International Economics

Fall 2010

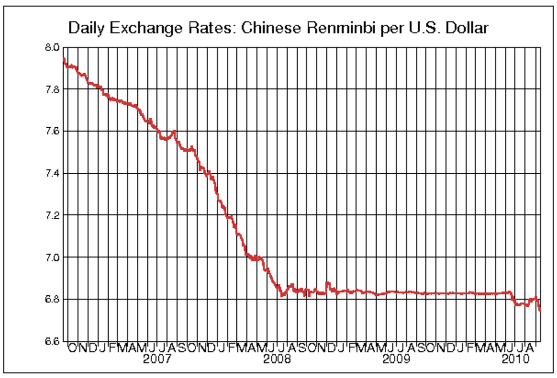
Trade and Income Inequality

Paul Deng

Sept. 15, 2010

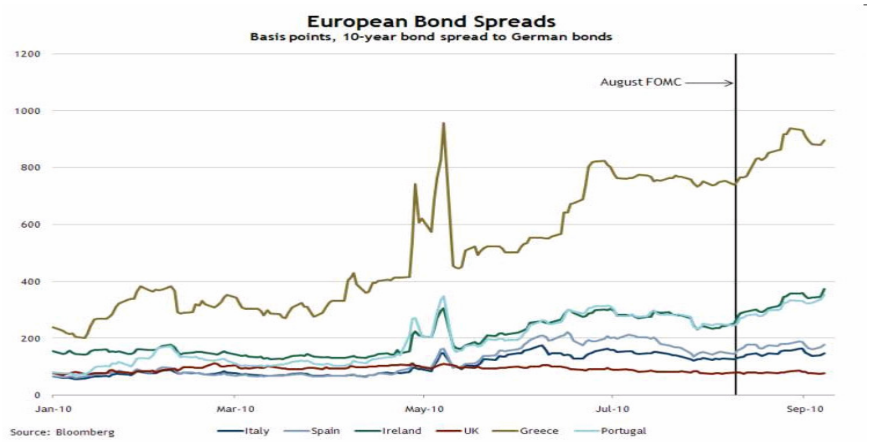
Morning Coffee (09/15)

- Cuba laid off half a million workers as the current economy, in which 85% labor force is employed by state-sectors, no longer works.
- Chinese Yuan resumed rising against the US dollar, again almost always before a US official's visit.



Morning Coffee (09/15)

Europe may be back to crisis mode soon



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.
- While trade is partly explained by differences in labor productivity, it also can be explained by differences in resources, such as labor, capital and land, across countries.
- Very briefly, the theory states countries tend to export goods whose production is intensive in factors with which they are abundantly endowed.
- 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:

$$a_{TF}Q_F + a_{TC}Q_C \leq T$$

Total amount of **land** resources

Land required for each unit of food production

Total units of food production

Land required for each unit of cloth production

Total units of cloth production

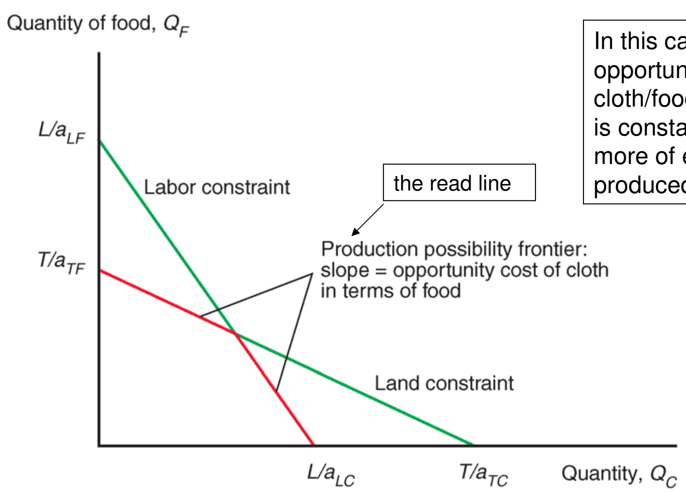
$$a_{LF}Q_F + a_{LC}Q_C \leq L$$

Total amount of **labor** resources

Labor required for each unit of food production

Labor required for each unit of cloth production

Kinked Production Possibility Frontier when no factor substitution is allowed

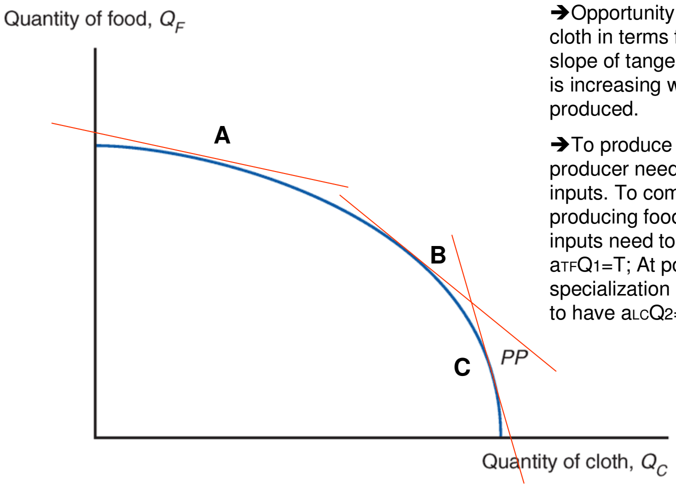


In this case, opportunity cost of cloth/food production is constant when more of each good is produced.

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 high amount of food
  - it's larger when the economy produces a large *amount of cloth* and a low amount of food
  - What's the intuition:
    - 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 labor for land~~ (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 equal to saying "replace labor with land".

HO model: Isovalue Line

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

$$V = P_C Q_C + P_F Q_F$$

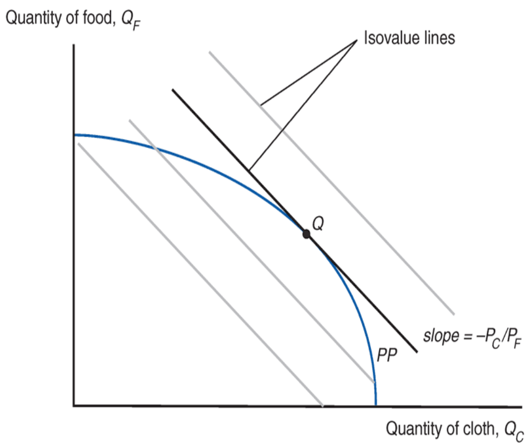
  - where P_C is the price of cloth and P_F is the price of food.
- **Isovalue line** is defined as a line representing a constant value of production, $\overline{V}$.
- It's derived from $\overline{V} = P_C Q_C + P_F Q_F$

→$P_F Q_F = \overline{V} - P_C Q_C$

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

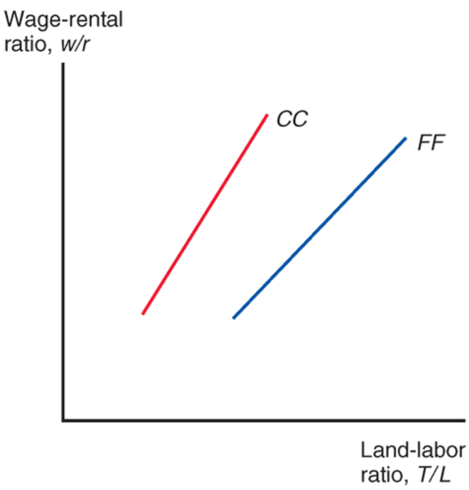
→The slope of the isovalue line is $\boldsymbol{-(P_C/P_F)}$

Linking Prices and Production



- At point Q, where the isovalue line is tangent to PPF, producer maximizes value of production within PPF.
- The slope of the PPF equals – (P_C/P_F). This means the opportunity cost of cloth production in terms of food equals to the relative price of cloth.
- In other words, the trade-off in production equals to the relative market prices of the two goods.

Factor Prices and Input Choices

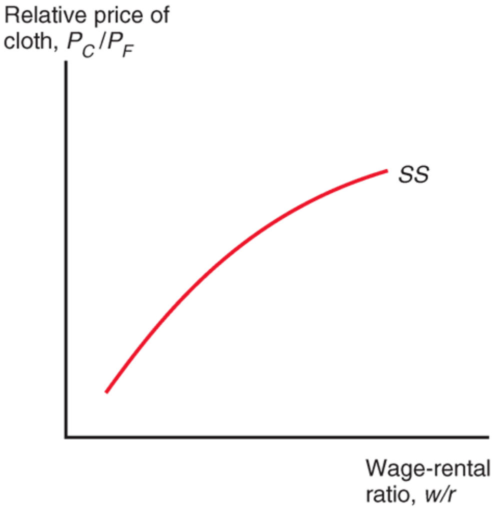


At any given wage-rental ratio, food production (in blue) uses a higher land-labor ratio than cloth production (in red).

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



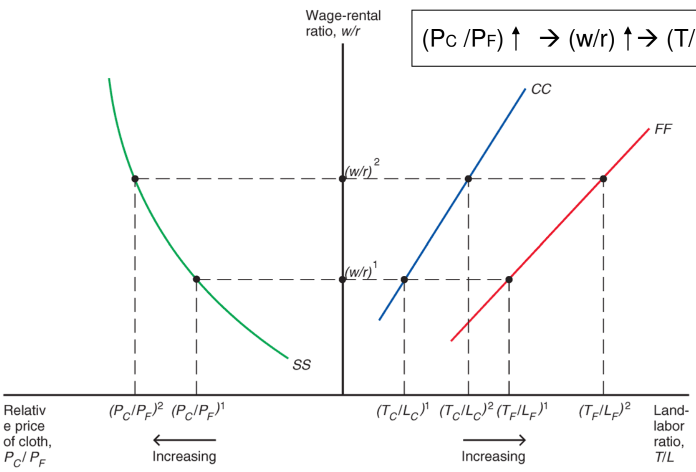
In a competitive market, prices reflects production cost.

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

$(P_C/P_F)\uparrow \rightarrow (w/r)\uparrow \rightarrow (T/L)\uparrow$



➔ Stolper-Samuelson Theorem

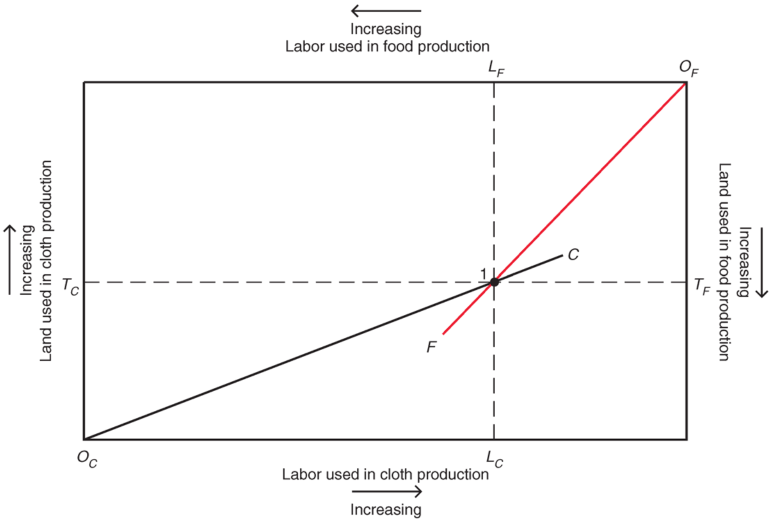
Stolper-Samuelson theorem: if the relative price of a good increases, then the real return of the factor (i.e., real wage for the labor, or real rent for the land) used more intensively in the production of that good increases, while the real return of the other factor used less intensively decreases.

- 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.)

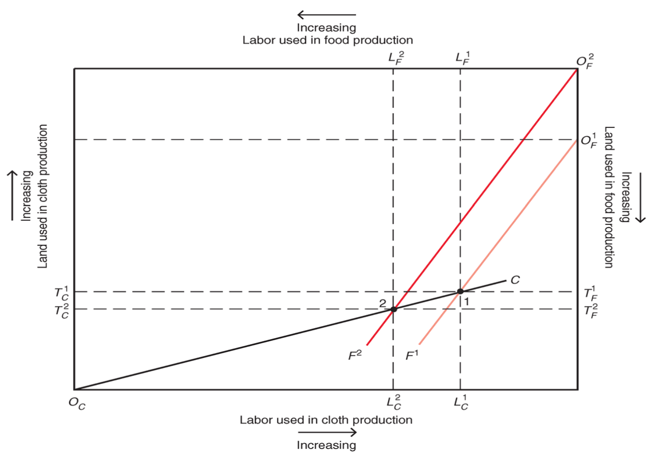
- Now we have a theory that predicts changes in the distribution of income when the relative price of goods changes.
- Trade is one source that causes such relative price change.
- An increase in the relative price of cloth, P_C/P_F, is predicted to:
  - raise income of workers relative to that of landowners, *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:

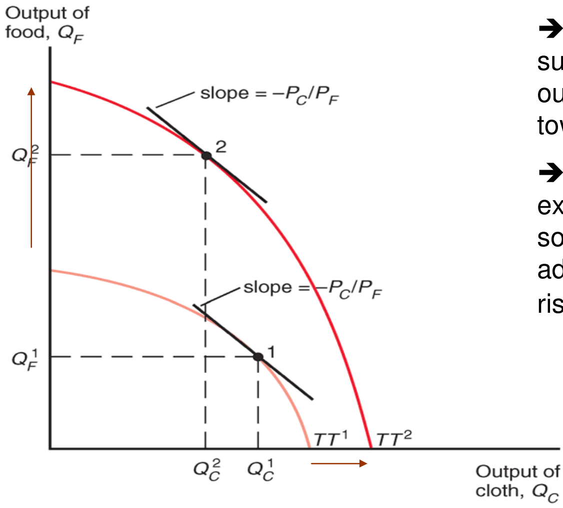
When there is an increase in the supply of land



➔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 intensively, and decrease the output o f 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

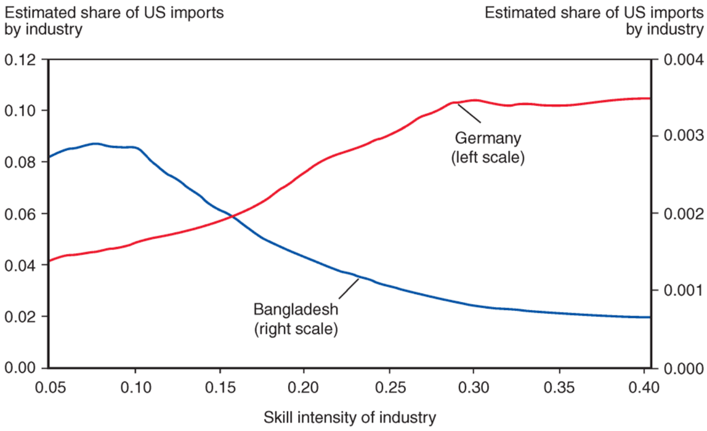
➔ An economy is predicted to export goods that are intensive in its relative **abundant** factors of production, and import goods that are intensive in its relative **scarce** factors of production.

Empirical Evidence of HO Model

- Generally, a very influential theory but not with very strong empirical support → let's say it's only a good theory on paper.

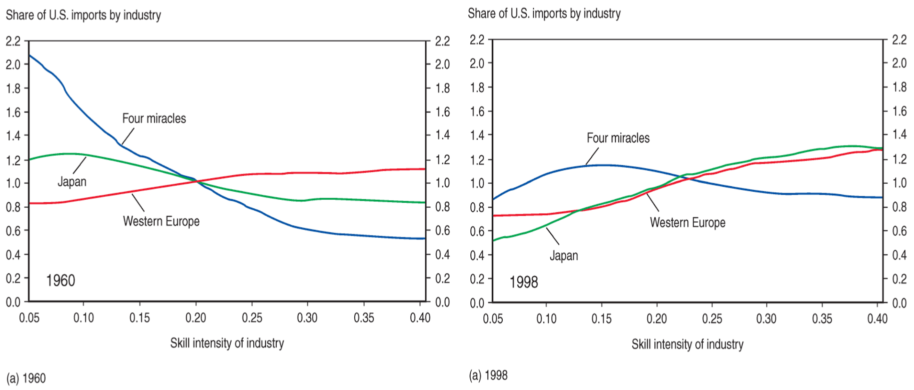
- Since this part of textbook is a bit too advanced for students at current level, I will try to be brief in the empirical evidence. It's safe not to pay too much attention to this section.

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



Trade and Inequality

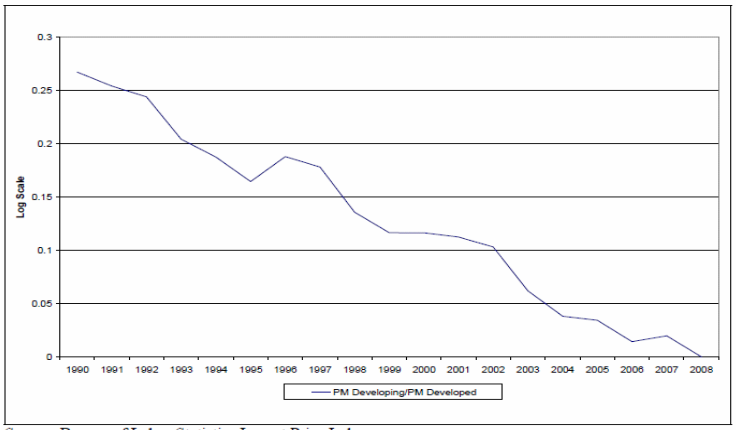
- Predictions from the theories
- Some basic facts
- Why should we care or not care?
  - Is inequality a bad thing?
- Lastly, is trade to blame for rising inequality?

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

Some Basic Facts

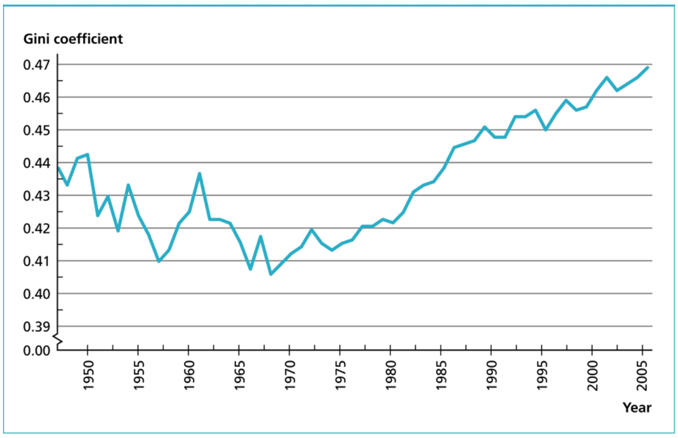
Figure 1: Ratio of developing to industrial country US manufactured import prices (Log Scale 2008 = 0)



Source: Bureau of Labor Statistics Import Price Indexes.

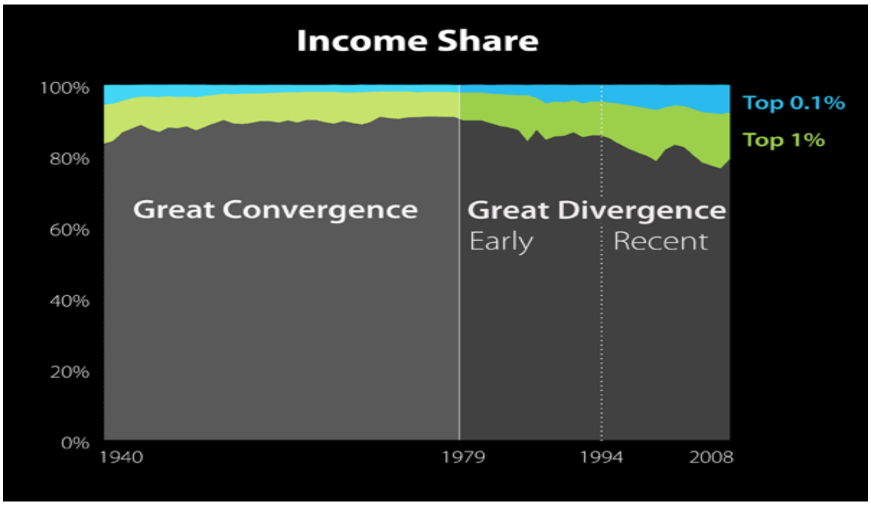
Some Basic Facts :

Income Inequality in the United States (1947–2005)



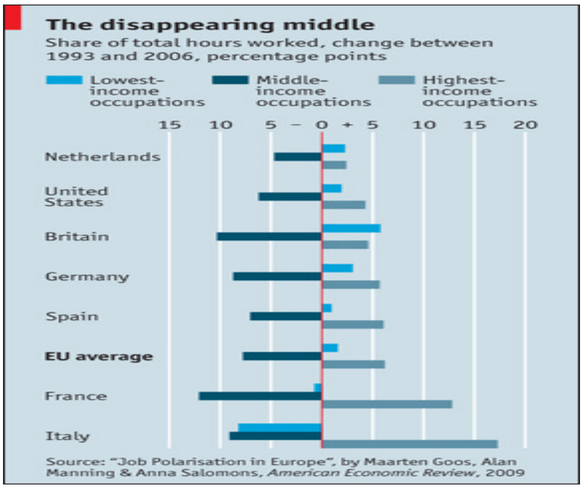
Sources: Weinberg (1996); Jones and Weinberg (2000); DeNavas-Walt, Proctor, and Smith (2007).

US Income Inequality



Source: Thomas Piketty and Emmanuel Saez.

Some Basic Facts

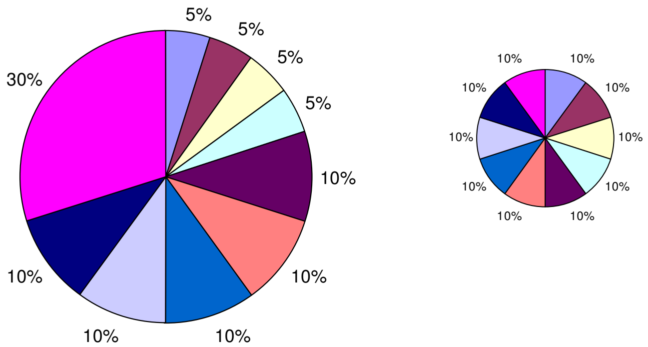


General Discussion - Is inequality a bad thing?

- 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, education etc.
    - More entrepreneurial spirit and risk taking
  - Bad causes
    - Nepotism, favoritism, etc.
    - Corruption or other rent-seeking activities
    - Discrimination (non-equal opportunities: gender, racial)
  - Neutral causes: e.g., inheritance, technology
- Sensible policies ought to target inequality with bad causes only
- 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



Has trade increased income inequality?

- What could have increased income inequality besides trade?
  - Technology: skill-biased tech. change increases demand for skilled labor and their wage level.
  - Education: closely related to skill-biased technology change and the increasing demand of higher education may be a rational response to such change
- The consensus in economics profession so far is that trade has only played a minor role in rising income inequality, but again Paul Krugman thinks it might not be the case any more.
- Other people looked at the same question from very innovative angles.

Has trade increased income inequality?

- Other people looked at the same question from very innovative angles.
  - Broda and Ramalis: rather than look at income inequality, they innovatively compare standards of living of different income groups by their effective purchasing power. After adjusting for the right inflation index, they found that due to Chinese imports via Walmart, the price of a typical shopping basket of poor income group has been declining, thus their effective living standards was underestimated by simple income measure. This finding cast doubt on the very fact that income inequality in the US has been rising. (refer to: "How China helps America's poor")
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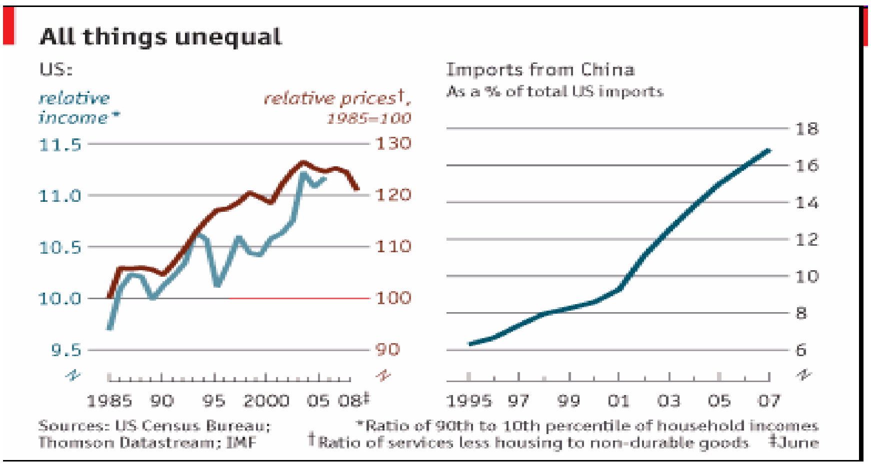
Has trade increased income inequality?



Source: Economist Magazine, "Cheap and Cheerful", July 2008.

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 still be buying 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?

- Summary, still an open question…
  - 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 causing higher income inequality
- Since in theory there are possibilities on both sides, more empirical works are needed – economic theories ought be judged, ultimately, by data – a major difference from other social sciences.
- Policy makers should keep an open mind and steer the debate in the right direction
  - not to sacrifice trade for income equality
  - but to focus on how to make the benefits from world trade more inclusive

For the next time…tomorrow

- read KS chapter 8
- read M. Friedman, “The case for free trade” (paper linked on course website)