EC3355: International Trade
The Ricardian model

Stijn van Weezel

Department of Economics
Royal Holloway, University of London

Last week

- Size matters
  - Large economies produce more and have more to sell in export market
  - Large economies generate more income and can buy more imports
- Gravity model
  - Larger trade flows if countries have large economies or are close to each other
  - Describes trade flows reasonably well
- Persistent effect of distance
  - Trade decreases in distance
  - Distance proxies for other factors that influence trade
  - Borders associated with trade reduction

UK imports in 2012

From first lecture

- Bananas from Equador (68 Million US $)
- Lamb meat from New Zealand (441 Million US $)
- Oil from Kuwait (2 billion US $)
- Cars from Germany (17.2 billion US $)
- Turbojets from the USA (4.2 billion US $)

UK exports 2012

- Mineral fuels, oils and waxes (62.7 Billion US $)
- Nuclear reactors and boilers (61.8 Billion US $)
- Vehicles (48.3 Billion US $)
- Pharmaceutical products (27.5 Billion US $)

Today

- Comparative advantage
- Ricardian model
- Gains from trade
- Productivity
- Extensions and limits

Comparative advantage

Reasons why countries trade

- Proximity of countries to each other
- Based on cross-country differences
  - Differences in amount of resources/factors of production
  - Countries can benefit from things they do relatively well
- Based on economies of scale and product differentiation
  - Produce limited amount of goods but more efficient

Comparative advantage

Ricardo's idea

- Countries trade due to technological differences
- Countries can always gain from trade
  - Even a country that is better at everything

Comparative advantage

Context of Ricardo's idea

- Time of mercantilism
  - Focus on positive trade balance
  - Exports are good, imports are bad
- Mercantilism was in favour of high tariffs
  - Corn Laws in the UK
- Ricardo showed that free trade could benefit all trade partners

Comparative advantage

Ricardo's example

	Cloth (m)	Wine (L)
Portugal	20	300
England	10	100

- Portugal has an **absolute** advantage in producing both goods
- Portugal can still benefit from trade

Comparative advantage

Ricardo's example

1. England should specialise in cloth where it has a **comparative** advantage
   - 10 m of cloth can be traded against 150 L of wine ($10 * \frac{300}{20}$), rather than produce 100 L domestically
2. Portugal should specialise in wine production
   - 300 L of wine will get 30 m of cloth ($300 * \frac{10}{100}$), instead of just 20 m at home

Comparative advantage

Ricardo's example

- England has a comparative advantage in producing cloth, Portugal in producing wine
- Both countries gain by specialising and trading

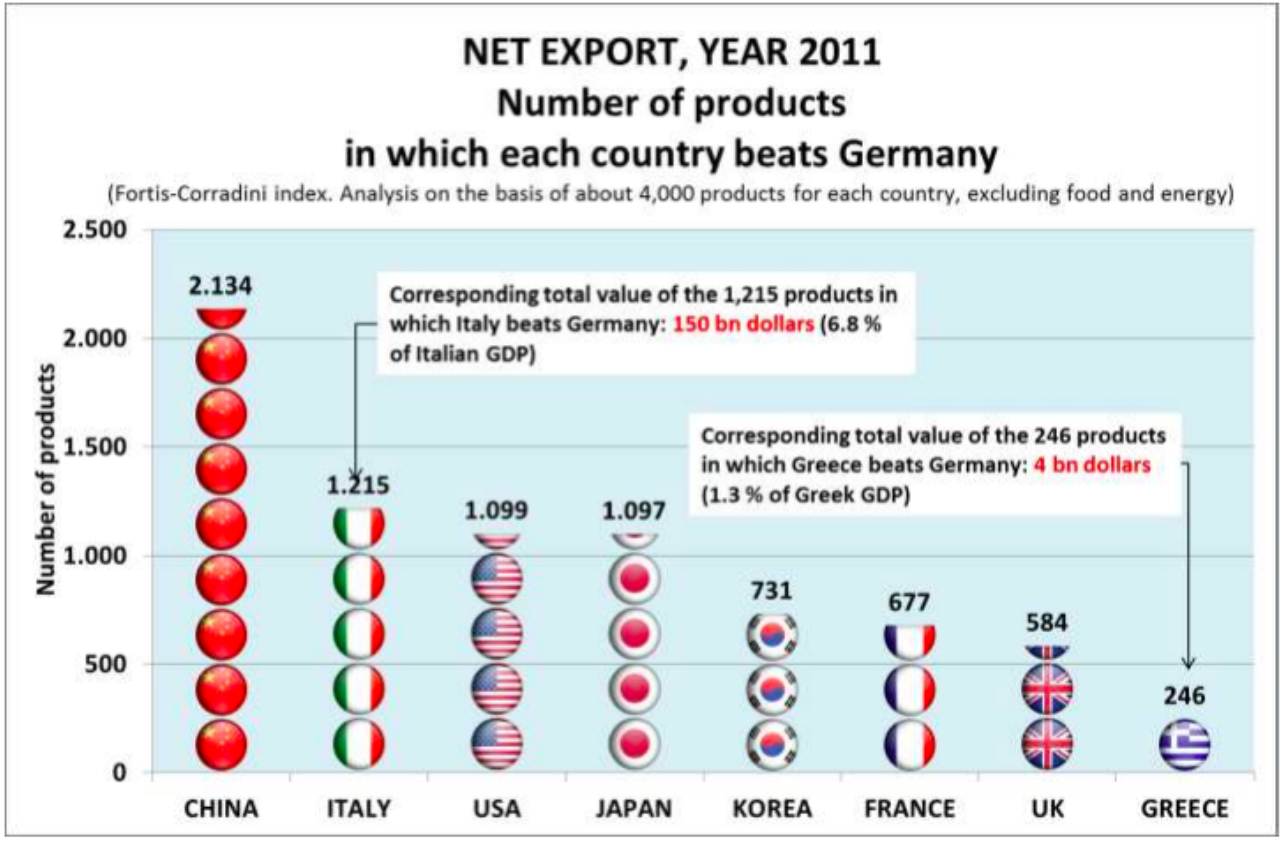
Comparative advantage

Main idea of the Ricardian model

- Trade due to technological differences
  - Labour productivity
- Countries will benefit by specialising
  - Under free trade countries will specialise
- Free trade weakly benefits all participants (relative to autarky) even if some countries are terrible at everything

Comparative advantage

Italy is the second country after China
for the highest number of non-food manufactured products
with a net trade value higher than of Germany's



Source: compiled by Fondazione Edison on data from United Nations Comtrade, Eurostat, Istat

Ricardian model

Basic model

- 2 countries: Home and Foreign
- 2 goods: X and Y
- 1 production factor: labour L

Ricardian model

Model assumptions

- Supply
  - Labour is mobile across sectors
  - Market for labour is competitive (work in sector with higher wages)
  - Supply of labour is constant
  - Production with constant returns to scale
  - Labour cannot move between countries
- Demand
  - Consumers consume X and Y to maximise utility
  - Constrained by labour income
  - If price in one good rises, substitute other good
  - Under free trade: can buy goods produced anywhere

Ricardian model

Production

1. Home has L hours of labour
   - One unit of x takes a_x hours
   - One unit of y takes a_y hours
2. Foreign has L^* hours of labour
   - One unit of x takes a_x^* hours
   - One unit of y takes a_y^* hours

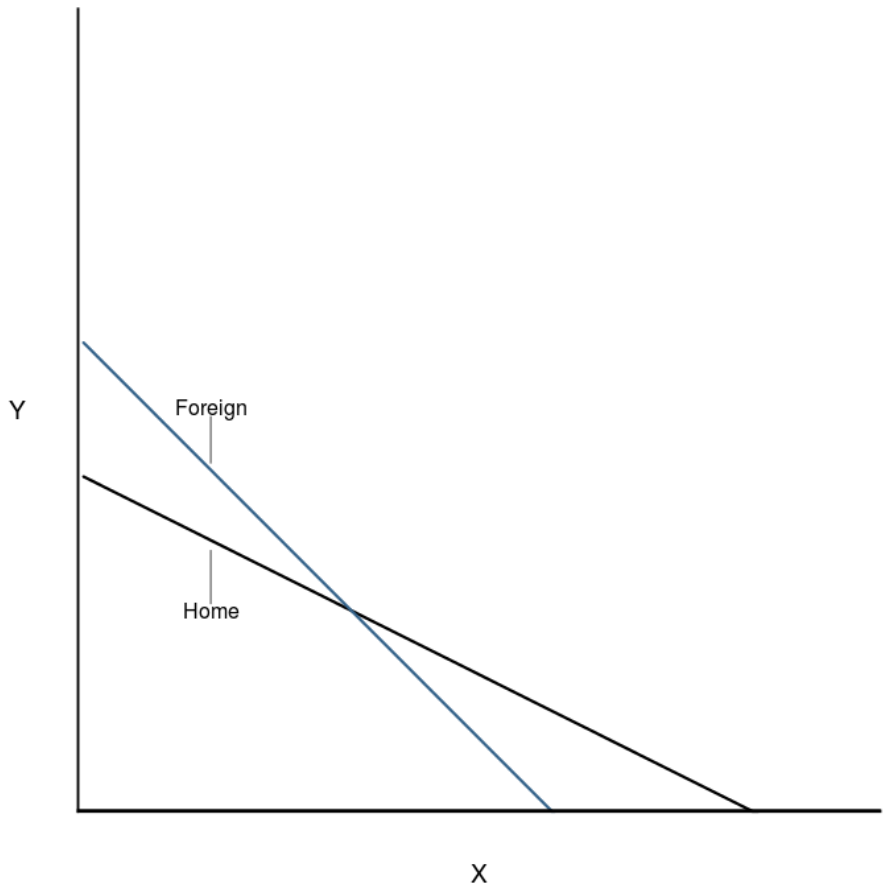
- Production probabilities frontier (PPF):

$$L = a_x X + a_y Y$$

$$L^* = a_x^* X + a_y^* Y$$

Ricardian model

Production possibility frontier Home and Foreign



Ricardian model

Production probability frontier

- In autarky the PPF acts as a budget constraint for the country
- In a perfectly competitive market the country will produce at its highest level of utility within the limits of the PPF

Ricardian model

Relative prices under perfect competition

Under autarky we have:

$$p_x = a_x w; p_y = a_y w \Rightarrow p_a = \frac{p_x}{p_y} = \frac{a_x}{a_y}$$

$$p_x^* = a_x^* w^*; p_y^* = a_y^* w^* \Rightarrow p_a^* = \frac{p_x^*}{p_y^*} = \frac{a_x^*}{a_y^*}$$

Wage is given by:

$$w = \frac{p_x}{a_x} = \frac{p_y}{a_y}$$

Ricardian model

Opportunities for trade and specialisation

In autarky the relative price of good X is higher in Home than Foreign

$$\frac{a_x}{a_y} > \frac{a_x^*}{a_y^*}$$

- Opportunity cost of X in terms of Y is higher in Home than Foreign
- Means that Home is better for producing Y and importing X from Foreign

Ricardian model

Opportunities for trade and specialisation

$$\frac{p_x}{p_y} < \frac{a_x}{a_y}$$

- Home specialises in Y and imports X

$$\frac{p_x}{p_y} > \frac{a_x^*}{a_y^*}$$

- Foreign specialises in X and imports Y

Ricardian model

Trade patterns

- Each country will export its comparative advantage good
  - Home will export Y
  - Foreign will export X
- Mutual beneficial exchange implies a convergence of prices until:

$$\frac{p_x}{p_y} = \frac{p_x^*}{p_y^*}$$

Ricardian model

Three possible equilibria

1. Free trade relative price can equal Home autarky relative price
2. Free trade relative price can equal Foreign autarky relative price
3. Free trade relative price can be strictly in between autarky relative prices

Ricardian model

Free trade relative price = Home autarky relative price

- Home will produce both goods
- Foreign will only produce X
- Foreign gains, Home does not

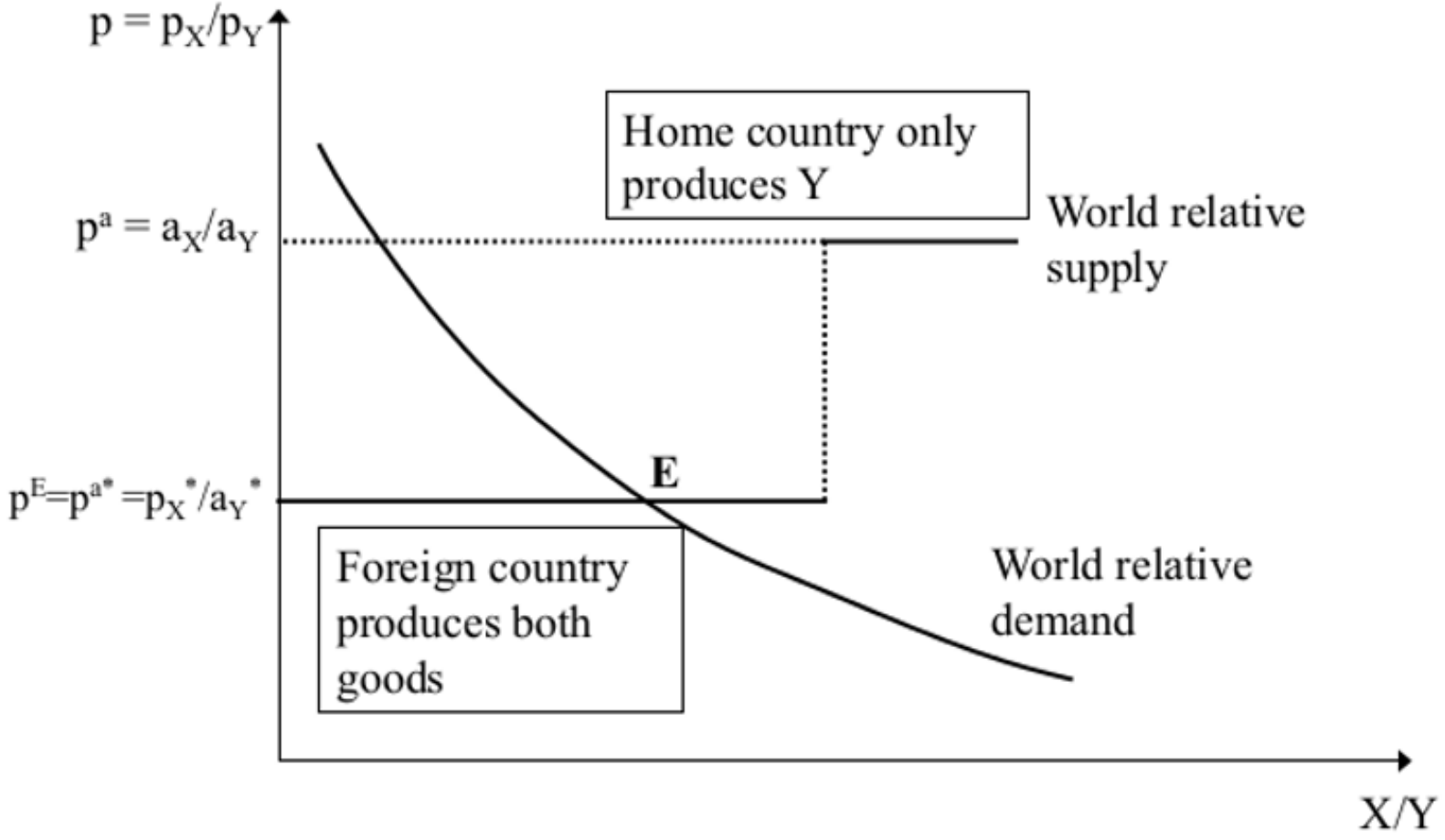
Ricardian model

Free trade relative price = Foreign autarky relative price

- Foreign produces both goods
- Home only Y
- Home gains, foreign does not

Ricardian model

World equilibrium with incomplete specialisation



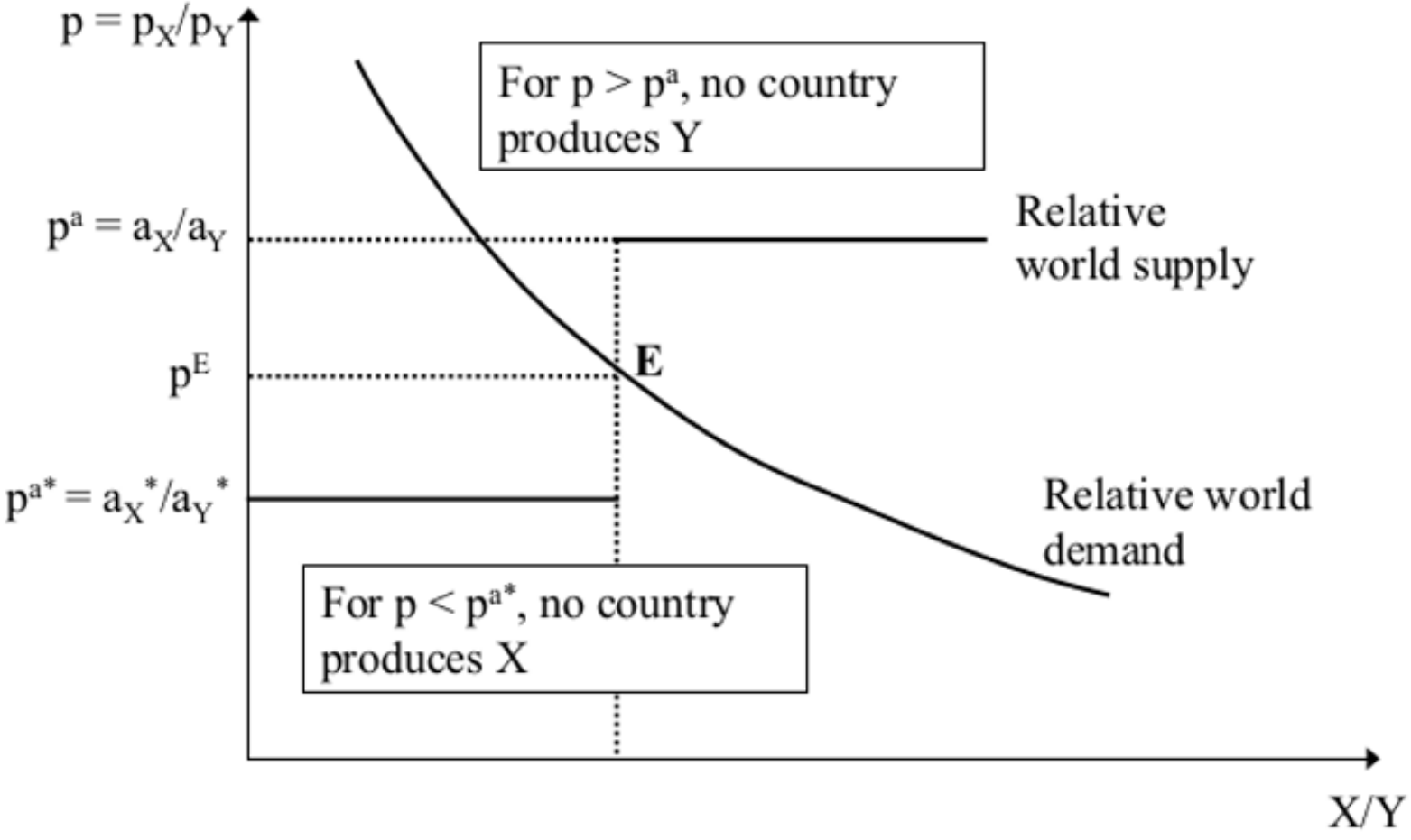
Ricardian model

Free trade relative price strictly in between autarky relative prices

- Home produces only X, Foreign only Y
- Both gain

Ricardian model

World equilibrium with full specialisation



Ricardian model

World equilibrium with full specialisation

- Full specialisation if:

$$\frac{a_x^*}{a_y^*} < p < \frac{a_x}{a_y}$$

- Relative supply:

$$\frac{X}{Y} = \frac{L^*/a_x^*}{L/a_Y}$$

Gains from trade

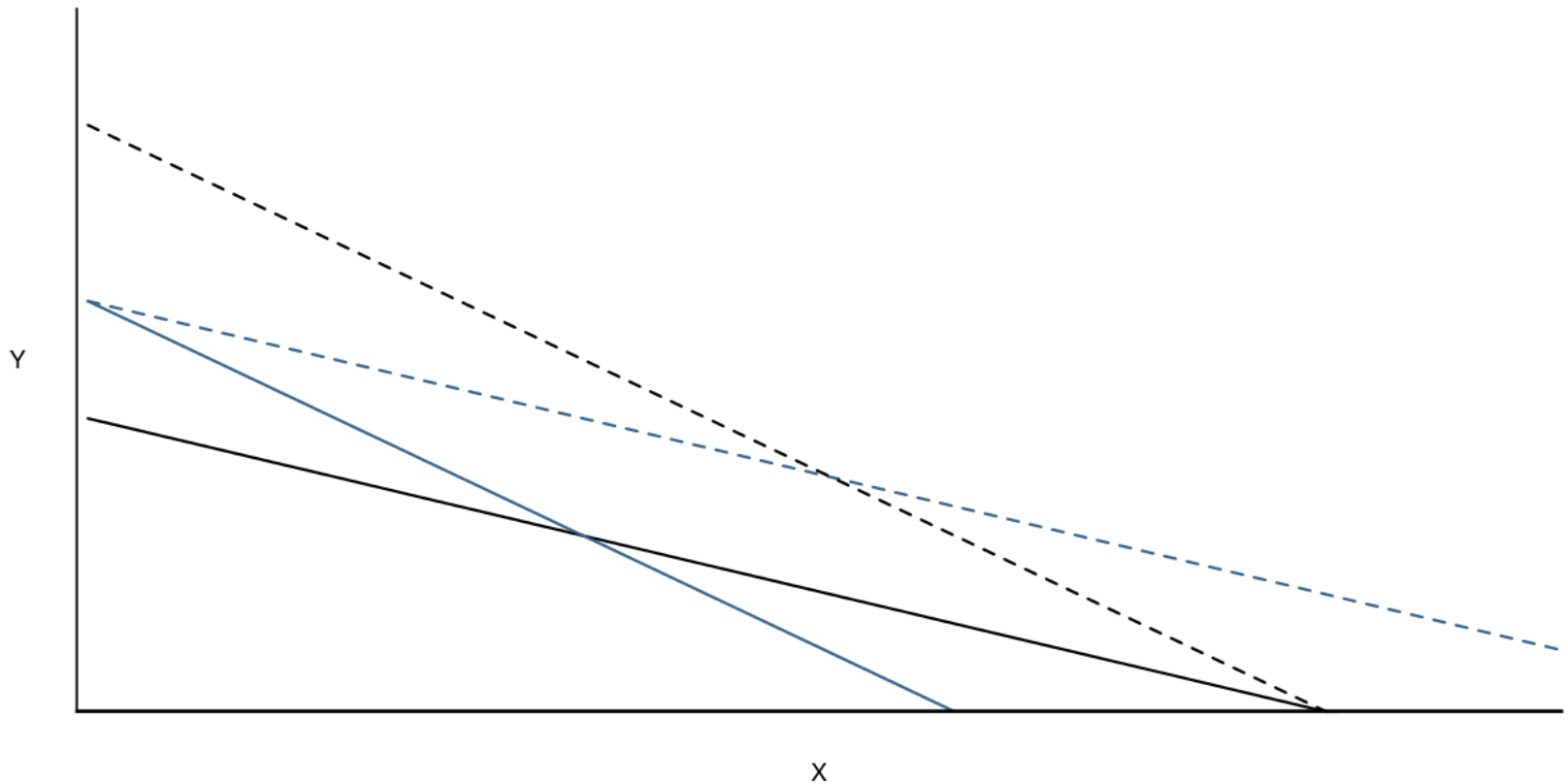
- Gains from trade stem from specialisation on the most resource efficient industry and using the generated income to buy desired goods and services
- Workers benefit from trade since opening up the economy increases the price of their exported goods

Gains from trade

- Trade can be regarded as indirect method of production or new technology
- In absence of trade, country has to allocate resources to produce all of the goods it wants to consume
- With trade, country can specialise its production and trade the products for goods it wants to consume
- Trade expands consumption possibilities beyond production possibilities

Gains from trade

Trade Possibility Frontier



Gains from trade

Welfare gains under full specialisation

- Free trade create additional consumption possibilities
- Instead of producing additional unit of X, Home saves a_x units of labour
- a_x units of labour are used to produce $\frac{a_x}{a_y}$ units of Y
- Extra units of Y are sold to Foreign and import $\frac{p_y}{p_x}\frac{a_x}{a_y} >$ units of X

Productivity and wages

Determination of wages

- Industry will hire workers up to the point at which wages equal value of production
- Labour is hired up to the point where $w = p * MPL$ for each industry
- Labour can move freely between industries, and will move to highest paying industry until wage equalisation occurs

Productivity and wages

Determination of wages

$$p_X MPL_X = p_Y MPL_Y$$

$$\frac{p_X}{p_Y} = \frac{MPL_Y}{MPL_X}$$

- Price ratio $\frac{p_X}{p_Y}$ denotes relative price of the good in the numerator in terms of foregone goods in the denominator

Productivity and wages

Determination of wages

Under autarky:

$$p_x^a = wa_x, p_y^a = wa_y; p_x^{*a} = w^* a_x^*, p_y^{*a} = w^* a_y^*$$

Full specialisation:

$$w = \frac{p_y}{a_y}; w^* = \frac{p_x}{a_x^*}$$

Relative wages:

$$\frac{w}{w^*} = \frac{p_y}{p_x}\frac{a_x^*}{a_y}$$

Productivity and wages

Determination of wages

- Productivity differences determine wage differences in the Ricardian model
- Trade is determined by comparative advantage, but wages by absolute advantage
  - A country with absolute advantage in producing a good will enjoy a higher wage in that industry after trade

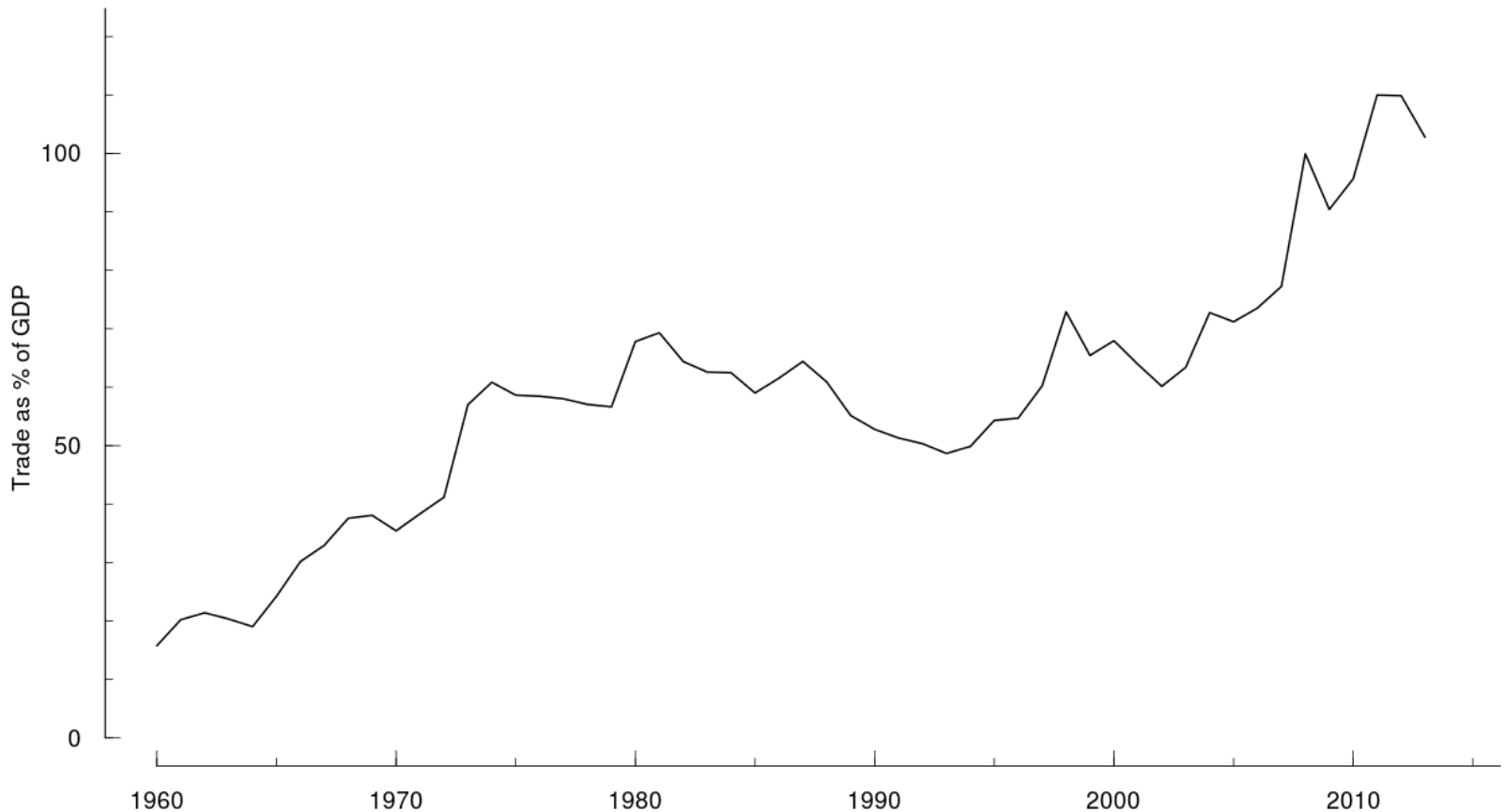
Productivity and wages

Determination of wages

- Both countries have cost advantage in production
  - Cost of high wages can be offset by high productivity
  - Cost of low productivity can be offset by low wages
- Follows that countries with poor technology can export at competitive prices by having low wages
  - When technology improves, wages will rise
- Ricardian model predicts that when countries engage in trade, real wages will rise.

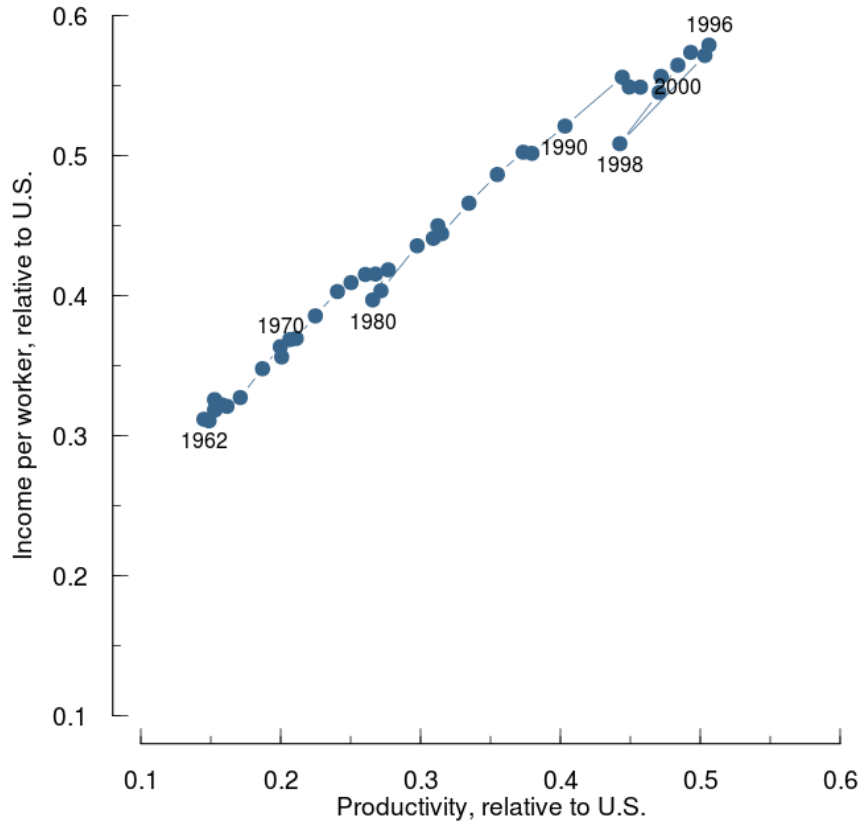
Empirical evidence

Trade relative to GDP South Korea 1961-2000 (*Source: WDI*)



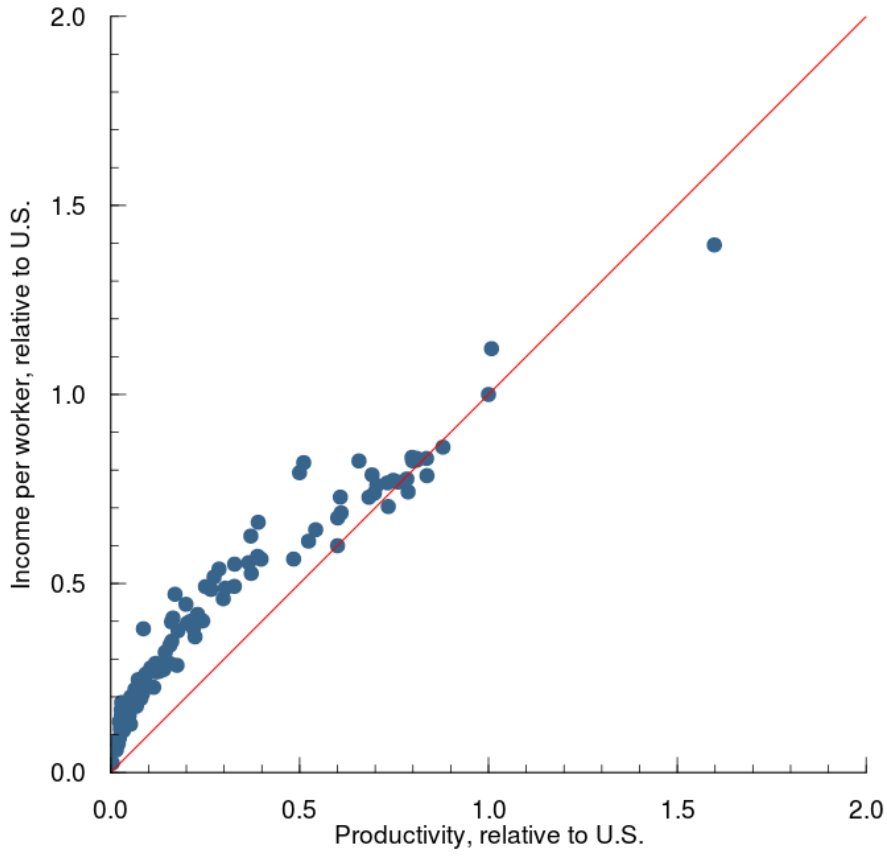
Empirical evidene

Productivity and wages Korea 1961-2000 (*Source: UNIDO*)



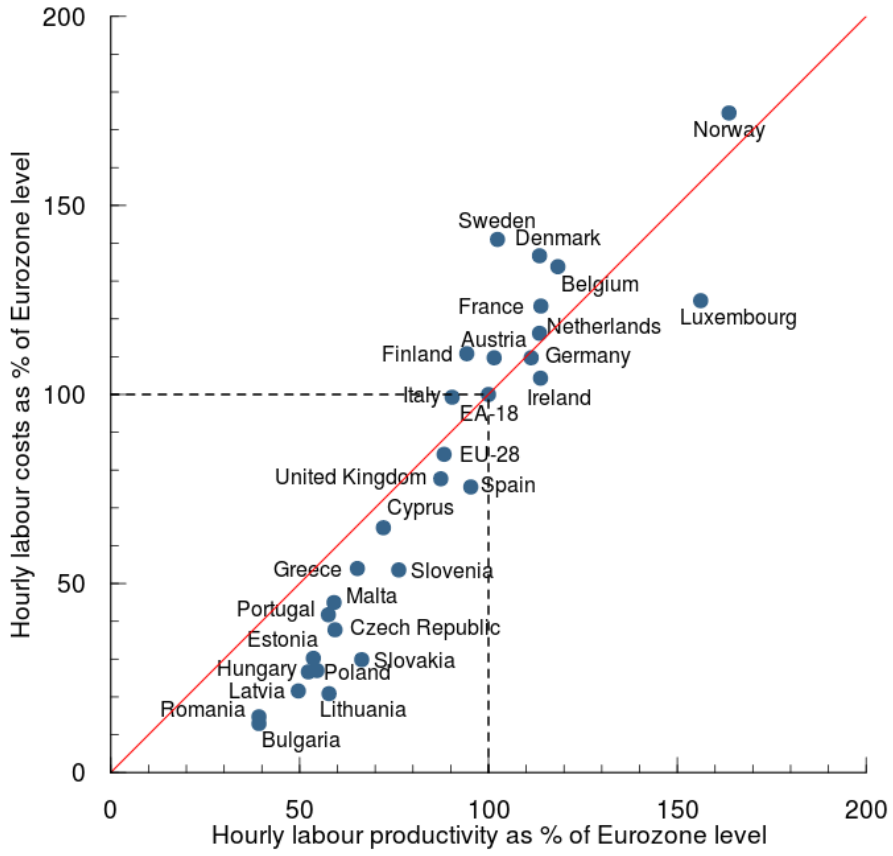
Empirical evidence

World productivity and wages for 2000 (*Source: UNIDO*)



Empirical evidence

Hourly productivity and labour costs European Union 2012 (*Source: Eurostat*)



Empirical evidence

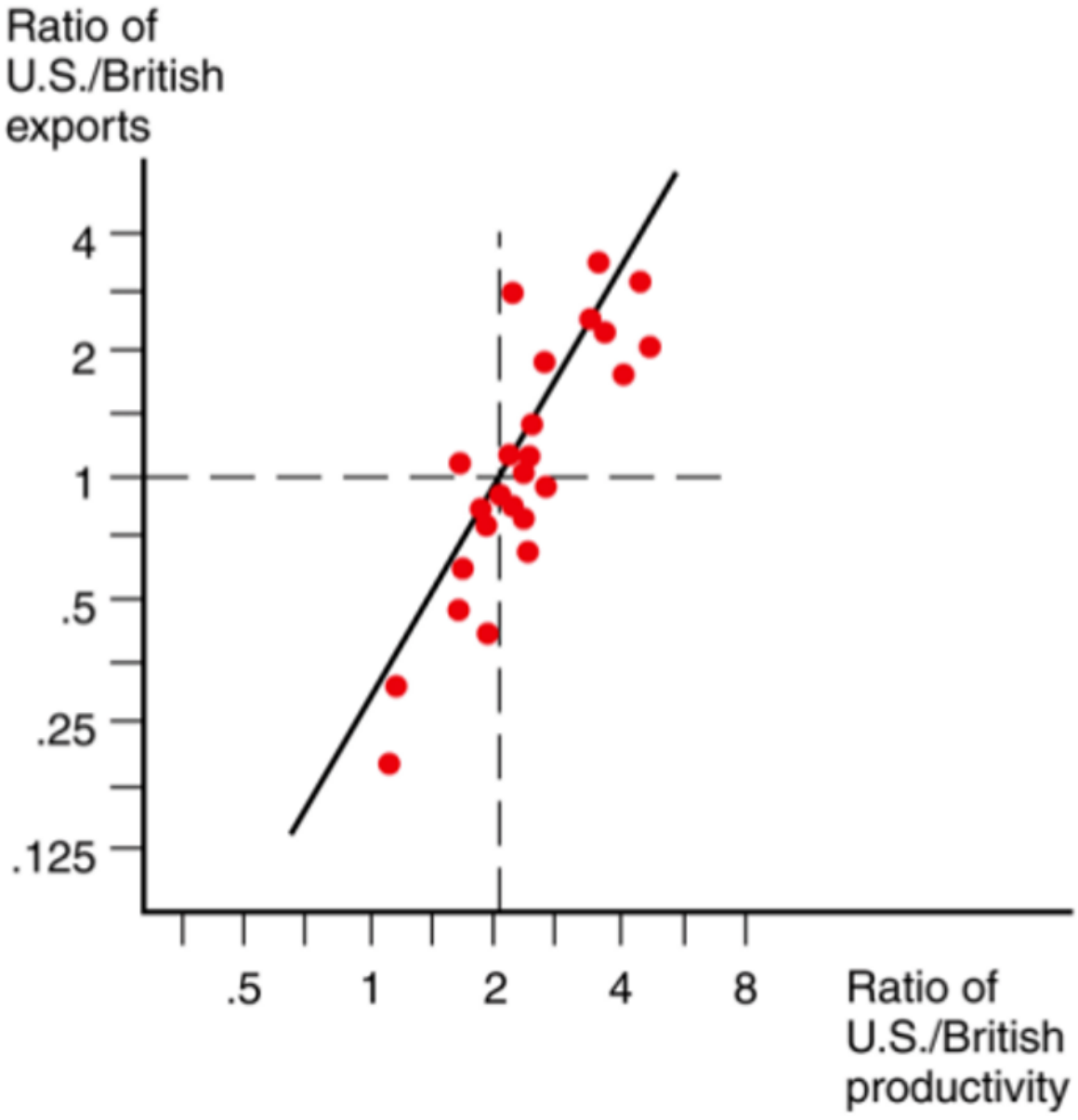
Bangladesh's relative productivity in textiles

	Bangladeshi Output per Worker as % of China	Bangladeshi exports as % of China
All industries	28.5	1.0
Apparel	77	15.5

Source: McKinsey and Company, "Bangladesh's ready-made garments industry: The challenge of growth," 2012; UN Monthly Bulletin of Statistics.

Empirical evidence

US ratio of exports lowest in least productive sectors for 1951(From the textbook)



Extensions and limits

More than two goods

- Rank all goods based on productivity

$$\frac{a_1^*}{a_1} < \frac{a_2^*}{a_2} < \ldots \frac{a_n^*}{a_n}$$

- Locate $\frac{w}{w^*}$ in this serie
- Products $\frac{a_i^*}{a_i} > \frac{w}{w^*}$ are exported by home
- Disadvantage in terms of wages is compensated by advantage in terms of productivity

Extensions and limits

Transport costs

- Proportional transport cost τ
- Good i is not traded if:

$$wa_i < w^* a_i^* < wa_i(1+\tau)$$

Extensions and limits

Popular misconceptions

1. Trade only helps countries that are more productive than other countries
   - Unproductive countries benefit from free trade as they can specialise in industries that use resources most efficiently
2. Trade with low wage countries hurts high wage countries
   - Trade benefits consumers in high wage countries by providing cheaper products
   - Trade can hurt some groups in high wage countries
3. Trade hurts poor countries because low wages are needed to allow exports
   - Situation would be worse in absence of trade

Extensions and limits

Absence of specialisation

- Predicted specialisation rarely happens
  - Transportation costs reduce/prevent trade (last lecture)
  - More than one factor of productions which reduces specialisation tendency (next lecture)
  - Protectionism (after reading week)

Extensions and limits

Other limitations

- What determines technological differences?
- Factors such as weather
- Manufacture local and avoid trade costs