p = (a_{wp}/a_{we})L_p$
- Demand is $C_p = \alpha I/p_{cp}$ and $W_p = (1-\alpha)I/p_{wp}$
  - $C_p = a_{ce}\alpha I$ and $W_p = a_{we}(1-\alpha)I$
  - $C_p = a_{ce}\alpha (a_{wp}/a_{we})L_p$ and $W_p = a_{we}(1-\alpha) (a_{wp}/a_{we})L_p$
  - $C_p = a_{ce}(a_{wp}/a_{we})\alpha L_p$ and $W_p = (1-\alpha)(a_{wp})L_p$
  - $a_{wp} > a_{we} \Rightarrow (a_{wp}/a_{we}) > 1$ $a_{ce} > a_{cp} \Rightarrow a_{ce}(a_{wp}/a_{we}) > a_{cp}$
  - $a_{ce}(a_{wp}/a_{we})\alpha L_p > a_{cp}\alpha L_p$
- England gets nothing because prices are as in autarky
  - If $L_p > (1-\alpha)/\alpha L_e$ then England gets the gain

Comparative advantage

- Assume that $a_{we} < a_{wp}$ and $a_{ce} > a_{cp}$
- But Ricardo claimed that even if you were worse at everything you should still trade.
  - So now lets look at $a_{we} < a_{wp}$ and $a_{ce} < a_{cp}$ (Portugal is better at producing both cotton goods and wine)
  - Assume that that the british are relatively better at cotton than wine ($a_{ce}/a_{cp} > a_{we}/a_{wp}$)
- $C_e = a_{ce}\alpha L_e$ and $W_e = a_{we}(1-\alpha)L_e$
- The only possible alternative is to sell cotton to the Portuguese

Selling cotton

- Portugal will only accept cotton at Portugese prices (a_{cp})
  - England is fully specialize in cotton and it sells part of its output to Portugal for some wine (at price a_{we})
  - It produces $a_{ce}L_e$ given Portugese prices its income $I_e=(a_{ce}/a_{cp})L_e$
- Demand is $C_e= \alpha I/p_{cp}$ and $W_e= (1-\alpha)I/p_{wp}$
  - $C_e= a_{cp}\alpha I$ and $W_e= a_{wp}(1-\alpha)I$
  - $C_e= a_{cp}\alpha(a_{ce}/a_{cp})L_e$ and $W_e= a_{wp}(1-\alpha)(a_{ce}/a_{cp})L_e$
  - $C_e= a_{ce}\alpha L_e$ and $W_e= (1-\alpha)a_{wp}(a_{ce}/a_{cp})L_e$
  - So cotton consumption remains unchanged but wine depends on
  - $a_{wp}(a_{ce}/a_{cp})\alpha L_e>a_{we}\alpha L_e$?

  Or $a_{ce}/a_{cp}>a_{we}/a_{wp}$ Which is garanteed by comparative advangage
  - Wine consumption goes up
  - So England gains from trade even if it is worse at everything
- Because it saves on resources by concentrating on what it is best at

Comparative advantage

Wine
$(a_{ce}/a_{wp})L_e$

$a_{we} L_e$

$a_{we}(1-\alpha)L_e$

Cotton

$a_{ce}\alpha L_e$

L_e /a_{ce}
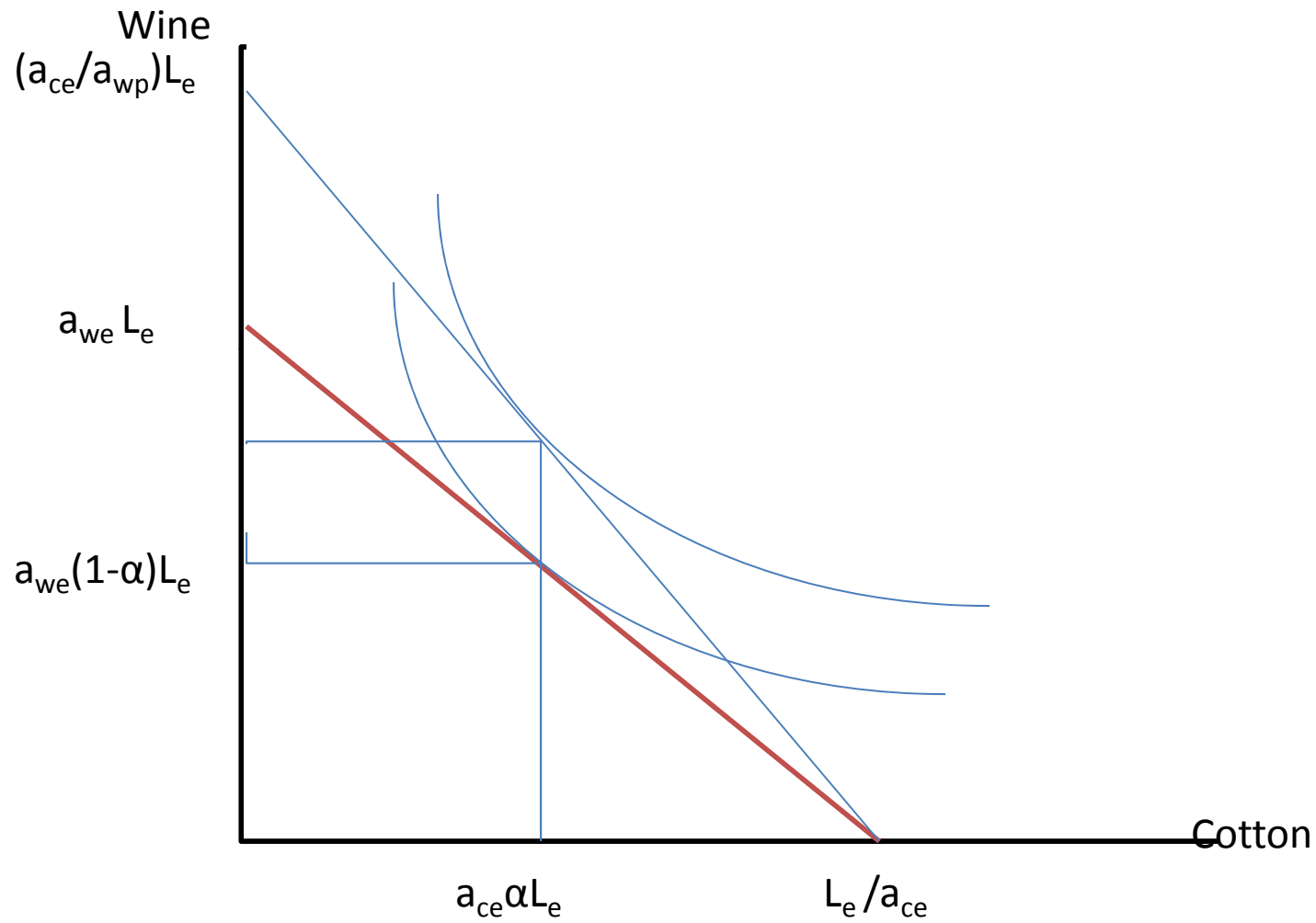
A specific lesson

- The argument that Ricardo put forth still strongest argument in favor of trade
- Trade is not about gaining from others
- Its about avoiding spending time at things you are not good at.
- The goal of Ricardo was to persuade England to abandon protection (tariffs) for agriculture
- He argued that total consumption in England would be bigger…

A more general lesson

- This idea applies at multiple levels
  - Individual
    - If you produce everything you use you must be spending time doing things you are not very good at (so that is relatively costly)
    - You want to concentrate your effort on where the marginal value product is highest.
    - Economists view is not find what you love, its find what pays you best.
  - Firms
    - A firm can either buy inputs or it can make them
    - The more it vertically integrates the more likely it is doing tasks that it is bad at.
    - So profits come from focusing on those things one is good at

Beyond the static model

- Ricardo is static, gains are much like the Edgeworth box; only difference you have production as well.
- But there are no long term gains. If you have trade barriers there is no trade,
- As you lower trade barriers you approach the better free trade equilibrium
- So what about dynamics?
- Then you have to go back in time

Dynamics V.1.
(Smith)

- When England (in our example) gets out of making wine it gains only because it spends fewer resources making wine by buying it

- But maybe it learns how to make really appealing cotton cloth and drives its cost down

- That idea can happen at the level of a worker.

A expanded model

- Suppose costs depend on skill and on labor input. (let F(L) now be F(l,k)

- Under autarky the worker spends α of her time making wine and $(1-\alpha)$ making cotton

- So her investment in wine making skills are going to be found by solving $\alpha \partial F_w / \partial k = r$

- So her investment in cotton making skills are going to be found by solving $\alpha \partial F_c / \partial k = r$

- If she were to fully specialize in cotton she would solve $\partial F_w / \partial k = r$ and that would involve acquiring more skills.

- Can make the same argument about capital and show that in fact as you specialize you have more capital per task and less total capital.

A few problems with the model

- The main problem is that workers who stop producing wine don't immediately find jobs producing cotton
- So trade liberalization is not Pareto improving
  - Loss of jobs, loss of skills
- But it is generally good for growth
  - There are some who gain a lot and other who loose out.

Conclusion

- The key issue that we have assumed throughout is that the two countries have different technologies.

- But one would think that they could learn

- Ricardo did not make enough of a difference in terms of cost differences between endowments and technology

- That was a contribution that waited a hundred years to be tackled.