Lecture objectives and reading

- Learn about empirical facts
  - Labor market data
  - Evidence on wage premia and returns to education
  - Discussion of income inequality
- Introduce stylized labor market models
  - A simple Walrasian model of the labor market
  - A bathtub model of unemployment
  - Modern theories of labor markets
  - Pareto optimal allocations and distortionary taxation
- Tools
  - Walrasian equilibrium
  - Computation of the value of human capital
- Reading
  - Jones – Chapter 7 + additional materials on course website

Outline

1. Labor market evidence from the U.S.
   - Measuring unemployment
   - Business cycles vs. long term trends
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   - Labor supply and labor demand
   - Labor taxes and a cross-country comparison
3. A bathtub model of unemployment
4. Search and matching theory of the labor market
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   - Beveridge curve
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   - Human capital valuation
6. Trends in wage inequality
   - Inequality, redistribution and distortionary taxation

Some definitions

- See http://www.bls.gov/bls/glossary.htm
- Civilian non-institutional population POP_t
  - Age 16+, not inmates of institutions (penal, mental), not on active duty in armed forces.
  - Growing at about 1% per year.
- Civilian labor force L_t
  - Subset of non-institutional population
  - Have a job or seeking a job (i.e., both employed and unemployed)
- Labor force participation L_t/POP_t
  - Labor force as a share of non-institutional population
- Civilian employment E_t
  - Currently employed or self-employed (incl. those on vacation, ill, in job training)
  - Volunteer work not included
- Employment-population ratio E_t/POP_t
  - Employment divided by non-institutional population
- Unemployed persons U_t
  - Members of labor force who do not have a job and actively search for a job
- Unemployment rate $u_t = U_t/L_t$
  - Number of unemployed persons as a share of **labor force** (not total population!)

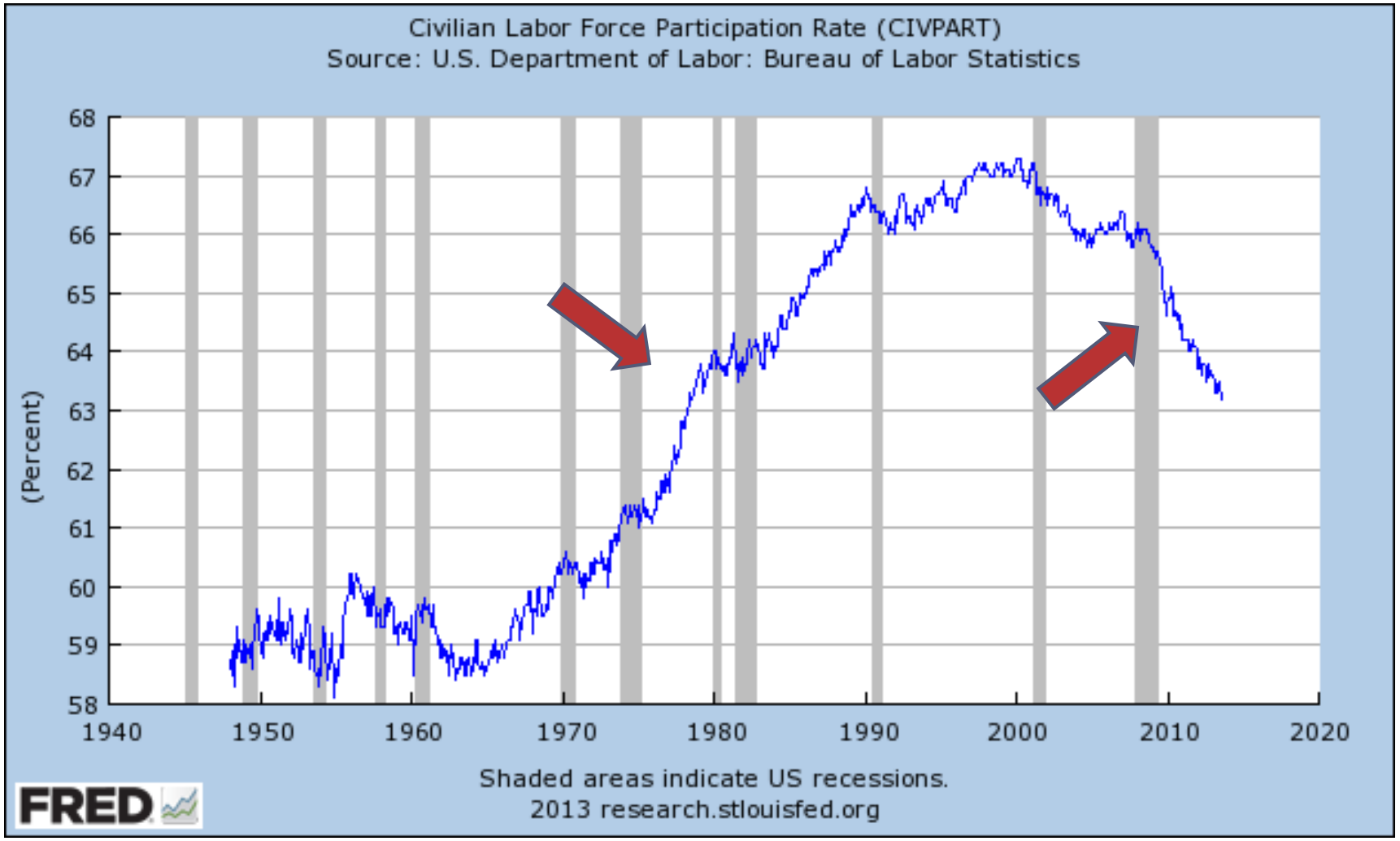
Split of total U.S. population (316.7 million)

Aged <16, institutionalized, or in armed forces	70.7 million
Civilian non-institutional population aged 16+	246.0 million
Out of labor force	90.5 million
Civilian labor force	155.5 million
Employed	144.2 million
Unemployed	11.3 million

Labor force participation = labor force / population aged 16+	63.2 %
Employment-population ratio	58.6 %
Unemployment rate = unemployed / labor force	7.3 %

Source: FRED, August 2013

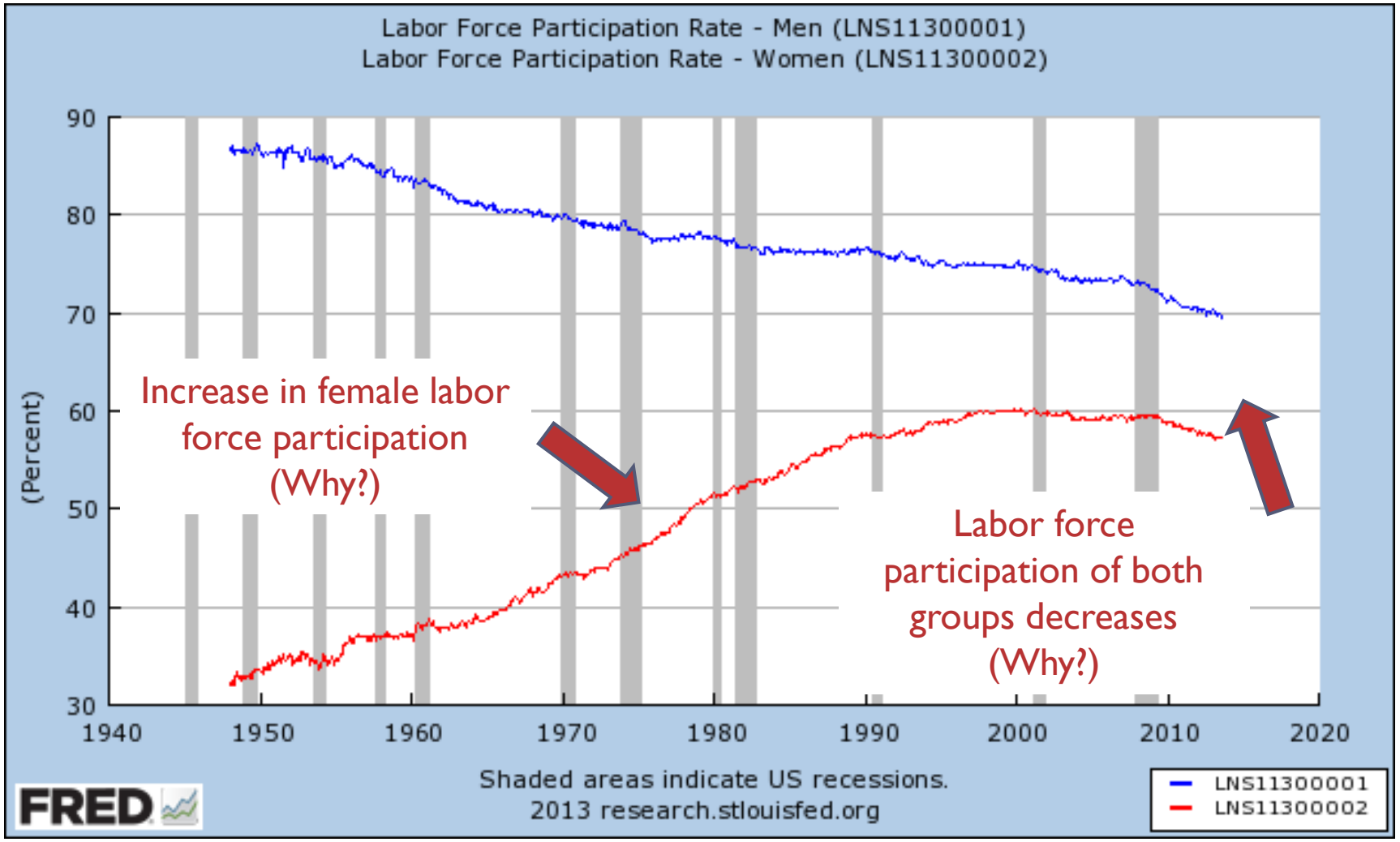
Labor force participation rate



- Labor force participation is procyclical (increases in expansions, decreases in recessions).

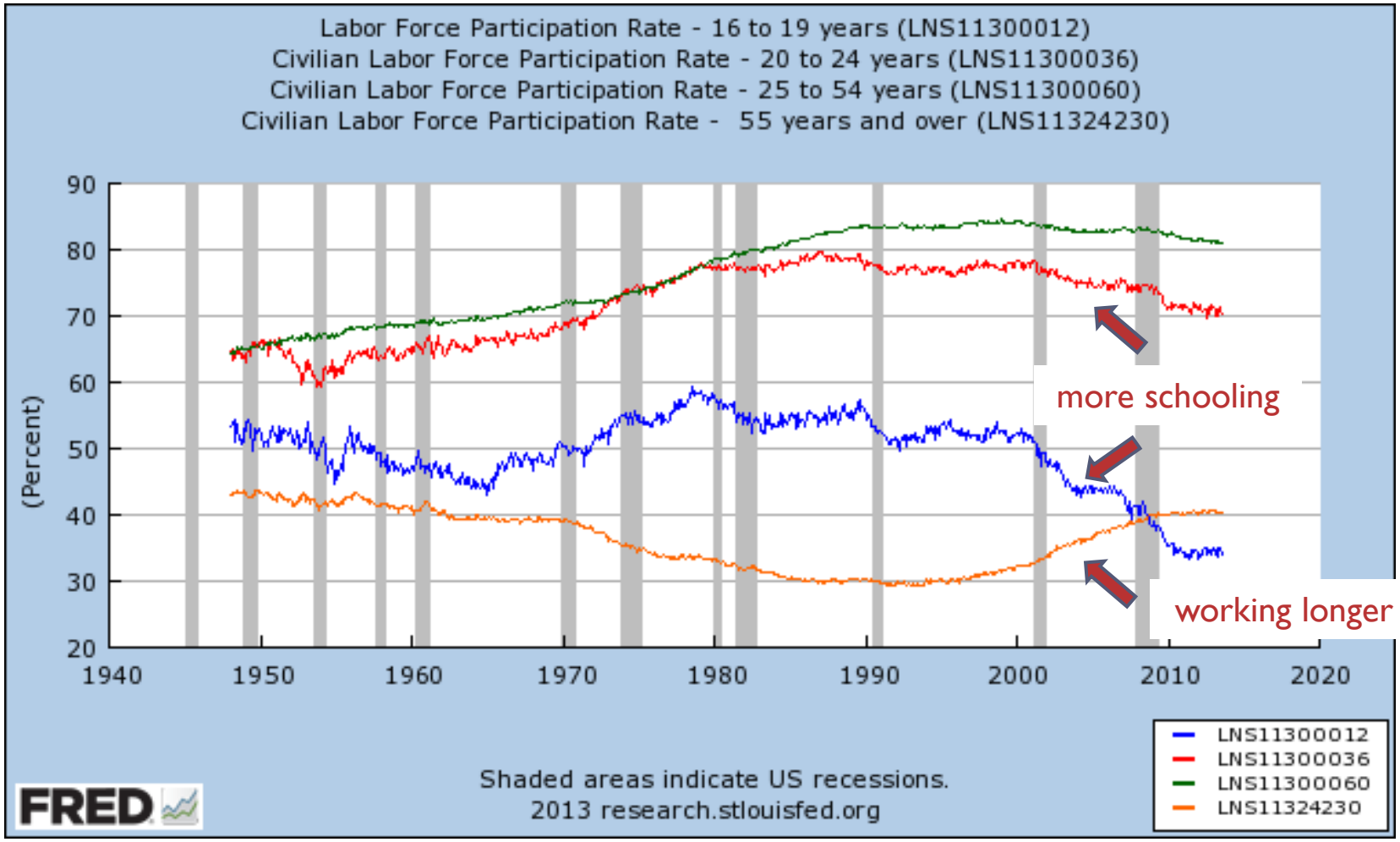
Source: FRED

Labor force participation – men and women



Source: FRED

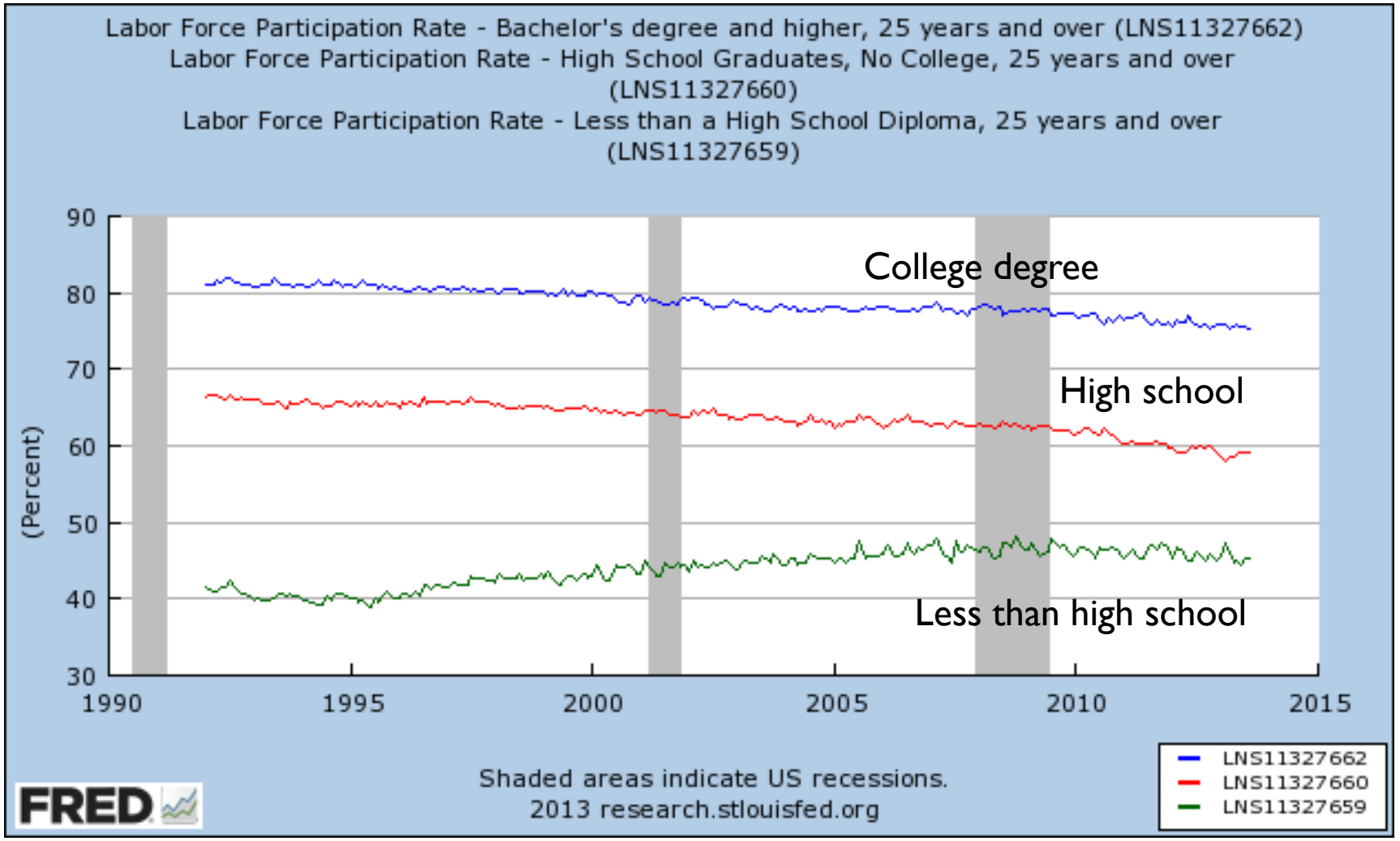
Labor force participation by age group



- **Composition effects**: As population ages, more people move to older age groups with lower labor force participation

Source: FRED

Labor force participation by education

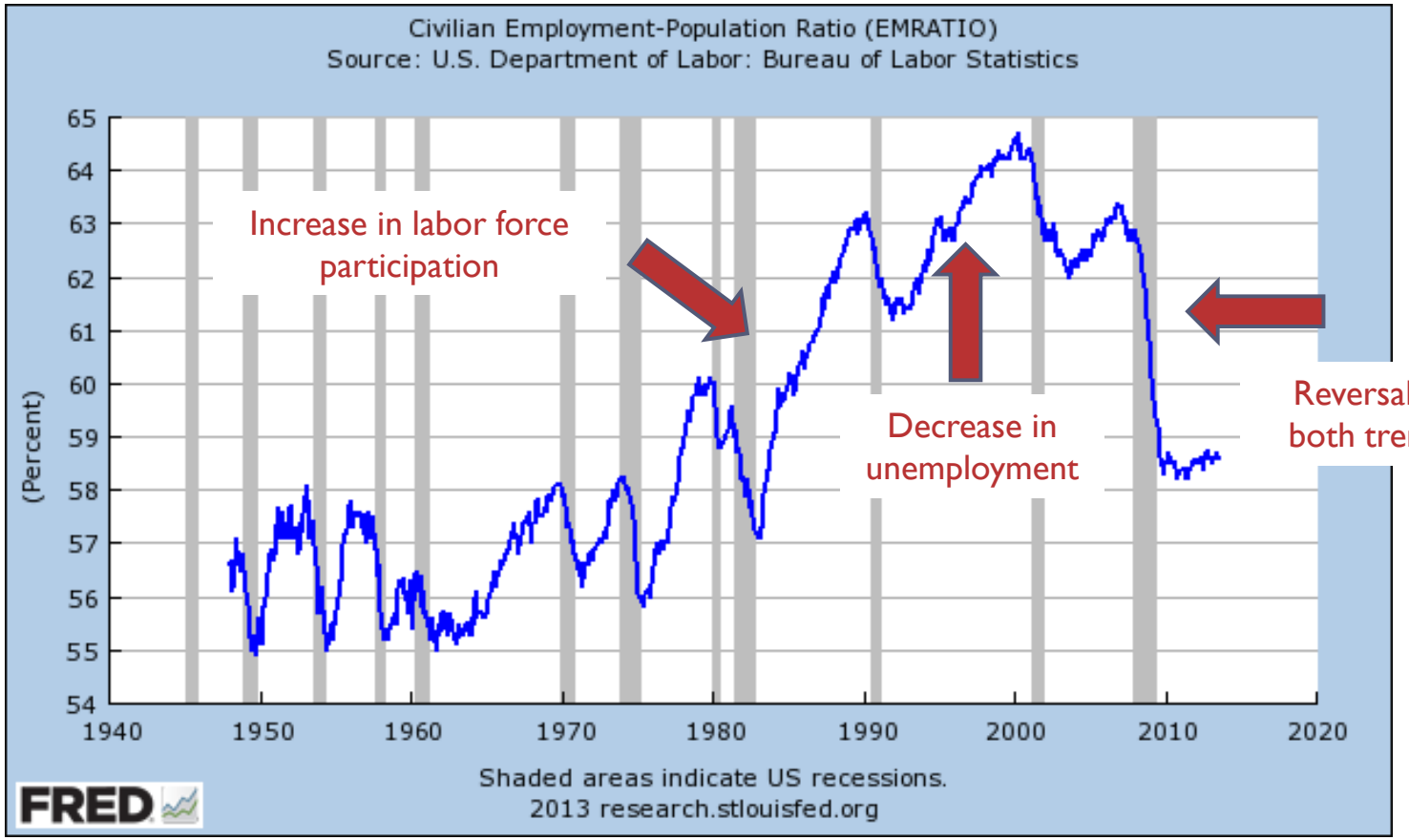


Source: FRED

Labor force participation summary

- Differences in participation rates by gender
  - Slow, persistent declines for men
  - Rapid increase and then stabilization for women
- Age composition
  - Young and old cohorts are less attached to labor market
  - Increases in participation rates for old cohorts
- Differences in participation rates by education
  - More educated people have much higher participation rates
- Two main shifts since 1950s
  - Increase in participation rate between 1960s and 1990s
    - Driven primarily by increased participation of women (changes in social norms, technology for managing fertility, reduced discrimination)
  - Decline in 2000s
    - Partly due to aging population (composition effects)
    - Young people join labor force later (schooling)

Employment-population ratio



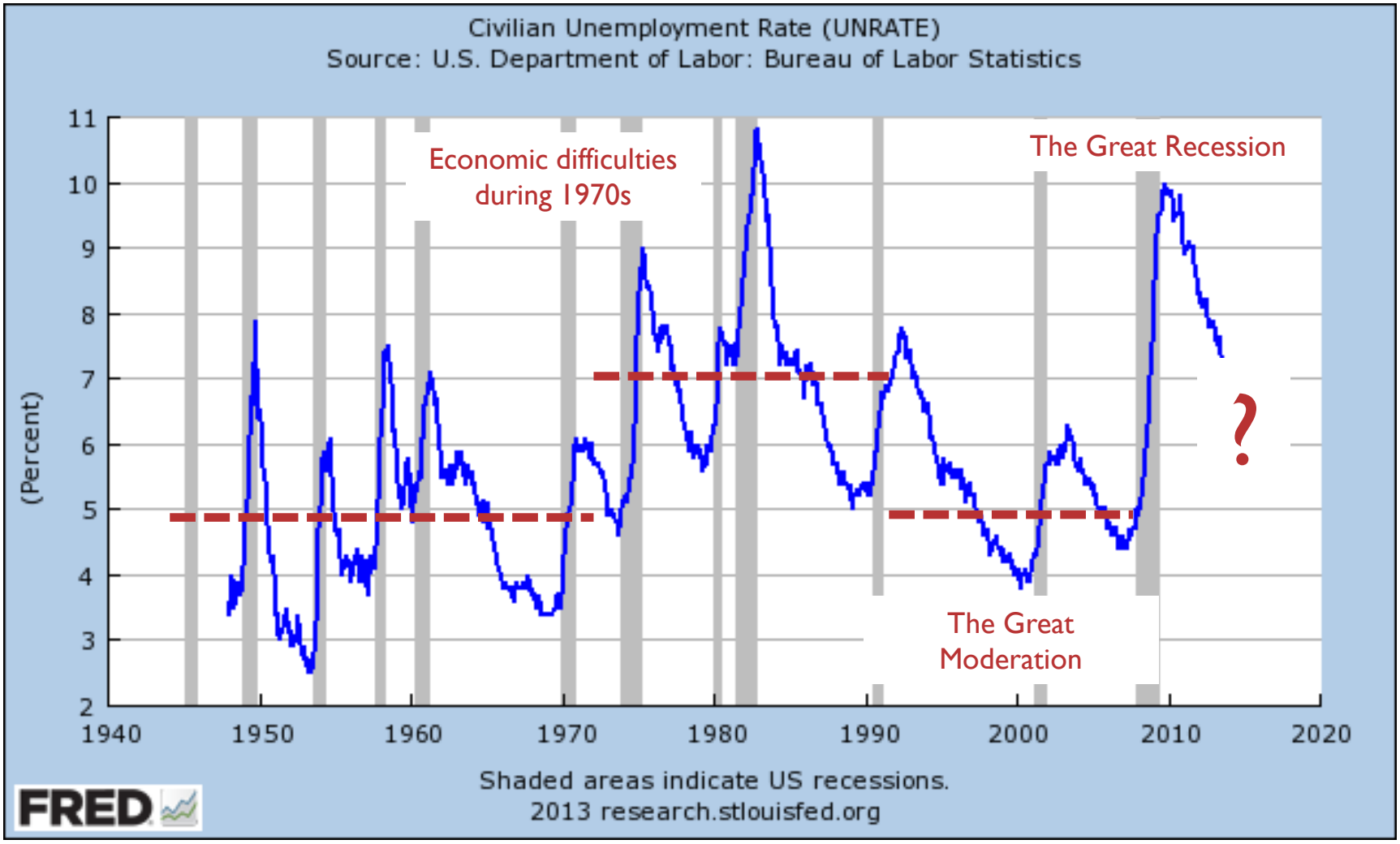
- Incorporates both labor participation as well as effects of unemployment

$$\frac{E_t}{POP_t} = \frac{E_t}{L_t}\frac{L_t}{POP_t} = (1 - u_t)\frac{L_t}{POP_t}$$

- Highly procyclical

Source: FRED

Unemployment rate



- Unemployment rate is countercyclical (low in expansions, high in recessions).

Source: FRED

Unemployment rate and labor market conditions

- Is the unemployment rate a good measure of labor market conditions?
  - When economic conditions worsen significantly, some unemployed may get discouraged and stop searching
  - Not searching ⇒ not in labor force ⇒ not counted as unemployed!
  - Discouragement actually lowers the unemployment rate.
  - Some workers may have jobs but work less than they would like to.
- Alternatives?
  - Study the labor force participation as well (will reflect discouraged workers)
  - Other measures of unemployment
    - Unemployed + marginally attached workers (FRED: U5RATE) + working part time for economic reasons (FRED:U6RATE)

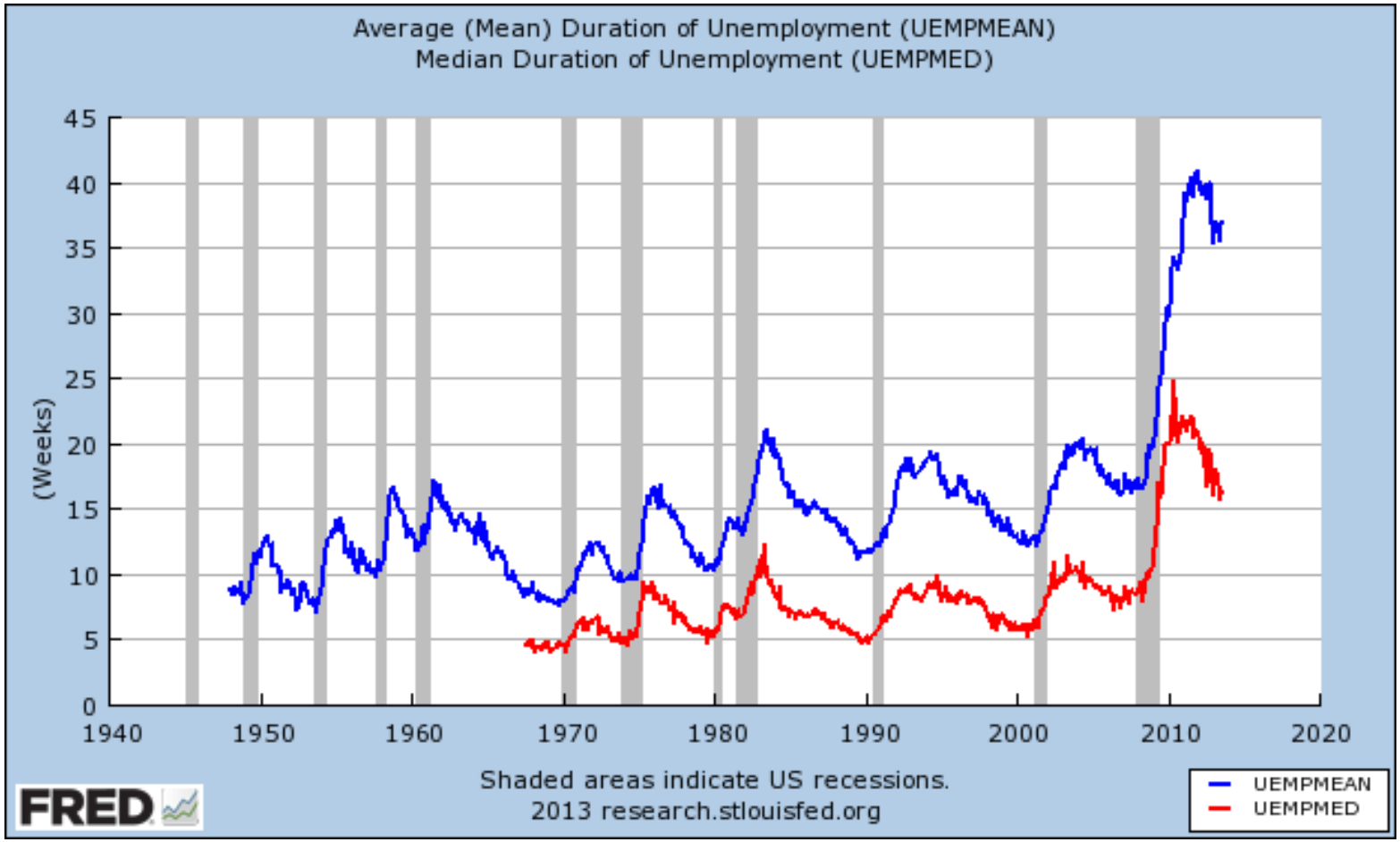
Different types of unemployment

- Actual unemployment = natural + cyclical unemployment
  - Natural rate of unemployment
    - "*rate of unemployment arising from all sources except fluctuations in aggregate demand*"
    - NAIRU = "*non-accelerating inflation rate of unemployment*"
    - Unemployment rate that would prevail if economy was neither in expansion nor in recession
    - Cannot be measured directly, need a model to determine it.
  - Natural rate of unemployment = frictional + structural
    - Frictional unemployment = resulting from the fact that search for a new job takes time (recall the model of search and matching!)
    - Structural unemployment = caused by labor market institutions that slow down matching – incl. hiring and firing costs, unemployment benefits and minimum wage
  - Cyclical unemployment
    - Caused by short-run business cycle fluctuations

Unemployment duration

- In normal times, unemployment spells are mostly short
  - Median duration < 10 weeks, average duration ~ 15 weeks
  - Why is median duration shorter than average?
- In recessions, duration lengthens
- Hysteresis in the labor market
  - As workers stay unemployed for a long time, they lose skills
  - It is even more difficult for them to find a new job
  - Unemployment declines only very slowly

Unemployment duration



- Highly countercyclical, slowly trending up, very high during the recent recession.

Source: FRED

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Labor demand and labor supply

- Labor demand curve
  - Derived from the firm profit maximization problem

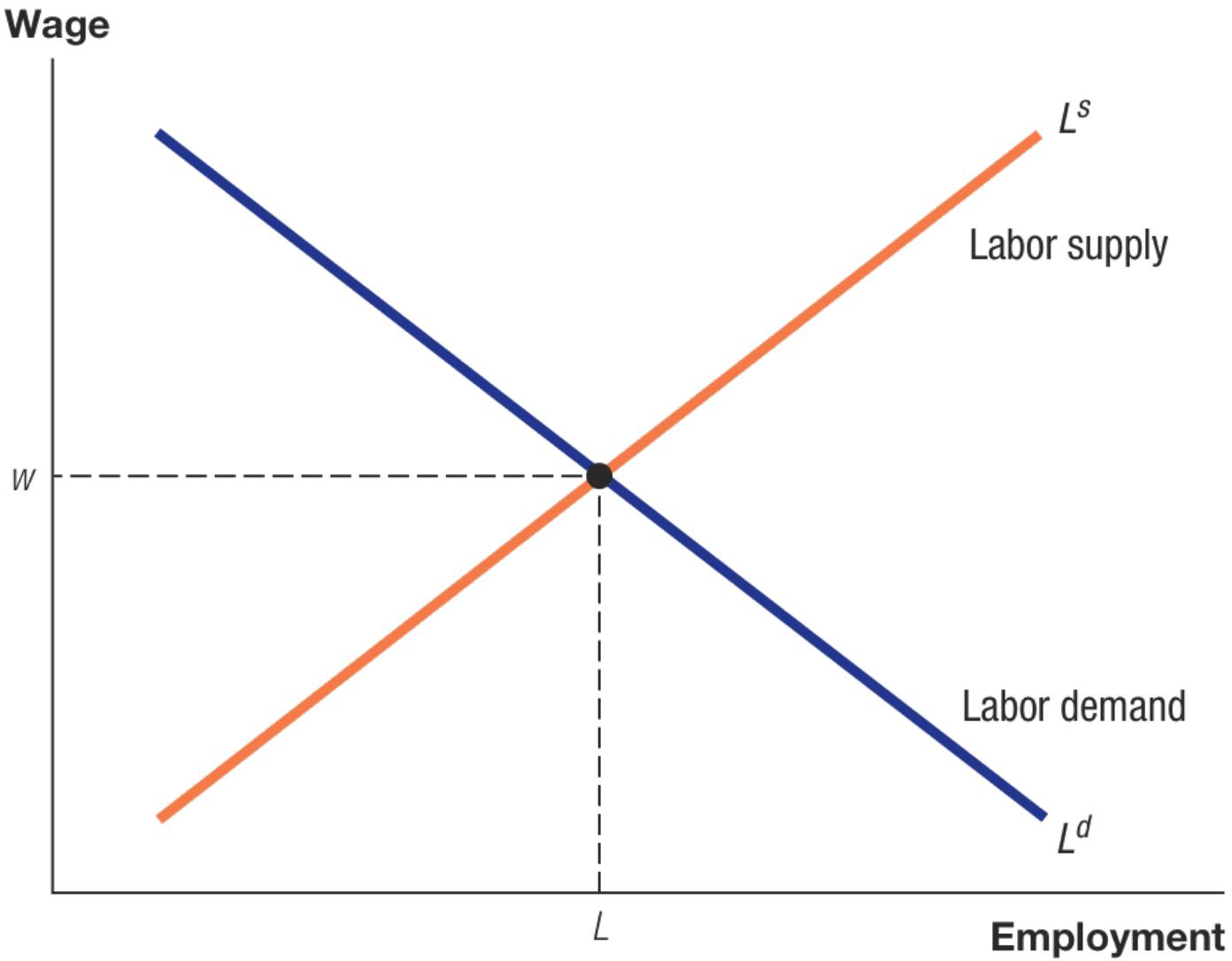
$$\max_{K,L} F(K,L) - (1+\tau)wL - rK$$

  - First-order condition $MPL = (1+\tau)w$.
  - Solve for labor demand function (with Cobb-Douglas)

$$L = \left(\frac{(1-\alpha)A}{(1+\tau)w}\right)^{\frac{1}{\alpha}} K$$

    - A decreasing function of wage
- Labor supply curve
  - Represents the willingness of people to work at different wages
    - An increasing function of wage on aggregate level
    - Compare this to the *individual labor supply curve* where the income effect can dominate the substitution effect.

Labor market equilibrium



Source: Jones – Macroeconomics

When does the labor demand curve shift?

- Movement along the labor demand curve
  - Represents the fact that in given economic conditions, firms want to hire different amounts of labor at different levels of prevailing market wages
- Shift of the labor demand curve
  - Represents a change in economic conditions that influences the decision of the firm how much labor to hire at a given wage.
    - Taxes imposed on the firm
    - Changes in hiring or firing costs
    - Changes in demand for the firm's product
    - Financial conditions – availability of credit used to finance production, investment and wages.
    - Changes in prices of other inputs (raw materials, energy,…)
  - What about our theoretical model? $L = \left(\frac{(1-\alpha)A}{(1+\tau)w}\right)^{\frac{1}{\alpha}} K$
    - Labor demand curve shifts up when productivity of labor increases (either a higher *A* or more capital *K*)

Shifts in labor demand – questions

- We deduced that labor demand shifts up when productivity increases.
  - Alternative view: Productivity growth makes jobs obsolete (less workers needed to produce the same output).
  - Consider the Cobb-Douglas production function and deduce the amount of labor needed given a fixed amount of output.
    - Decreasing function of productivity.
  - Which view is correct? Labor demand increases with productivity,
    - The reason is that demand for products is sufficiently elastic – it does not stay constant as productivity increases.
    - Productivity increases, marginal cost falls, price falls, demand for product increases, the amount of labor needed to produce output increases.
- Why don't hours per worker keep growing?
  - Wealth effects – as workers' wages increase, they become richer, and labor supply curve shifts up.
  - This offsets the upward shifts in the labor demand.
  - Wages grow over time, hours per worker stay unchanged.

When does the labor supply curve shift?

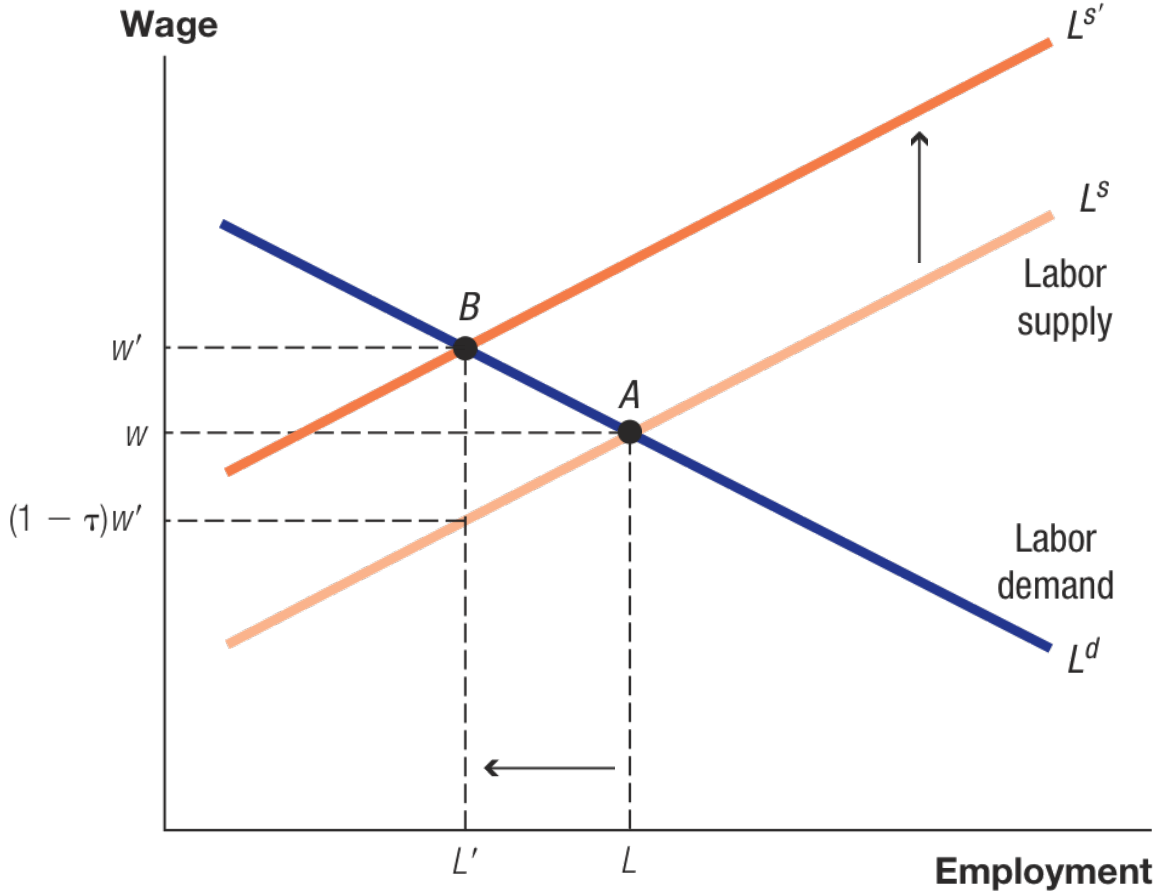
- Movement along the labor supply curve
  - Represents the fact that when wage increases
    - People want to work more, sacrificing more leisure (intensive margin)
    - More people join the labor force (extensive margin)
- Shift of the labor supply curve
  - Factors other than wage that determine the willingness of people to work.
    - Wealth – with more wealth (that is not generated by wages), people would want to work less
    - Unemployment benefits
    - Labor taxes imposed on the worker
    - More fun in leisure?

Labor market equilibrium and labor taxes

- A tax on labor income introduces a wedge between pre-tax and post-tax wage
  - Pre-tax wage w paid by the employer
    - Determines the equilibrium in the labor market
  - Post-tax wage $(1-\tau)w$ received by the worker
    - Determines the decision of the worker on how much to work
- Who should "pay" the tax? Employer or employee?
  - It does not matter!
  - Plot a graph where the labor tax is paid by employer
- Who "pays" the tax?
  - That depends on the elasticities (slopes) of labor demand and supply.
- What are the consequences of a labor income tax?
  - Inefficient allocation of labor $\Rightarrow$ welfare loss.
  - Welfare loss will be zero if labor supply or labor demand are perfectly inelastic (vertical). Why?

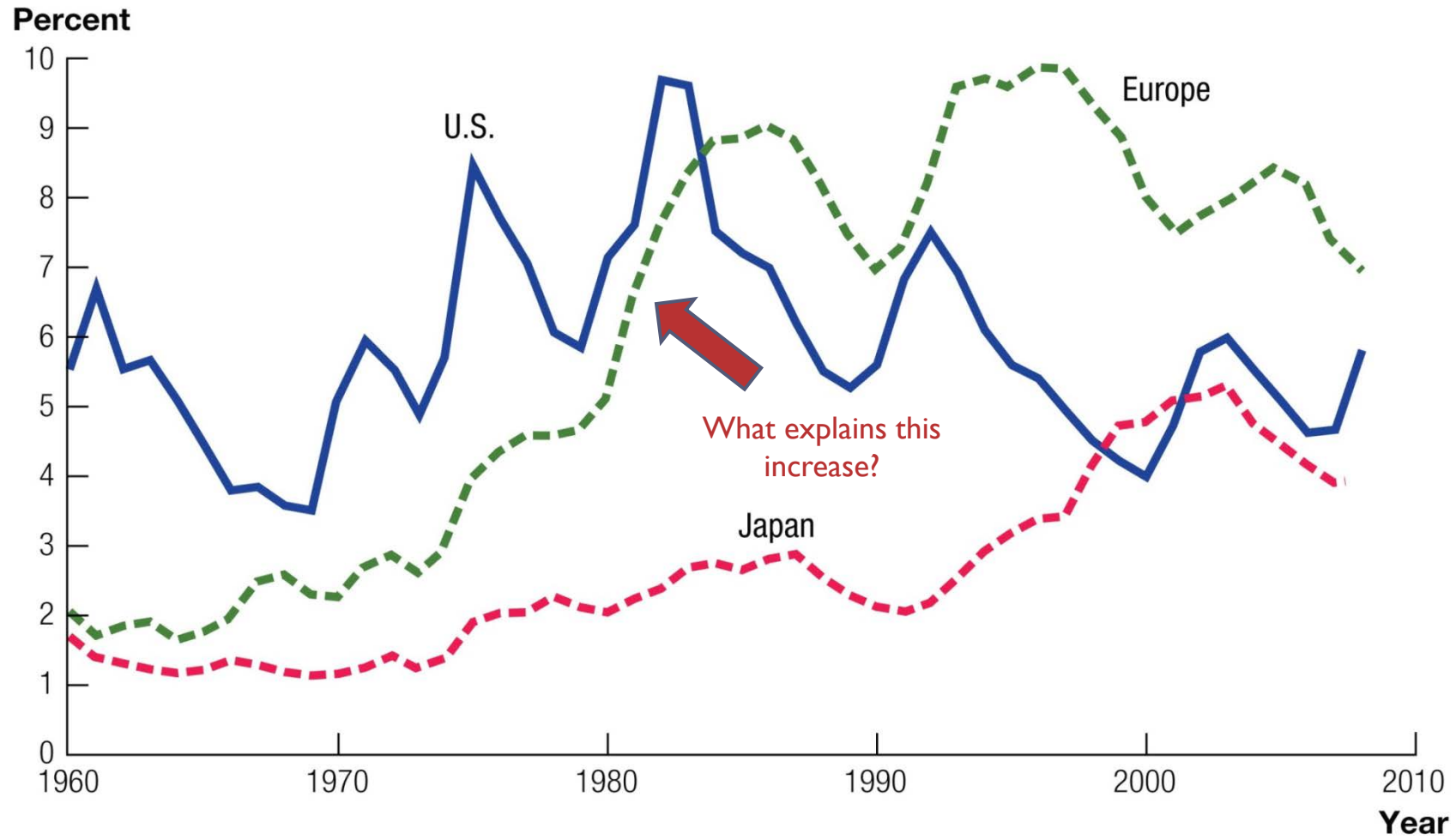
Labor market equilibrium and labor taxes

- An increase in the labor tax rate paid by the worker.
- Compare to a labor tax paid by the employer!



Source: Jones – Macroeconomics

Unemployment – international comparison

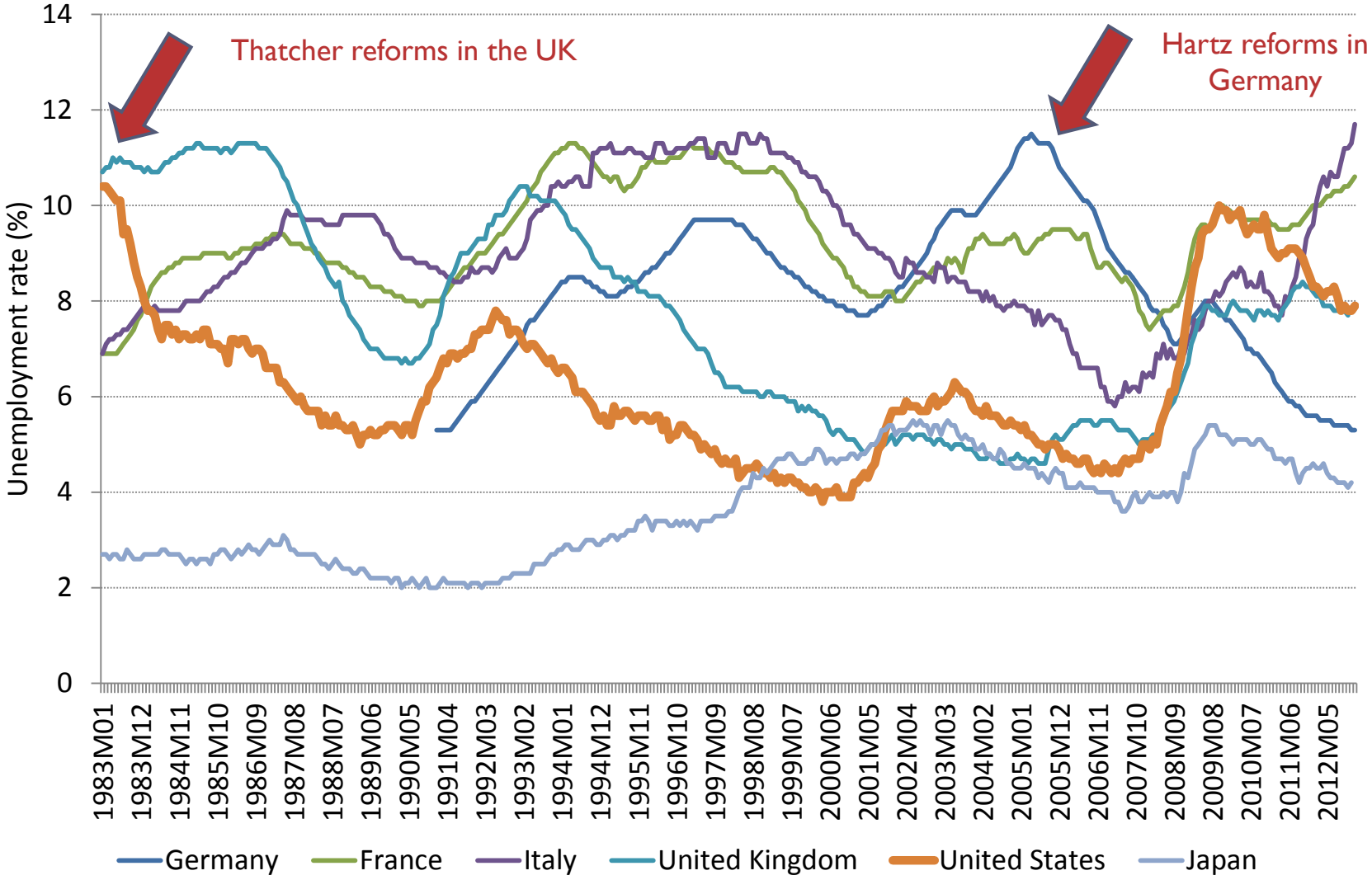


Source: Jones – Macroeconomics

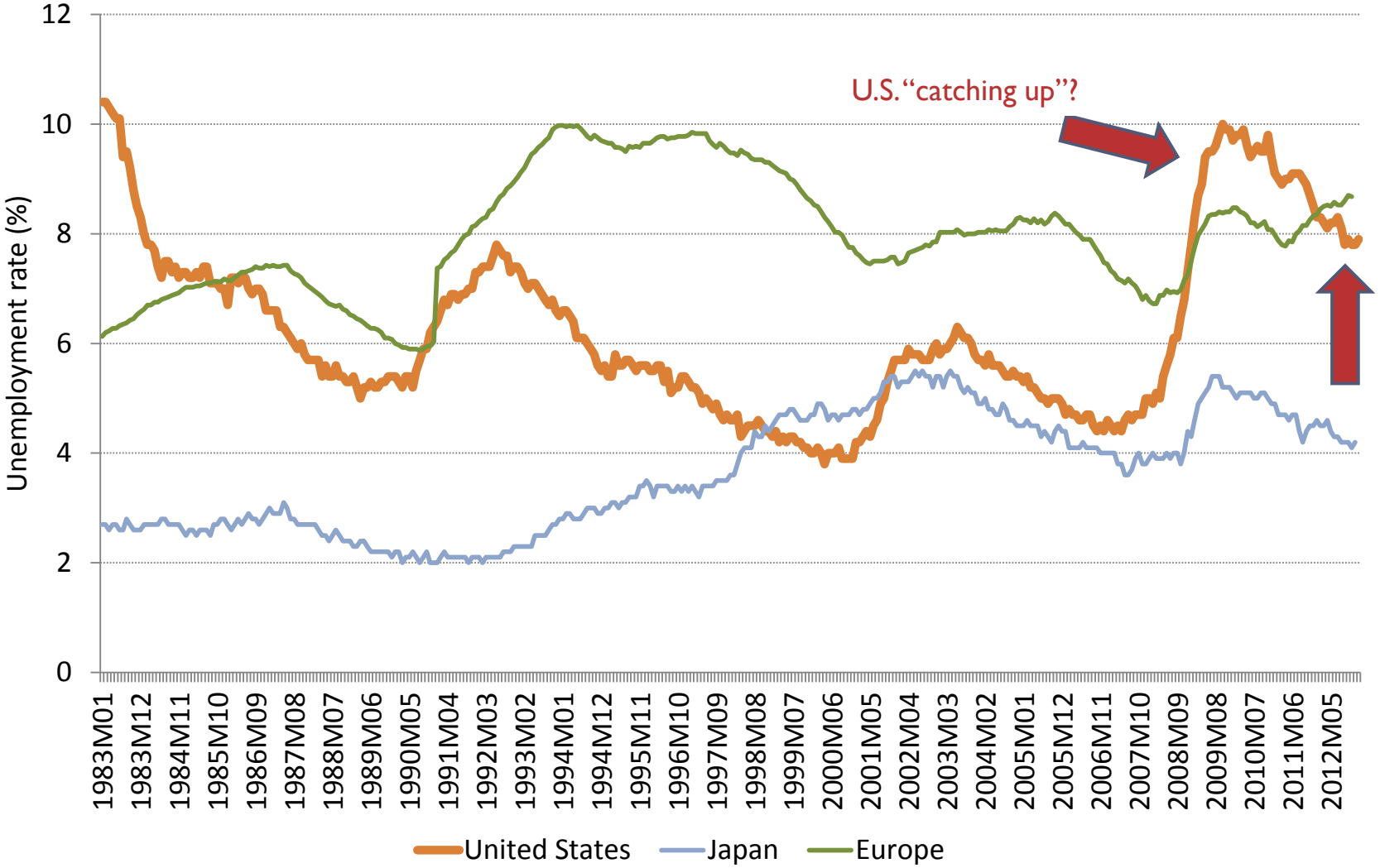
Unemployment – international comparison

- What lead to an increase in unemployment in Europe?
  - Adverse economic shocks in 1970s
    - But U.S. were hit as well, and unemployment decreased again.
  - Unemployment insurance and social safety net
    - U.S. – 20-30% of wages for about 6 months (longer during recessions)
    - Europe – up to 60% of wage for much longer periods (even 2-5 years) Removes part of uncertainty connected to loss of employment
    - Reduces incentives to work – adding up benefits and the value of leisure may make work look unattractive
    - But generous unemployment insurance was in place in Europe already before unemployment started increasing.
    - Other labor market contribute rigidities as well – unions, regulations prohibiting firing
  - Maybe a combination of both
    1. Adverse shocks increased unemployment
    2. Inefficient institutions prevented unemployment from falling

International comparison - disaggregated

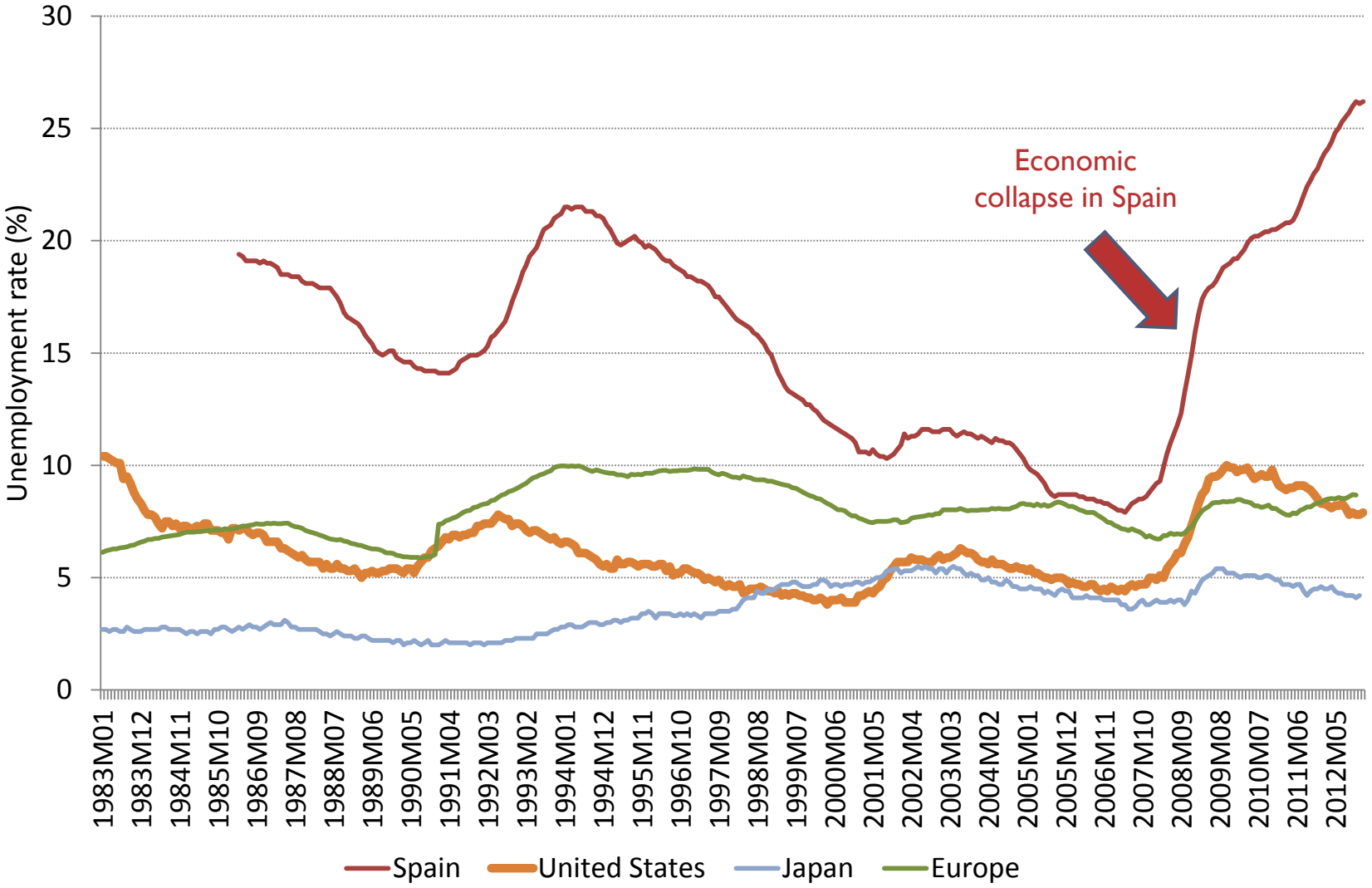


International comparison – recent data



Source: Eurostat (Europe = average of Germany, Italy, UK and France)

International comparison – with Spain



Source: Eurostat (Europe = average of Germany, Italy, UK and France)

GDP and hours worked

- Less hours worked per person is an important factor behind the lower GDP in Europe relative to the U.S.
  - Lower labor force participation, higher unemployment, less hours worked per worker
    - Is this voluntary (enjoying leisure) $\Rightarrow$ welfare improving …
    - Or due to inefficient institutions $\Rightarrow$ welfare decreasing?
- Hours worked per person aged 16-64 (U.S. = 100)

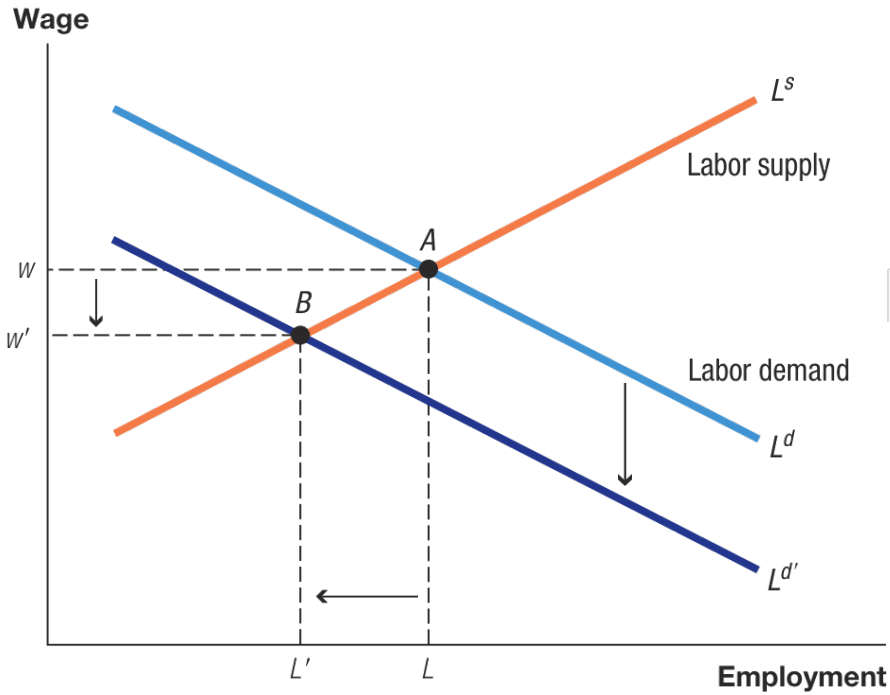
	1970-74	1993-96
Italy	82	64
France	105	68
Germany	105	75
Canada	94	88
United Kingdom	110	88
United States (=100)	100	100
Japan	127	104

Source: Jones – Macroeconomics; and Prescott (2004)

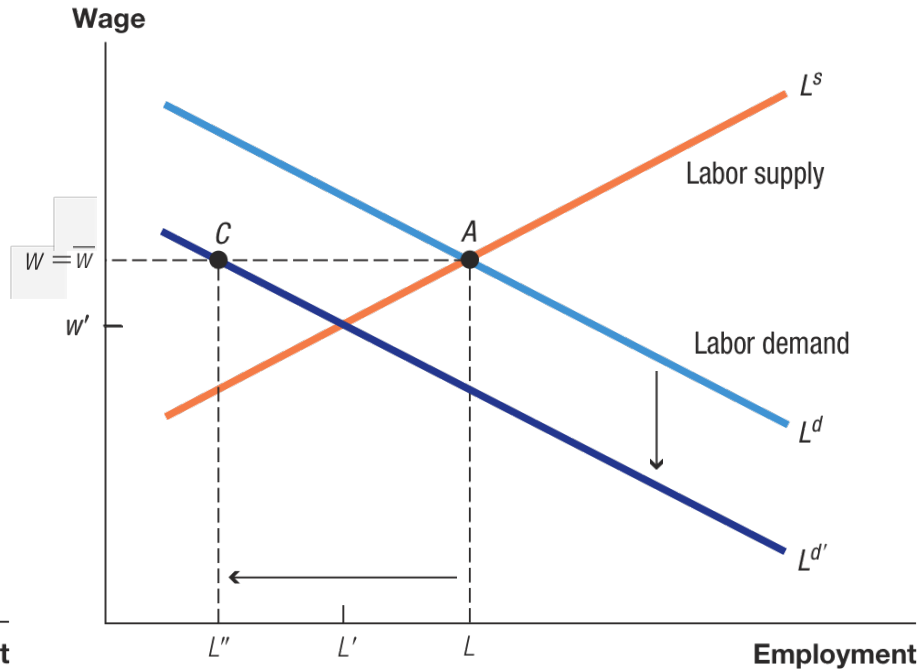
Flexible vs. rigid wages

- Our baseline model could not generate involuntary unemployment
  - Everybody who wanted to work at the market wage had a job
- We need another mechanism – rigid wages
  - Consider the impact of a negative labor demand shock

Flexible wages – wage decreases, no involuntary unemployment



Rigid wages – wage does not decrease, involuntary unemployment (Keynes)



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A bathtub model of unemployment

- Each person can be in one of two states – employment or unemployment
  - Employment and unemployment are like two bathtubs
  - Workers who lose and find jobs represent flows between bathtubs.
  - A steady state exists when outflows from each state are equalized.
- Two equations
  - Resource constraint: $E_t + U_t = \bar{L}$
  - Inflow into the unemployment pool: $\Delta U_{t+1} = \bar{s}E_t - \bar{f}U_t$
    - $\bar{s}$ - job separation rate
    - $\bar{f}$ - job finding rate
- Model solution – steady state: $0 = \bar{s}E_t - \bar{f}U_t$
  - Steady state unemployment rate: $u^* = \frac{U^*}{\bar{L}} = \frac{\bar{s}}{\bar{f}+\bar{s}}$
  - Unemployment will be lower when $\bar{s}$ is lower or $\bar{f}$ is higher
  - What does it imply for desirable labor market policies?

Efficiency wages (Henry Ford's plan)

- Our baseline model: ceteris paribus, firms would not pay a higher than market wage because this decreases profits.
- Efficiency wages: an increase in wage can actually be profit-increasing
  - Better paid worker can eat healthier and becomes more productive
    - This is more likely to work in developing countries.
  - Higher wage increases effort, reduces shirking
    - Maybe because losing the job would be a big loss for the worker.
  - Firm can attract a better pool of workers
    - This can only work for one firm – once all firms engage in it, this selection advantage disappears.

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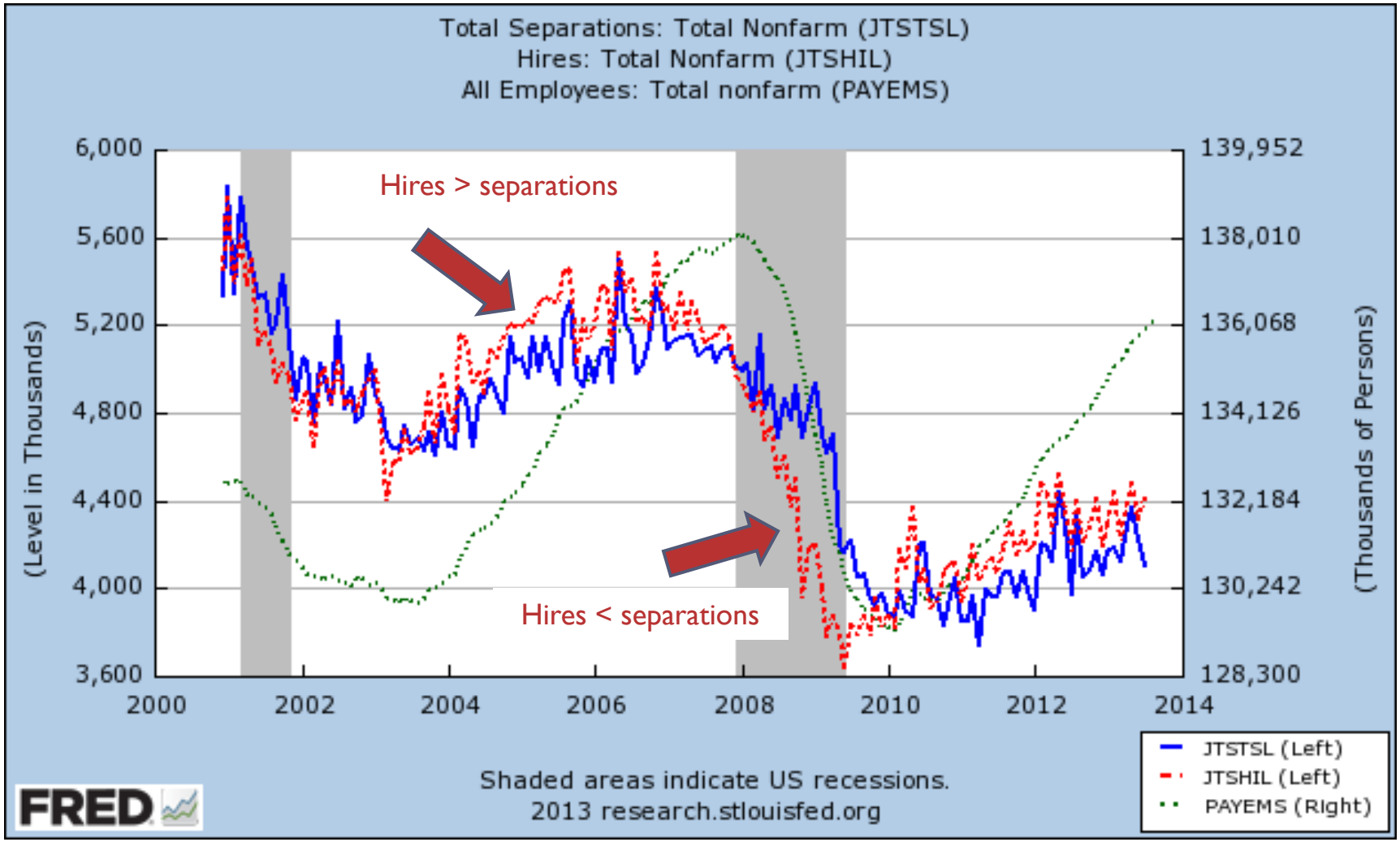
Labor market flows

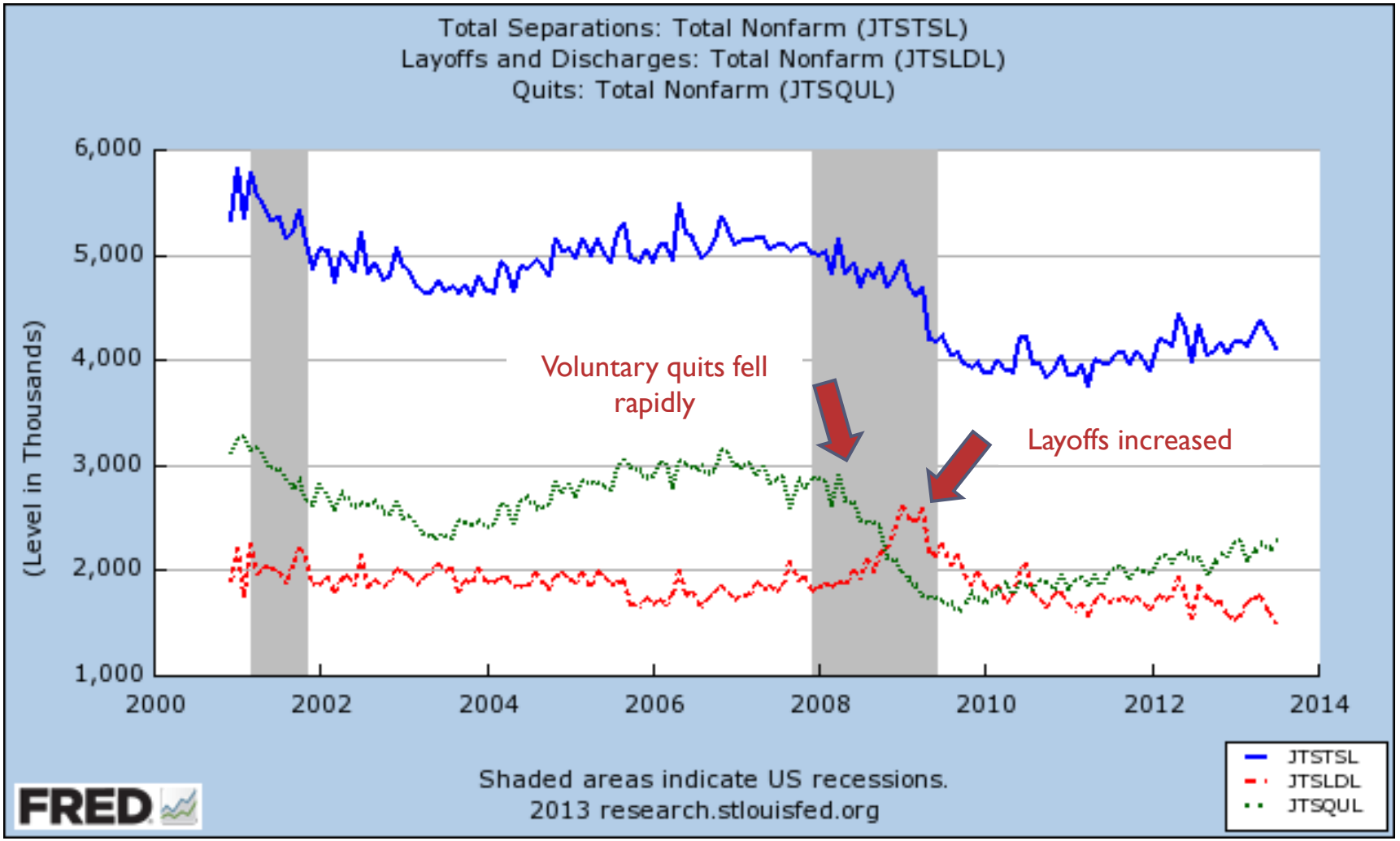
- U.S. labor market is very dynamic
  - Hiring and firing is relatively easy
  - Every month, 4-5 million workers lose or leave a job, and about the same amount of workers finds a job
  - About a third of the labor force switches jobs each year
- Change in employment = hires minus separations
  - Hires – number of newly hired people
  - Separations – number of people who leave or lose a job
    - Quits – voluntary from the side of the employee
    - Layoffs – involuntary from the side of the employee
    - Other separations (retirement, transfer, …)
- Davis and Haltiwanger (2002)
  - *Gross Job Creation, Gross Job Destruction and Employment Reallocation*

Worker flows and labor market turnover



Source: FRED

Why do separations fall during recessions?



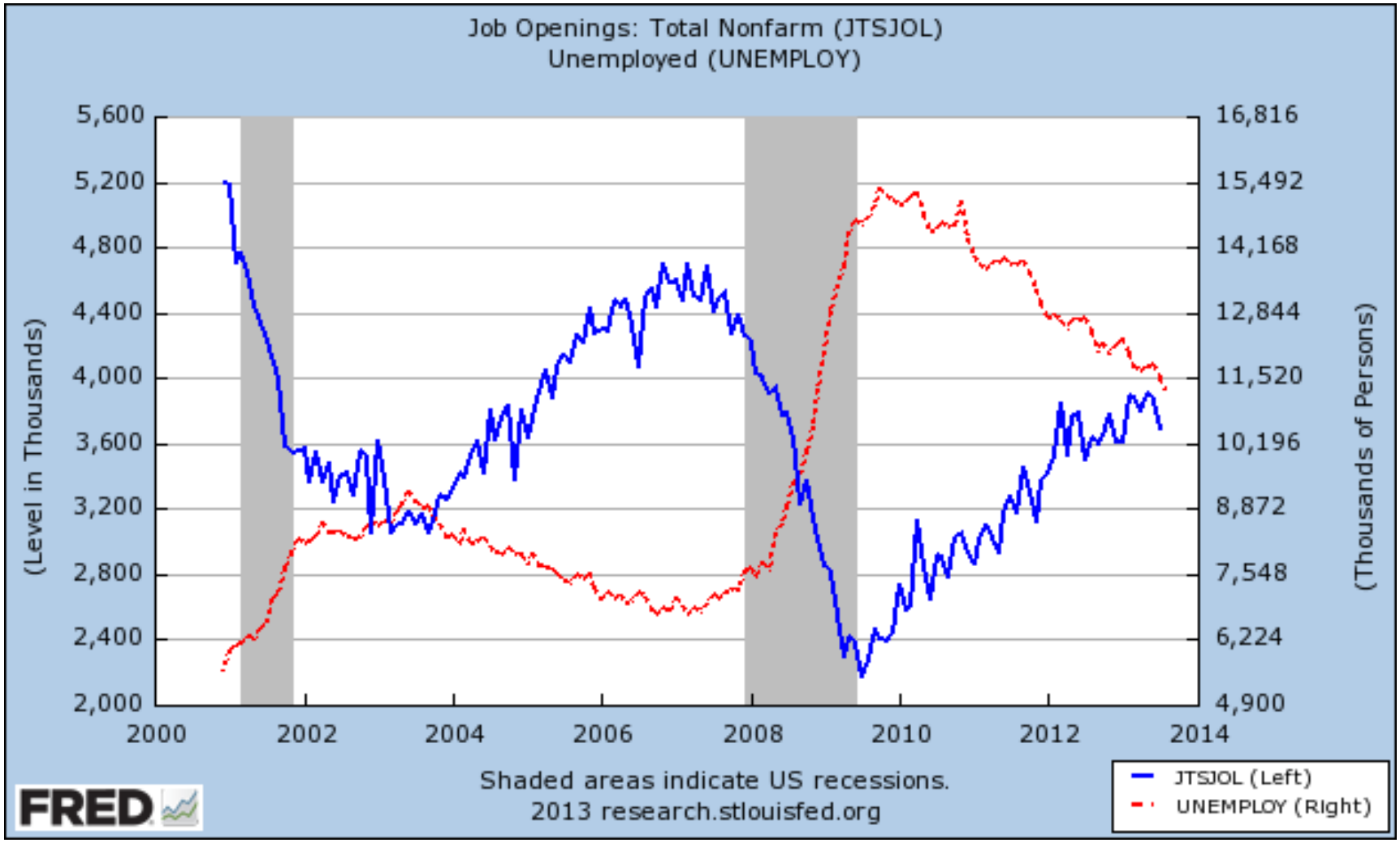
- Is the drop in voluntary separations a good thing?

Source: FRED

Search and matching models

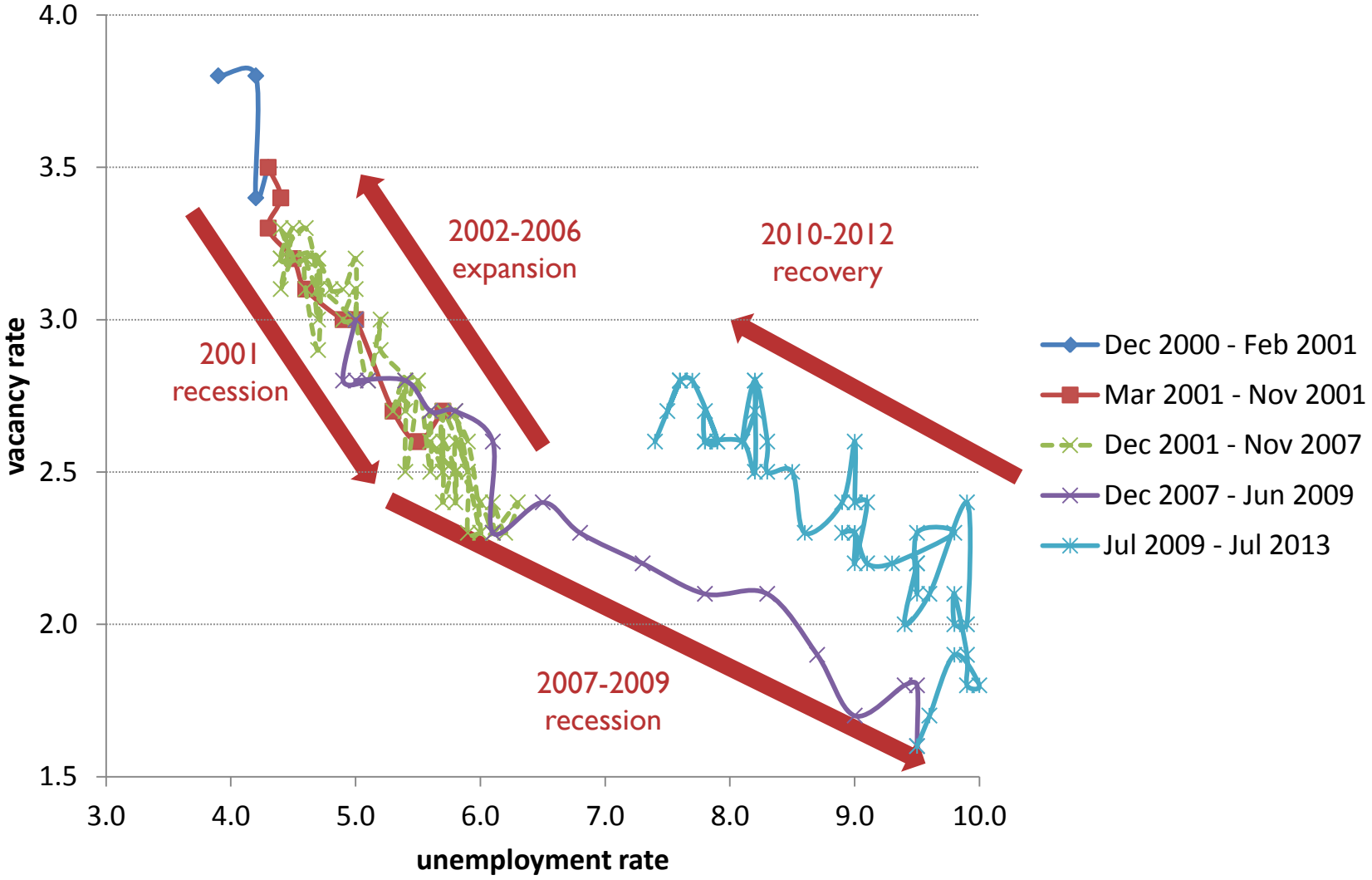
- Modern models of unemployment are based on the idea that searching for a job takes time (search friction)
  - Search and matching models of unemployment
  - Nobel Prize 2010: Diamond, Mortensen, Pissarides (reading!)
- Two critical variables
  - Number of job searchers – unemployed searching for a job
  - Number of vacancies – available job openings
- Economic bad times (recession)
  - Few vacancies, many job searchers competing for the few vacancies $\Rightarrow$ hard to find a job, long duration of unemployment
- Economic good times (expansion)
  - Many vacancies, few competing job searchers $\Rightarrow$ easy to find a job, short duration of unemployment
- Beveridge curve – the systematic relationship between the vacancy rate and the unemployment rate
  - Vacancy rate: # vacancies / employment
  - What do shifts in the Beveridge curve indicate? (see graph)

Job openings and unemployed



Source: FRED and JOLTS data

Beveridge curve



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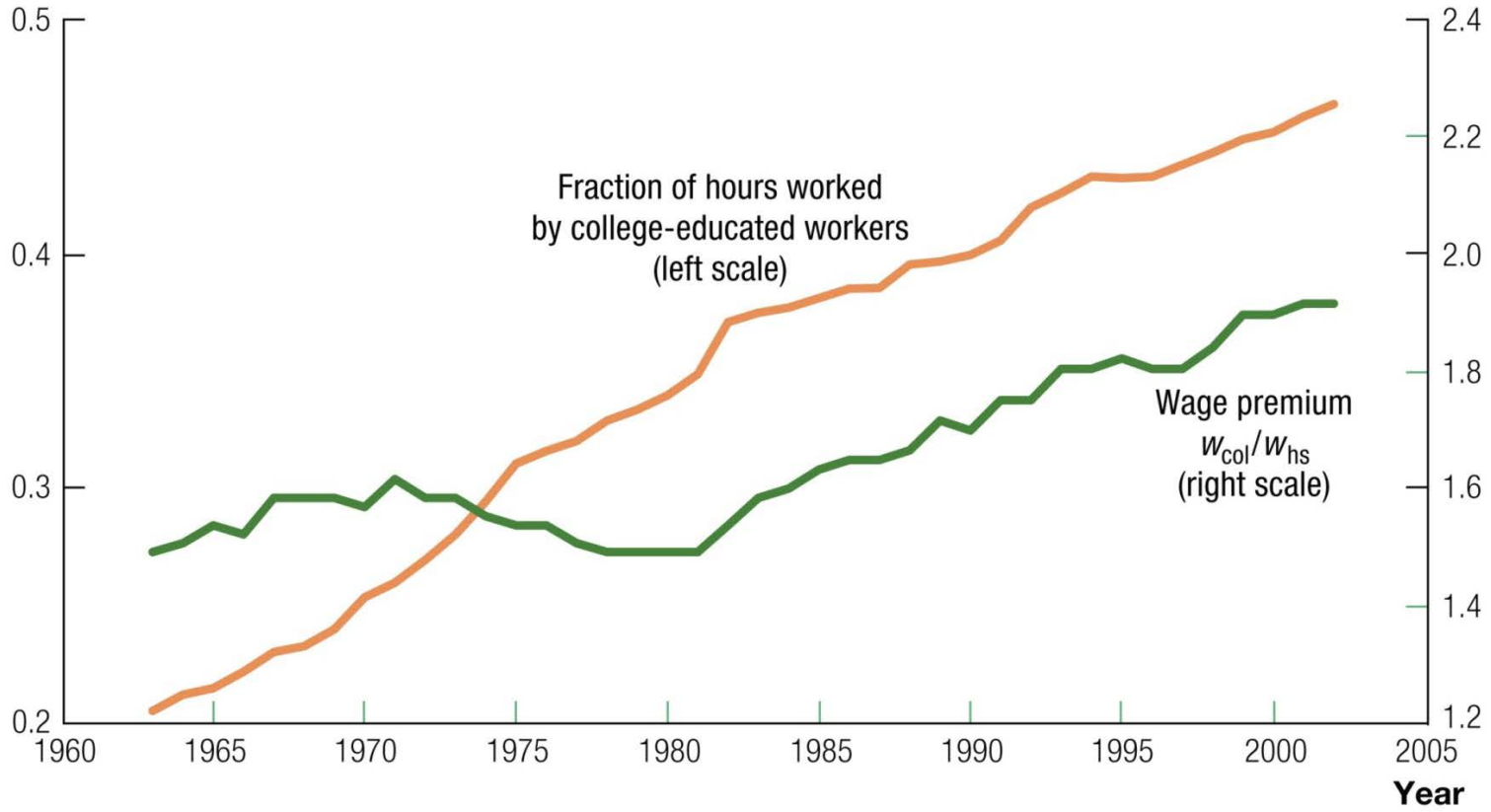
Human capital and returns to education

- Human capital accumulation is an important source of growth
  - Educated workers more productive $\Rightarrow$ reflected in higher wages.
  - Technological progress requires more skills to operate capital.
- Wage premium – the difference in wages between educated and uneducated workers (e.g., college vs. high school)
  - This wage premium makes education attractive – people are willing to sacrifice time and current income to study.
  - Also other benefits
    - Some attractive jobs (e.g., those which generate life satisfaction) cannot be attained without education (think about the teacher in front of you?)
    - Educated workers are more flexible in finding new jobs when fired.
    - Advantages in marriage market, impact on children,…
- Strong positive externalities of education
  - Education generates more social benefits than what the educated worker collects for himself.
  - An argument for subsidization of education.

Wage premium and skilled labor

- Share of college educated labor persistently increasing
- Wage premium for skilled labor increasing as well
  - One reason why students are willing to pay high tuitions

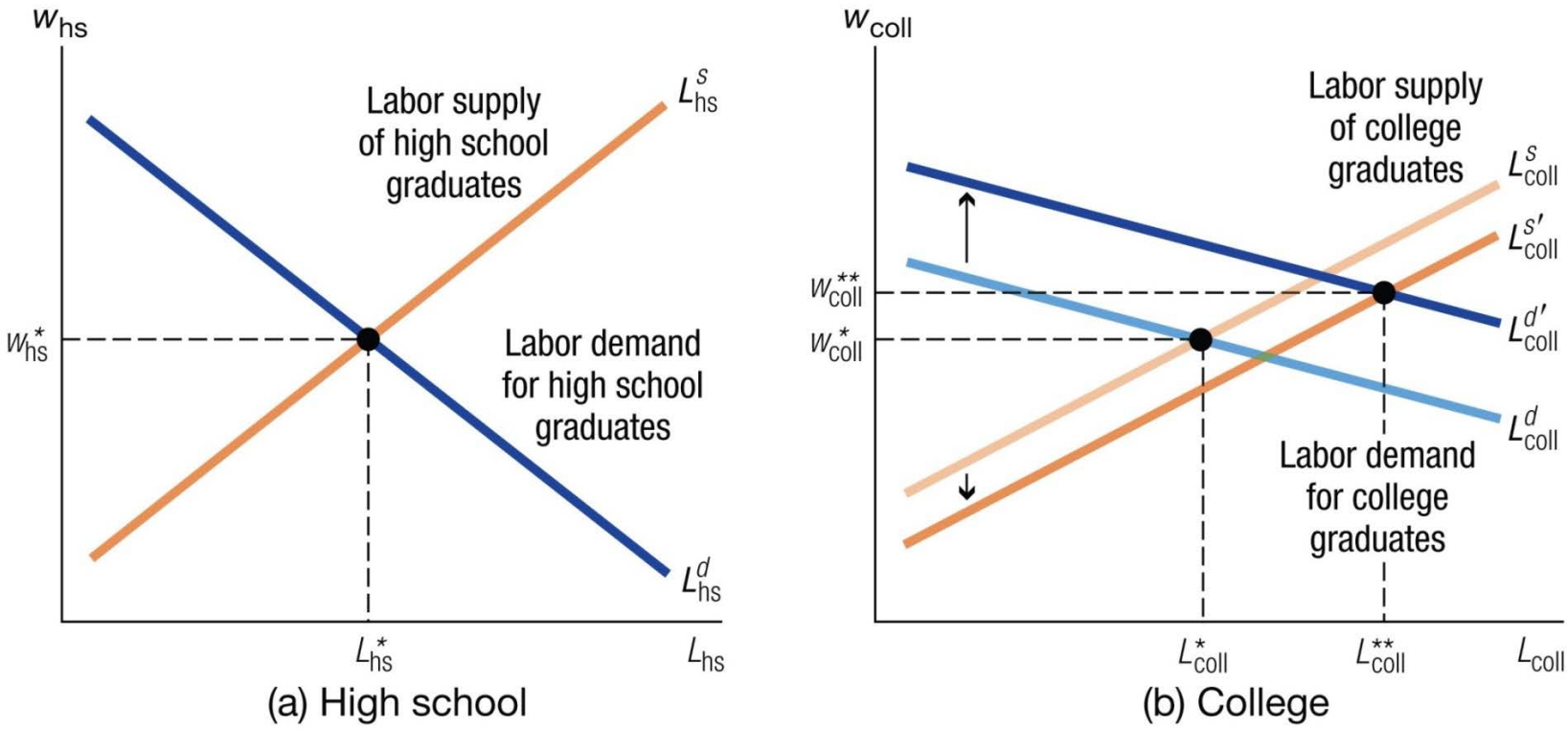


Source: Jones – Macroeconomics

Wage premium and skill-biased technical change

- The previous two facts seem to be inconsistent
  - More college educated workers should make skilled labor more abundant
  - This should push the wage premium down
- Explanation: Skill-biased technical change
  - Technological progress is such that it requires more and more skills
    - Shift from industry to services and high-tech sectors
  - The increase in skilled labor can be then partly caused by the skill-biased technical change
    - Technical change increases the wage premium.
    - This makes education more attractive $\Rightarrow$ more people study.
    - This pushes the wage premium down but not quite to the original level.
- Another factor: Globalization
  - In the world economy, skilled labor is scarcer than in the U.S.
  - In a connected world, highly educated people can provide their services globally.

Wage premium and skill-biased technical change



Source: Jones – Macroeconomics

Valuation of human capital

- How much education should you obtain?
  - That depends on the cost of education and the future gains from the wage premium.
  - Cost of education is a once off cost paid now.
    - Tuition, forgone income.
  - Wage premium benefits are a flow over the whole lifetime.
- Need to compute the present discounted value of the wage premium flow.
  - Geometric sum formula (see math handout and textbook).
- Will be covered in recitations and practice problems.

Wage premium – an important caveat

Median personal income by educational attainment (in USD)					
Some high school	High school graduate	Bachelor's degree	Master's degree	Doctorate degree	Professional degree
20,321	26,505	43,143	52,390	69,432	82,473

- We observe very large differences in incomes by educational attainment
- Does this mean that these differences are all due to schooling?
- No! There are substantial self-selection effects.
  - Students who decide to college have better skills than those who just finish high school – already in the moment when they enroll to college.
  - These students would typically have higher wages than the average high-school graduate, even without going to college.
  - Separating the differences that are due to self-selection from the true value added provided by college is a nontrivial task.
    - Extreme example: College does not really teach you anything useful for the job. It is just a way how you can credibly signal to the employer that you are able to learn anything he may require from you when he employs you.
  - Still, most studies show that there are substantial returns to schooling, even when we take into account the self-selection effects.

Source: U.S. Census, 2005 income statistics

Outline

1. Labor market evidence from the U.S.
   - Measuring unemployment
   - Business cycles vs. long term trends
2. Walrasian model of the labor market
   - Labor supply and labor demand
   - Labor taxes and a cross-country comparison
3. A bathtub model of unemployment
4. Search and matching theory of the labor market
   - Labor market flows, unemployed and job vacancies
   - Beveridge curve
5. Human capital and the wage premium
   - Human capital valuation
6. Trends in wage inequality
   - Inequality, redistribution and distortionary taxation

Inequality – positive and normative perspective

- Inequality has become an increasingly important issue
- Positive economics
  - Describes economic phenomena (allocations) as they are
  - Market allocations – if markets are efficient, allocations are Pareto optimal
    - To make somebody better off, you must make somebody else worse off (e.g, through taxation)
    - This has nothing to do with fairness or equity – allocations can be very uneven
    - There are many such allocations – Pareto optimality criterion cannot compare them
- Normative economics
  - Value judgments about what the allocations should be
    - Inequality and poverty can be viewed as unfair
    - Policy recommendations on how to mitigate inequality – even at the cost of making somebody worse off
  - Positive economics can still address the issue on how to achieve a desired allocation in the best possible way

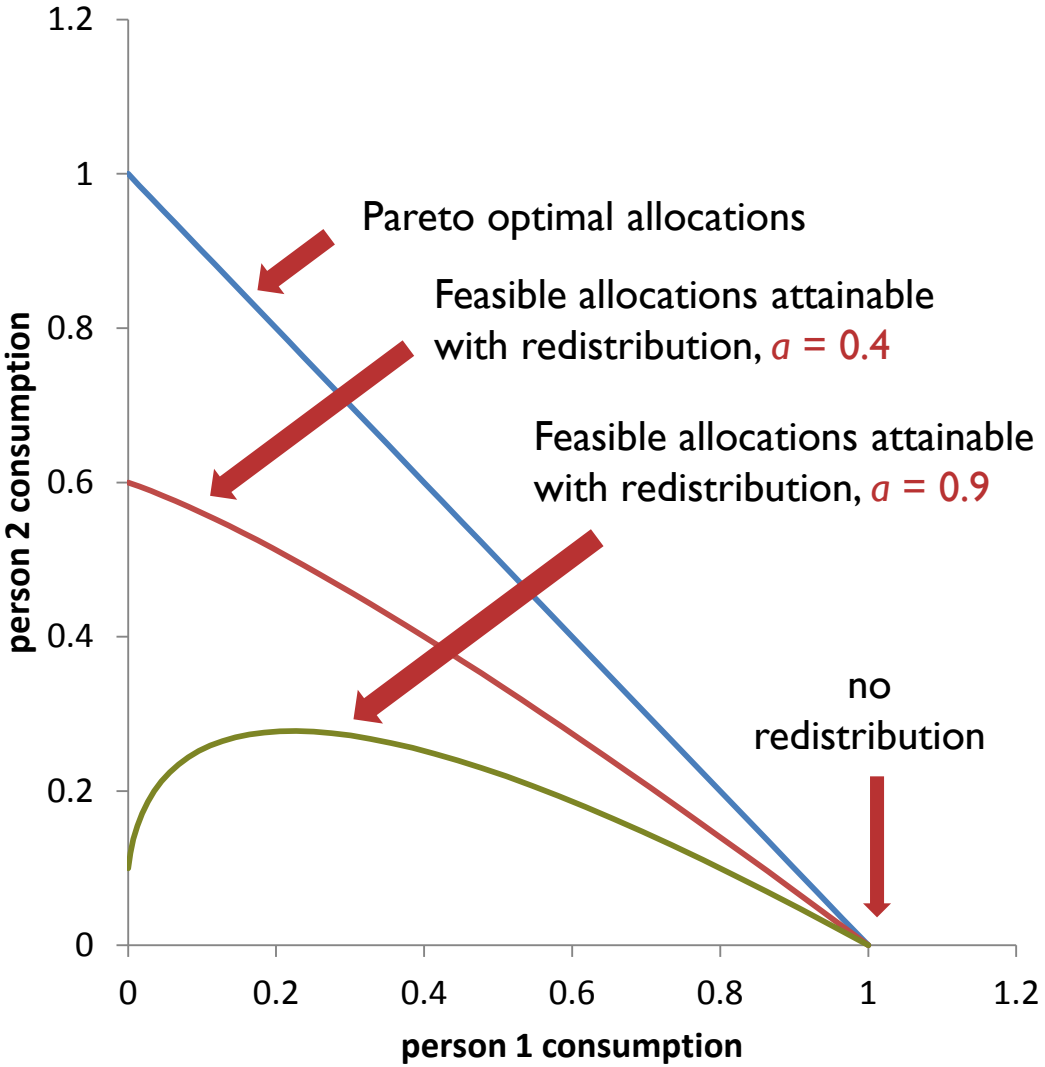
Inequality and redistribution

- Problem: redistribution typically distorts people's behavior, which leads to inefficiency
- Example: economy with two people
  - Person 1 can work to produce up to one unit of good. Person 2 does not (cannot) work = market allocation.
  - Pareto optimal allocations: Any distribution of output between the two people that sums up to the one unit produced.
  - The government may view the market allocation as unfair $\Rightarrow$ desire to redistribute $\Rightarrow$ typically using taxation (tax rate τ).
  - But taxation leads to less effort by person 1. Output produced

$$Y(\tau) = 1 - a\tau \qquad 0 \leq a \leq 1$$

  - Person 1 receives $(1-\tau)Y(\tau)$, person 2 receives $\tau Y(\tau)$
  - Which allocations can the government achieve? (depends on a)

Pareto optimal allocations and redistribution

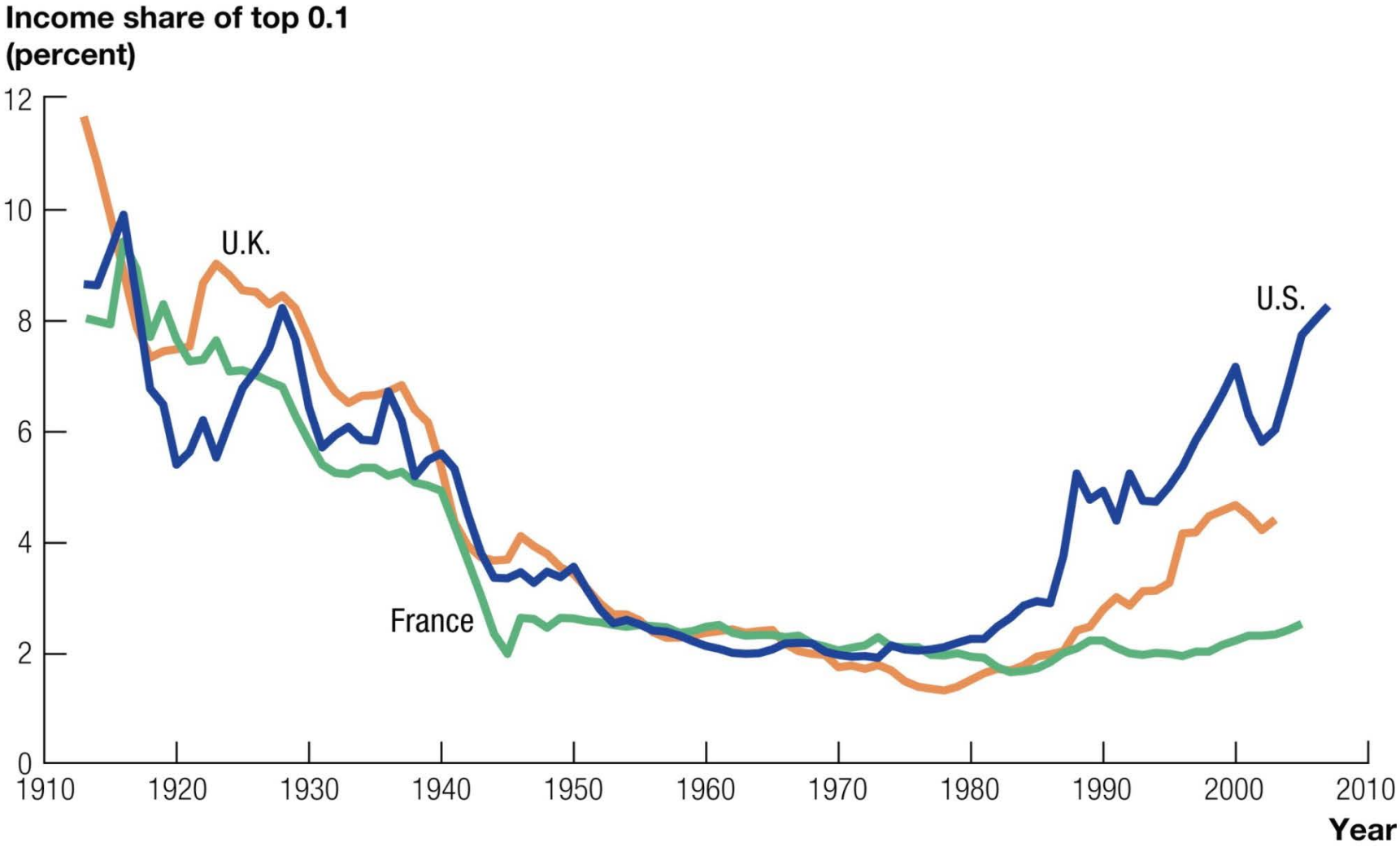


- Distortionary taxation cannot achieve Pareto optimal allocations
- Higher tax rate $\Rightarrow$ move further away from Pareto frontier
- For $a = 0.4$, can we say which feasible allocations are better than other?
- For $a = 0.9$, can we say which feasible allocations are better than other?

Inequality – wealth, income, consumption

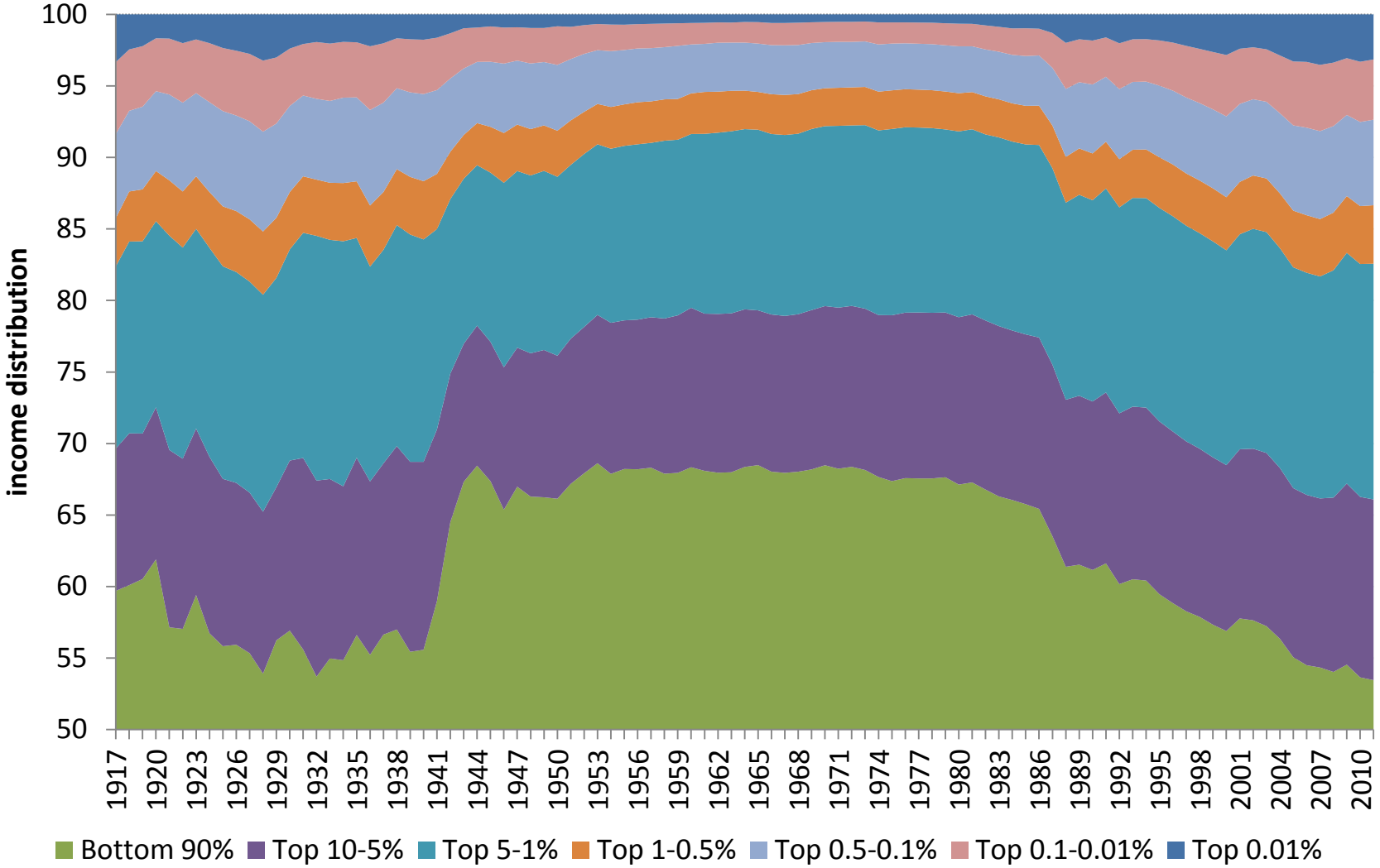
- There are different measures of inequality, for instance:
  1. Wealth: This measure shows tremendous disparities
     - Some disparities are natural: Accumulation of wealth over the life cycle, differences in consumption/saving rates across people.
     - Should we incorporate the value of human capital as well?
  2. Income: Much less unequal than wealth, but inequality rising
     - Early 20th century – main source of income of the very rich was capital income.
     - Nowadays – substantial portion generated by wage and business income (CEOs, fund managers, pop and sports stars, …).
  3. Consumption: This is the inequality that we ultimately care about but it is difficult to measure.

Inequality – U.S., UK, France



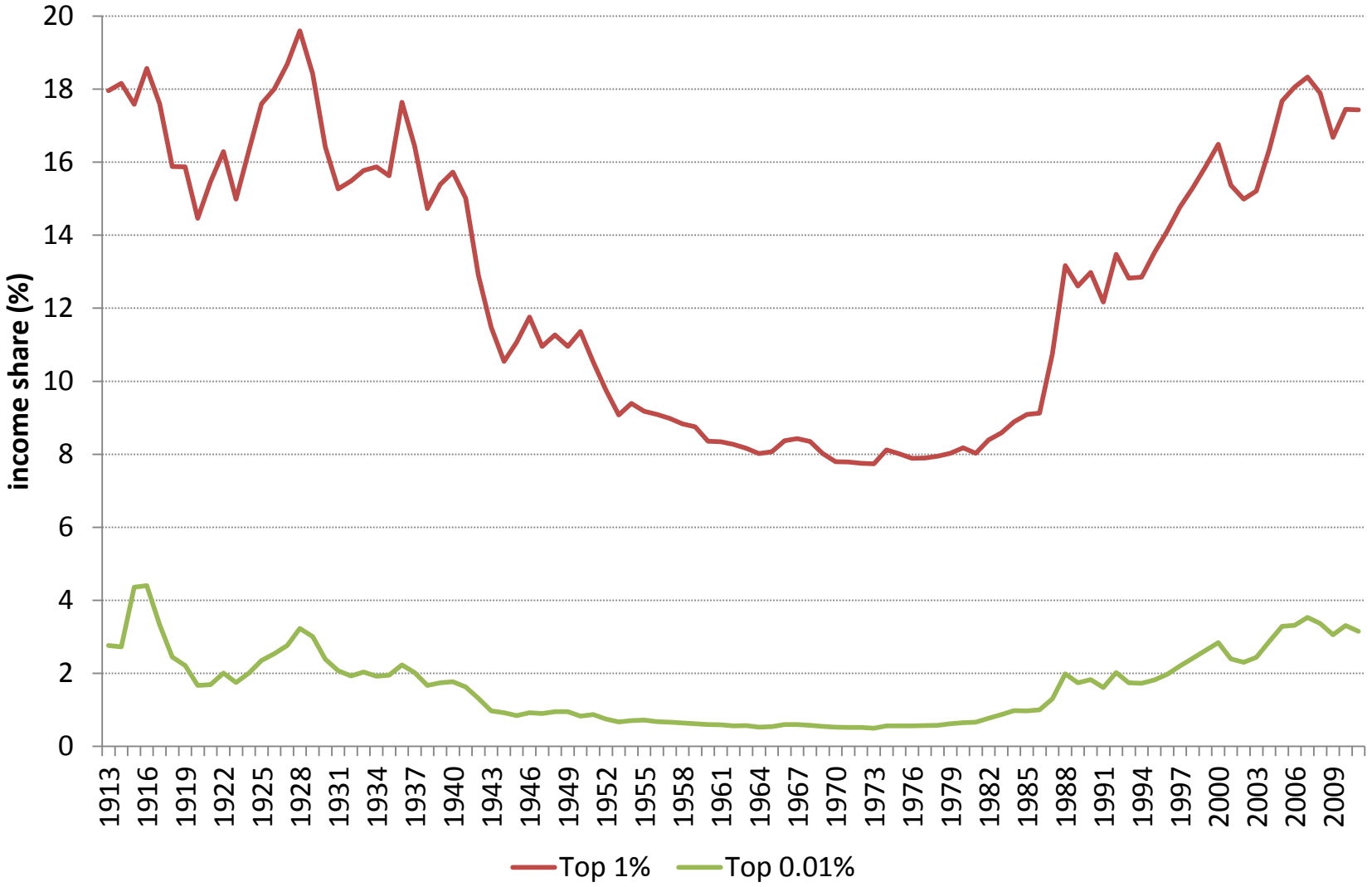
Source: Jones – Macroeconomics; Piketty and Saez data

Income distribution in the U.S. (excl. capital gains)



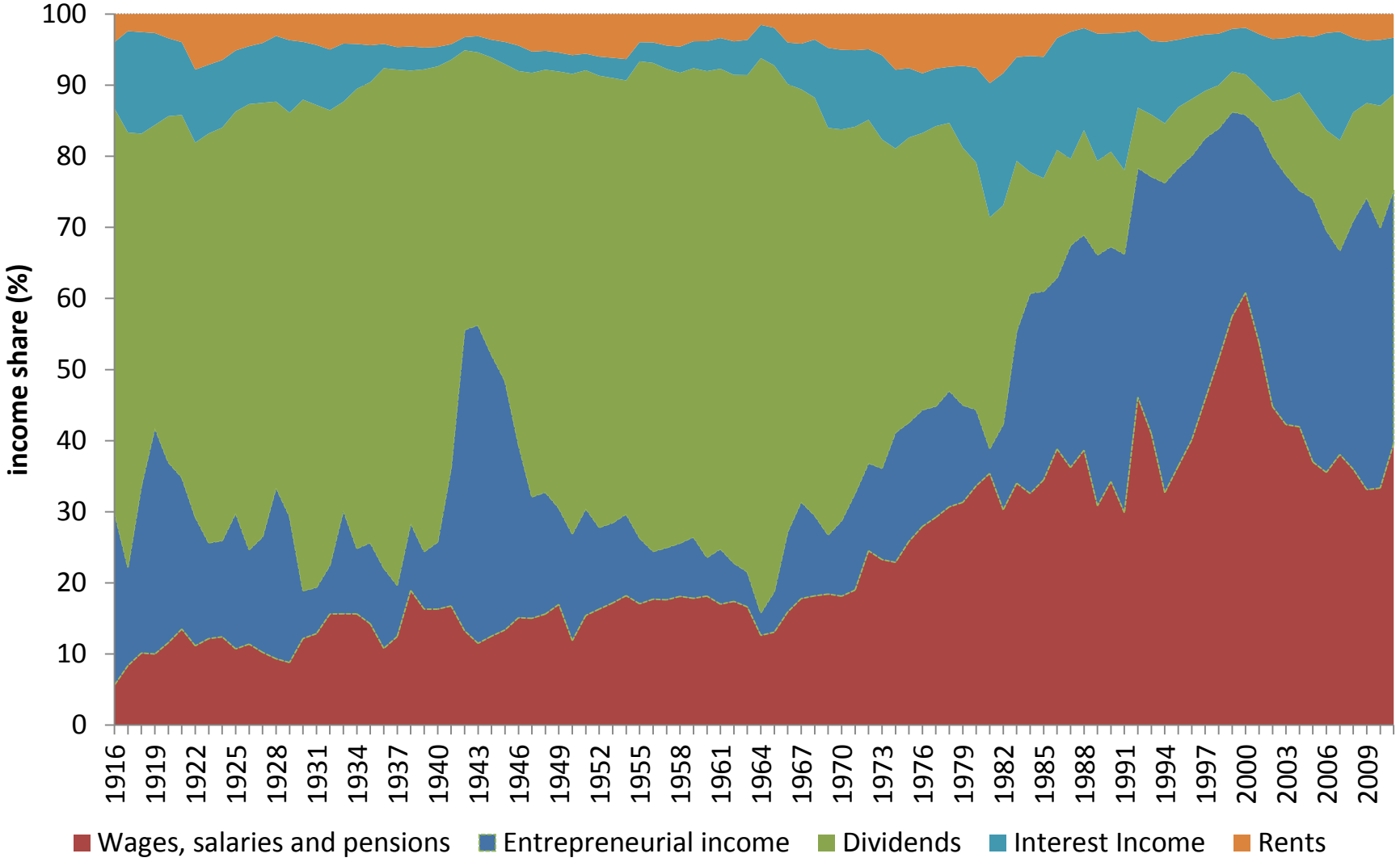
Source: Piketty and Saez data (http://topincomes.g-mond.parisschoolofeconomics.eu)

Income share of the top 1%, 0.01%



Source: Piketty and Saez data (http://topincomes.g-mond.parisschoolofeconomics.eu)

Composition of top 0.01% incomes



Source: Piketty and Saez data (http://topincomes.g-mond.parisschoolofeconomics.eu)

Inequality in the U.S. – summary

- Substantial reduction in inequality in 1940s
- Inequality started growing again in 1980s
  - Concentration of incomes mainly in the top 1%, little happened below the 5% quantile.
- Composition top incomes shifted from capital income (dividends, interest income, rents) to wage and entrepreneurial income
  - CEO compensation, incomes of fund managers
  - Globalization and technology increase wage premia
  - In some professions (e.g., fund managers) it is difficult to distinguish capital income from wage income (manipulation for tax purposes)
- Inequality did not increase much in Japan or France, did in UK
- Go check the world income database yourself!
  - http://topincomes.g-mond.parisschoolofeconomics.eu

Review questions

- What are the stylized facts in the U.S. (and in other countries, as discussed) for
  - Unemployment and employment
  - Job market flows
  - Inequality
- What is a Walrasian model of the labor market?
- Why did we construct the bathtub model of unemployment?
- Why can't the Walrasian model with flexible wages explain involuntary unemployment? What is a remedy we used?
- What is the race between technology and education and why is it important?
- What are Pareto optimal allocations? Can the government implement them using distortionary taxation?
- What is the distinction between positive and normative economics?
- How can we compute the value of human capital?
- How are globalization and skill-biased technical change linked to the increase of the wage premium?