Econ 110A: Lecture 13

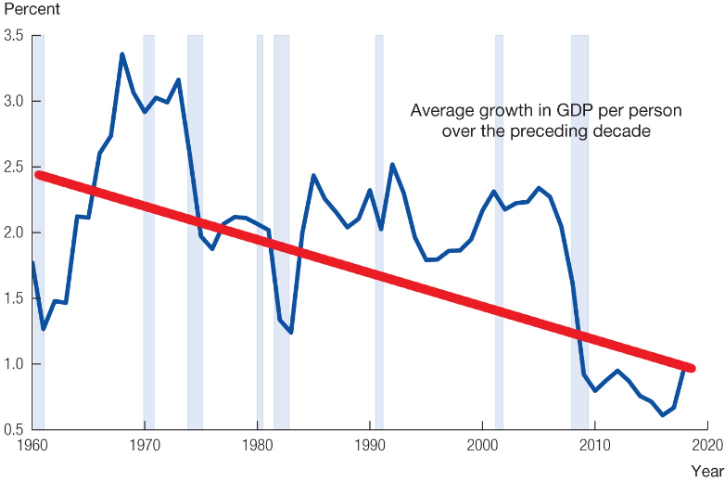
Carlos Góes[1]

[1]UC San Diego

UCSD

Growth Accounting

Growth Accounting



Source: FRED and author's calculations.

Growth Accounting

$$g_{Y,t} - g_{L,t} = g_{A,t} + \frac{1}{3}(g_{K,t} - g_{L,t}) + \frac{2}{3}(g_{Ly,t} - g_{L,t})$$

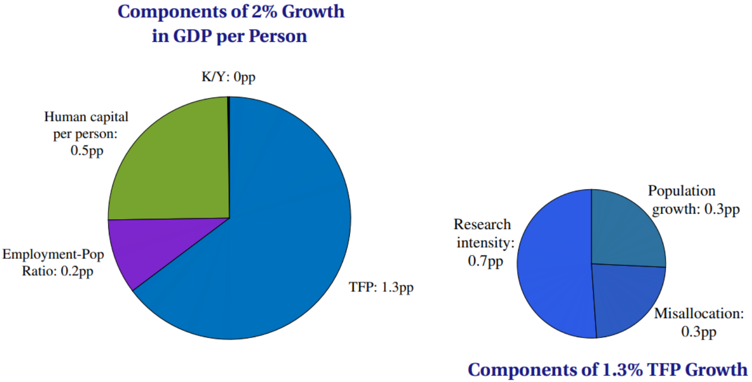
TABLE 6.2					
Growth Accounting for the United States					
	1948–2017	1948–1973	1973–1995	1995–2003	2003–2017
Output per hour, *Y/L*	2.3	3.3	1.5	3.2	1.4
Contribution of *K/L*	0.9	1.0	0.8	1.4	0.5
Contribution of labor composition	0.2	0.2	0.2	0.3	0.2
Contribution of TFP, *A*	1.2	2.1	0.5	1.5	0.7

The table shows the average annual growth rate (in percent) for different variables.

Source: Bureau of Labor Statistics, *Multifactor Productivity Trends*

Growth Accounting

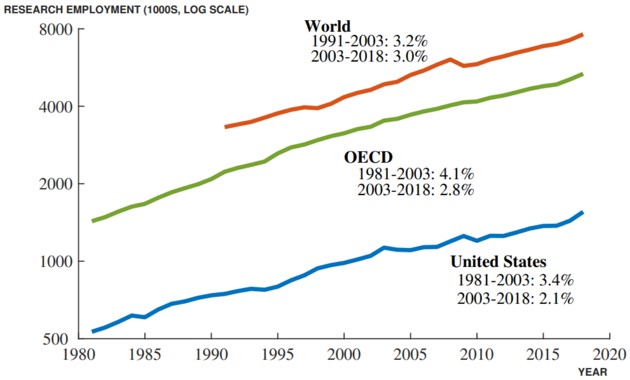
Figure 2: Historical Growth Accounting



Note: The figure shows a growth accounting exercise for the United States since the 1950s using equations (15) and (16). See the main text for details.

Growth Accounting

Figure 3: Research Employment in the U.S., OECD, and World



Note: "World" is the OECD plus China and Russia. Average annual growth rates of research employment are reported for each region for the first and second parts of the time frame. The data for Russia start in 1994, so we assume the values for 1991 to 1993 are equal to the 1994 value (research employment in Russia was declining in the 1990s). Source: OECD Main Science and Technology Indicators (2021).

Growth Accounting

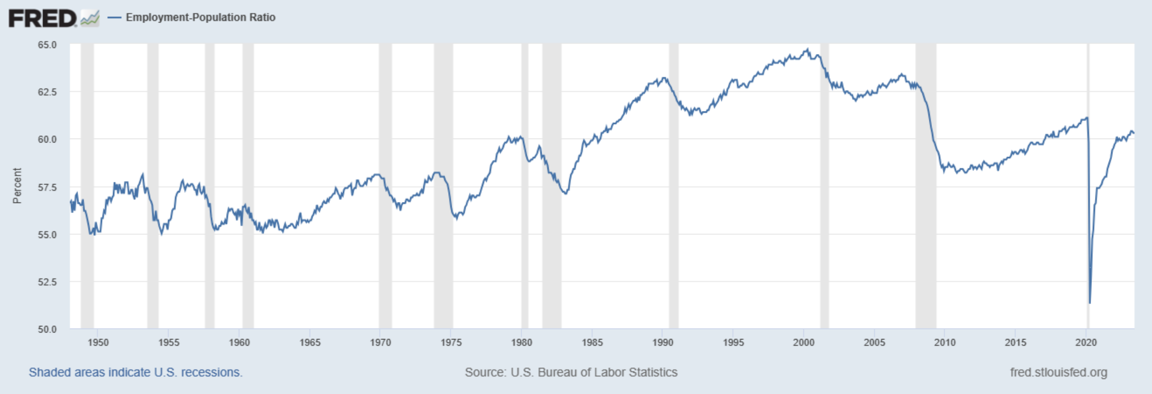
The Past and Future of Economic Growth: A Semi-Endogenous Perspective
Charles I. Jones
NBER Working Paper No. 29126
August 2021
JEL No. E0,O4

ABSTRACT

The nonrivalry of ideas gives rise to increasing returns, a fact celebrated in Paul Romer's recent Nobel Prize. An implication is that the long-run rate of economic growth is the product of the degree of increasing returns and the growth rate of research effort; this is the essence of semi-endogenous growth theory. This paper interprets past and future growth from a semi-endogenous perspective. For 50+ years, U.S. growth has substantially exceeded its long-run rate because of rising educational attainment, declining misallocation, and rising (global) research intensity, implying that frontier growth could slow markedly in the future. Other forces push in the opposite direction. First is the prospect of "finding new Einsteins": how many talented researchers have we missed historically because of the underdevelopment of China and India and because of barriers that discouraged women inventors? Second is the longer-term prospect that artificial intelligence could augment or even replace people as researchers. Throughout, the paper highlights many opportunities for further research.

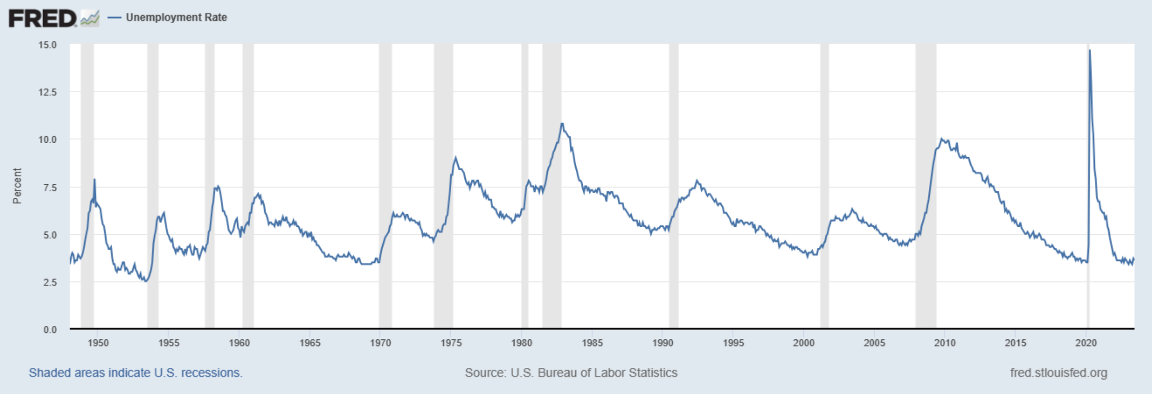
Facts of about the Labor Market

Employment-to-Population Ratio (Labor Force/Population, over 16yo)



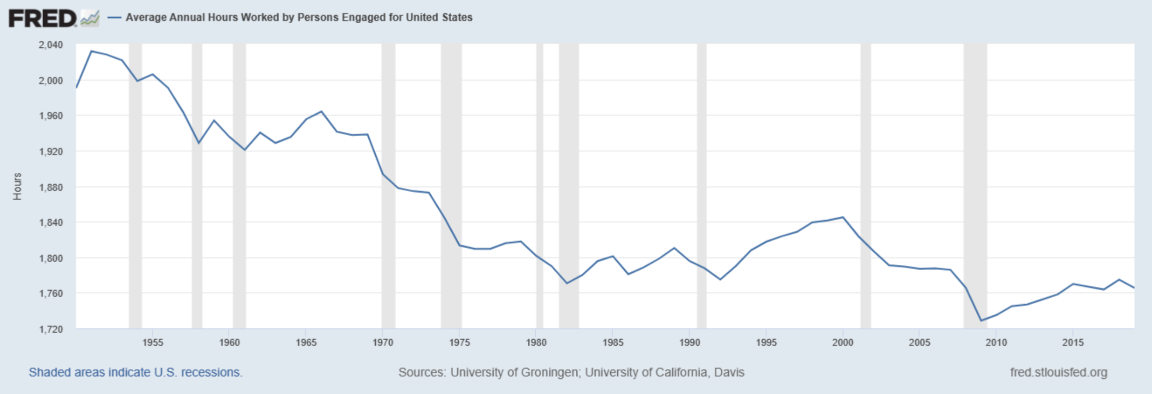
https://fred.stlouisfed.org/series/EMRATIO#

Unemployment Rate (Unemployment/Labor Force)



https://fred.stlouisfed.org/series/UNRATE

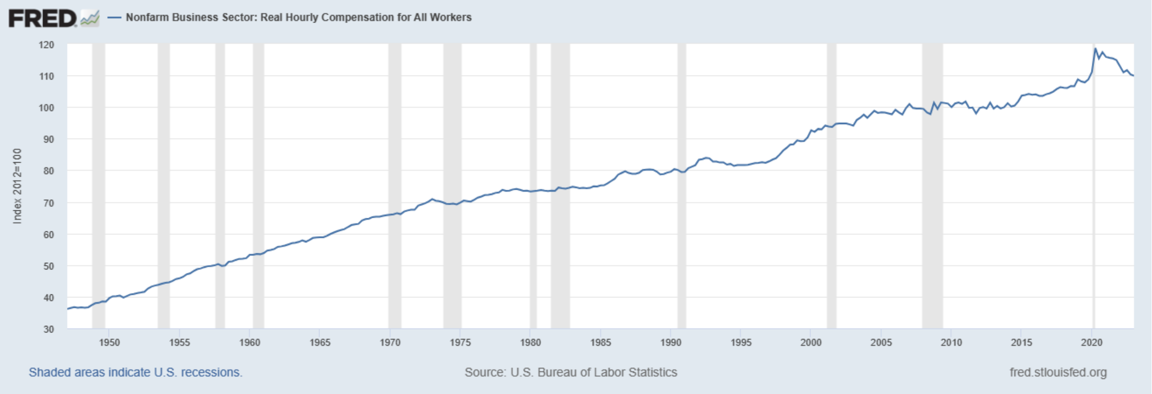
Average Hours Worked



`https://fred.stlouisfed.org/series/AVHWPEUSA065NRUG#`

Real Compensation per Hour

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



https://fred.stlouisfed.org/series/COMPRNFB#

A stylized model of the Labor Market

Labor Demand

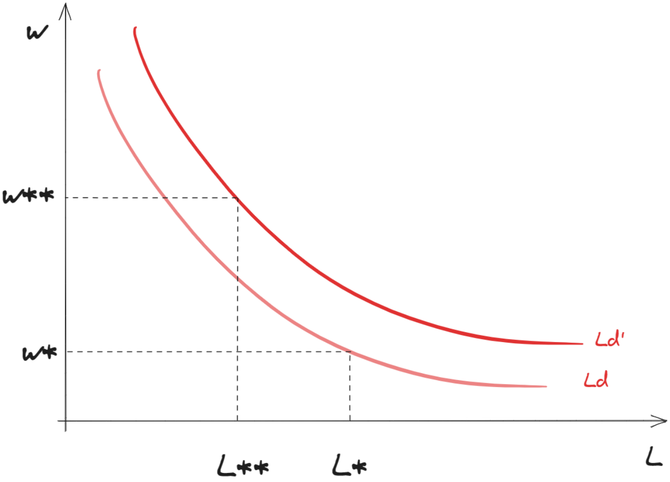
Firm is choosing labor to maximize profits

$$\max_{\{L,K\}} \pi = AK^{\alpha}L^{1-\alpha} - rK - wL$$

Solution for L:

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

What happens if $A' > A$?



Labor Supply

Household is choosing time to supply to the labor market. Time supplied is remunerated by wage, which is taxed at rate τ, but it also provides disutility in the form of less leisure.

$$\max_{\{C,L\}} U(C,L) = C - \frac{1}{2}\gamma L^2 \qquad s.t. \quad C = wL(1-\tau)$$

Labor Supply

Household is choosing time to supply to the labor market. Time supplied is remunerated by wage, which is taxed at rate τ, but it also provides disutility in the form of less leisure.

$$\max_{\{C,L\}} U(C,L) = C - \frac{1}{2}\gamma L^2 \qquad s.t. \quad C = wL(1-\tau)$$

Substituting it in:

$$\max_{\{L\}} wL(1-\tau) - \frac{1}{2}\gamma L^2$$

Labor Supply

Household is choosing time to supply to the labor market. Time supplied is remunerated by wage, which is taxed at rate τ, but it also provides disutility in the form of less leisure.

$$\max_{\{C,L\}} U(C,L) = C - \frac{1}{2}\gamma L^2 \qquad s.t. \quad C = wL(1-\tau)$$

Substituting it in:

$$\max_{\{L\}} wL(1-\tau) - \frac{1}{2}\gamma L^2$$

First order condition:

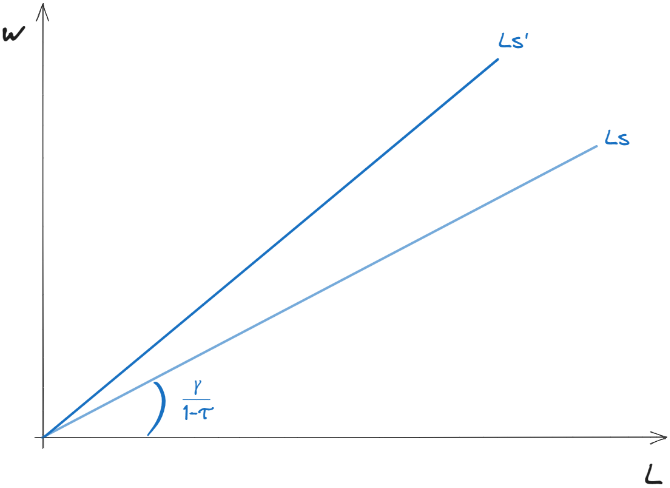
$$w(1-\tau) - \gamma L = 0 \implies w = \frac{\gamma}{1-\tau} L$$

Labor Supply

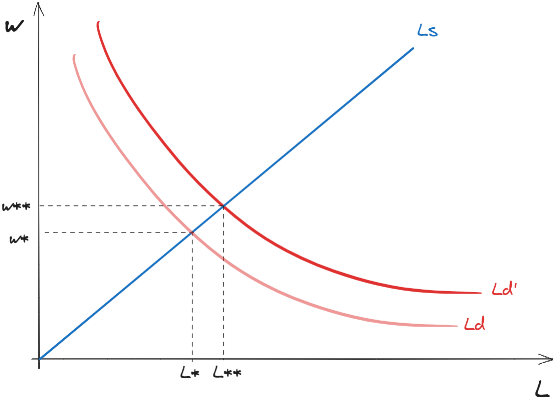
Optimal household labor supply

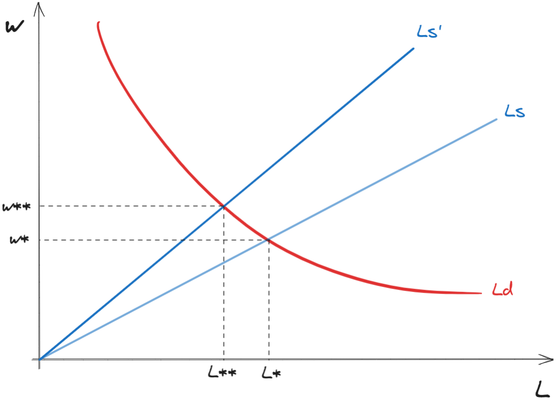
$$w(1-\tau) - \gamma L = 0 \implies w = \frac{\gamma}{1-\tau} L$$

What happens if $\tau' > \tau$?

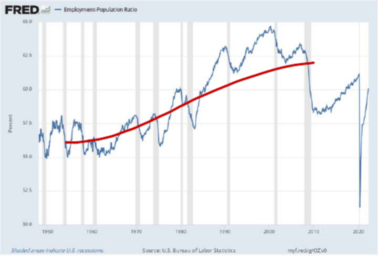


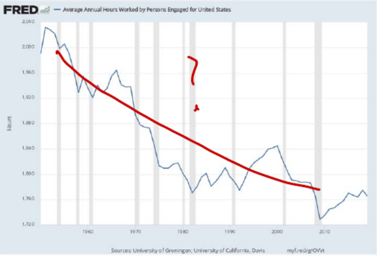
Labor Market Equilibrium

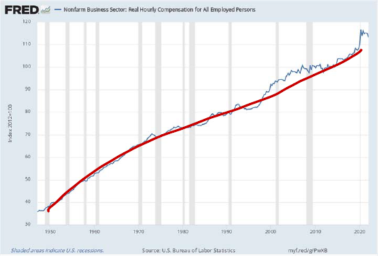


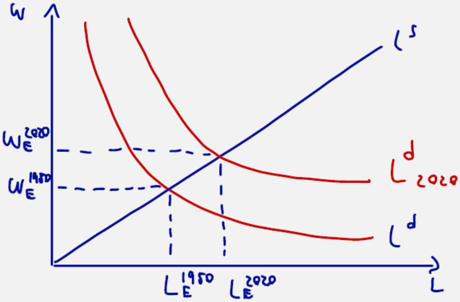


What can we learn from the model?









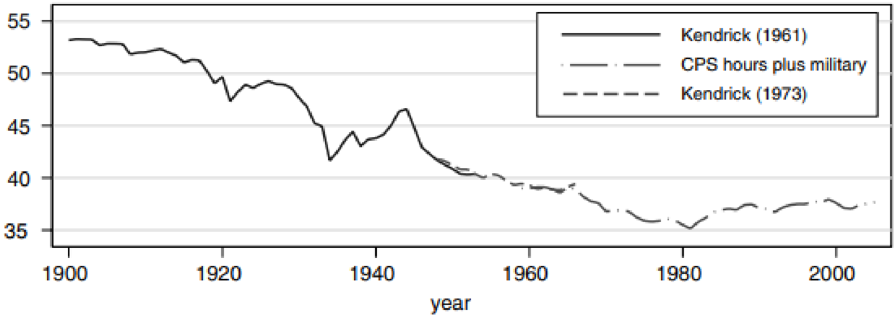
A Century of Work and Leisure[†]

By Valerie A. Ramey and Neville Francis*

We develop comprehensive measures of time spent in market work, home production, schooling, and leisure in the United States for the last 106 years. We find that hours of work for prime age individuals are essentially unchanged, with the rise in women's hours fully compensating for the decline in men's hours. Hours worked by those 14 to 24 years old have declined noticeably, but most of this decline was offset by a rise in hours spent in school. Overall, per capita leisure and average annual lifetime leisure increased by only four or five hours per week during the last 100 years. (*JEL* D13, J16, J22)

From Ramey and Francis (2009) "A Century of Work and Leisure" American Economic Journal: Macroeconomics 2009, 1:2, 189–224

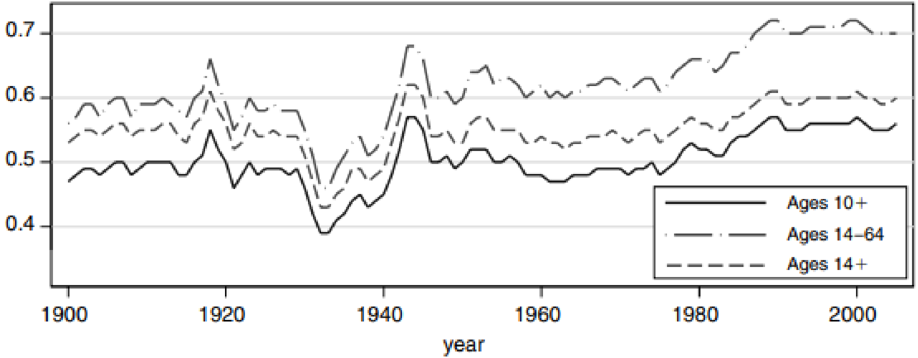
Hours per **employed person** went down



A. Average weekly hours per employed person

From Ramey and Francis (2009) “A Century of Work and Leisure” American Economic Journal: Macroeconomics 2009, 1:2, 189–224

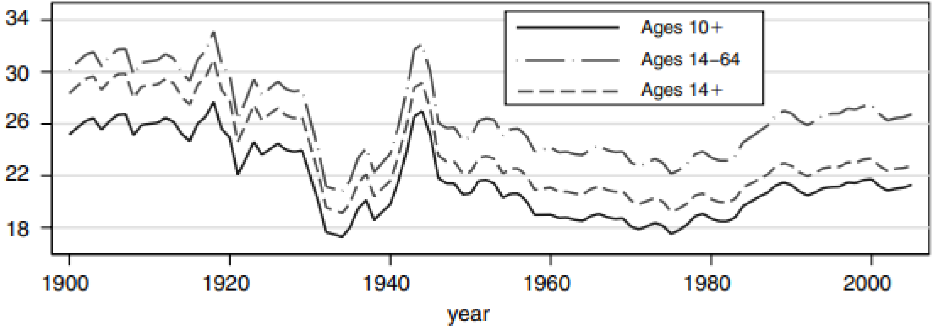
But employment as a share of working age population went up



B. Employment divided by the working age population

From Ramey and Francis (2009) “A Century of Work and Leisure” American Economic Journal: Macroeconomics 2009, 1:2, 189–224

So hours per person in the working age population stayed flat



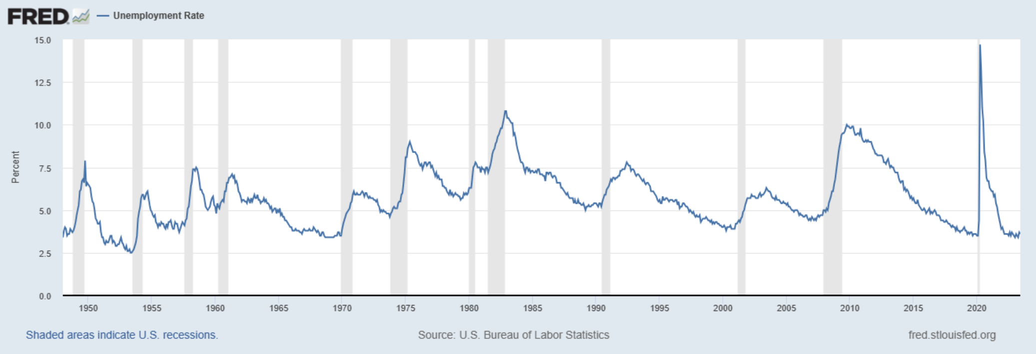
C. Hours per person in the working age population

From Ramey and Francis (2009) “A Century of Work and Leisure” American Economic Journal: Macroeconomics 2009, 1:2, 189–224

Unemployment

Inability to find gainful occupation while willing to work at the prevailing wage.

Unemployment Rate Long-Run and Short-Run Unemployment



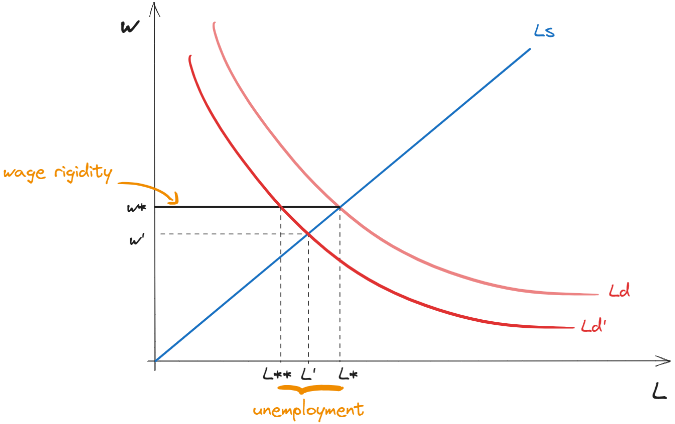
$$\text{unemployment rate} = \underbrace{\text{frictional}}_{\text{changing jobs}} + \underbrace{\text{structural}}_{\text{institutions}} + \underbrace{\text{cyclical}}_{\text{recessions/booms}}$$

Wage Rigidity and Unemployment

Wage Rigidity: Wages only partially adjust to changes in labor market conditions (supply or demand), especially in the short run.

Suppose there is a negative Labor Demand Shock. Show what happens to labor and wage with and without wage rigidity.

$$UR = L^* - L^{**}$$



Efficiency Wages

If the wage rate is set in the context of an ongoing relationship between the employer and the employee, it can exceed the wage that would be "market-clearing" (equal to MPL).

Reason: to make sure the employee is motivated to work at his best (i.e. being "efficient"), the wage is set to be less sensitive to current economic conditions (especially negative conditions), and it can be higher than the current MPL, in anticipation of an increasing MPL due to accumulating experience on the job.

Is the Labor Market really that simple?

- Labor relationship is multiperiod.
- Market power (of employers, or worker) may be important
- Labor relationship is more than just the monetary wage payment.
- The stylized labor market we have studied should be used with extra care when considering labor market policies…
- Next lecture we will make things more realistic!
- We will think more about **monopsony**, **market structure**, **minimum wages**, **hiring** and **quitting**.