



# Topic 5 – Trade and Inequality

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## Introduction

- Increasing inequality within countries and globalization are two of the defining economic trends of the last three decades. So does globalization cause inequality?
- In this lecture, we will take a look at the evidence on the effects of trade on inequality. This is a very active research area which has received a lot of attention recently
- Our main finding will be that trade has not been the main driver of the overall increase in inequality even though it has played a more important role in recent years
- Our discussion is largely based on an excellent book by Goldberg (2014) which collects some of the most influential papers on this topic in recent years



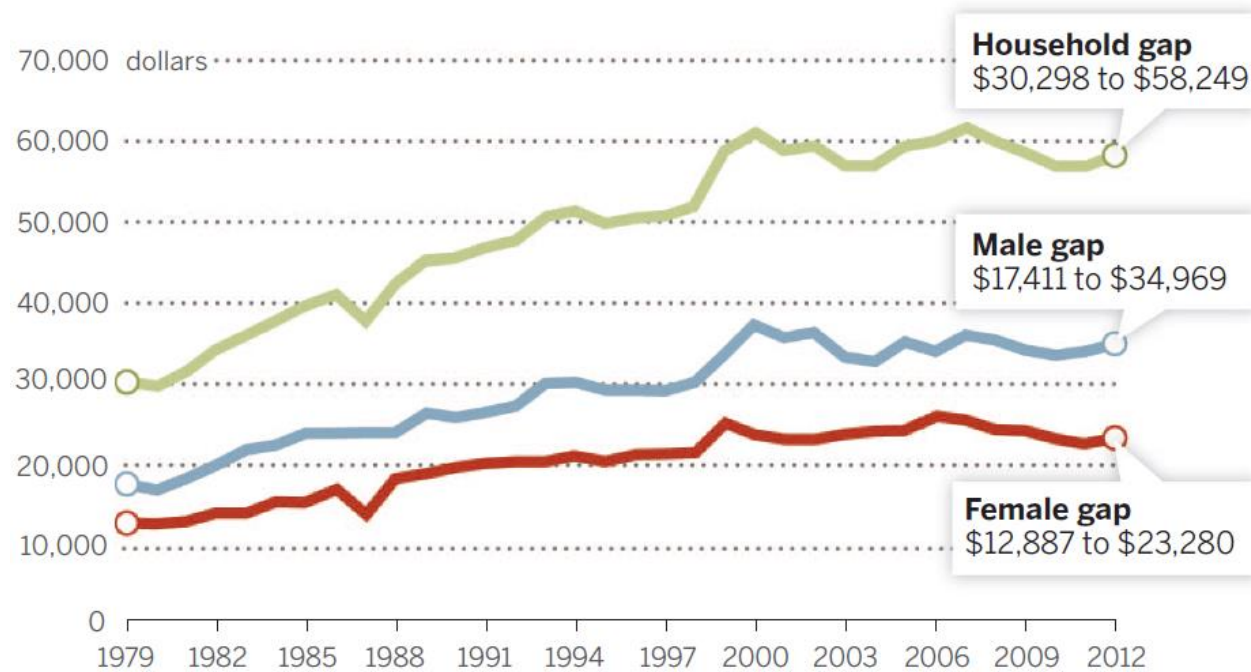
## Overview of the lecture

- Basic facts
- Stolper Samuelson at work?
- Skill-biased technological change
- The effects of trade revisited
- Developing countries

## Basic facts – Skill premium in the US

### College/high school median annual earnings gap, 1979–2012

In constant 2012 dollars

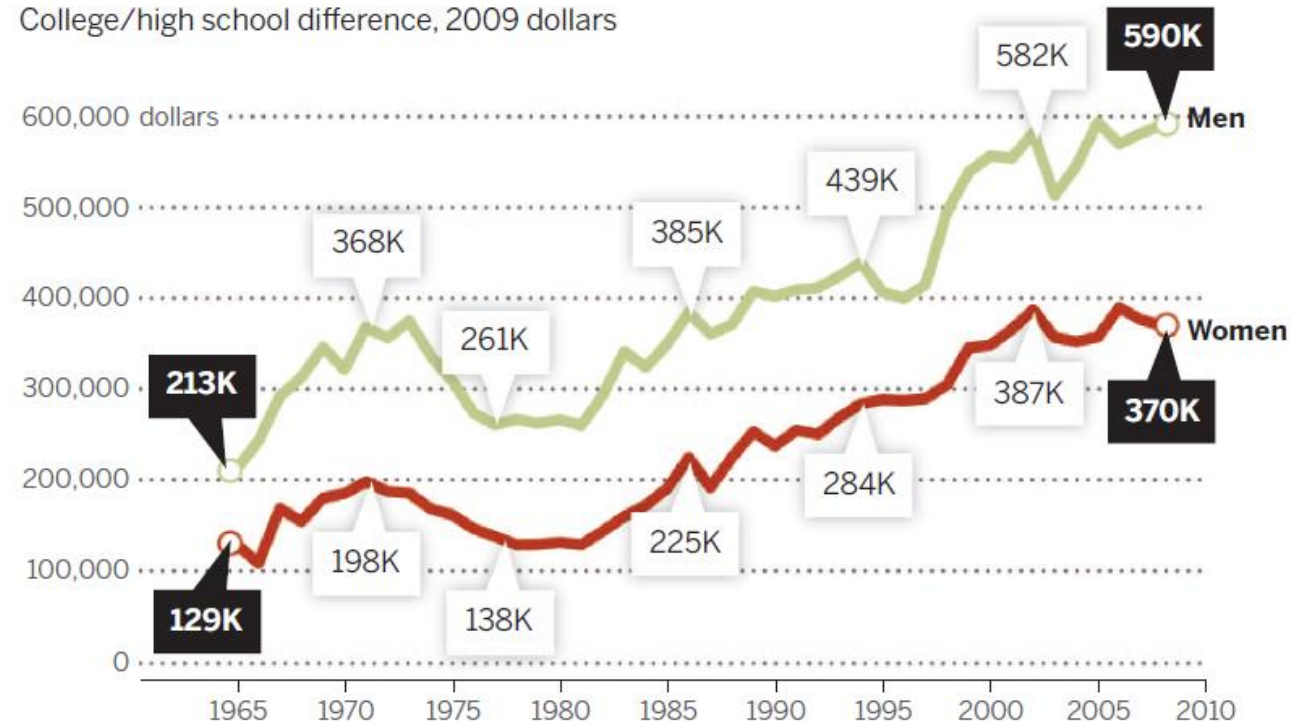


Source: Autor (2014)

## Basic facts – Returns to college in the US

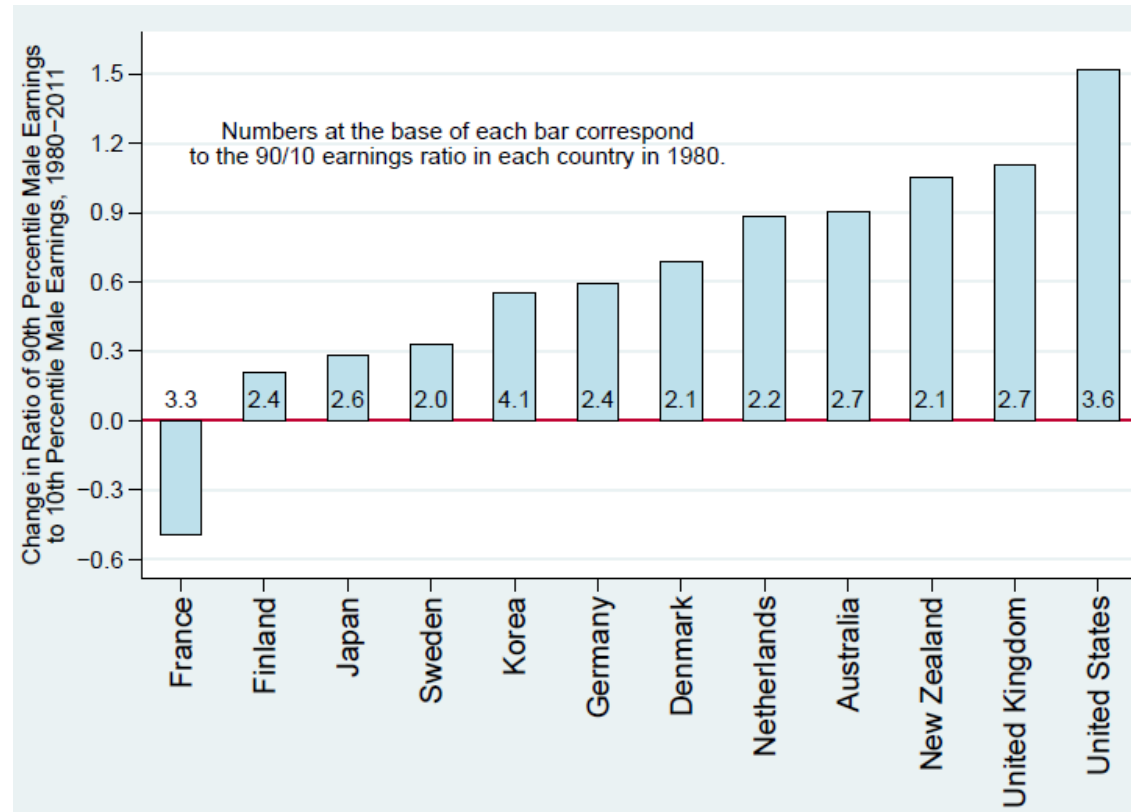
### Present discounted value of college relative to high school degree net of tuition, 1965–2008

College/high school difference, 2009 dollars



Source: Autor (2014)

## Basic facts – Comparison to other countries

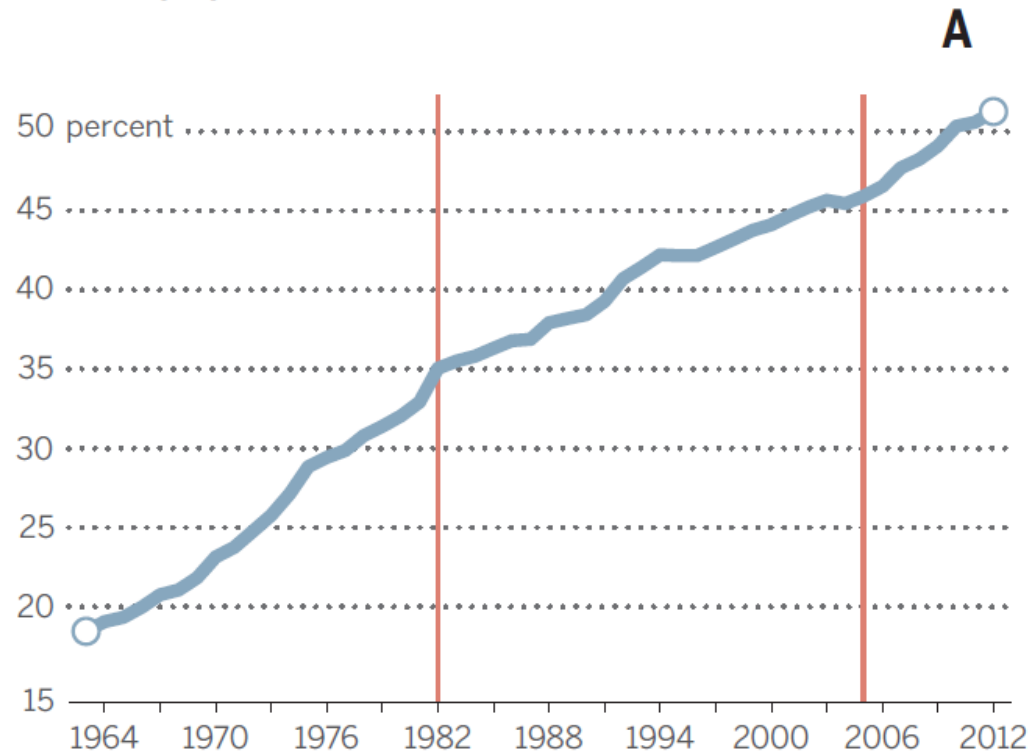


Source: Autor (2014)

## Basic facts – Relative supply of college graduates in the US

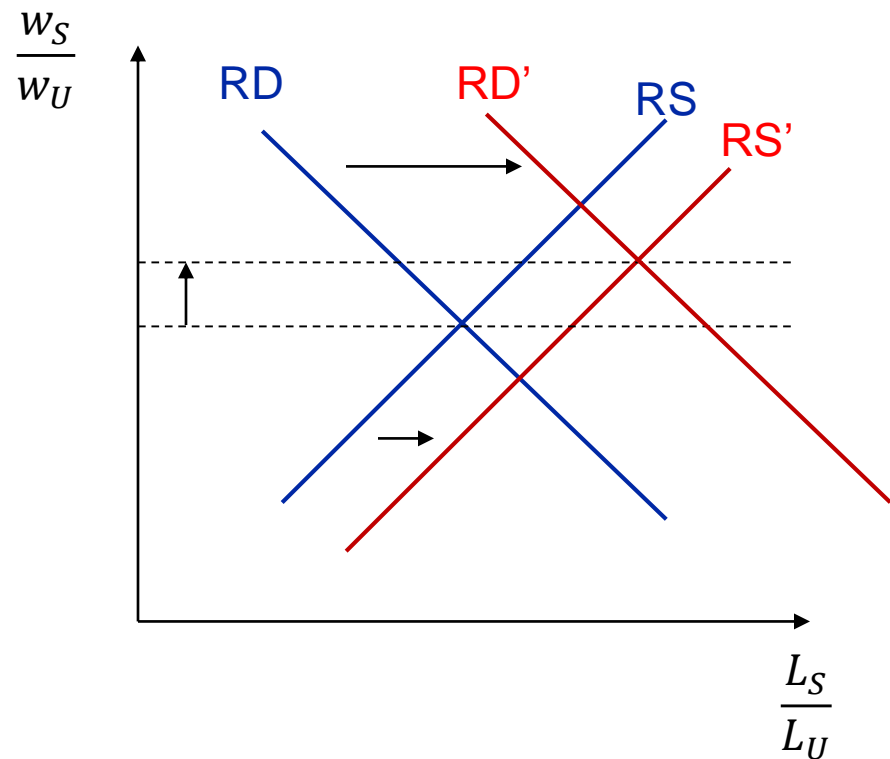
### The supply of college graduates

College share of hours worked (%), 1963–2012:  
All working-age adults



Source: Autor (2014)

## Basic facts – Drivers of the rise in the skill premium



- In principle, the skill-premium can increase because of a fall in the relative supply of skills or an increase in the relative demand for skills
- Given that there has been an increase in the relative supply of skills, the driver must be an increase in the relative demand for skills

### Clicker question:

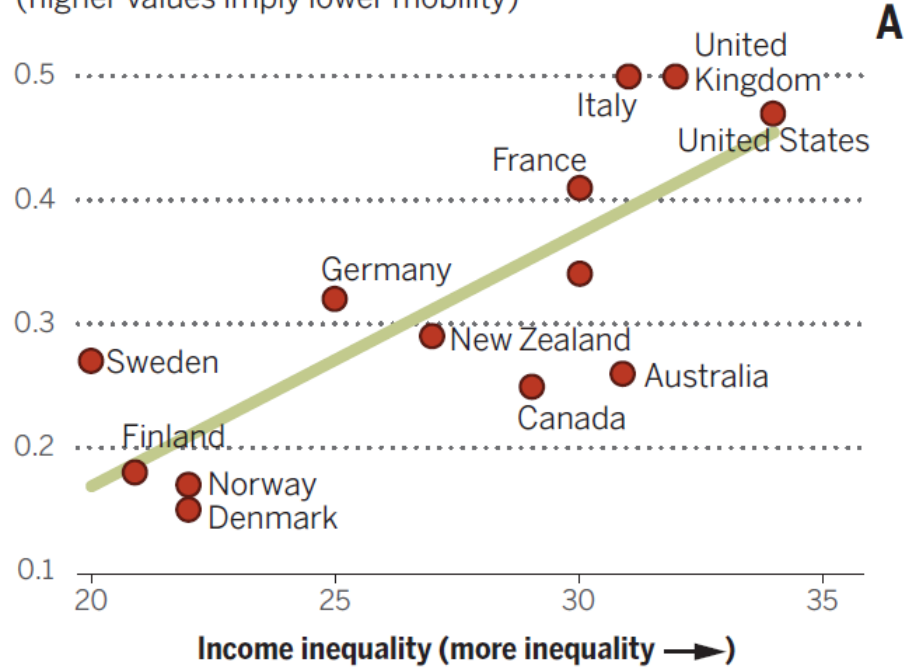
*Consider a Heckscher-Ohlin model in which one country is skilled-labor abundant and one industry is skilled-labor intensive. In this model, the RD for skilled workers would shift out in both countries upon trade liberalization. True or false?*



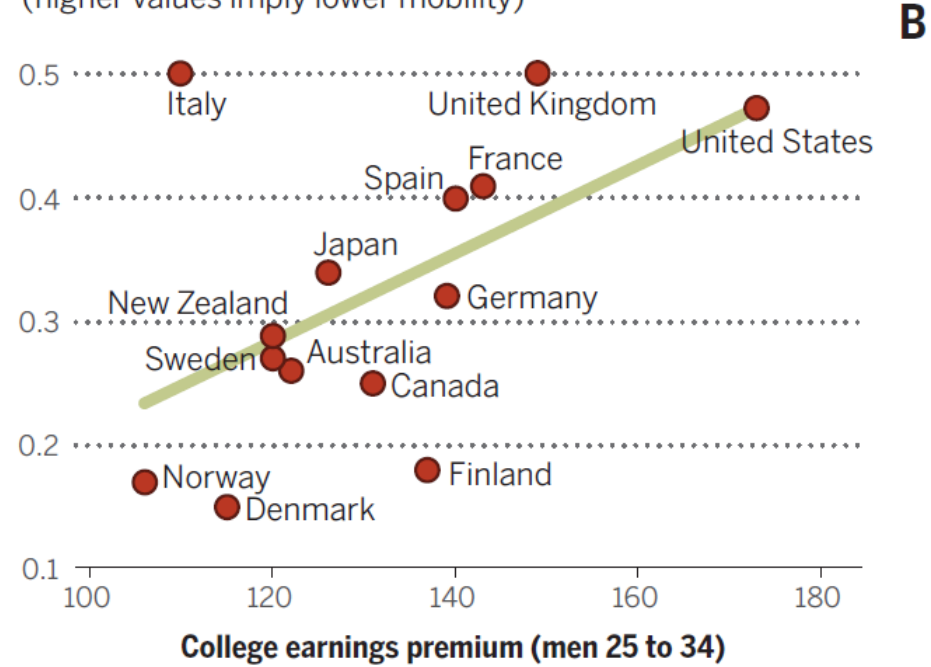
## Basic facts – Inequality and economic mobility

### Earnings inequality and economic mobility: cross-national relationships

Generational earnings elasticity  
(higher values imply lower mobility)



Generational earnings elasticity  
(higher values imply lower mobility)

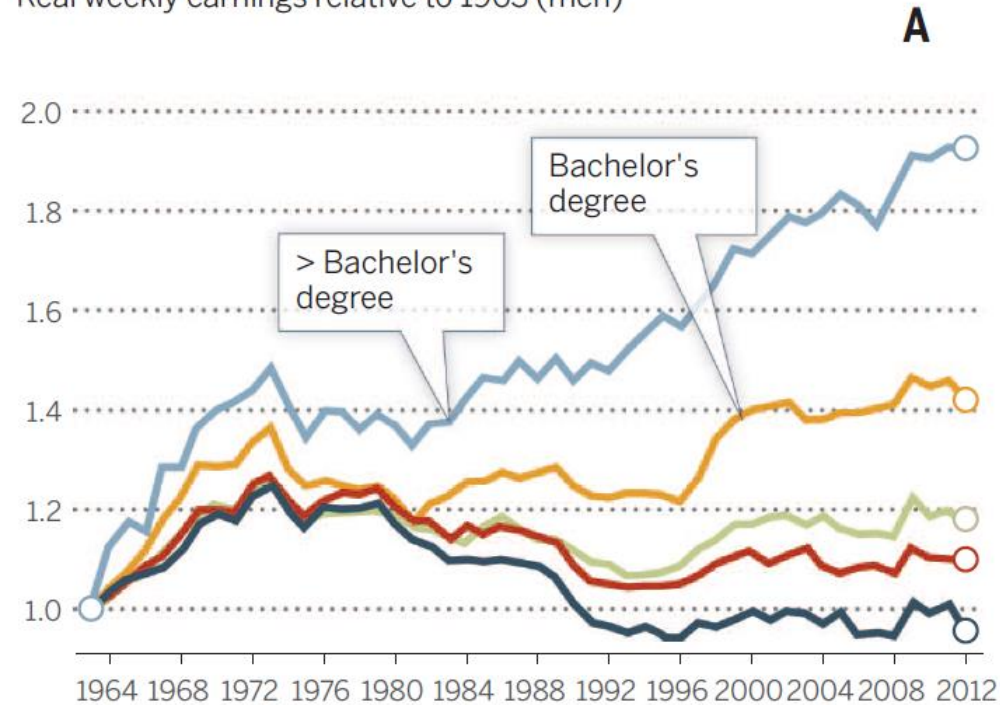


Source: Autor (2014)

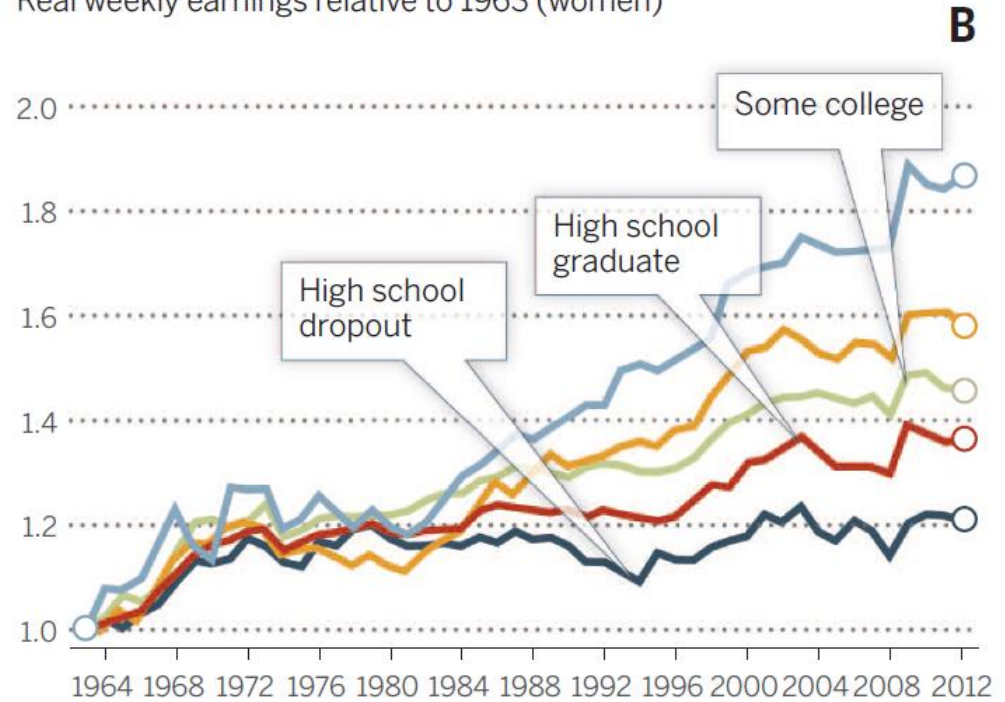
## Basic facts – Real wages in the US

### Changes in real wage levels of full-time U.S. workers by sex and education, 1963–2012

Real weekly earnings relative to 1963 (men)



Real weekly earnings relative to 1963 (women)



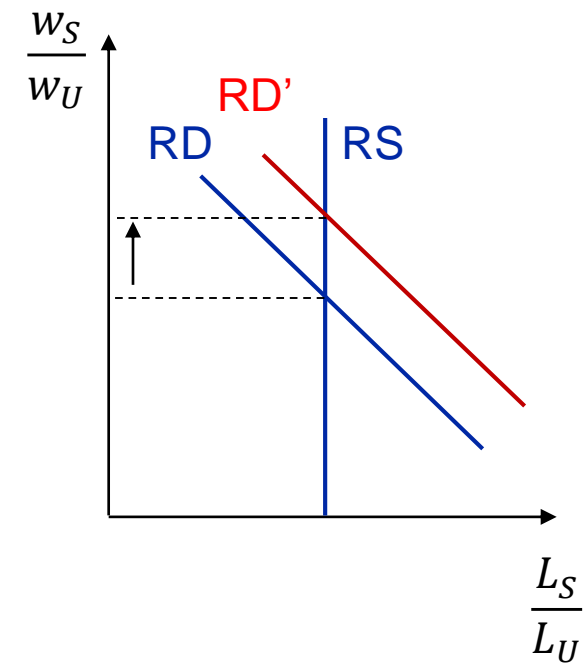
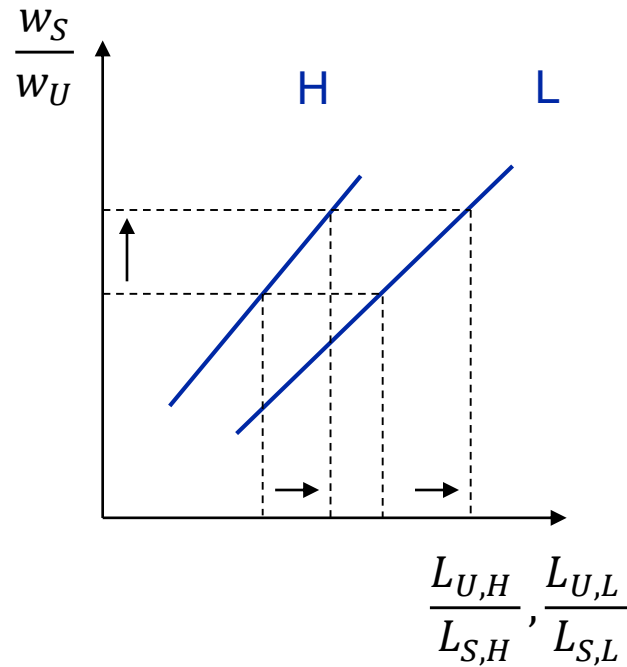
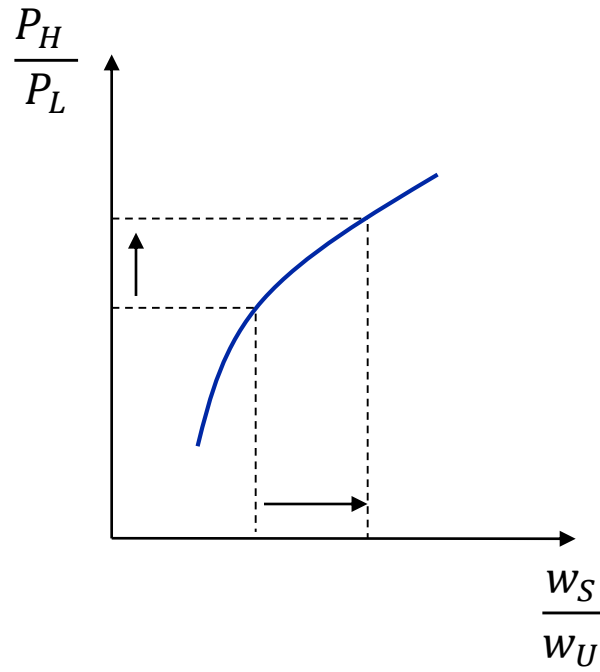
Source: Autor (2014)



## Stolper Samuelson at work?

- At first sight, Stolper-Samuelson effects look like a natural explanation for the observed increase in the skill premium in the US
- To see this, relabel our earlier Heckscher-Ohlin model to be about the US and China, skilled labor and unskilled labor, and high-tech and low-tech manufactures
- Moreover, assume realistically that the US is skilled labor abundant and high tech manufactures are skilled labor intensive
- Following our earlier discussion in the previous lecture, the model then predicts the following effects of trade liberalization in the US

## Stolper Samuelson at work? (contd.)





## Stolper Samuelson at work? (contd.)

- Hence, an increase in the relative price of high tech manufacturing goods is predicted to lead to an increase in the skill premium in the US (left panel)
- The increase in the skill premium is then predicted to lead to skill downgrading within industries in the sense that firms substitute away from skilled workers (center panel)
- The relative demand for skilled workers is nevertheless predicted to increase since the high tech industry expands as a whole (right panel)
- The exact reverse is predicted to happen in China. Among other things, the skill premium is predicted to fall in China

### Clicker question:

*Even though the RD for skilled workers falls within each US industry, it rises in the entire US economy because of the increase in the RS of skilled-labor intensive goods. True or false?*



## Stolper Samuelson at work? (contd.)

- However, three facts suggest that this mechanism was not the main driver of the increase in inequality observed in the data:
  1. The skill-premium has also increased in China
  2. There has been skill upgrading in most US industries
  3. The relative prices of skilled labor intensive goods appear to have fallen in the US
- Also, the change in inequality is simply too large to be plausibly explained by external forces. Trade is just not that important in the US
- Notice that this is not a refutation of the Heckscher-Ohlin model per se but merely says that other forces have been more powerful in the data



## Stolper Samuelson at work? (contd.)

- One reason why Stolper-Samuelson effects were weak in the US is that firms responded to import competition by quality differentiation
- In particular, Khandewal (2010) shows that US firms were able to escape low wage competition by differentiating their products along the quality dimension
- This effect was stronger in sectors which have a larger potential for quality differentiation (sectors in which many different qualities are observed)
- Countries no longer produce the same goods if they engage in quality differentiation thereby breaking the Stolper-Samuelson result



## Skill-biased technological change

- Until recently, the consensus among economists had thus been that trade had a relatively small effect on inequality in the US
- The leading explanation was instead **skill-biased technological change** brought about by computerization
- The argument is that computers are substitutes for unskilled labor but complements for skilled labor thereby shifting out the relative demand for skills
- For example, think about the effects of computers in banks. They harmed low skilled bank tellers but benefited high skilled quant traders





## Skill-biased technological change (contd.)

- Skill-biased technological change is also consistent with the three facts which contradicted the Stolper-Samuelson explanation:
  1. Computerization shifts out the relative demand for skilled labor in most countries
  2. Computerization leads to skill upgrading in most industries
  3. The argument does not rely on any particular movement in relative goods prices
- Moreover, it is more plausible from a quantitative perspective since it appeals to changing domestic technology

Clicker question:

*Since the RD for skilled workers rises within most industries according to this explanation, it is largely irrelevant which industries expand and contract. True or false?*



## The effects of trade revisited – Offshoring

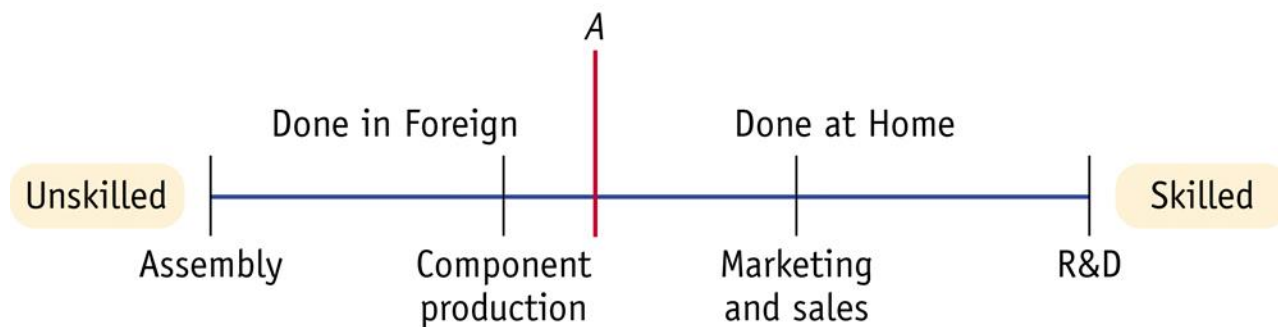
- The last few years have seen a revival of interest in the effects of trade on inequality in developed countries
- One line of work due to Feenstra and Hanson (1999) emphasizes the effects of offshoring, i.e. the global sourcing of intermediate inputs by firms
- It starts from the insight that the Stolper-Samuelson logic becomes consistent with the three stylized facts discussed earlier if it is applied to intermediate goods trade
- Intermediate goods trade has grown sharply over time and now accounts for over half of all goods imported into OECD economies

## The effects of trade revisited – Offshoring (contd.)

(a) Activities Ranked by Order in Production



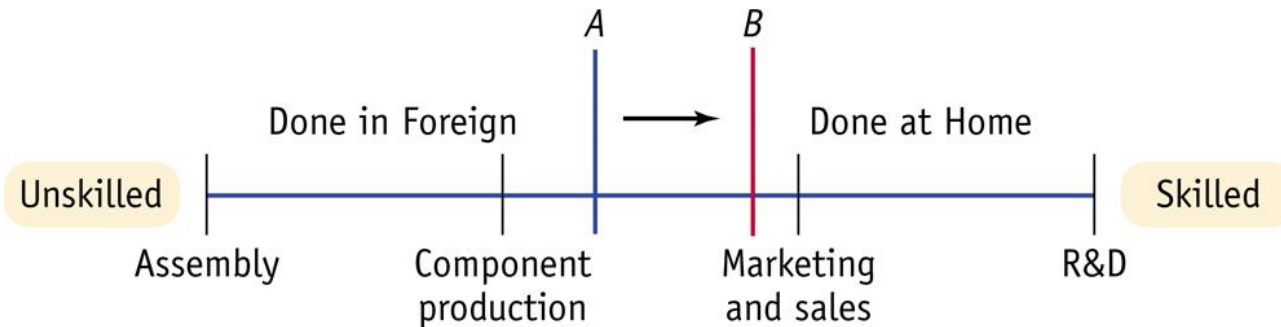
(b) Activities Ranked by Skilled/Unskilled Labor



- This graph represents a stylized model of offshoring which can apply within or across the boundaries of firms
- All the activities to the left of A are performed in China and all the activities to the right of A are performed in the US
- It is basic Heckscher-Ohlin-type specialization just applied to intermediate goods

Source: Krugman, Melitz, and Obstfeld textbook

## The effects of trade revisited – Offshoring (contd.)



Source: Krugman, Melitz, and Obstfeld textbook

- As trade costs fall, it becomes more attractive to offshore to China
- The key insight is that the newly offshored activities are at the upper end of the skill spectrum for China but at the lower end of the skill spectrum for the US
- As a result, the relative demand for skills increases in the US and China thus pushing up the skill premium everywhere



## The effects of trade revisited – Offshoring (contd.)

- Hence, this story is immediately consistent with the fact that the skill premium increased in the US and China
- Similar to the skill-biased technological change story, it is also consistent with the other two facts that indicated that the textbook Stolper-Samuelson mechanism was not at work
- In particular, offshoring leads to skill upgrading in most industries and the argument does not rely on any particular movement in relative goods prices
- Feenstra and Hanson (1999) estimate that outsourcing accounts for approximately 15% of the increase in the skill premium while computers contribute around 35%



## The effects of trade revisited – Offshoring (contd.)

- A recent study by Hummels et al (2014) backs up the basic Feenstra and Hanson (1999) story using substantially better data
- In particular, the authors have access to matched employer-employee data for the universe of private sector firms in Denmark
- They document significant effects of offshoring on wages, with the wages of skilled workers increasing and the wages of unskilled workers decreasing as a result of offshoring
- They also find that workers who were displaced from offshoring firms suffer greater earnings losses than other displaced workers, and that the earnings losses are greater and more persistent for low-skilled than high-skilled workers



## The effects of trade revisited – Offshoring (contd.)

- The bottom line is that a Stolper-Samuelson-like story can explain some of the increase in inequality even though the textbook Stolper-Samuelson theorem can't
- This basic theme also reappears in other recent studies such as an interesting calibration exercise by Burstein and Vogel (forthcoming)
- As we will discuss in more detail later, not all firms export and exporters hire relatively more skilled workers than non-exporters which generates another Stolper-Samuelson-like link between trade and inequality
- Burstein and Vogel (forthcoming) add this channel to a quantitative Ricardo-Heckscher-Ohlin model and show that a reduction in trade costs leads to an increase in the skill premium almost everywhere



## The effects of trade revisited – China

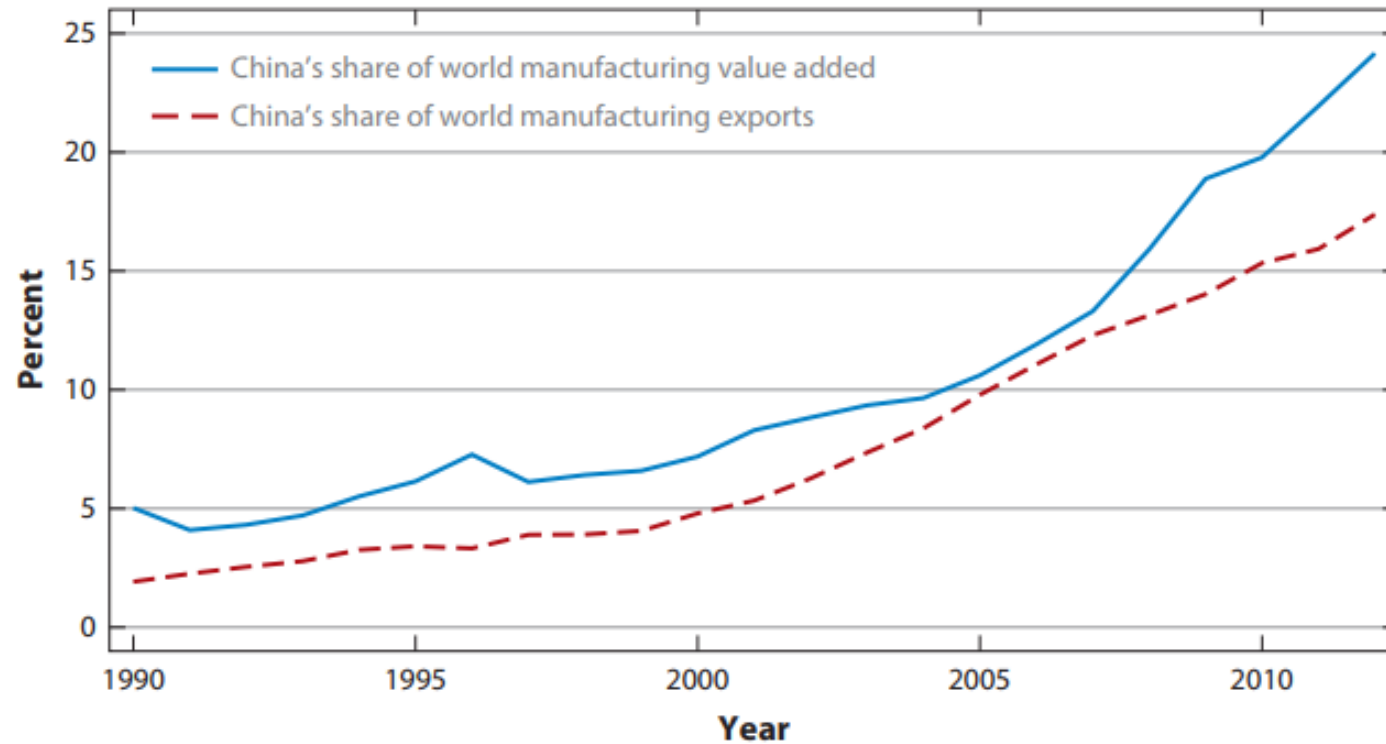
- Another line of work departs entirely from the Heckscher-Ohlin model and takes a reduced-form approach to the effects of trade on inequality
- Pioneered by Autor et al (2013), it studies the effects of the spectacular rise of China's manufacturing sector on labor markets in advanced economies
- The main insight is that the effects of import competition do not immediately dissipate across skill groups as in the Heckscher-Ohlin model but rather hit people working in the wrong industry in the wrong place
- This suggests that there are substantial adjustment frictions in real-world labor markets which the Heckscher-Ohlin model does not take into account

### Clicker question:

*In the Heckscher-Ohlin model, the real wages of unskilled workers are predicted to fall in the skilled-labor abundant country even if they work in the export industry. True or false?*

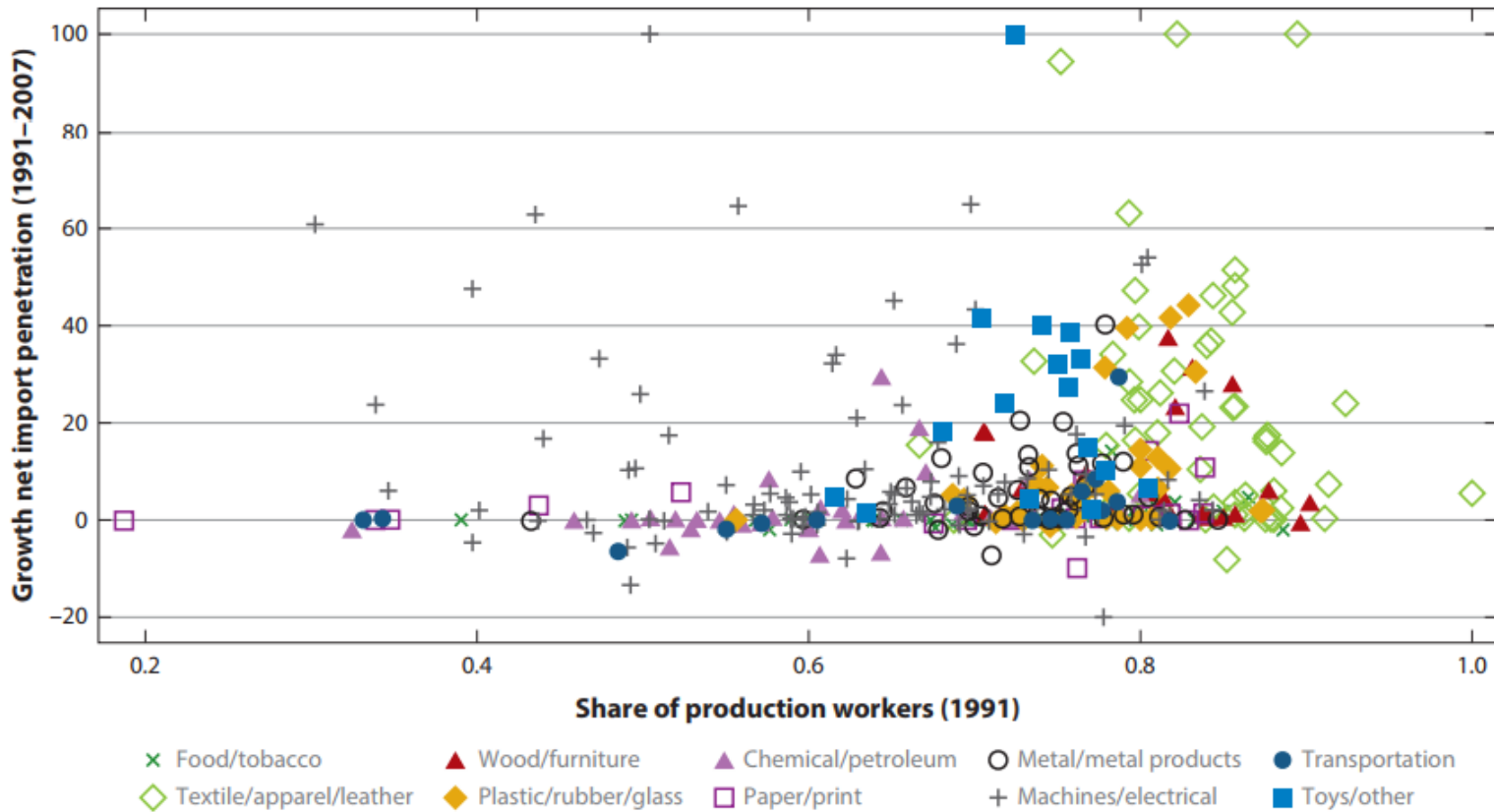


## The effects of trade revisited – China (contd.)



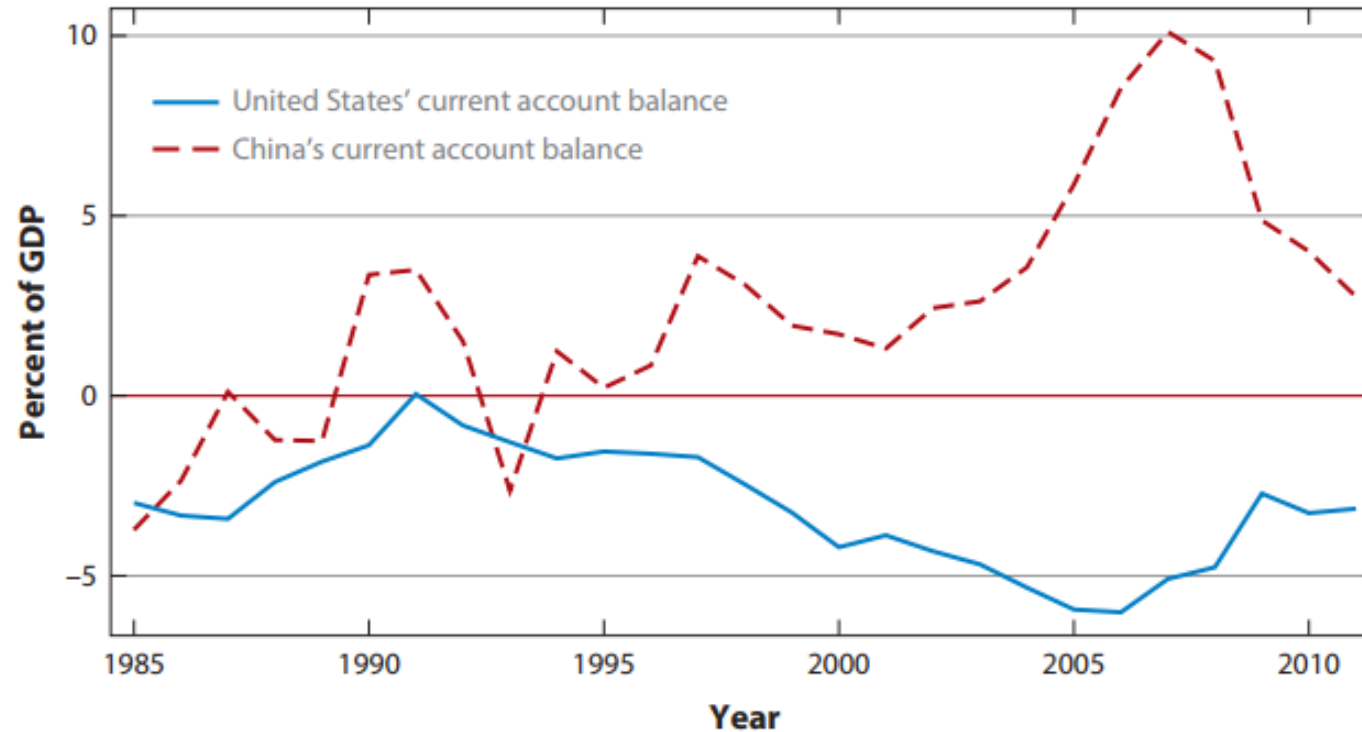
Source: Autor et al (2016)

## The effects of trade revisited – China (contd.)



Source: Autor et al (2016)

## The effects of trade revisited – China (contd.)



Source: Autor et al (2016)

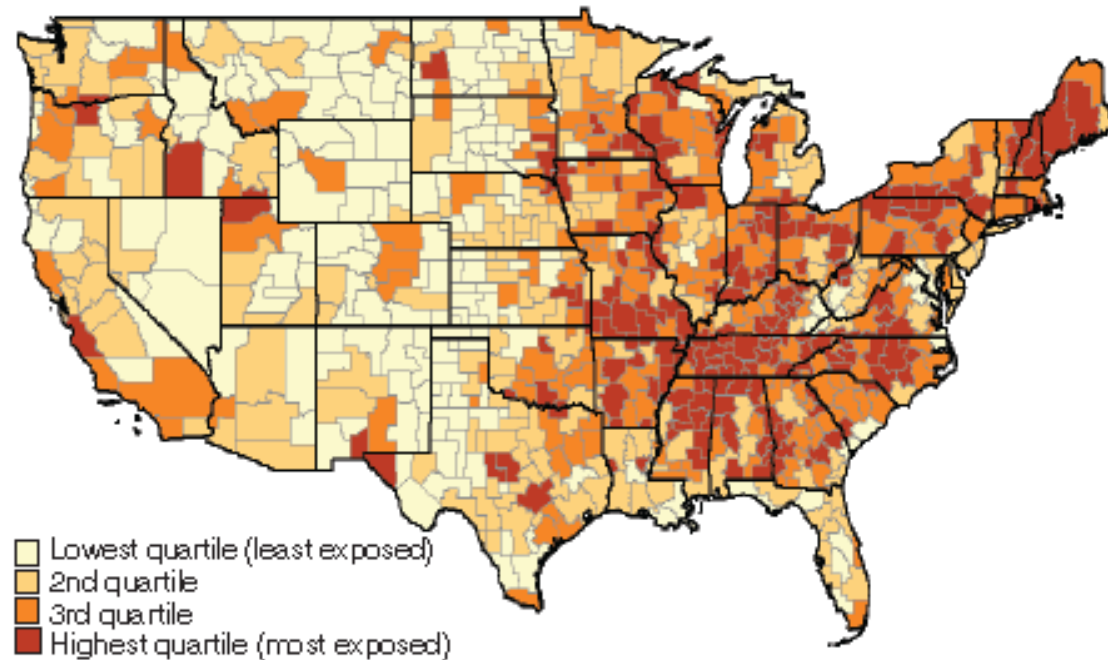


## The effects of trade revisited – China (contd.)

- Autor et al (2013) consider US local labor markets as defined by commuting zones. They differ in their exposure to import competition from China because of
  1. Regional variation in the employment share of manufacturing (25% of the variation)
  2. Regional variation in within-manufacturing specialization (75% of the variation)
- As one would expect, the traditional manufacturing regions of the US appear among the most exposed commuting zones. This includes substantial parts of the Northeast and South Central US, where labor-intensive manufacturing industries such as furniture, rubber products, toys, apparel, footwear, and leather goods are concentrated

## The effects of trade revisited – China (contd.)

Panel B. Trade Exposure by Commuting Zone,  
1990–2007



Source: Autor et al (2013)



## The effects of trade revisited – China (contd.)

- To identify the effects of Chinese import competition on US local labor markets, Autor et al (2013) use a **differences-in-differences** strategy
- This simply means that they are comparing two differences, namely the change in labor market conditions before and after the China shock in regions which were most and least affected by Chinese import competition
- The main advantage is that this controls for other contemporaneous shocks to US labor markets as long as they are uncorrelated with the China shock
- The main disadvantage is that it only measures the relative effect of the China shock on the most affected versus the least affected industries and not on its absolute effect

## The effects of trade revisited – China (contd.)

Table 4: Import Competition and Outcomes in U.S. Local Labor Markets, 1990 - 2007

<u>A. <math>\Delta</math> Fraction of Working Age Population in Manufacturing, Unemployment, NILF</u>			
Employed in Manufacturing (1)	Employed in Non- Manufacturing (2)	Unemployed (3)	Not in Labor Force (4)
-0.60*** (0.10)	-0.18 (0.14)	0.22*** (0.06)	0.55*** (0.15)

<u>B. <math>\Delta</math> Log Population, Log Wages, Annual Wage and Transfer Income</u>			
$\Delta$ Log CZ Population (log pts) (5)	$\Delta$ Avg Log Weekly Wage (log pts) (6)	$\Delta$ Annual Wage/Salary Inc per Adult (US\$) (7)	$\Delta$ Transfers per Capita (US\$) (8)
-0.05 (0.75)	-0.76*** (0.25)	-549.3*** (169.4)	57.7*** (18.4)

N=1444 (722 commuting zones x 2 time periods 1990-2000 and 2000-2007). Employment, population and income data is based on U.S. Census and American Community Survey data, while transfer payments are based on BEA Regional Economic Accounts. All regressions control for the start of period percentage of employment in manufacturing, college-educated population, foreign-born population, employment among women, employment in routine occupations, average offshorability index of occupations, and Census division and time dummies. Models are weighted by start of period commuting zone share of national population. Robust standard errors in parentheses are clustered on state. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Source: Autor et al (2016)



## The effects of trade revisited – China (contd.)

- This table shows the results of comparing commuting zones with a \$1,000 per-worker difference in additional import exposure
- The interpretation is that the fraction of the working age population employed in manufacturing fell by - 0.60 percentage points more in the more exposed commuting zone and so on
- Notice that the faster fall in manufacturing and non-manufacturing employment corresponds roughly to the faster rise in unemployment and labor force non-participation
- Notice also that wages fall faster and transfer payments grow faster in the more exposed region but there are no differences in the population growth rates

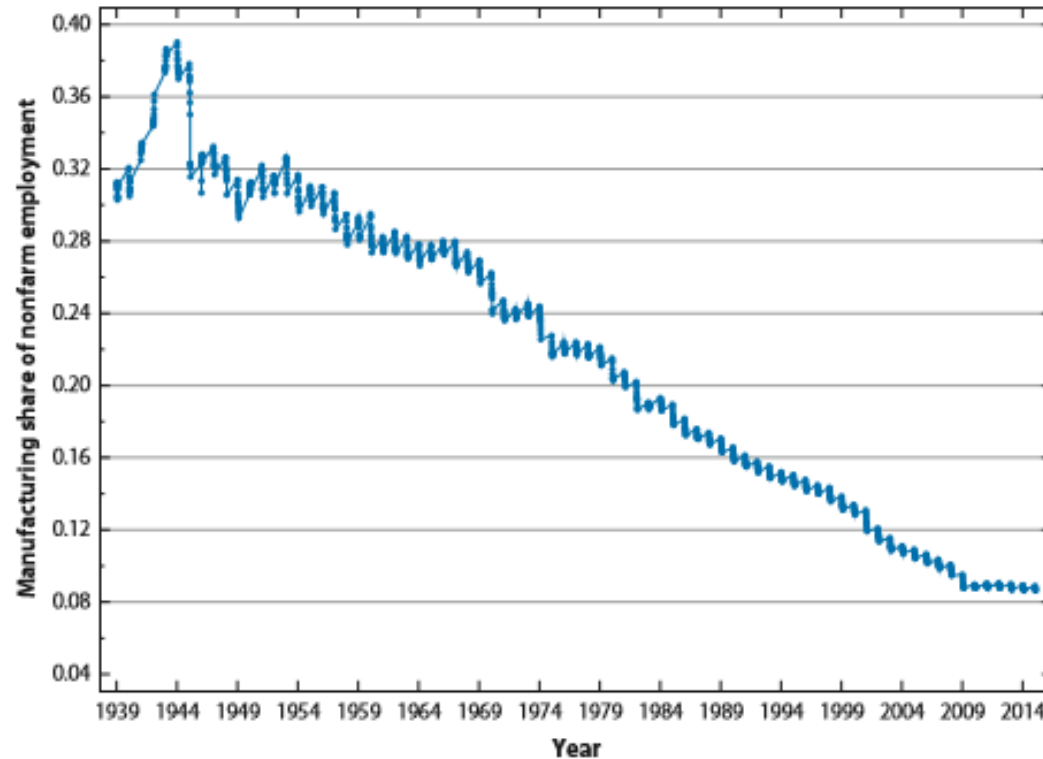




## The effects of trade revisited – China (contd.)

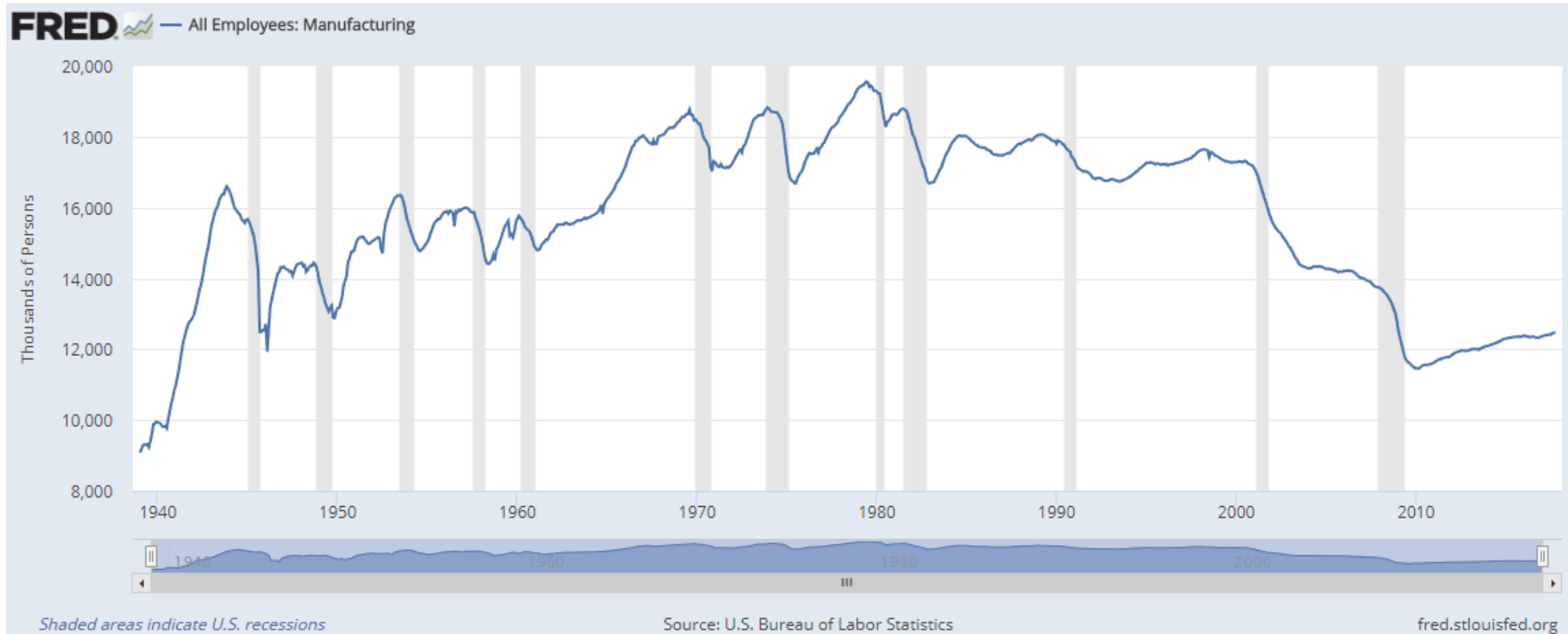
- Autor et al (2013) also attempt to back level effects out of their differences-in-differences specification by calculating the effects relative to commuting zones with no observed change in import competition
- But this is only valid under strong identifying assumptions such as the absence of general equilibrium effects or effects operating through the exchange rate
- Putting such concerns aside, Autor et al (2013) conclude that about one quarter of the aggregate decline in US manufacturing employment between 1990 and 2007 can be attributed to rising import competition
- Should this be true, it would at least generate another puzzle because there is no apparent acceleration in the decline of the US manufacturing employment share

## The effects of trade revisited – China (contd.)



Source: Autor et al (2016)

## The effects of trade revisited – China (contd.)



Source: St. Louis Fed

## The effects of trade revisited – China (contd.)

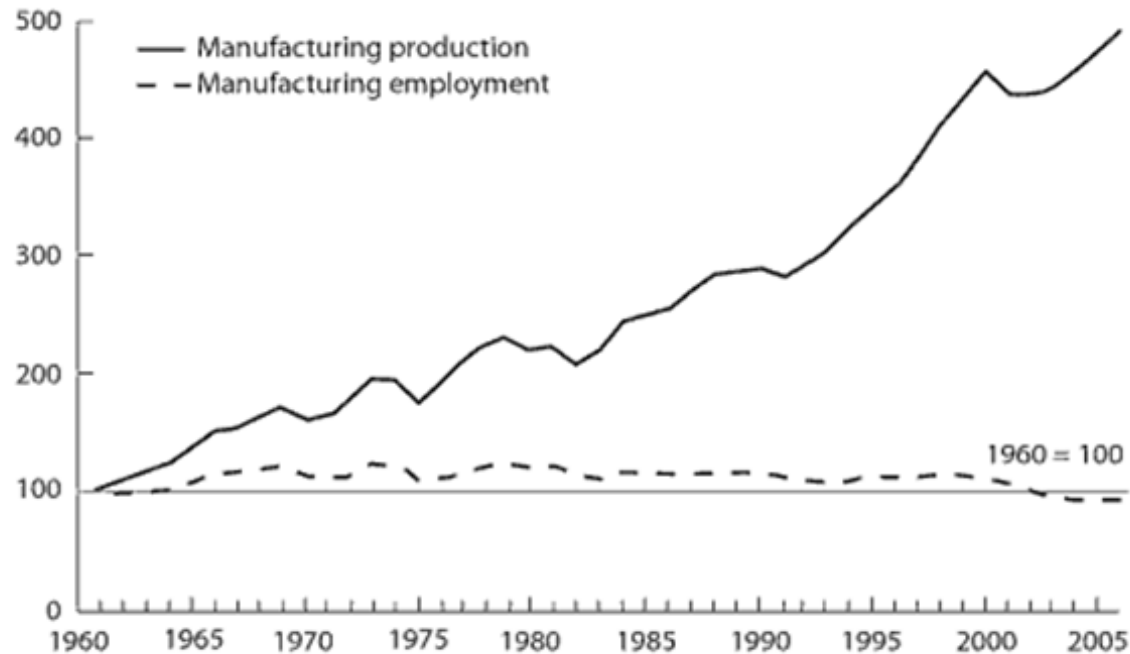


Figure 4.3

U.S. Manufacturing Production and Employment, 1960–2006.

Source: Council of Economic Advisers 2009, tables B-51, B-46.

Source: Irwin textbook

- The standard explanation for the decline in the manufacturing employment share is simply relatively high productivity growth
- In particular, productivity growth in manufacturing exceeds productivity growth in services so that the economy's resources shift out of services over time
- Notice that the dashed line represents the level of manufacturing employment and not the share of manufacturing employment in total employment



## Developing countries

- So far, we have only looked at the effects of trade on inequality in developed countries but there is also a sizeable literature focusing on developing countries
- Ravallion (2014) reports that average inequality within developing countries has only risen slowly until 2000 and has even stayed flat since then
- Against this background, it is not so surprising that most papers also find that trade had only a small (if any) effect on inequality
- One noteworthy exception is a study by Topalova (2010) which finds that rural poverty fell substantially slower in Indian regions which were more affected by India's trade liberalization in 1991



## Conclusion

- In this lecture, we took a look at the evidence on the effects of trade on inequality, focusing mainly on developed countries
- Our main finding was that trade has not been the main driver of the overall increase in inequality even though it has played a more important role in recent years
- The growing importance of trade for inequality is mainly due to increased offshoring and the spectacular growth of China's manufacturing sector



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