International Economics

Fall 2011

Trade and Income Inequality

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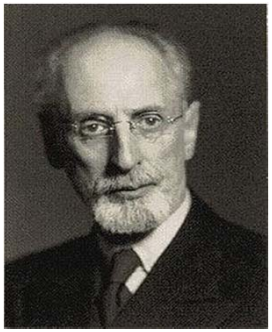
Today's Plan

- Heckscher-Ohlin (HO) model
  - Basic setup
  - Stolper-Samuelson (SS) theorem
  - Rybczynski (RB) theorem
  - HO theorem
  - Empirical evidence
- Trade and inequality

Heckscher-Ohlin (HO) model: Introduction

- A theory developed by two Swedish economists: Eli Heckscher and Bertil Ohlin
  - Heckscher was born in Stockholm into a prominent Jewish family, son of the Danish-born businessman Isidor Heckscher . He studied at university in Uppsala and Gothenburg, completing his PhD in Uppsala in 1907.



  - Ohlin received his B.A. from Lund University 1917, and his M.A. from Harvard University in 1923, and his doctorate from Stockholm University in 1924. In 1925 he became a professor at the University of Copenhagen. From 1929, he taught at Stockholm School of Economics. Ohlin was awarded Nobel prize in 1977.

Source: wikipedia

Heckscher-Ohlin (HO) model: Introduction

- While trade is partly explained by differences in labor productivity, it also can be explained by differences in factor endowments, such as labor, capital and land, across countries.
- Very briefly, the theory states countries tend to export goods whose production is intensive in factors they are abundantly endowed with.
- Unlike theory of comparative advantage, HO theory has more than one factor of production (i.e., labor), thus it enables us to analyze the impact of trade on income distribution.

HO model: basic setup

- Two countries: Home, *H* and Foreign, *F*
- Two goods: Food, *F* and Cloth, *C*
- Two production factors in fixed supplies
  - Labor (L, L^*)
  - Land (T, T^*) (* denotes foreign)

HO model: basic setup

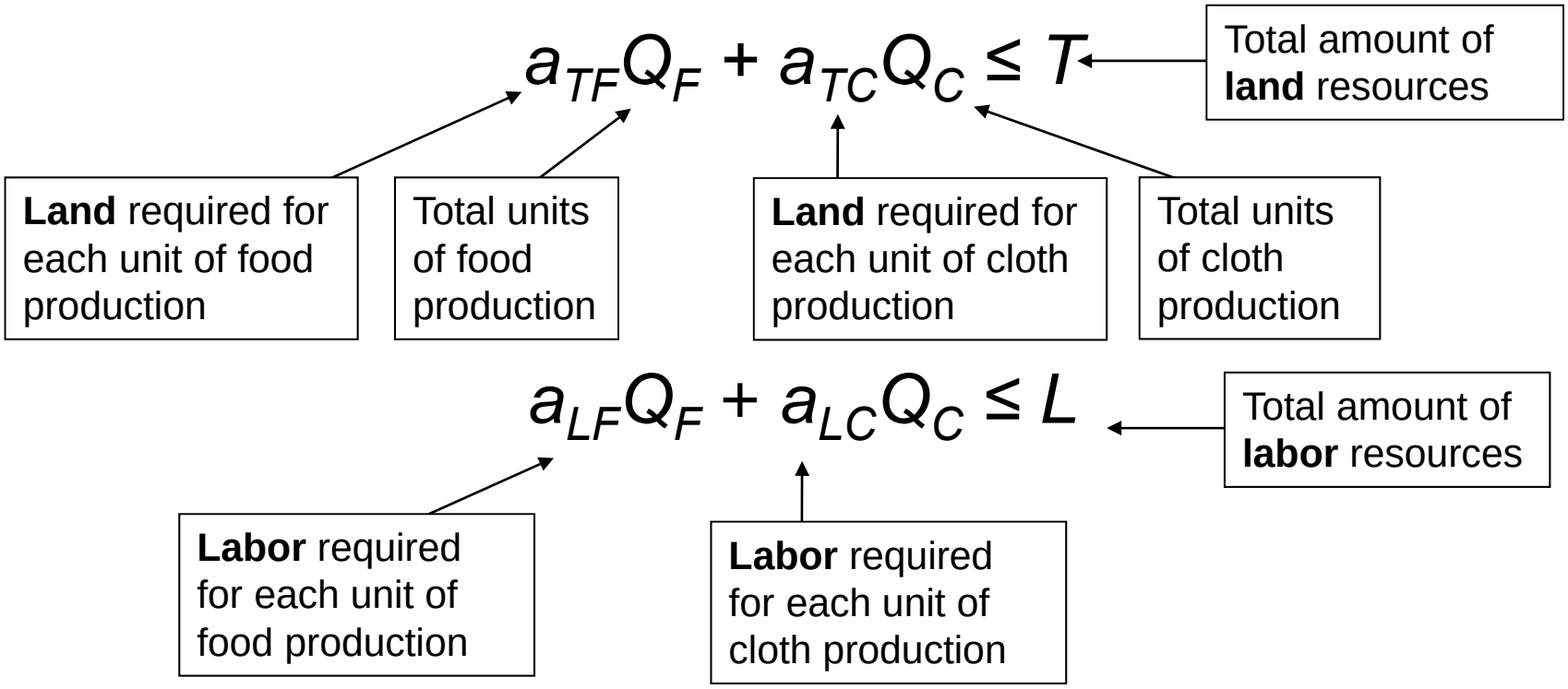
- Two factors of production: labor and land.
  - a_{TC} = acres of land used to produce one yard of cloth
  - a_{LC} = hours of labor used to produce one yard of cloth
  - a_{TF} = acres of land used to produce one calorie of food
  - a_{LF} = hours of labor used to produce one calorie of food
  - L = total amount of labor services available for production
  - T = total amount of land (terrain) available for production

HO model: basic setup

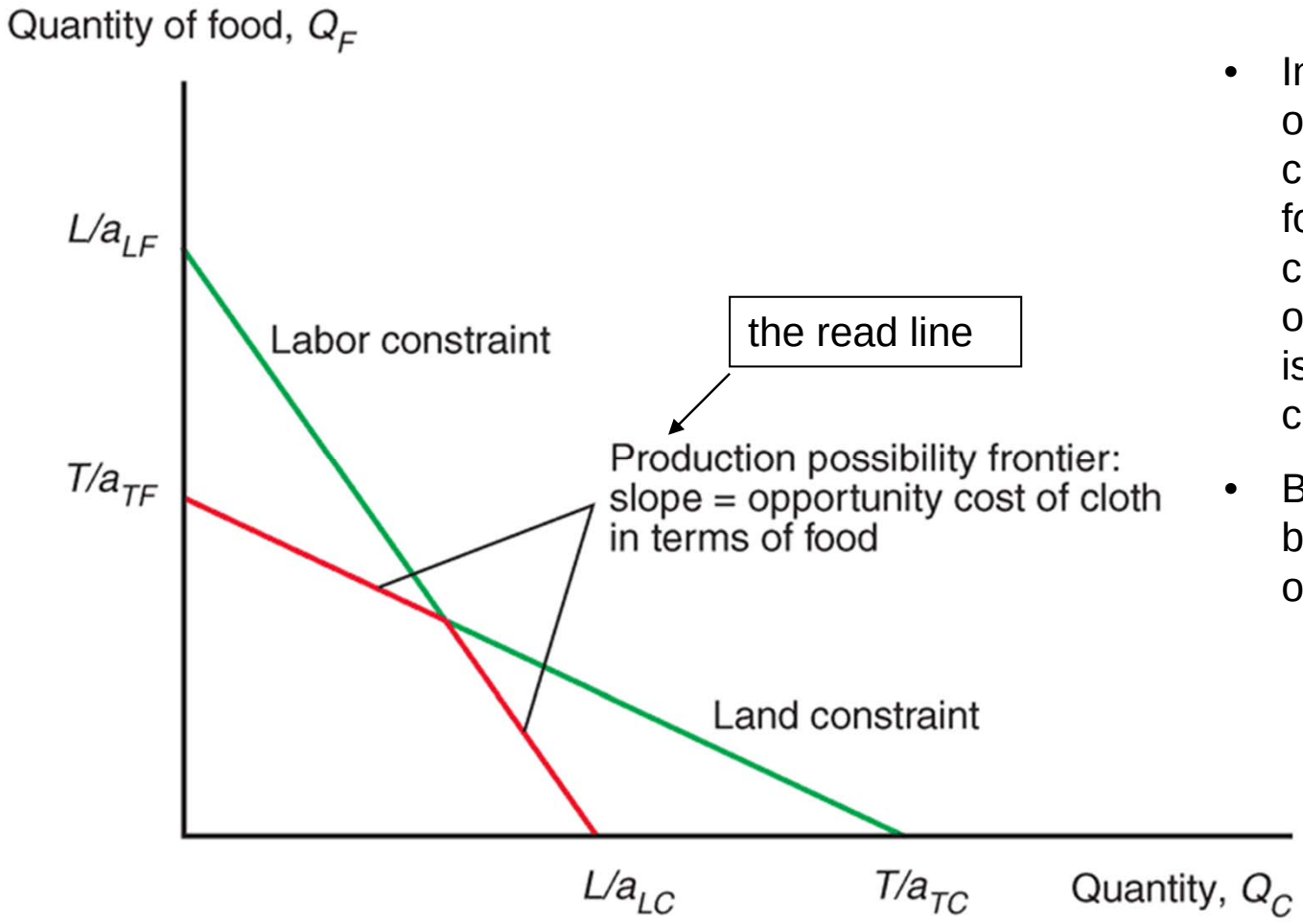
- Let's assume
  - that cloth production is **labor intensive**, i.e., $a_{LC}/a_{TC} > a_{LF}/a_{TF}$ (or $a_{LC}/a_{LF} > a_{TC}/a_{TF}$)
  - and food production is **land intensive,** i.e., $a_{TF}/a_{LF} > a_{TC}/a_{LC}$ (or $a_{TF}/a_{TC} > a_{LF}/a_{LC}$)

HO model: basic setup

- Production possibilities are constrained by *both* total land and total labor:



Production Possibility Frontier (PPF) when no factor substitution is allowed

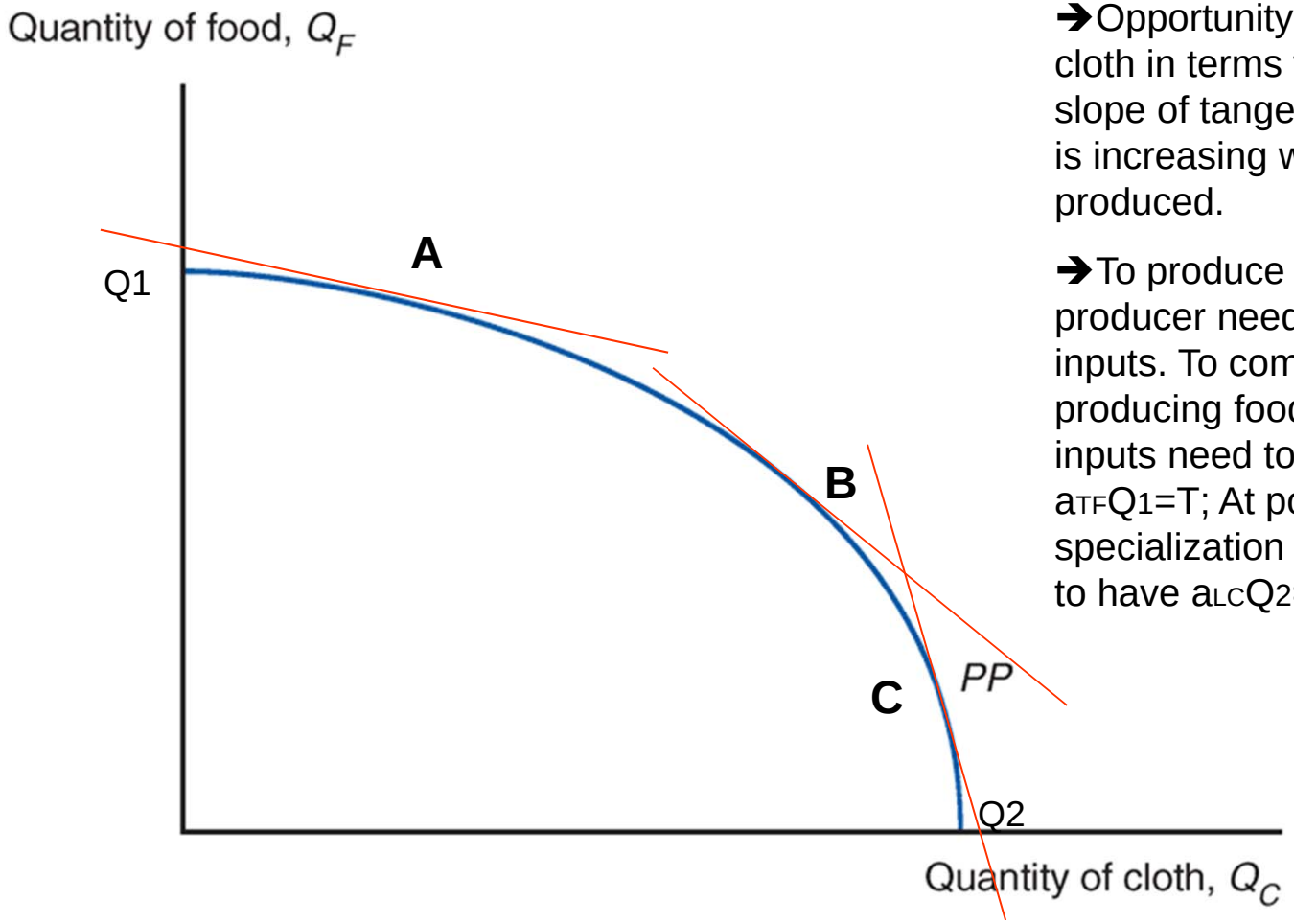


- In this case, opportunity cost of cloth (in terms of food) production is constant when more of each **unit** of cloth is produced – constant slope
- But producer can do better if substitution of factor is allowed

HO model: PPF

- In reality, producers can substitute one input for another in the production process, then the PPF becomes curved.
  - For example, to produce the same amount of food, many workers could work on a small plot of land, or a few workers could work on a large plot of land

PPF with Factor Substitution



➔Opportunity cost of producing cloth in terms food is equal to the slope of tangent line (in red), and it is increasing with increasing Qc produced.

➔To produce any food or cloth, producer needs to have both factor inputs. To completely specialize in producing food, at point Q1, factor inputs need to satisfy: $a_{LF}Q_1=L$ and $a_{TF}Q_1=T$; At point Q2 with complete specialization in cloth, it's required to have $a_{LC}Q_2=L$ and $a_{TC}Q_2=T$.

PPF with Factor Substitution (cont.)

- The opportunity cost of producing cloth in terms of food is not constant in this model:
  - it's smaller when the economy produces a *small amount of cloth* and a large amount of food
  - it's larger when the economy produces a large *amount of cloth* and a small amount of food
  - <u>What's the intuition:</u>
    - Theory of diminishing return tells us when the economy devotes larger share of resources towards producing cloth (e.g. from B to C), which uses labor more intensively, the marginal productivity of labor tends to decline. This gives producer incentives to **substitute land for labor***, which is at higher marginal productivity than before (C vs. B). Since food uses land more intensively, this also means the opportunity cost of cloth production at this point (C), in terms of producing food, is also higher, because food could be produced more efficiently than before (point B).

*note: substitute land for labor is equvalent as saying "replace labor with land".

HO model: Isovalue Line

- In general, the economy (producer) maximizes the value of production, *V:*

$$V = P_C Q_C + P_F Q_F$$

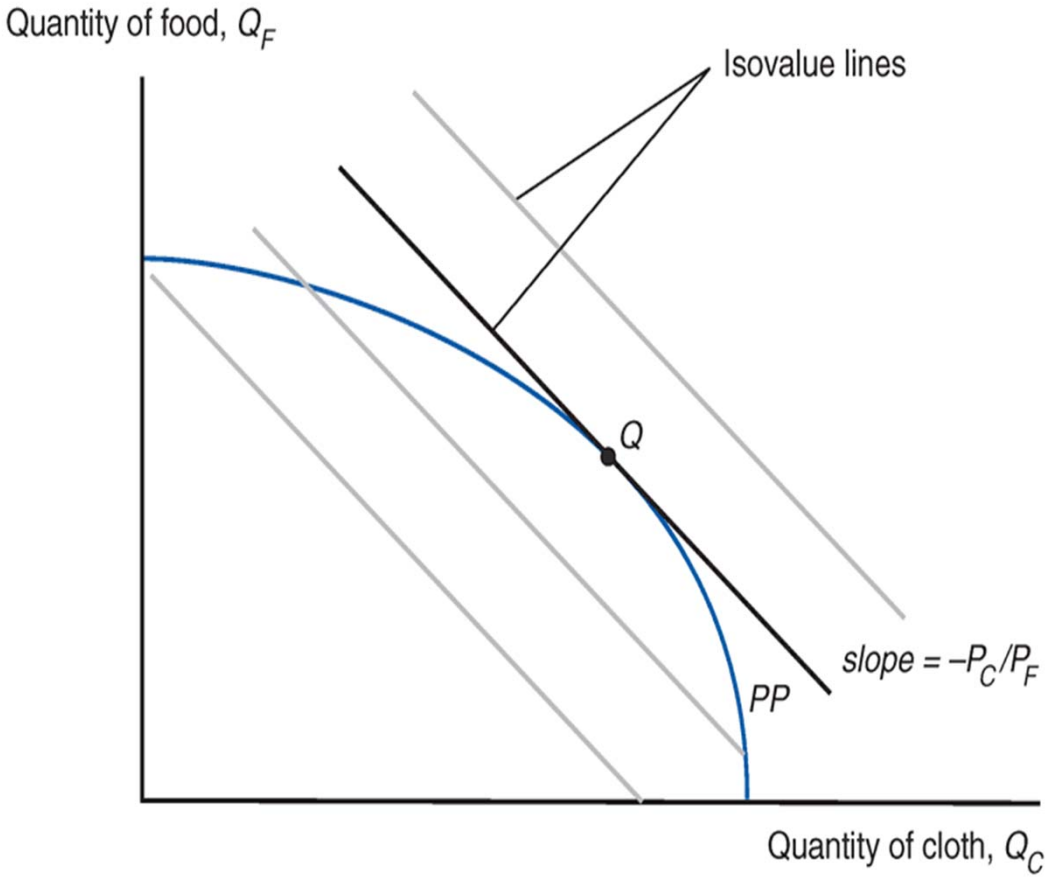
  - where P_C is the price of cloth and P_F is the price of food.
- **Isovalue line** is defined as a line representing a constant value of production, $\bar{V}$.
- It's derived from $\bar{V} = P_C Q_C + P_F Q_F$

  →$P_F Q_F = \bar{V} - P_C Q_C$

  →$\boldsymbol{Q_F} = \bar{V}/P_F - (P_C/P_F)\boldsymbol{Q_C}$

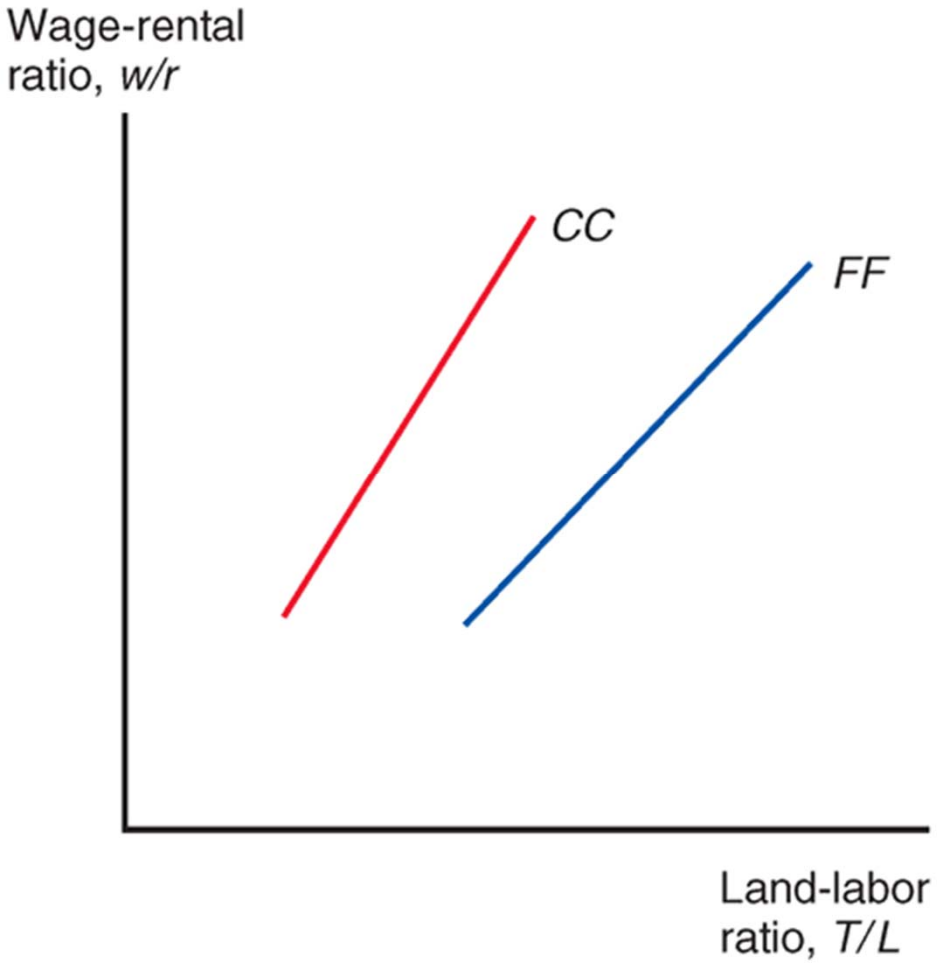
  →The slope of the isovalue line is **$-(P_C/P_F)$**

Link Prices with Production



- At point Q, where the isovalue line is tangent to PPF, producer maximizes value of production within PPF.
- At point Q, $-(P_C/P_F)$ is also the slope of PPF, which means the opportunity cost of cloth production in terms of food equals to the relative price of cloth.

Factor Prices and Input Choices

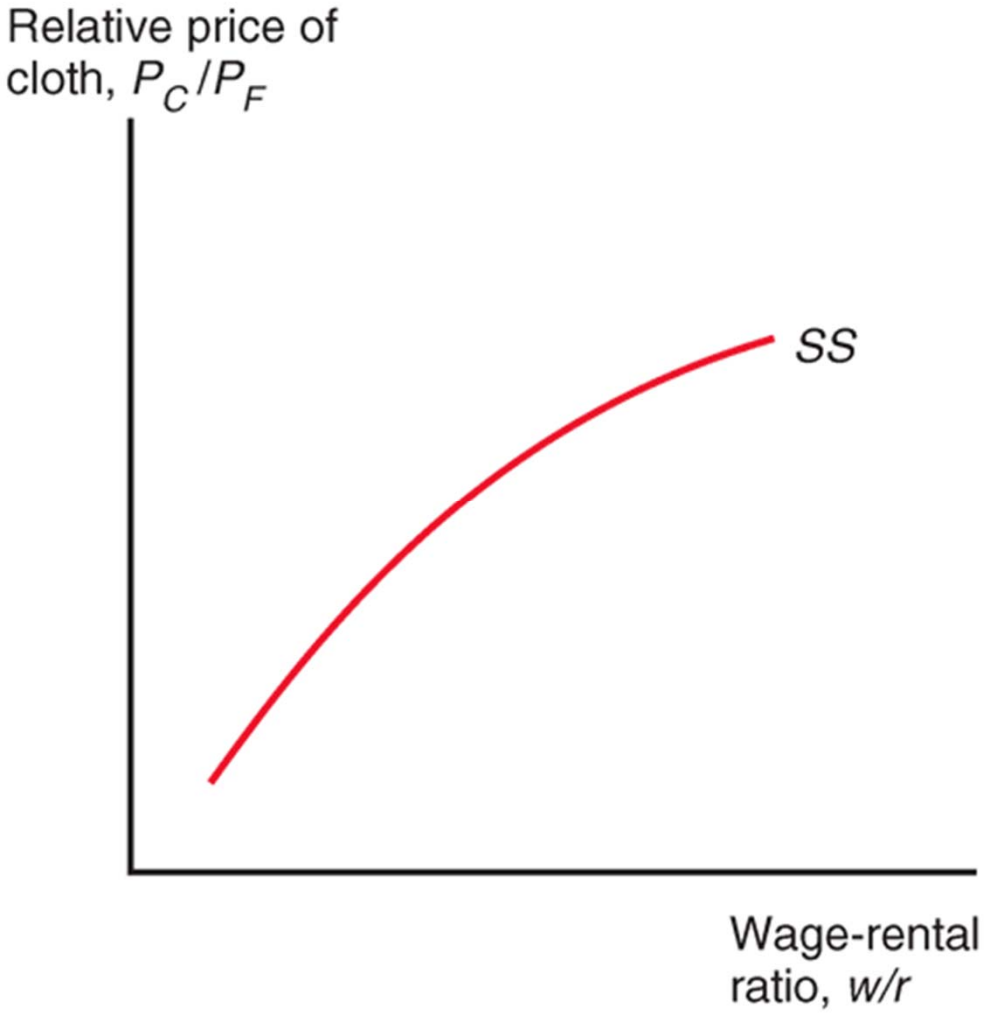


At any given wage-rental ratio, food production (in blue) uses a higher land-labor ratio than cloth production (in red).

In this case, we say that food production is land-intensive and cloth production is labor intensive.

As the wage rate increases relative to the land rental rate *r*, producers are willing to use less labor and more land in the production of **both** food and cloth.

Factor Prices and Goods Prices

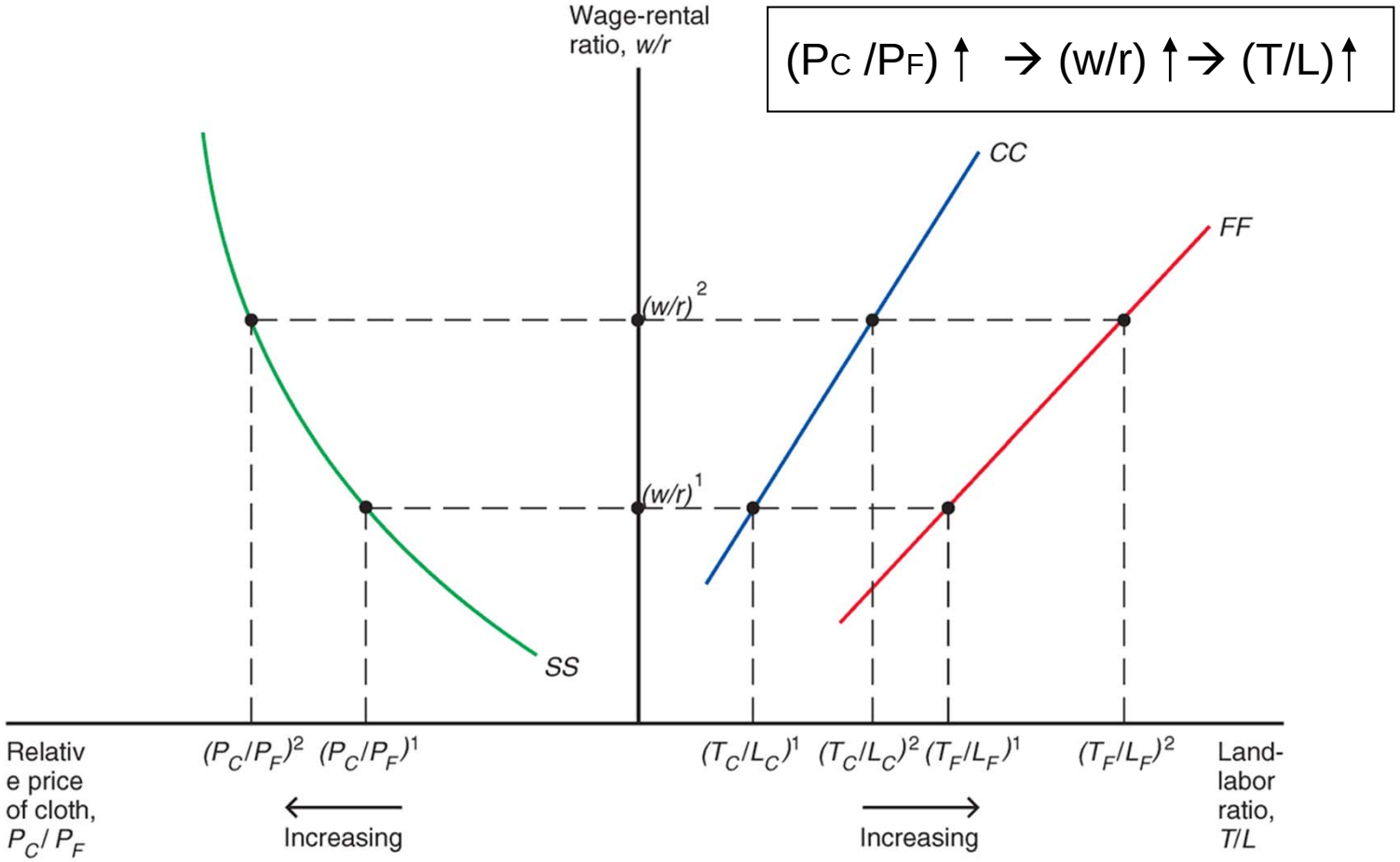


In a competitive market, prices reflects production cost.

When wage increases relative to rental rate of land, price of cloth also increases relative to price of food, since cloth is labor intensive, and food is land-intensive.

This shows up as positive relationship between relative price P_C/P_F and w/r.

Now linking the two:
From Goods Prices to Input Choices



➔ Stolper-Samuelson Theorem

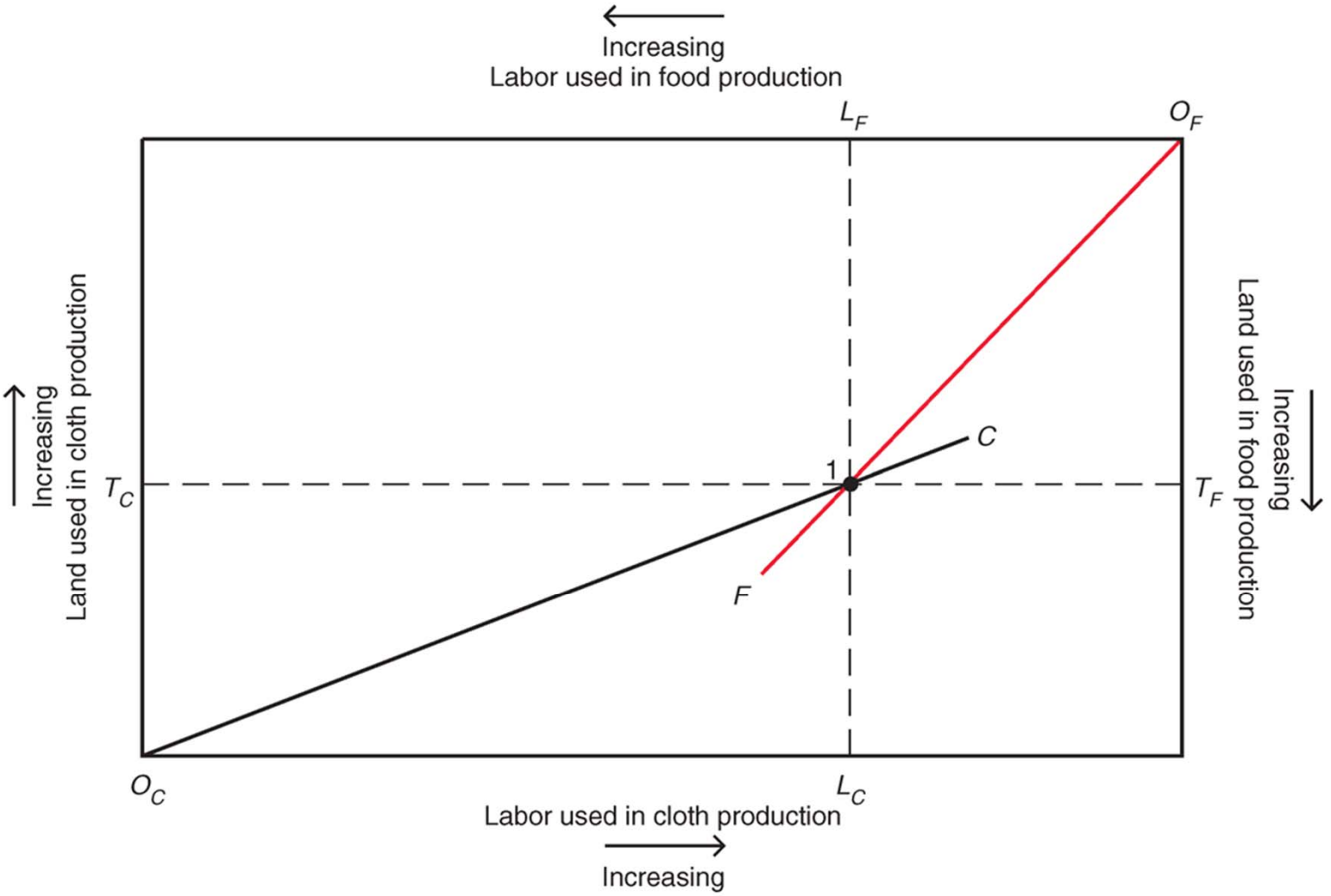
Stolper-Samuelson theorem: if the relative price of a good increases, then the real return of the factor (i.e., real wage for the labor, or real rent for the land) used more intensively in the production of that good increases, while the real return of the other factor used less intensively decreases.

- Under competition, the real wage/rate is equal to the marginal productivity of the factor.
- The marginal productivity of a factor typically decreases as the level of that factor used in production increases.

Stolper-Samuelson Theorem (cont.)

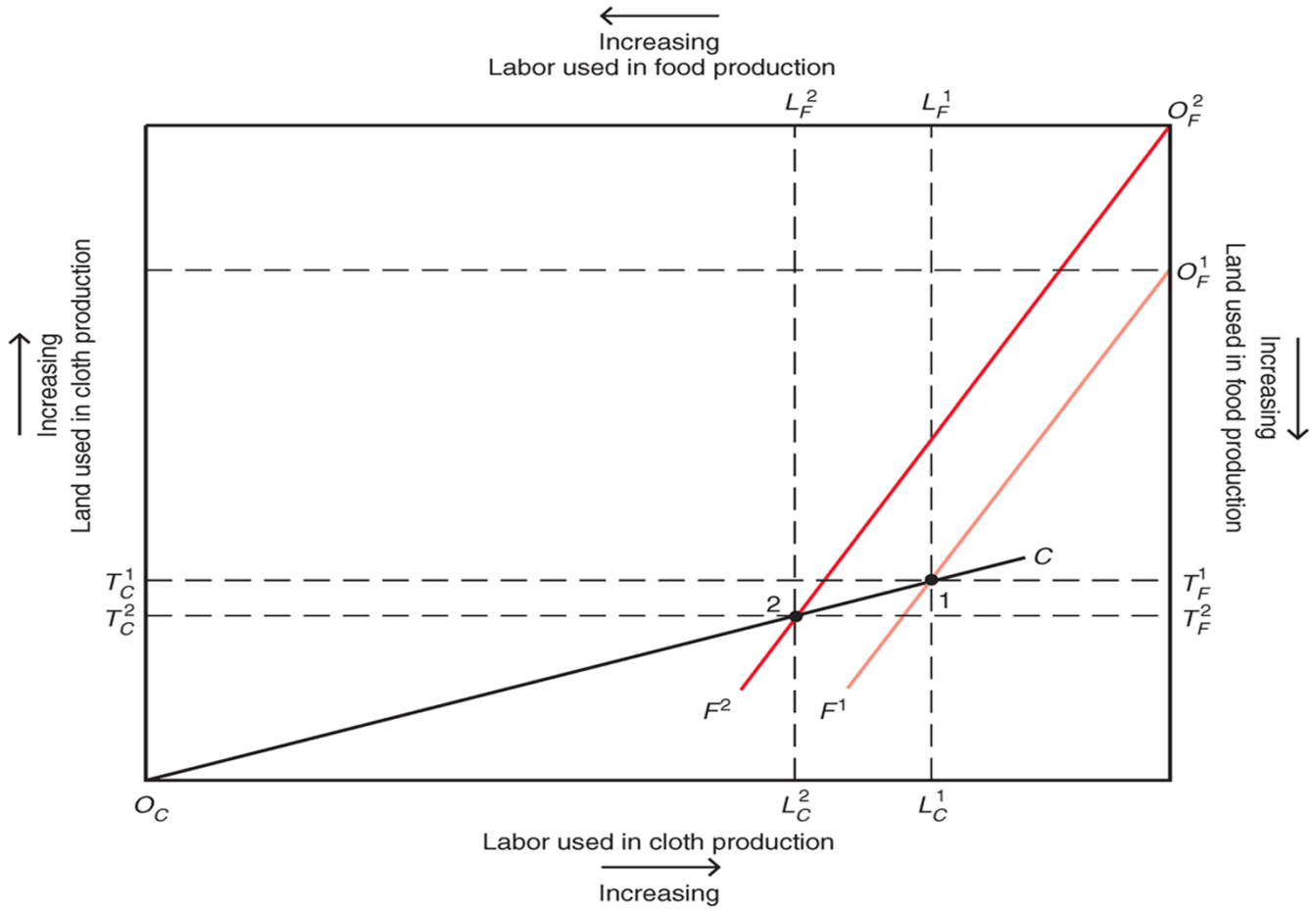
- Now we have a theory that predicts changes in the distribution of income when the relative price of goods changes.
- Trade is one source that causes such relative price change.
- An increase in the relative price of cloth, P_C/P_F, is predicted to:
  - raise income of workers relative to that of landowners, *w/r*.
  - raise the ratio of land to labor services, *T/L*, used in both industries and raise the marginal productivity of labor in both industries and lower the marginal productivity of land in both industries.
  - raise the real income of workers and *lower the real income of land owners*.
- We will talk more about trade and inequality later

Resources and Output



Resources and Output:

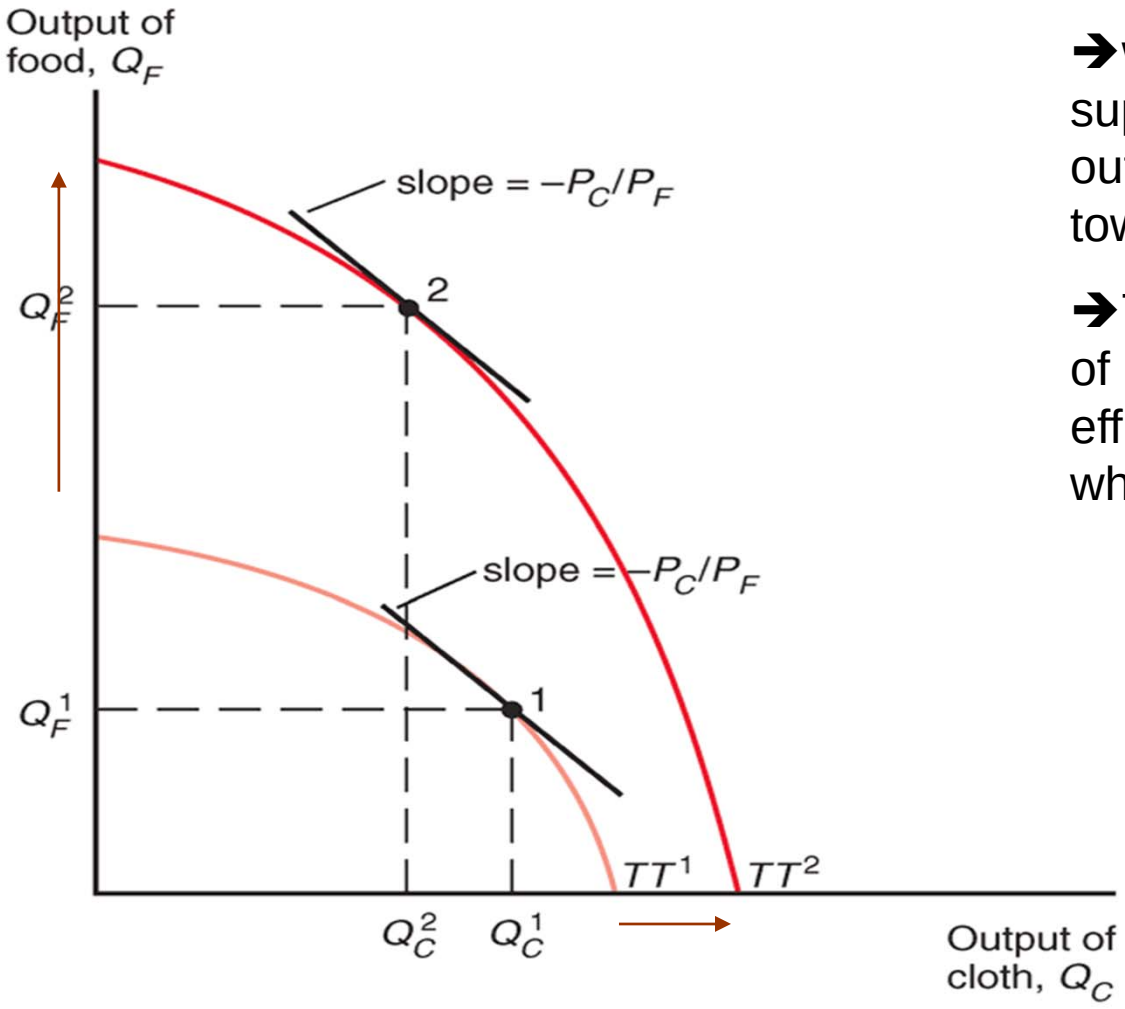
When there is an increase in the supply of land



➔an increase of land supply, surprisingly, leads to a fall in output of cloth, which is labor intensive.

➔ **Rybczynski Theorem**: an increase in a factor endowment will increase the output of the industry using it more intensively, and decrease the output of the other industry.

Resources and Output



➔with increase of land supply, PPF shifts outward but biased toward food production.

➔This biased expansion of PPF is a source of efficiency advantage, which gives rise to trade.

Heckscher-Ohline Theorem

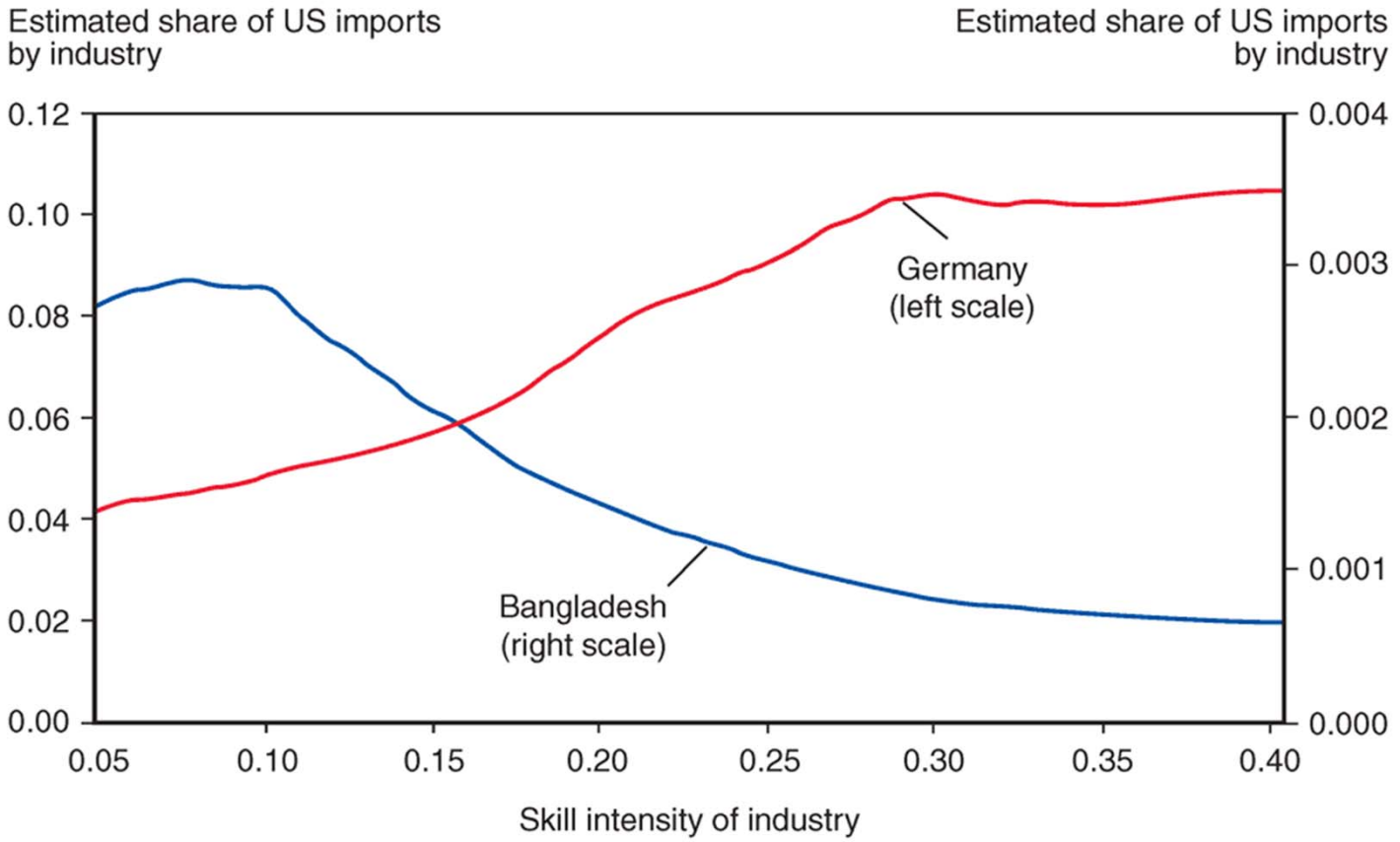
➔ An economy is predicted to export goods that are intensive in its relative **abundant** factors of production, and import goods that are intensive in its relative **scarce** factors of production.

Empirical Evidence of HO Model

- Generally, a very influential theory without strong empirical support → let's say it's only a good theory on the paper.

- I will just briefly show some empirical evidence.

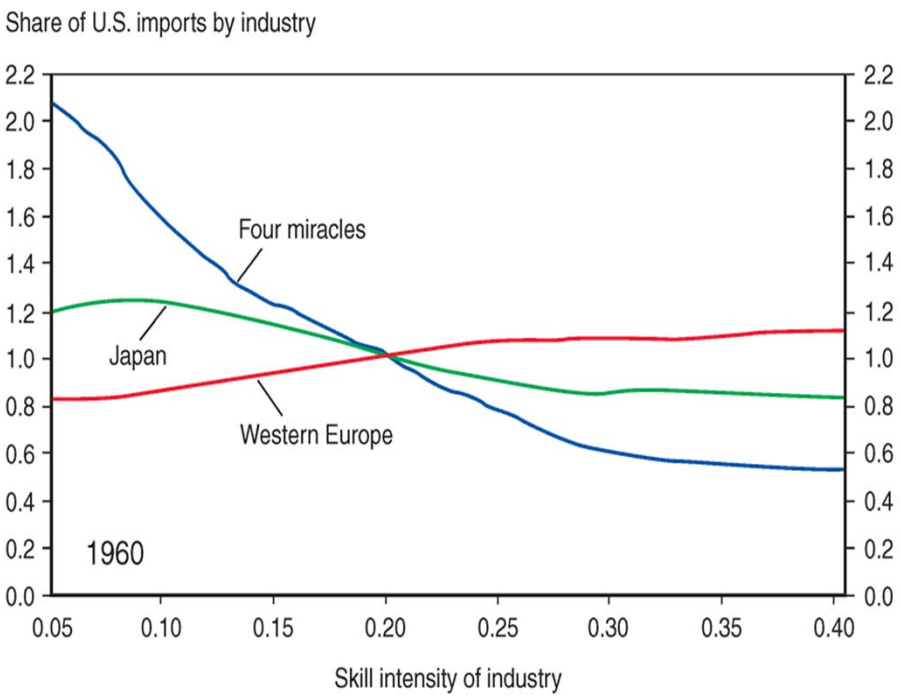
Empirical Evidence of HO Model



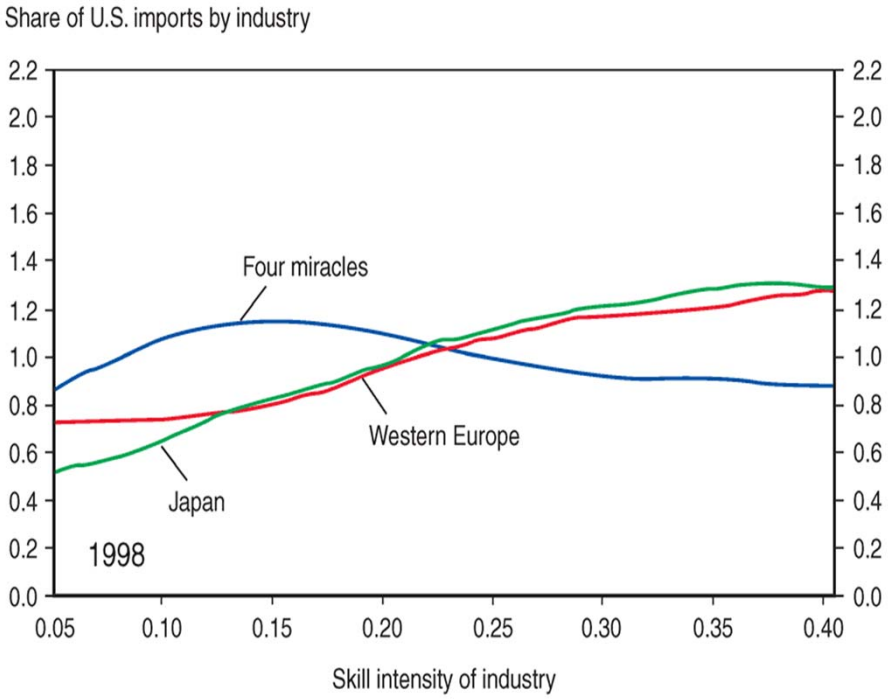
Source: John Romalis, "Factor Proportions and the Structure of Commodity Trade," *American Economic Review*, March 2004.

Empirical Evidence of the HO Model

Changes over time



(a) 1960



(a) 1998

Trade and Inequality

- Predictions from the theories
- Some basic facts
- Is trade to blame for rising inequality?
- Lastly, why should we care or not care?
  - Is inequality a bad thing?

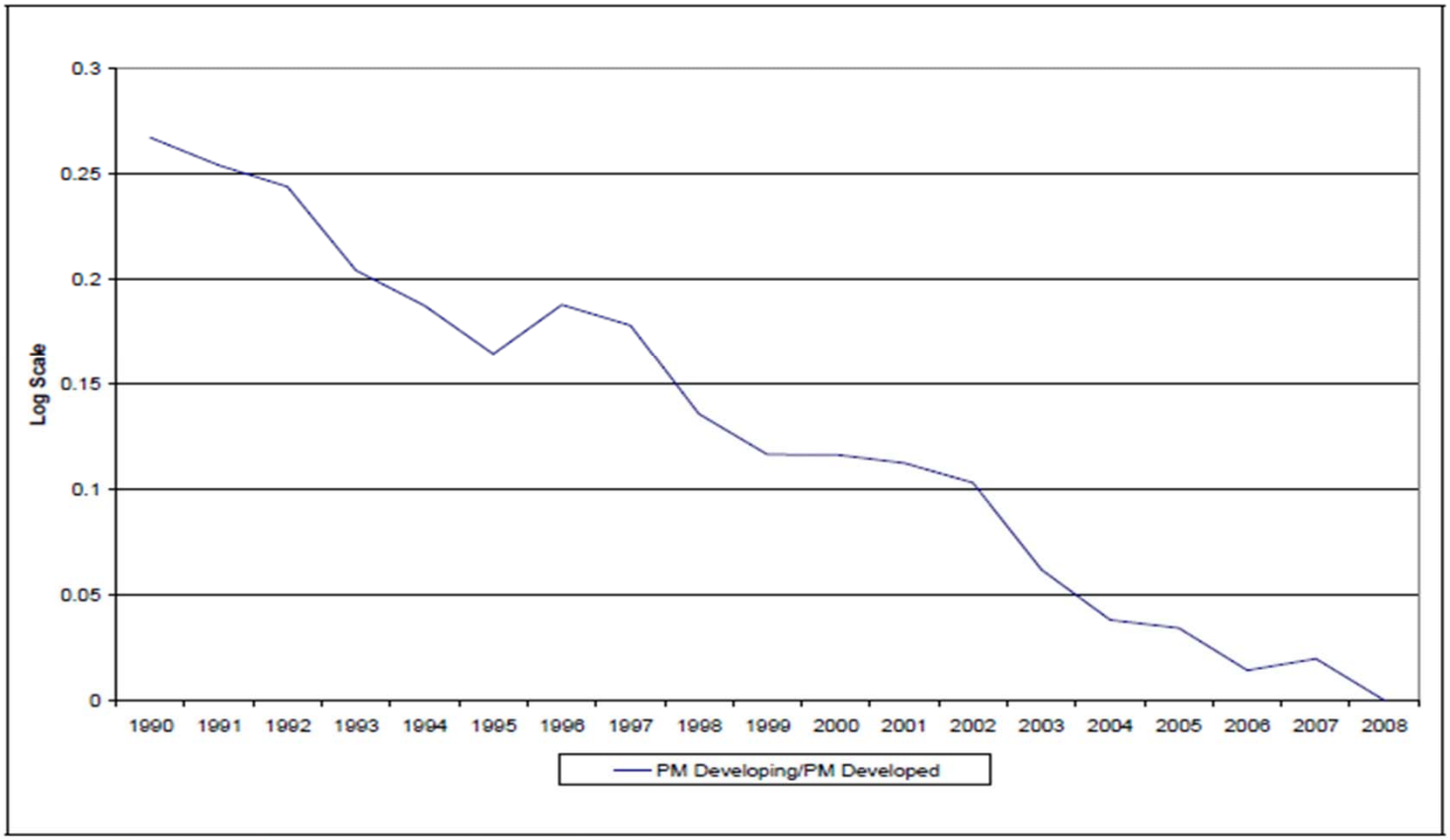
What do theories say?

- HO theory and SS theorem implies expanded trade between developed and developing countries will increase wage inequality in developed countries:
  - Developed countries export goods produced by more skilled labor, and import goods produced with low-skilled labor.
  - This drives up wage for high-skilled labor, and drives down wage for low-skilled labor, thus increasing wage inequality, or creating wage polarization, in developed countries.

- Some economists (e.g., Paul Krugman) started to doubt whether it's still safe to assert that trade has only played a minor role in rising income inequality. Two new factors are at play:
  - Rise of China
  - Increasing fragmentation of production process, especially among big multinational corporations (or MNCs)

Some Basic Facts

Figure 1: Ratio of developing to industrial country US manufactured import prices (Log Scale 2008 = 0)



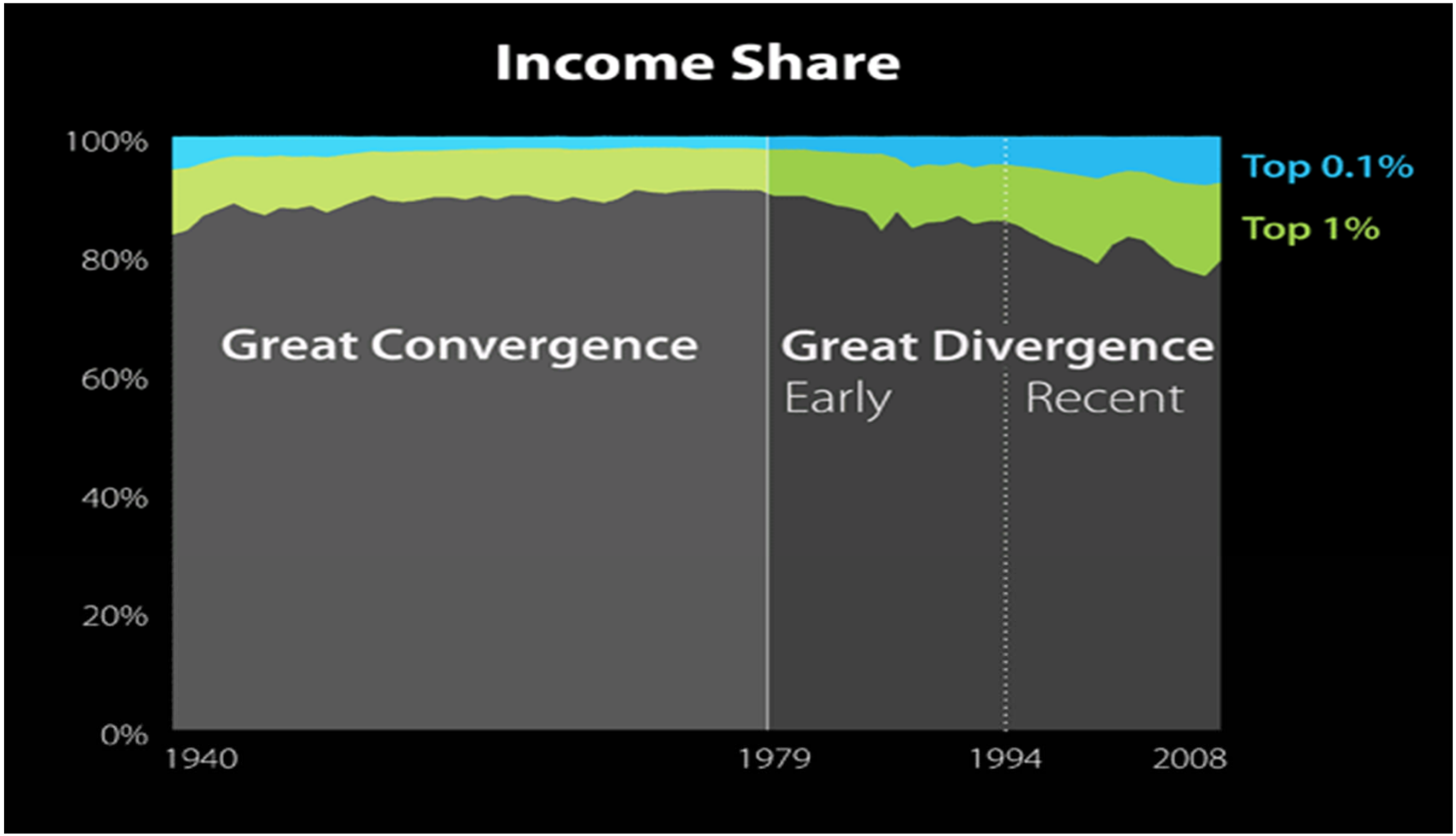
Source: Bureau of Labor Statistics Import Price Indexes.

Some Basic Facts

Income Inequality in the United States (1947–2005)

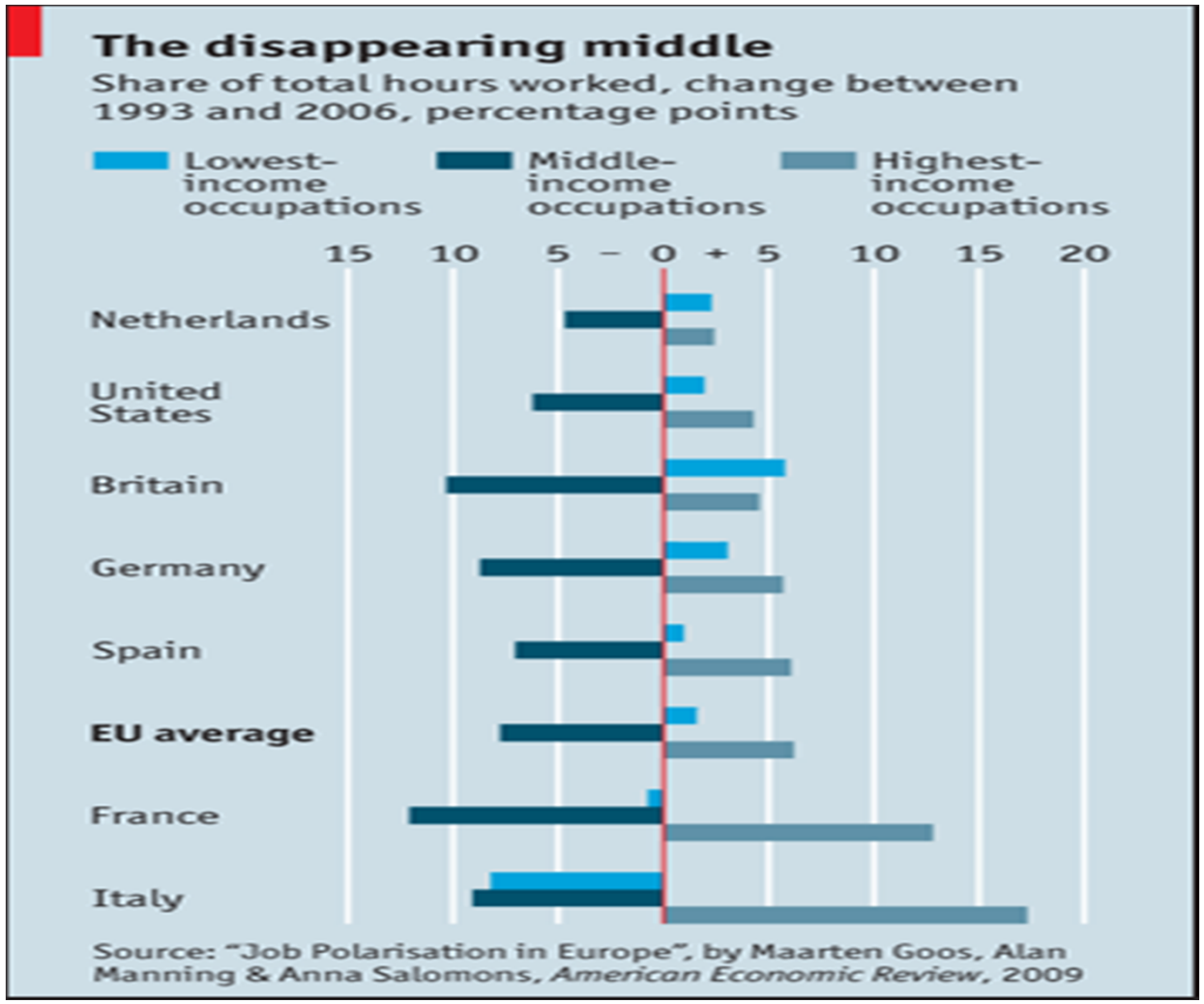
Sources: Weinberg (1996); Jones and Weinberg (2000); DeNavas-Walt, Proctor, and Smith (2007).

US Income Inequality



Source: Thomas Piketty and Emmanuel Saez.

Some Basic Facts

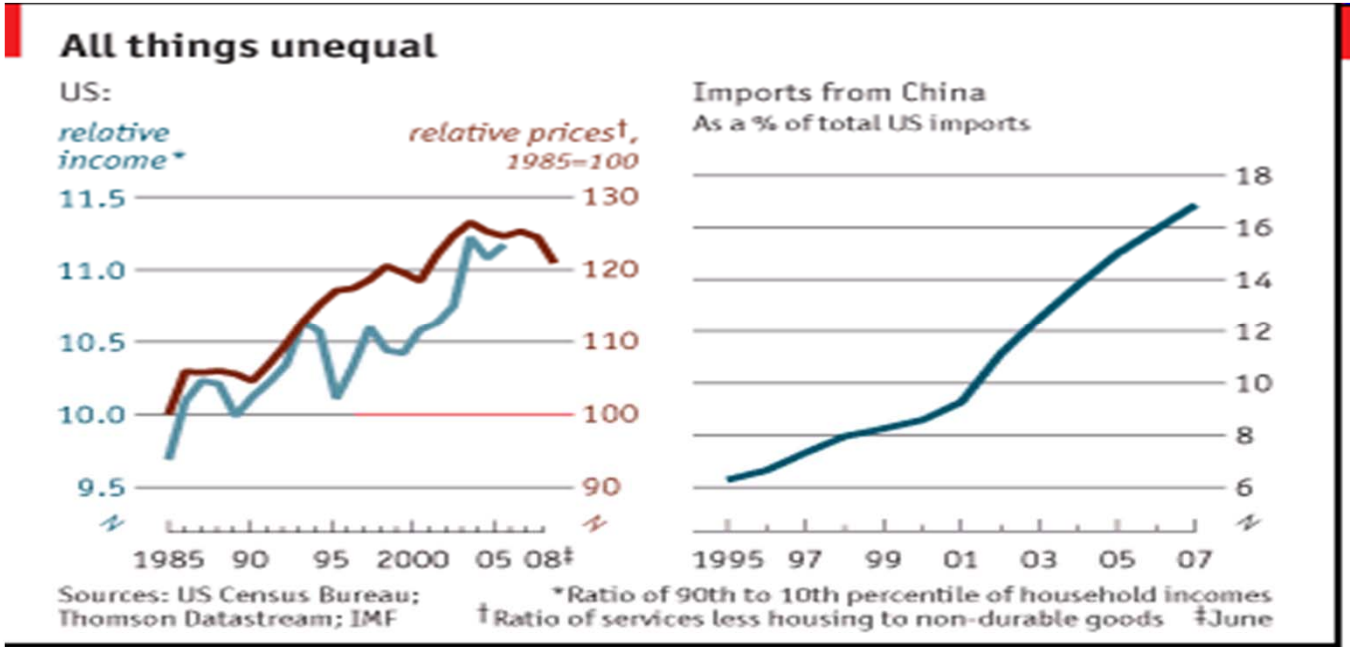


Has trade increased income inequality?

- Other people looked at the same question from very innovative angles.
  - Complements or Substitutes?
    - Another angle to look at the question is to look at whether imports from developing countries are substitutes to the products manufactured by blue-collar workers in developed countries, such as the US.
    - Bob Lawrence at Harvard showed recently that this is not the case.
    - Would you prefer to buy Italian shirts and French wine, even when Chinese shirts and Argentine wine are available?
  - Even they are substitutes, manufacturing jobs in the US may not have to be replaced by workers in China. This is because,
    - US firms can offset China's low-cost advantage by increasing labor productivity through more capital investment or better technology.
    - They can produce the same product at much higher efficiency.
    - By this, workers not only get to keep their jobs at home, but get to paid higher wage (higher labor productivity leads to higher income).

Has trade increased income inequality?

- People question whether the fact of rising inequality is true after adjusting for effective purchasing power



- People question whether imports from developing countries are necessarily substitutes for developed countries' exports, even at lower end.

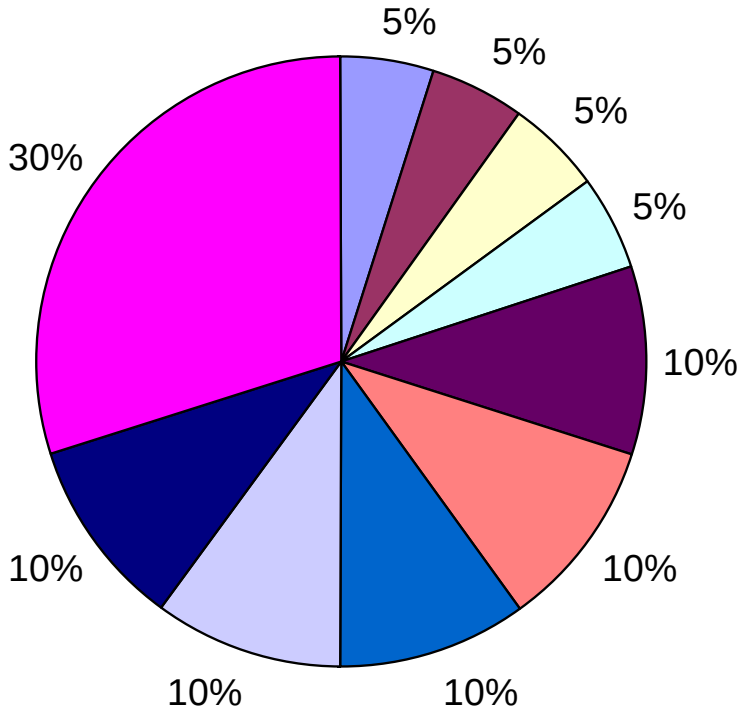
- People question trade has played a big role in increasing income inequality

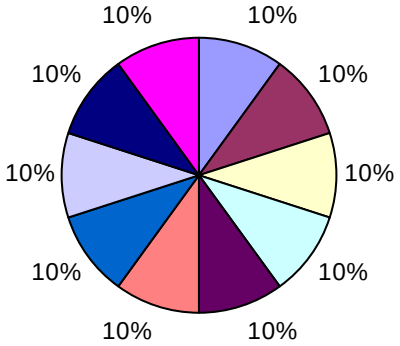
General Discussion - Is inequality a bad thing?

- So far, we treated inequality as if it's a bad thing. But is it?
- What causes inequality?
  - Good causes
    - Natural-born abilities
    - Better (higher) skills through training, e.g. higher education.
    - More entrepreneurial spirit and more creativity: e.g., Steve Jobs
  - Bad causes
    - Nepotism, favoritism, etc.
    - Corruption or other rent-seeking activities
    - Discrimination (non-equal opportunities: gender, racial)
  - Neutral causes: e.g., inheritance, technology
- Sensible ineququlity-reduction policies ought to target inequality with bad causes
- The ultimate policy goal is to provide **equal opportunity** (or equal access), **NOT equal outcome**.

General Discussion - Is inequality a bad thing?

Smaller share of big pie >> equal share of small pie



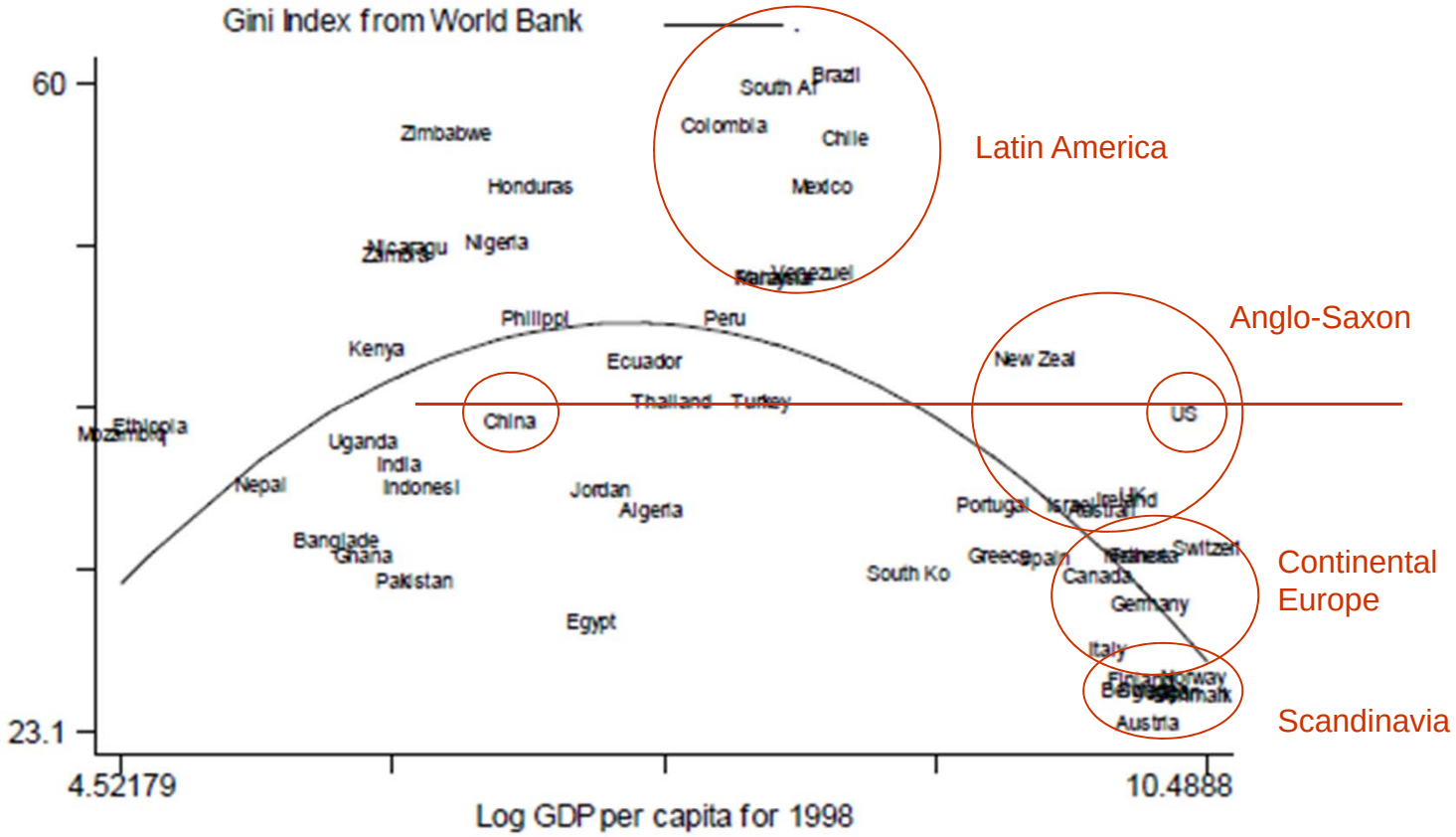


A quote on equality and freedom

A society that puts equality - in the sense of equality of outcomes - ahead of freedom will end up with neither equality nor freedom [but] a society that puts freedom first will, as a happy by-product, end up with both greater freedom and greater equality.

- Milton Friedman

World Inequality Compared



Source: Glaeser (NBER WP 2005)

For the next class…

- Read ”Outsourcing 101” on course website