LECTURE 19

EMPLOYMENT AND UNEMPLOYMENT IN THE LONG RUN

March 31, 2016

I.   OVERVIEW

II. HISTORICAL EVIDENCE OF TECHNOLOGICAL CHANGE

  A. New production techniques

  B. New goods

  C. Better institutions

III. SOURCES OF TECHNOLOGICAL PROGRESS

  A. Supply and demand diagram for invention

  B. Factors that could shift the supply and demand curves

  C. Policies to encourage technological progress

IV. EMPLOYMENT AND POTENTIAL OUTPUT

  A. Effects of an increase in N*/POP

  B. Effects of an increase in POP

V.   DETERMINANTS OF THE NORMAL EMPLOYMENT-TO-POPULATION RATIO AND THE NORMAL REAL WAGE

  A. Review and modification of labor supply/labor demand diagram

  B. Change in workers' tastes (Married women)

  C. Change in labor demand (Low-skilled males)

  D. The large rise in real wages over time

VI. THE NATURAL RATE OF UNEMPLOYMENT

  A. Definition

  B. Job rationing

  C. Job search

LECTURE 19
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Announcements

- Midterm 2 Logistics:

  - Thursday, April 7, 3:30–5:00

  - Sections 109, 110, 111, 112 (GSIs Dounia Saeme and Jeanette Ling) go to 245 Li Ka Shing Center (corner of Oxford and Berkeley Way).

  - Everyone else come to the usual room (2050 VLSB).

  - You do ***not*** need a blue book; just a pen.

Announcements (continued)

- **Midterm Format:**

  - Sample midterm.

  - Problems; true/false/uncertain questions; multiple choice.

- **Midterm Coverage:**

  - All of the material *since* the first midterm (starting with monopoly) and up through lecture on April 5th (saving and investment).

  - Lecture, section, textbook, and additional readings.

Announcements (continued)

- Places to Get Help:

    - Professor Office Hours: **Monday, April 4th, 3:30-5:30**. No professor office hours on Wednesday, April 6th.

    - GSI office hours.

    - Review session on Tuesday, April 5th, 5:15-6:30 p.m. in 2050 VLSB.

I. OVERVIEW

Material for Today

- Finish up discussion of technological change.

- Move on to discussion of employment and unemployment in the long run.

Aggregate Production Function

(1)
$$\frac{Y^*}{POP} = \frac{Y^*}{N^*} \bullet \frac{N^*}{POP}$$

(2)
$$\frac{Y^*}{N^*} = f\left(\frac{K^*}{N^*}, T\right)$$

(3)
$$\frac{Y^*}{POP} = f\left(\frac{K^*}{N^*}, T\right) \bullet \frac{N^*}{POP}$$

Technological change is a key determinant of economic growth.

$$\frac{Y^*}{POP} = f\left(\frac{K^*}{N^*}, T\right) \cdot \frac{N^*}{POP}$$

- Argument by elimination: If it is not N*/POP or K*/N*, it must be T.

II. HISTORICAL EVIDENCE OF TECHNOLOGICAL CHANGE

New Production Techniques

- New machines (electric motor)

- New methods of organization and management (assembly line, accounting).

New Products

- Another way to create improvements in the standard of living.

Table 1.7   **Treatment of the Great Inventions**

Invention	Treatment in Price Indexes
Aeronautics, helicopter	Except for lower costs of transportation of intermediate goods, lower prices not reflected in price indexes
Air-conditioning	Outside of refrigerated transportation and productivity increases in the workplace, amenities and health effects not captured in price indexes
Continuous casting of steel	A process innovation that showed up primarily in lower costs of intermediate goods and thus was reflected in price indexes of final goods
DDT and pesticides	Some (now questionable) benefits probably included in higher yields in agriculture and therefore included in price indexes; health benefits and ecological damages largely excluded from price indexes
Diesel-electric railway traction	A process innovation that showed up primarily in the price of goods and services
Insulin, penicillin, streptomycin	Improved health status not captured in price index
Internal combustion engine	Except for lower costs of transportation of intermediate goods, lower prices not reflected in price indexes
Long-playing record, radio, television	Major product inventions that are completely omitted from price indexes
Photo-lithography	Largely reflected in reduced printing costs
Radar	A wide variety of improvements, some of which might have shown up in lower business costs and prices (such as lower transportation costs or improved weather forecasting)
Rockets	A wide variety of implications: major application in telecommunications showed up in consumer prices; improvements in television not captured in price indexes; improved military technology and nuclear-war risk not reflected in prices
Steam locomotive	Reduced transportation costs of businesses reflected in price indexes; expansion of consumer services and nonbusiness uses not reflected
Telegraph, telephone	Improvements over Pony Express or mail largely unreflected in price indexes
Transistor, electronic digital computer	As key inventions of the electronic age, impacts outside business costs largely omitted in price indexes
Xerography	Major process improvement: some impact showed up in reduced clerical costs; expansion of use of copied materials not captured in price index
Zipper	Convenience over buttons omitted from price indexes

Better Institutions

- Example: Opening up to trade
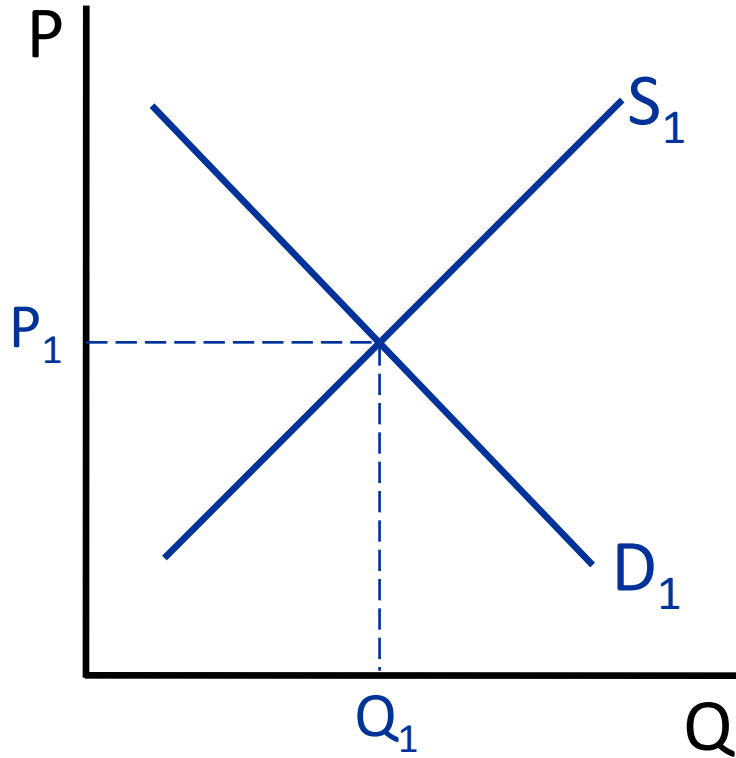
- Example: More reliance on market forces

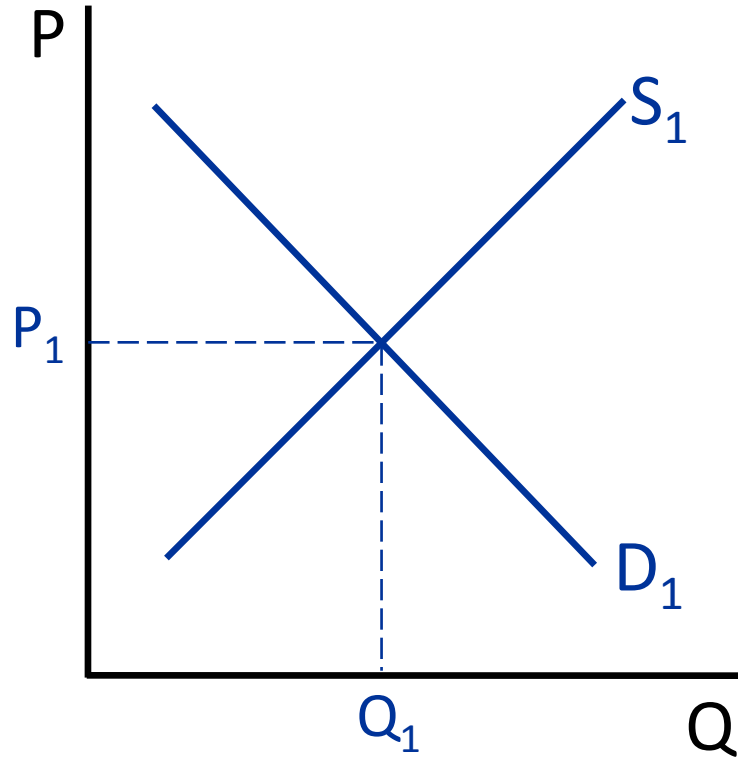# III. Sources of Technological Progress

Market for Inventions
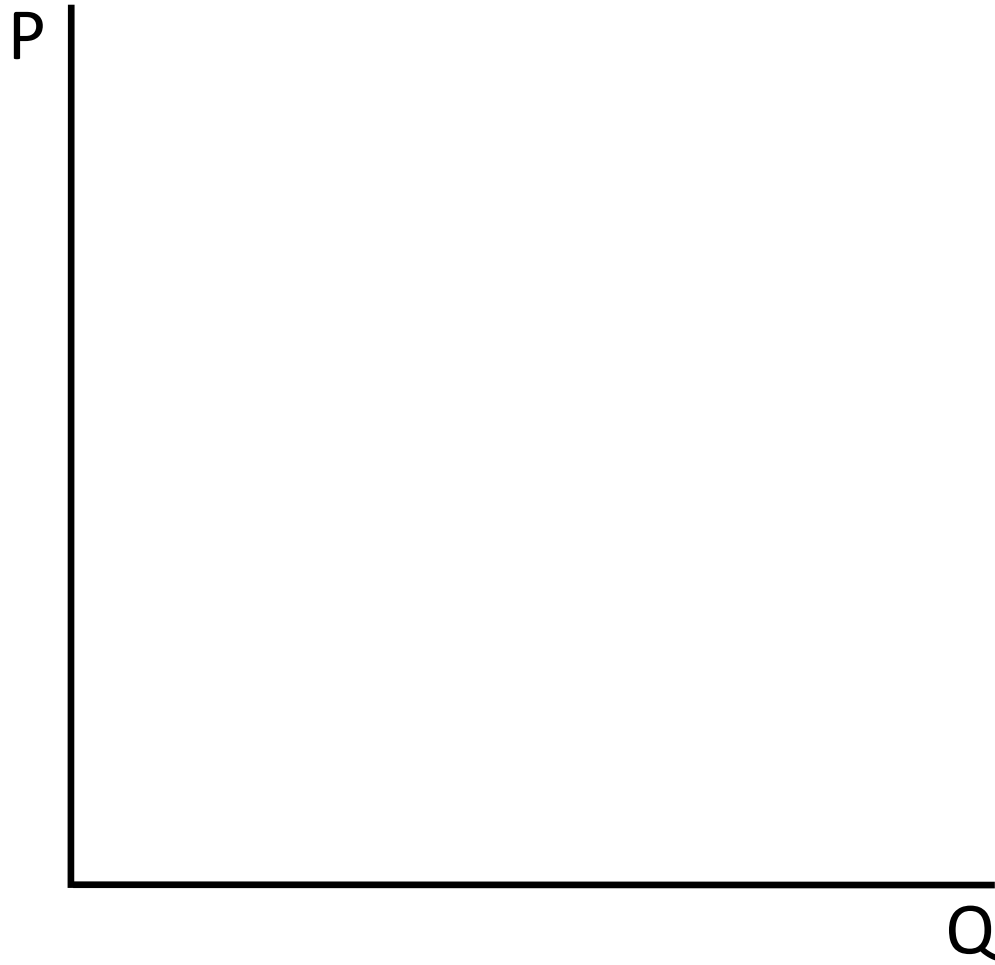
Factors Increasing the Supply of Inventions

Factors Increasing the Demand for Inventions

Policies to Encourage Technological Progress
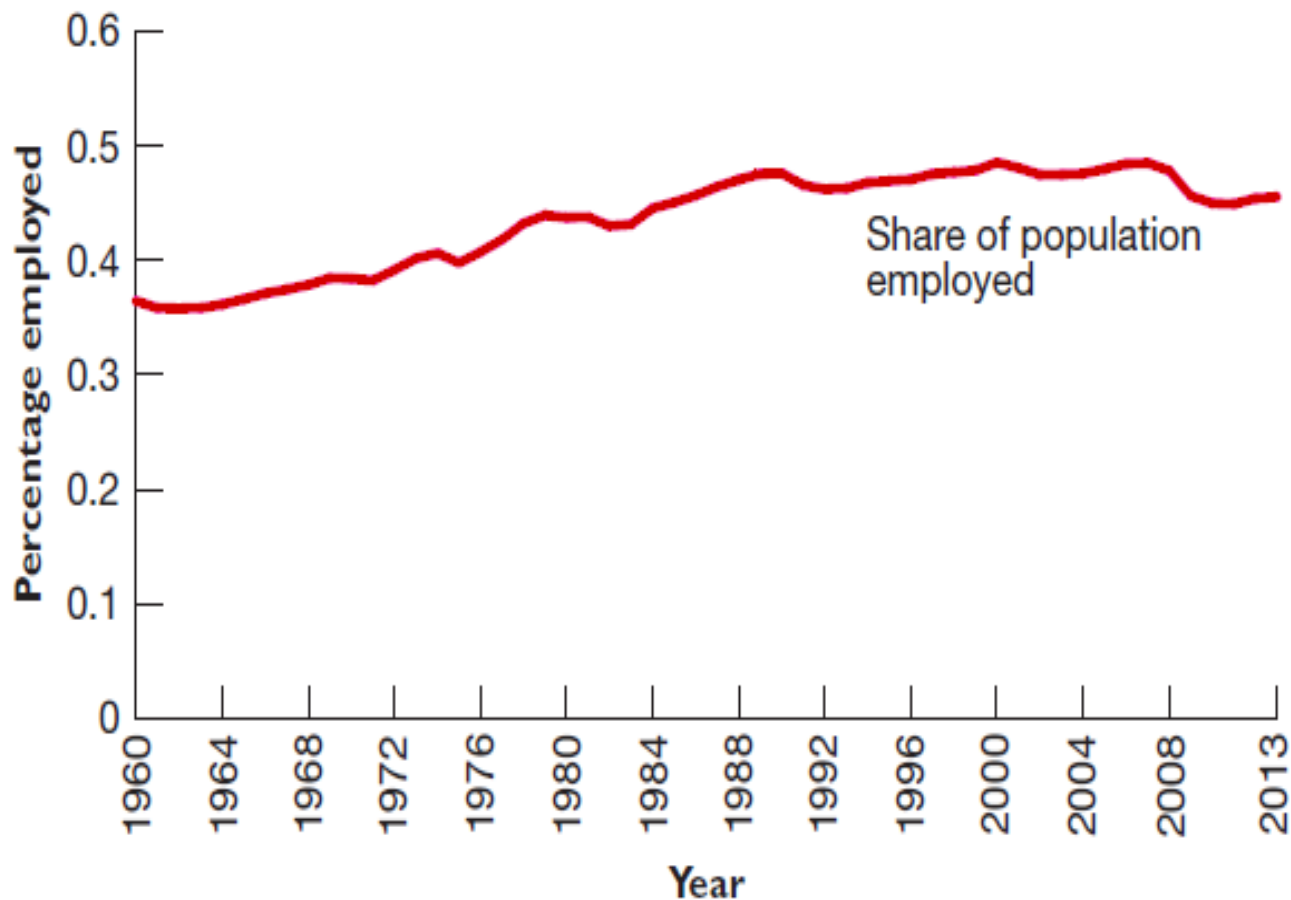
IV. Employment and Potential Output

Decomposition of Potential Output per Person

$$\frac{Y^*}{POP} = \frac{Y^*}{N^*} \cdot \frac{N^*}{POP}$$

where:

- Y* is potential output;

- POP is population;

- N* is normal employment.

- $\frac{N^*}{POP}$ is the normal employment-to-population ratio.
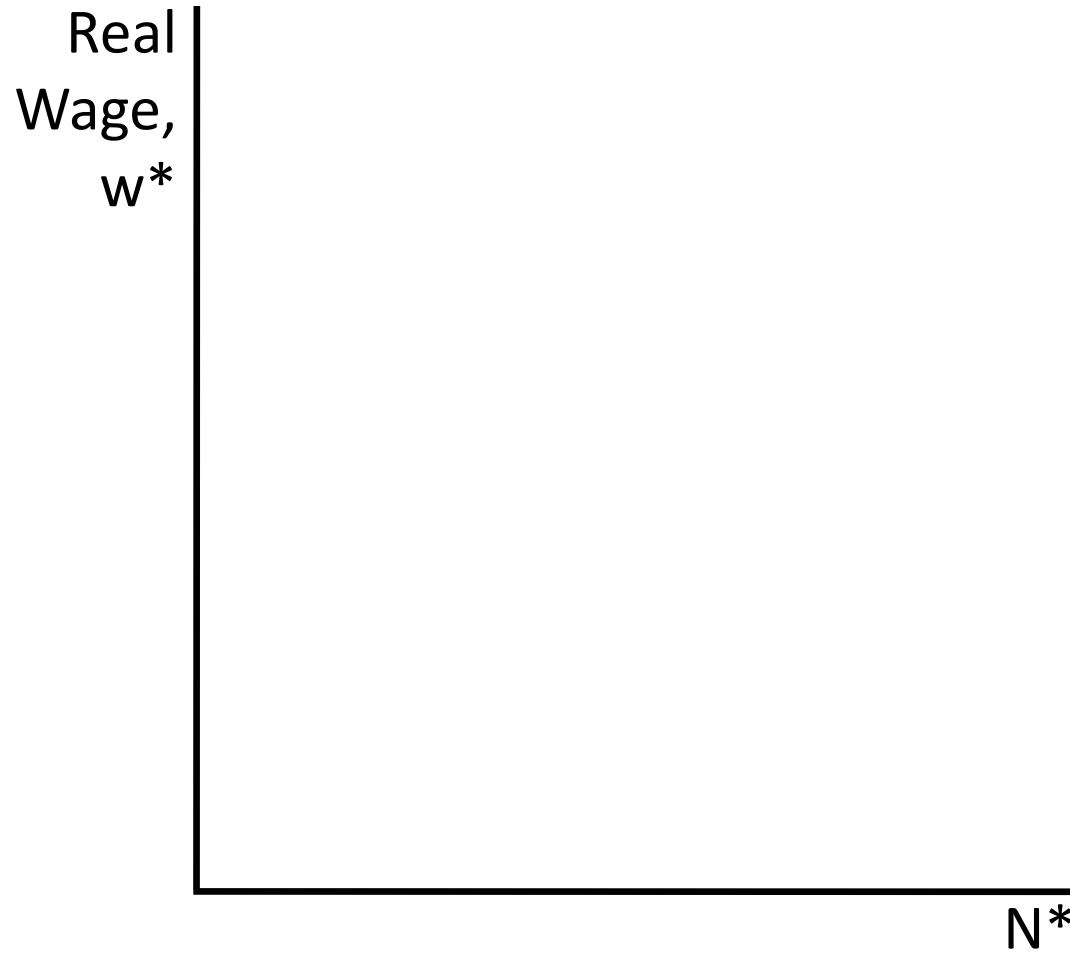
- $\frac{Y^*}{N^*}$ is normal average labor productivity.

Employment-to-Population Ratio in the U.S.

TABLE 1.1 STATISTICS ON GROWTH AND DEVELOPMENT

	GDP per capita, 2008	GDP per worker, 2008	Labor force participation rate, 2008	Average annual growth rate, 1960–2008	Years to double
"Rich" countries					
United States	$43,326	$84,771	0.51	1.6	43
Japan	33,735	64,778	0.52	3.4	21
France	31,980	69,910	0.46	2.2	30
United Kingdom	35,345	70,008	0.51	1.9	36
Spain	28,958	57,786	0.50	2.7	26
"Poor" countries					
China	6,415	10,938	0.59	5.6	13
India	3,078	7,801	0.39	3.0	24
Nigeria	1,963	6,106	0.32	0.6	114
Uganda	1,122	2,604	0.43	1.3	52
"Growth miracles"					
Hong Kong	37,834	70,940	0.53	4.3	16
Singapore	49,987	92,634	0.54	4.1	17
Taiwan	29,645	62,610	0.47	5.1	14
South Korea	25,539	50,988	0.50	4.5	16
"Growth disasters"					
Venezuela	9,762	21,439	0.46	−0.1	−627
Haiti	1,403	3,164	0.44	−0.4	−168
Madagascar	810	1,656	0.49	−0.1	−488
Zimbabwe	135	343	0.40	−1.5	−47

Source: Charles Jones and Dietrich Vollrath, *Economic Growth*.

Decomposition of Potential Output per Person

$$\frac{Y^*}{POP} = \frac{Y^*}{N^*} \bullet \frac{N^*}{POP}$$

where:

- Y* is potential output;

- POP is population;

- N* is normal employment.

- $\frac{N^*}{POP}$ is the normal employment-to-population ratio.

- $\frac{Y^*}{N^*}$ is normal average labor productivity.

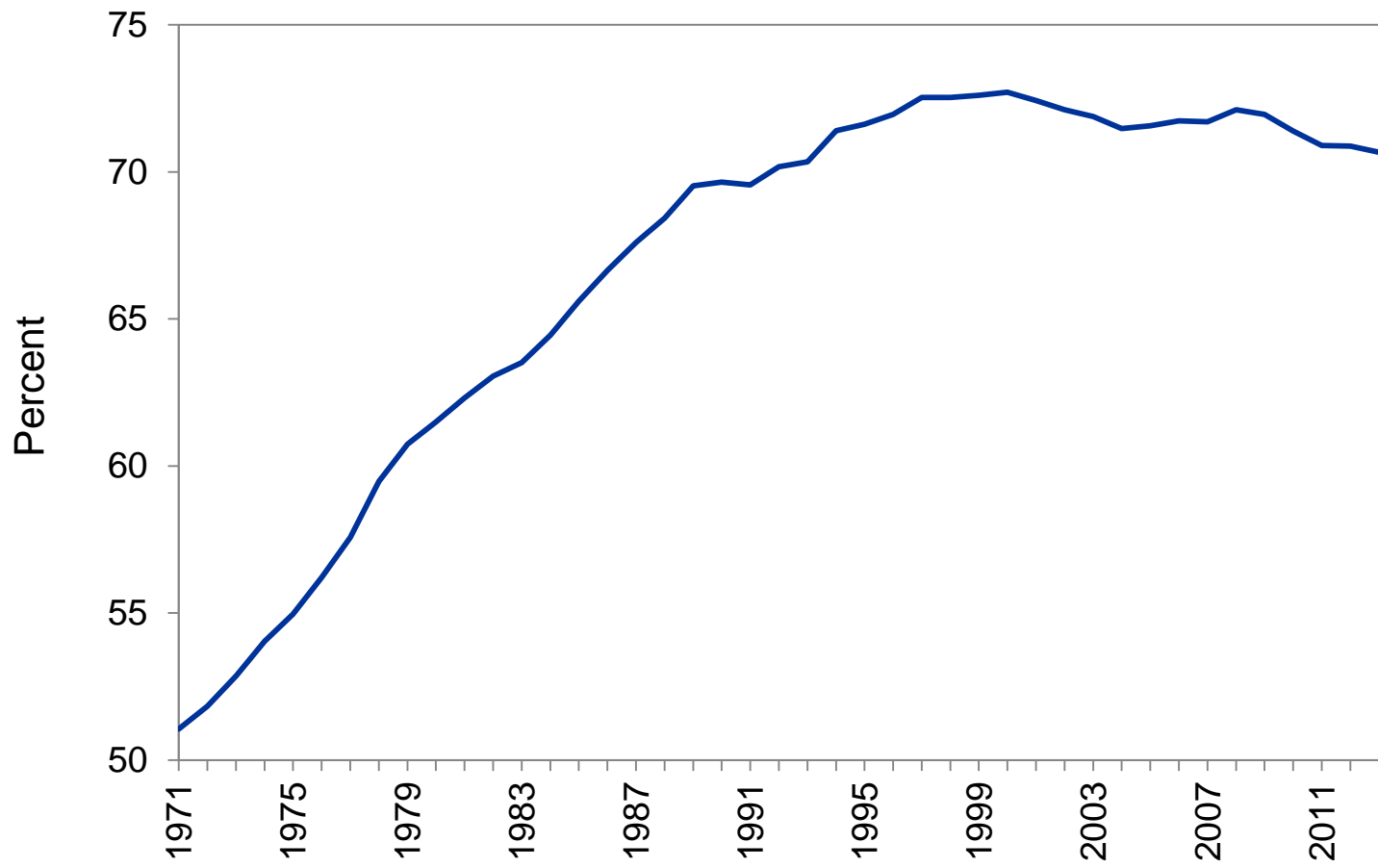# V. Determinants of the Normal Employment-to-Population Ratio and the Normal Real Wage
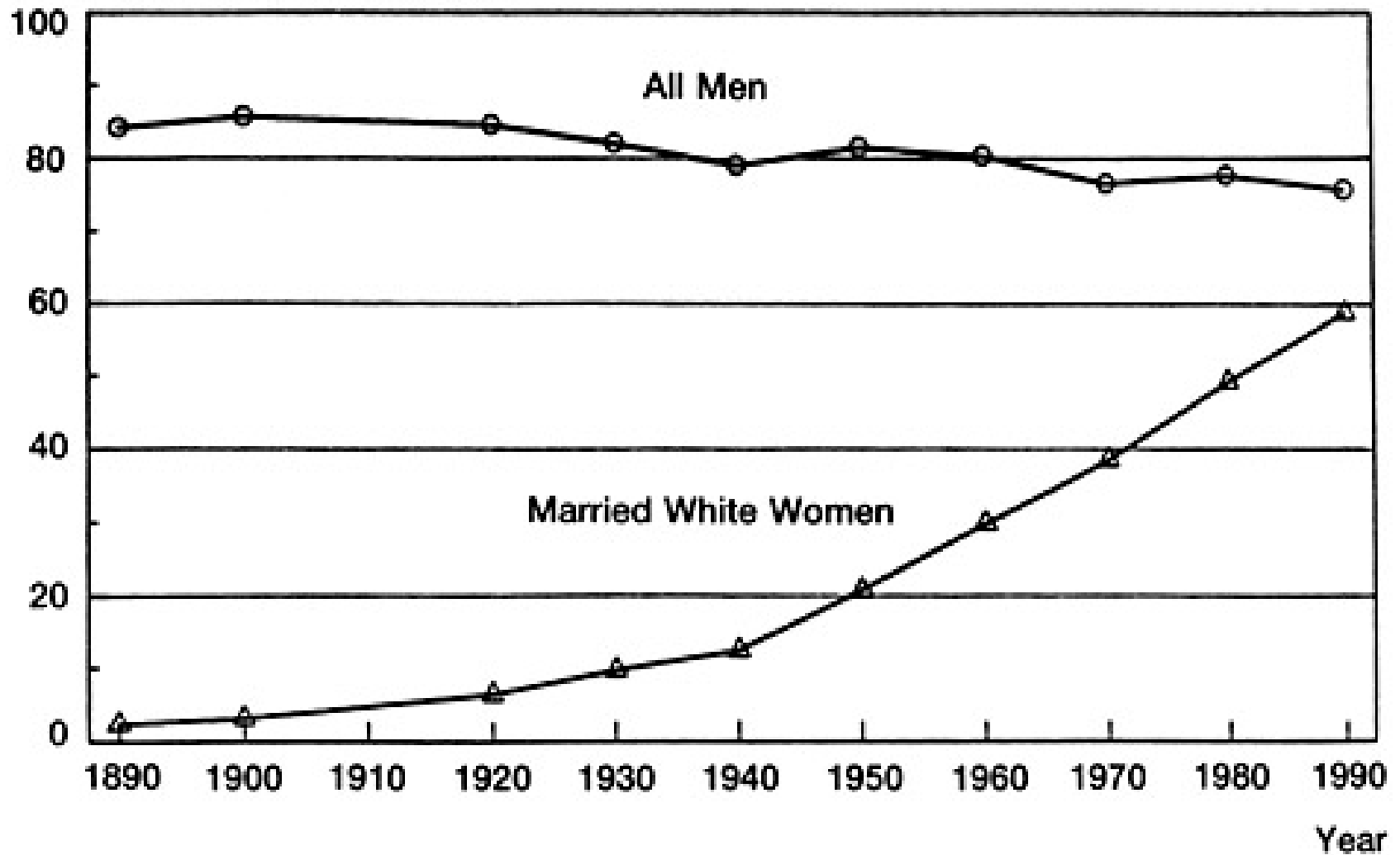
The Labor Market

Wage

Employment
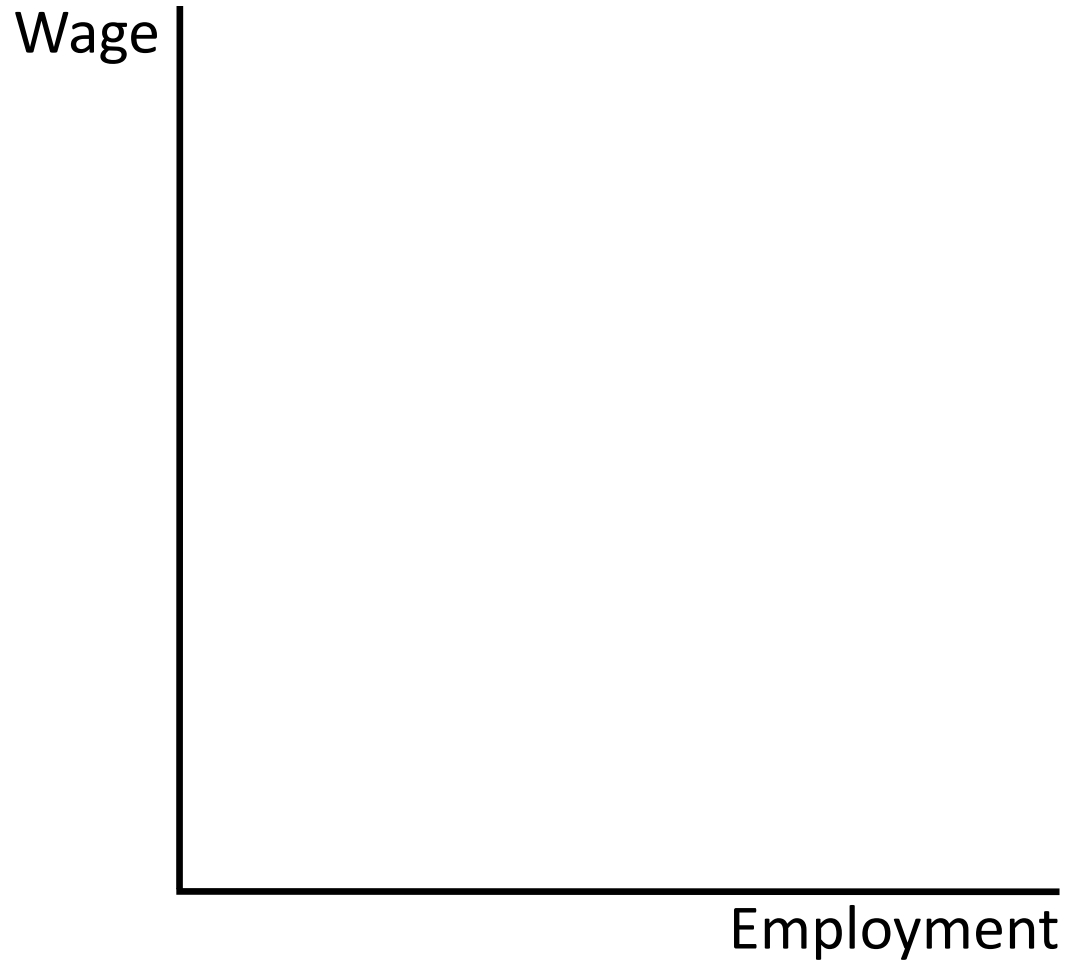
Long-Run Labor Market Diagram

Real
Wage,
w*

N*

Labor Force Participation Rate for Women in the U.S.

Labor Force Participation Rate

Source: Claudia Goldin, "Gender Gap," *The Concise Encyclopedia of Economics*.

An Increase in Labor Supply

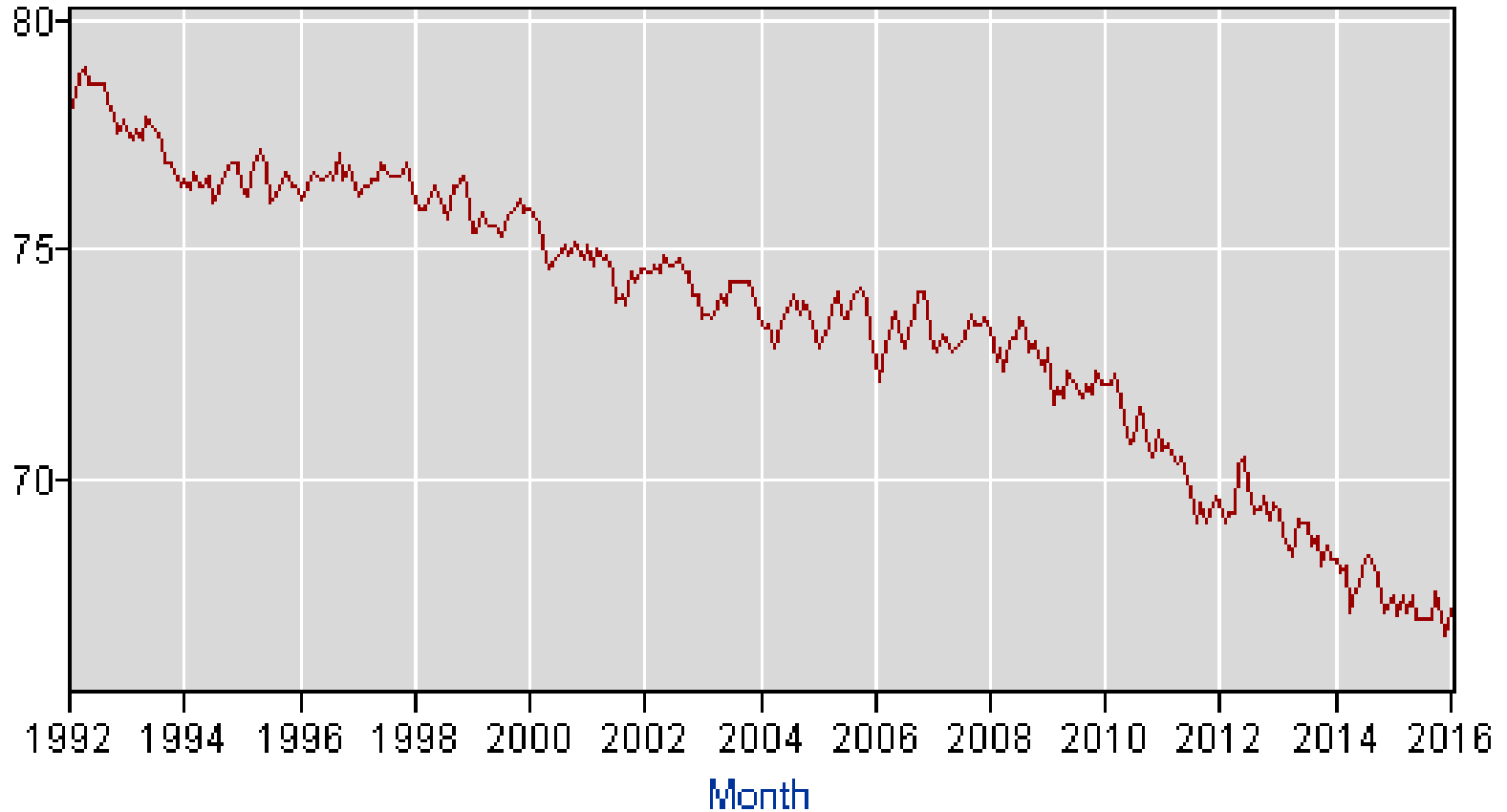# Labor Force Participation Rate for Women in the U.S.

Female Labor Force Participation Rate in the U.S., the U.K., and Japan

Labor Force Participation Rate – High School Graduates, No College, 25 yrs. & over, Men
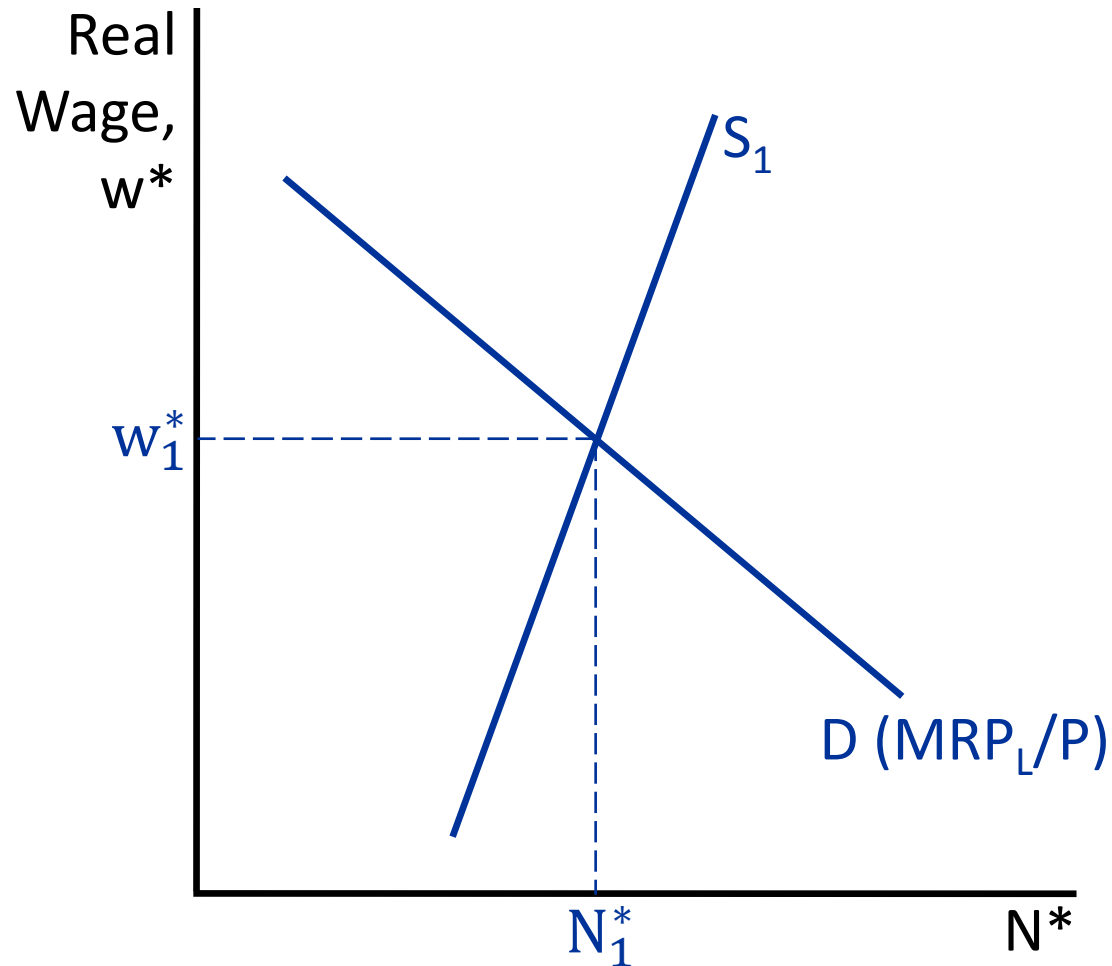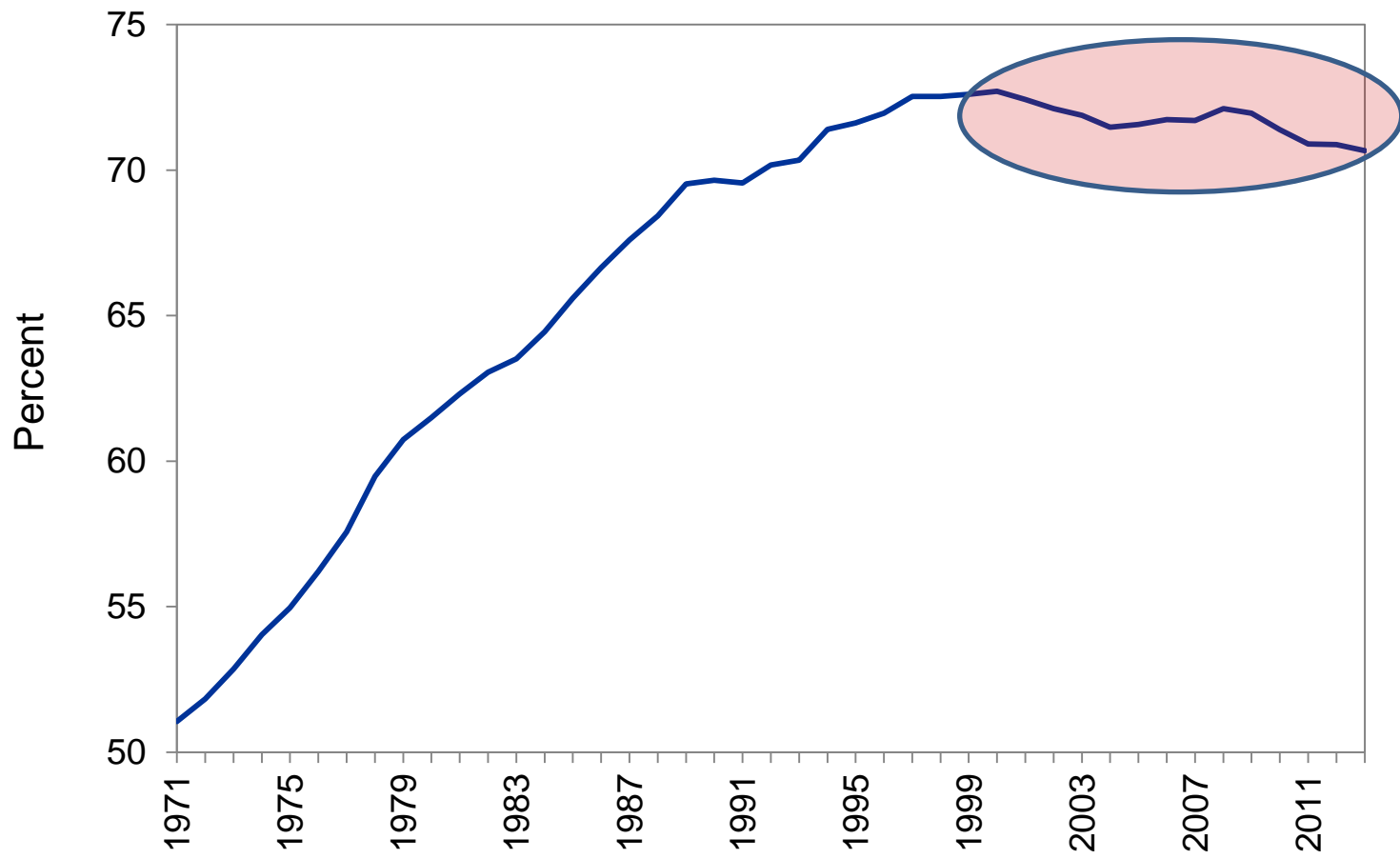
Source: Bureau of Labor Statistics.

A Fall in Labor Demand
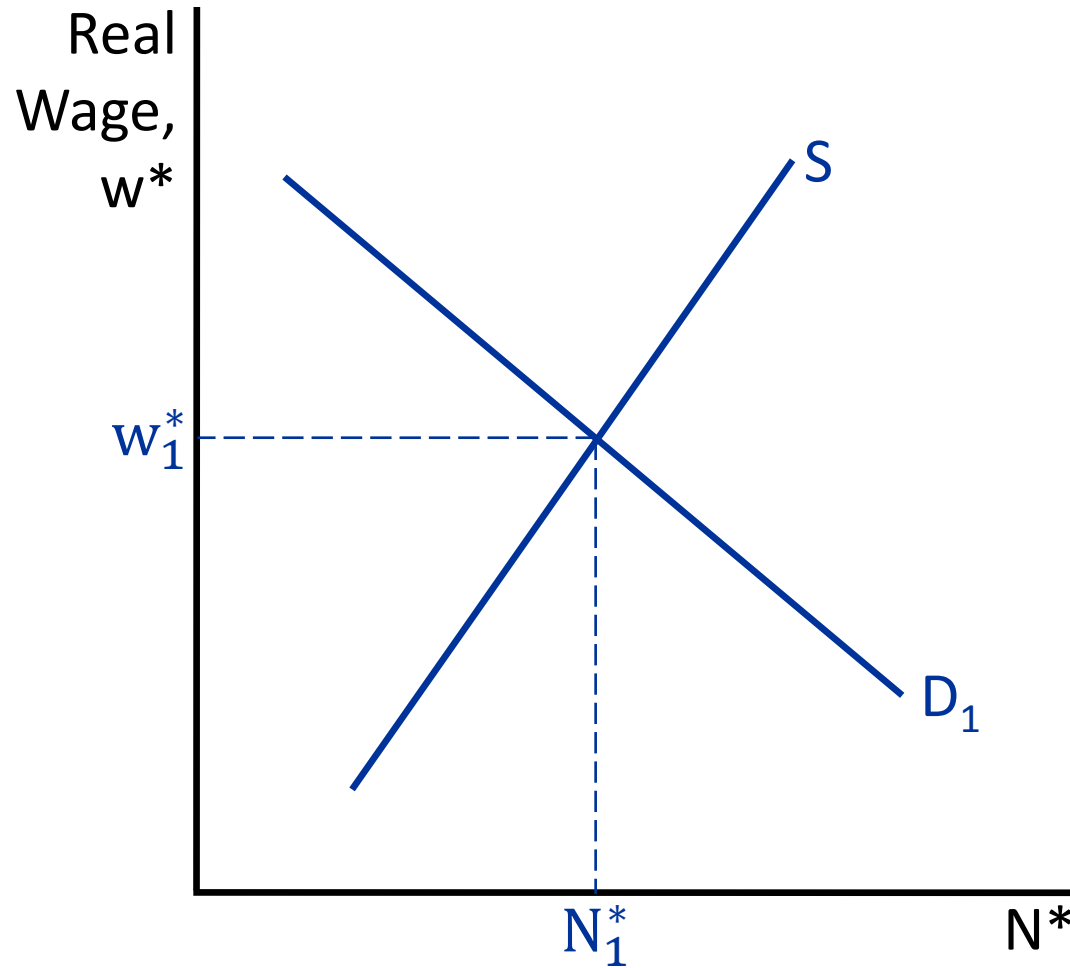
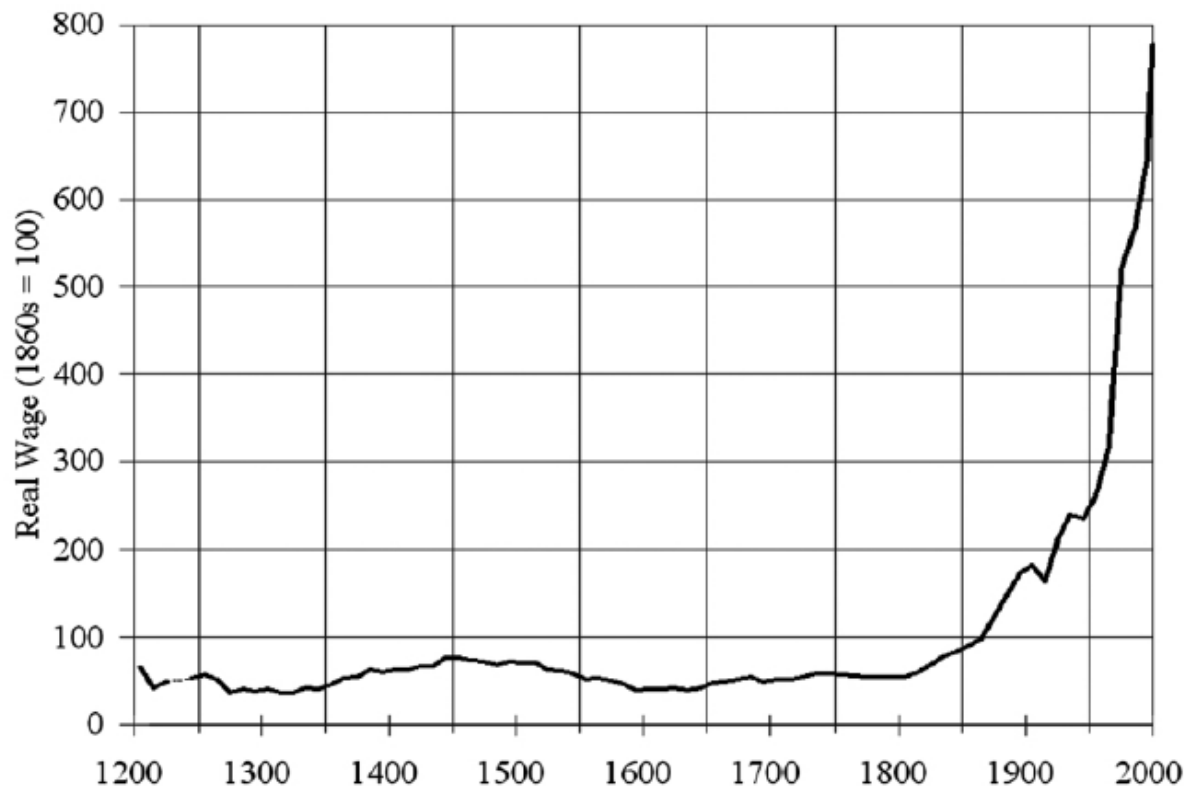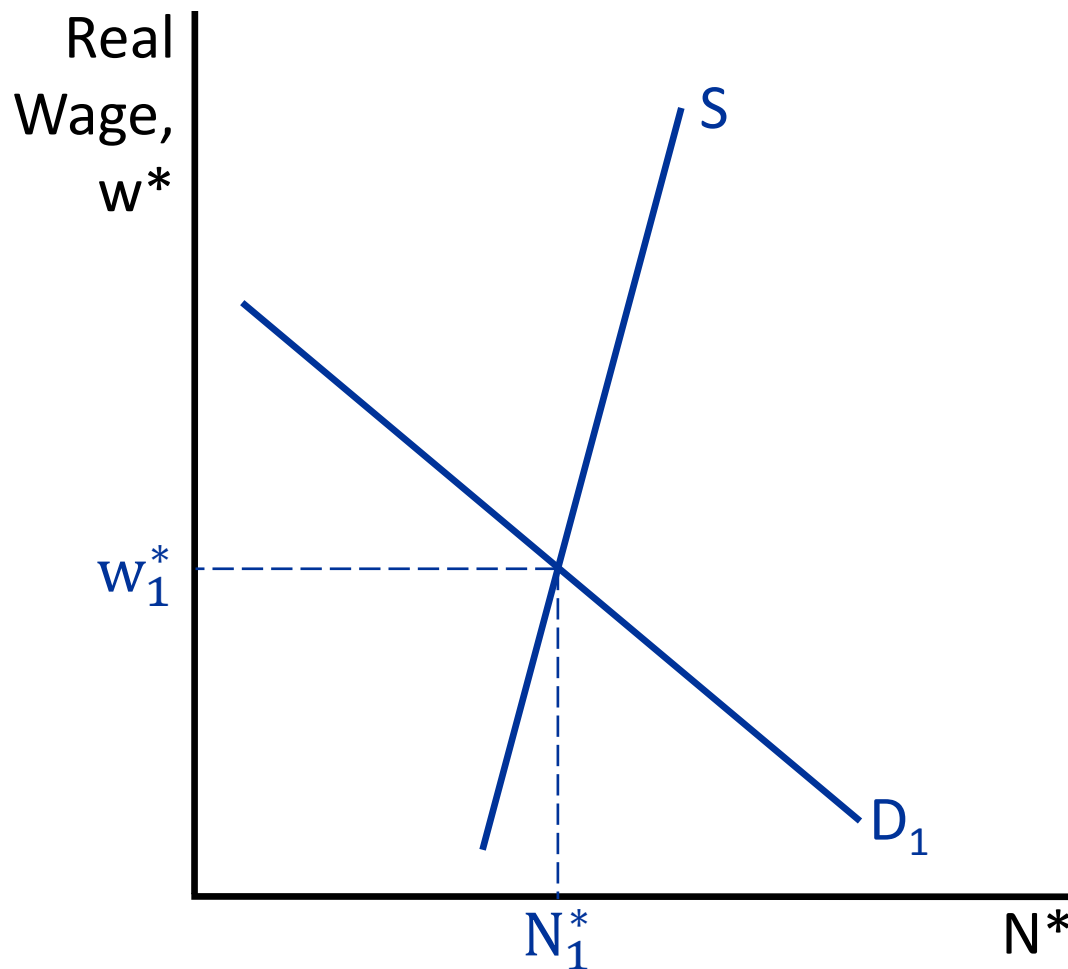# Real Wages in the U.K. over the Very Long Run

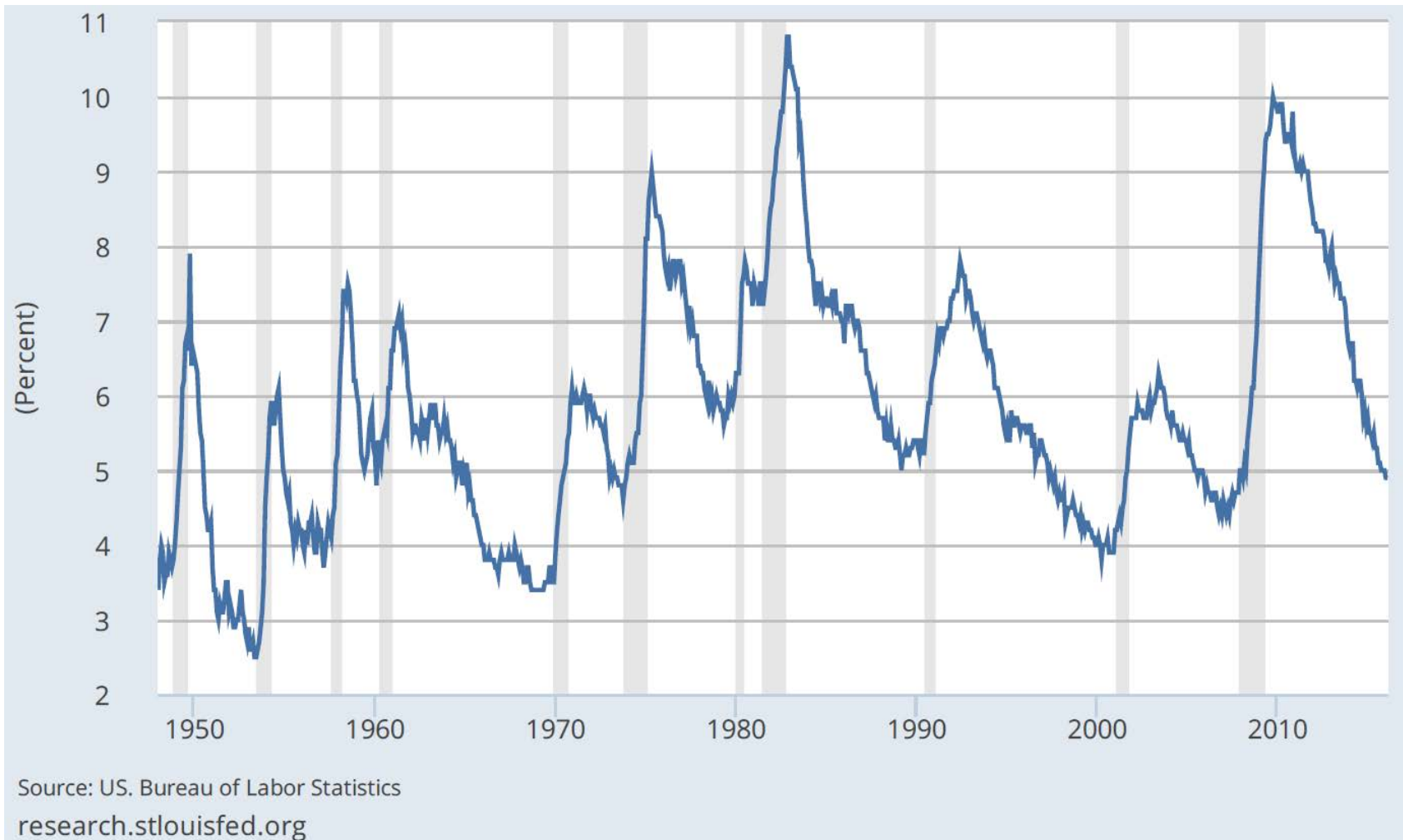Fig. 1.—Builders' real day wages, 1209–2004 (source: table A2)

From: Clark, "The Condition of the Working Class in England, 1209-2004"

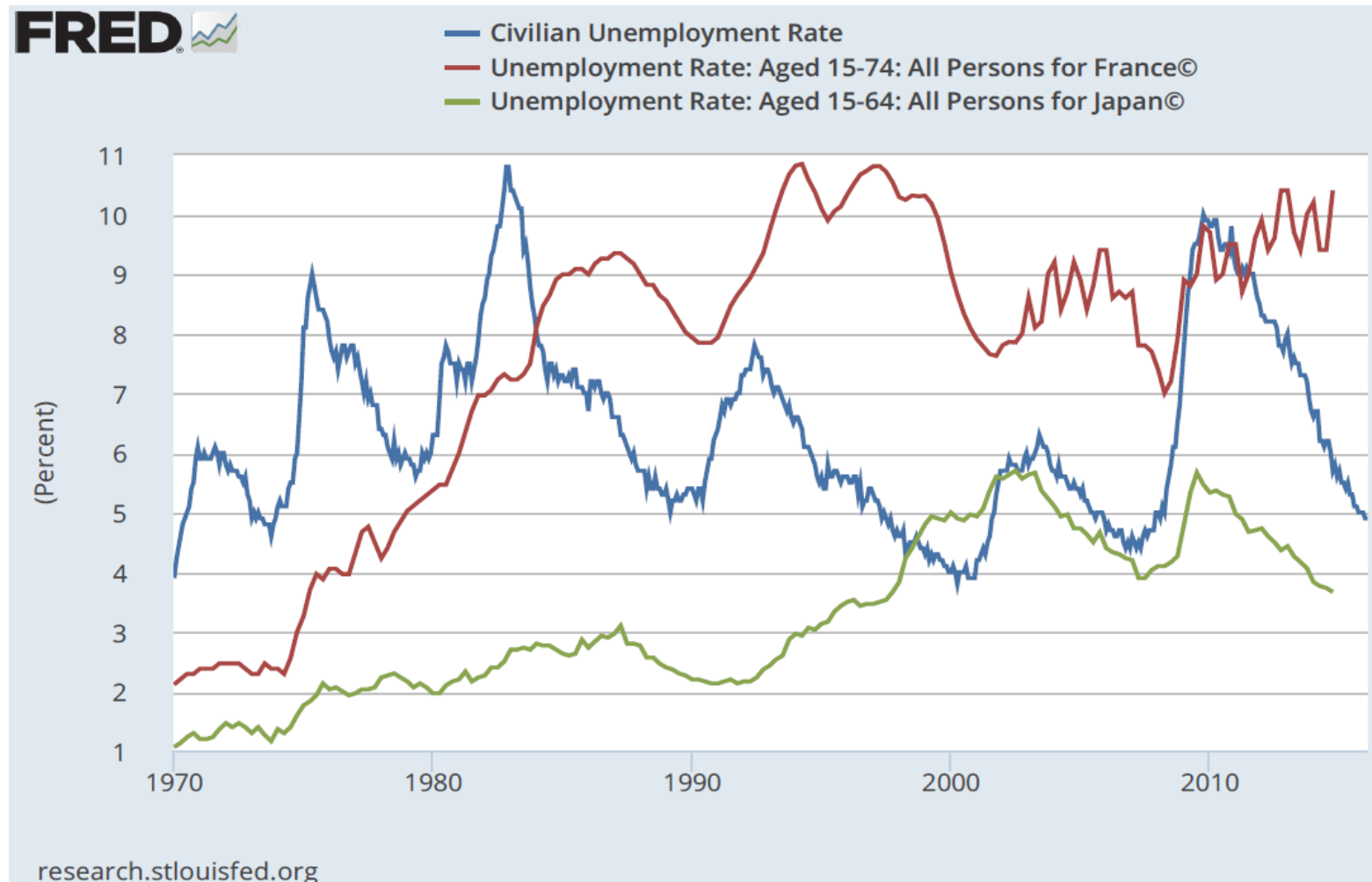# Large Increases in Capital and Improvements in Technology

VI. THE NATURAL RATE OF UNEMPLOYMENT

The U.S. Unemployment Rate, 1948–2016

Source: US. Bureau of Labor Statistics
research.stlouisfed.org

Source: FRED; data from Bureau of Labor Statistics.

Unemployment in the U.S., Japan, and France

Source: FRED.

The Natural Rate of Unemployment

- The economy's normal or usual unemployment rate.

Types and Sources of Unemployment

- Cyclical unemployment

  - Caused by output being below potential

- Structural unemployment

  - Caused by job rationing

- Frictional unemployment

  - Caused by turnover and job search

Normal or natural unemployment consists of structural and frictional unemployment.

Job Rationing

Real Wage, w^*

w_1^*

S

D (MRP_L/P)

N_1^*

N^*
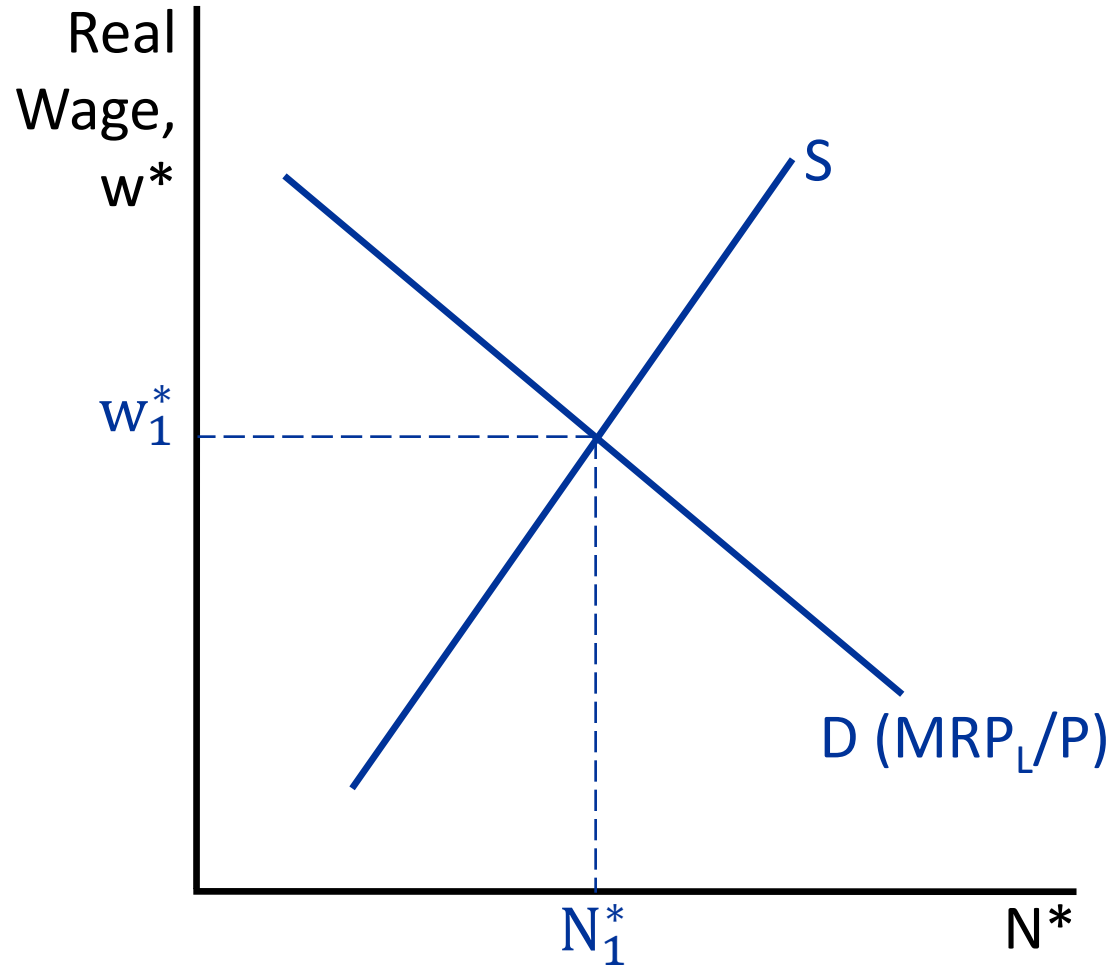
Sources of Job Rationing

- Minimum wage laws

- Unions

- Efficiency wages