Unemployment

Barometers of the Labor Market

Outline

1. Unemployment and Labor Force Participation

2. Types of Unemployment

3. Explaining Unemployment

- Textbook Readings: Ch. 9

Labor Market

- How well an economy uses its resources?
- An economy's **workers** are its **chief resource**
- Keeping workers employed is a key concern of policymakers
- **Employment trends** are a critical macroeconomic issue

Assessing Labor Market Conditions

- Every month (first Friday), the Bureau of Labor and Statistics (BLS) provides a detailed look at the labor market

- BLS performs two separate surveys:
  - The **Household Survey**, an interview of 60,000 individuals
  - The Establishment (**Payroll**) **Survey**, a review of 150,000 firms' payrolls

- These two surveys give **complimentary** –though sometimes contradictory– information about the state of US employment

The Household Survey

- Each adult (16+) in the household is placed in 1 of 3 categories:
  - **Employed**: Currently has a job (paid, own, family) or is temporarily away from his/her job
  - **Unemployed**: Not employed, available for work **and** has actively looked for work during the previous month
  - **Inactive/Not in the Labor Force**:
    - Available for work but not currently looking: Discouraged workers, childcare resp
    - Not available for work (majority): full-time students, homemakers, retirees

The Unemployment Rate

Labor Force = Number of Employed + Number of Unemployed

- Percentage of the labor force that is unemployed:

$$Unemployment\ Rate = \frac{Number\ of\ Unemployed}{Labor\ Force} \times 100$$

The Labor-Force Participation Rate

Working-Age or Adult Population = Labor Force + Inactive

- Percentage of the adult population that is in the labor force:

$$Labor\ Force\ Participation\ Rate = \frac{Labor\ Force}{Adult\ Population} \times 100$$

Employment Status of Adult Population in April 2018

Employed	155.2 million
Unemployed	6.3 million
Inactive	95.7 million

Labor Force = 155.2 + 6.3 = 161.5 million

Unemployment Rate = (6.3/161.5) x 100 = 3.9%

Labor-Force Participation Rate = (161.5 /257.2) x 100 = 62.8 %

"Don't believe these phony numbers when you hear 4.9% and 5% unemployment," Mr. Trump said in his victory speech after the New Hampshire primary Tuesday night. "The number's probably 28, 29, as high 35. In fact, I even heard recently 42% ." (from NY Times, 2016)

- What percentage of US population is not working?

Population = 257.2 Employed = 155.2

Ergo, not working = 257.2 – 155.2 = 102

$$\frac{102}{257.2} = 39.7\%$$

- Is this correct?

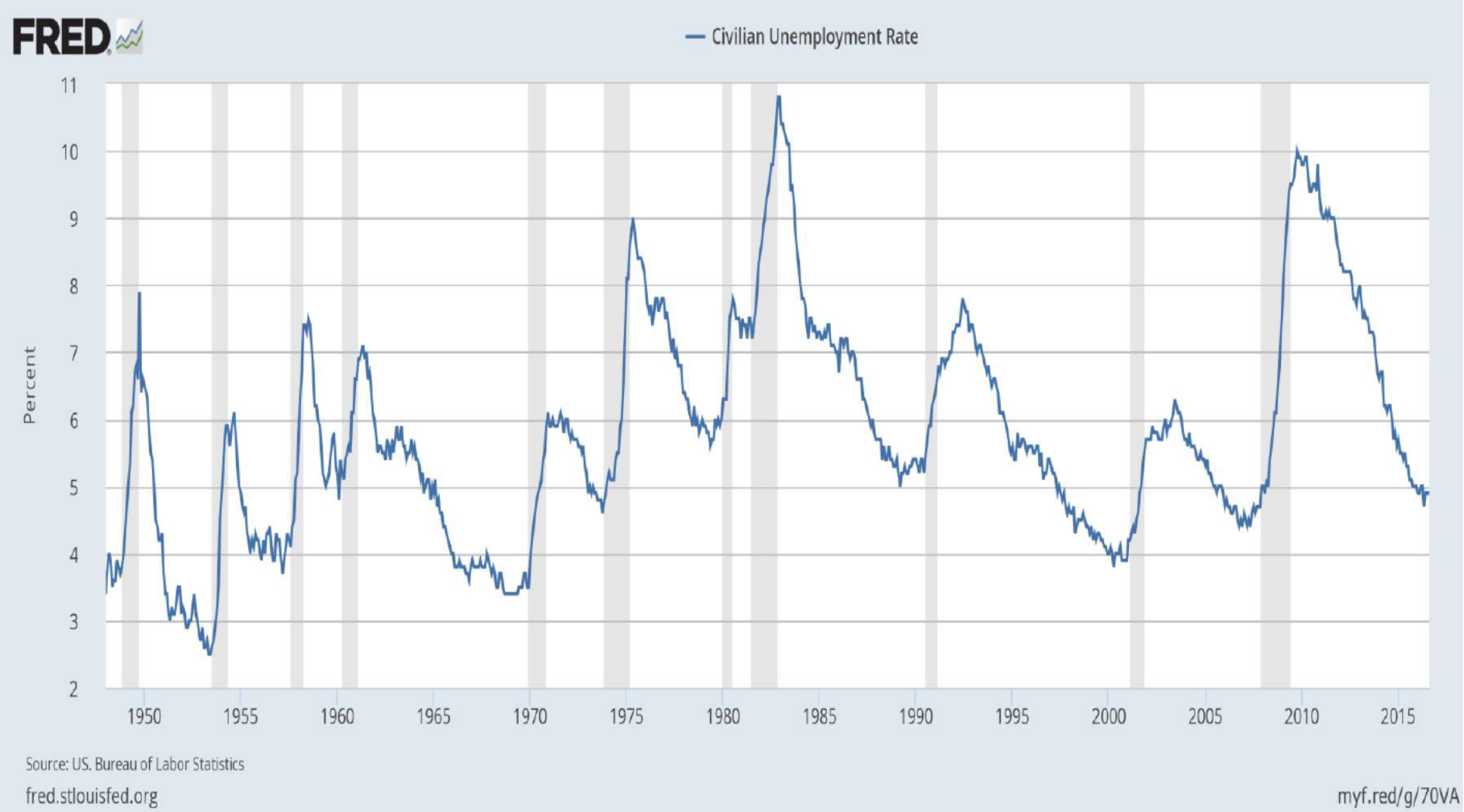
From Population Estimates to Measures of Employment

- **How does the household survey build into an unemployment rate?**
- (A) Population estimate (extrapolation from census data)
- (B) Labor force participation rate (% of the survey labeling themselves employed or jobless but looking for work)
- (C) Labor force level: (B) X (A)
- (D) Household employment (percent of phone survey labeled employed times "A").
- (E) Household unemployment (percent of tally labeled unemployed times "A").
- (F) Unemployment rate: (E/C) X 100

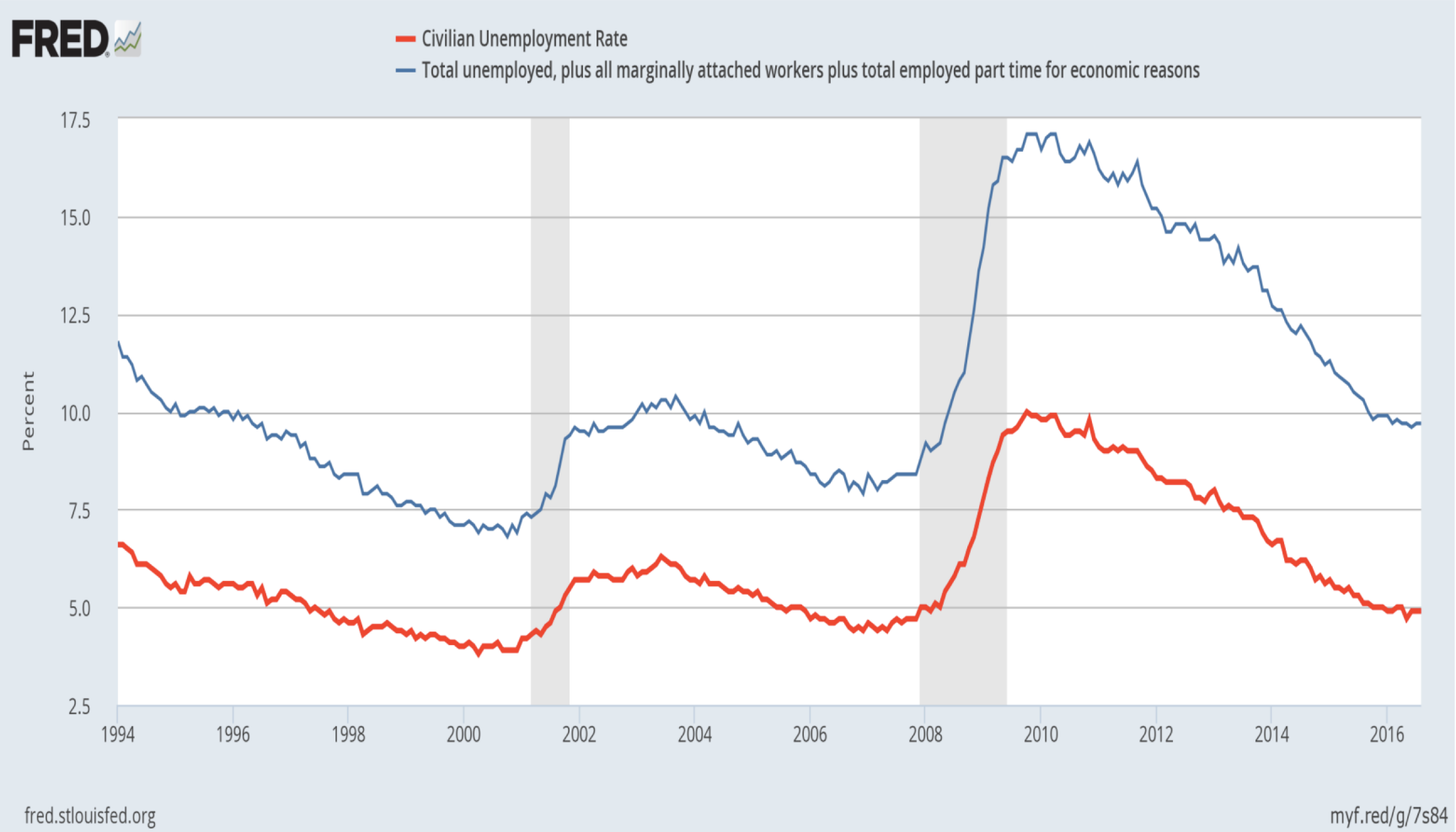
Example: BLS Estimates of Employed and Unemployed

- BLS asks: "*Are you employed or jobless but looking for job?*"
- In August 2016, **62.8%** said "Yes."
- BLS extrapolation for the **working age population** is **254 million**
- BLS estimate for the **labor force**: 0.628 x 254 million = **159 million**
- BLS asks: "*Are you out of work but looking for work?*"
- In August 2016, **3.1%** said "Yes."
- BLS estimate for **number of unemployed**: 0.031 x 254 million = **7.85 million**
- BLS estimate for **U rate** = 7.85/159 = **4.9%**

The Unemployment Rate in the US



Problems with Measuring the Unemployment Rate



Different Definitions of Unemployment Rate

- **U3** is a useful but imperfect measure of the labor market

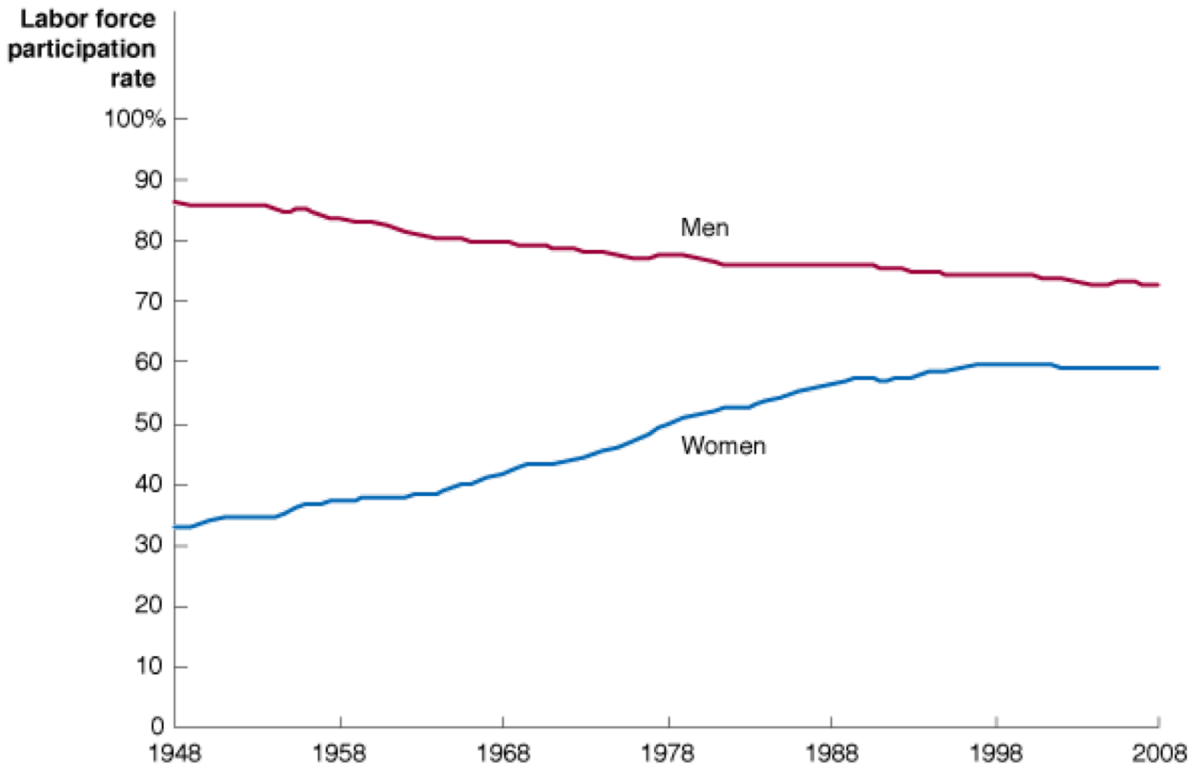
- **U6** is a broader measure
  - Available for work but not actively looking for jobs
  - Workers stuck in part-time jobs are "underemployed"

- Not all 4.4% unemployment rates are equal

	1999	2007	2017
U3 rate	4.4%	4.4%	4.4%
U6 rate	7.7%	8.0%	8.6%

Trends in Labor Force Participation

- Unemployment data also available by **demographic characteristics**
  - Age, race, sex, education
- Different groups (ethnic/educ.) have **different** unemployment rates



How Long Are People Typically Unemployed?

Duration of Unemployment

LENGTH OF TIME UNEMPLOYED	PERCENTAGE OF TOTAL UNEMPLOYED
Less than 5 weeks	35.6%
5 to 14 weeks	31.3%
15 to 26 weeks	15.7%
27 weeks or more	17.5%
(a) Duration of unemployment during an economic expansion.	
Less than 5 weeks	22.0%
5 to 14 weeks	24.2%
15 to 26 weeks	19.9%
27 weeks or more	33.8%
(b) Duration of unemployment during an economic recession.	

The Establishment Survey

- Calling and visiting 60,000 people, and asking for answers, leaves a lot of **room for error**
- The non-farm payroll tally, in its **final estimation**, is a much better descriptor of the labor market
- The problem?
  - The first estimates are **very preliminary**, with only a small sample

Recession or No Recession?

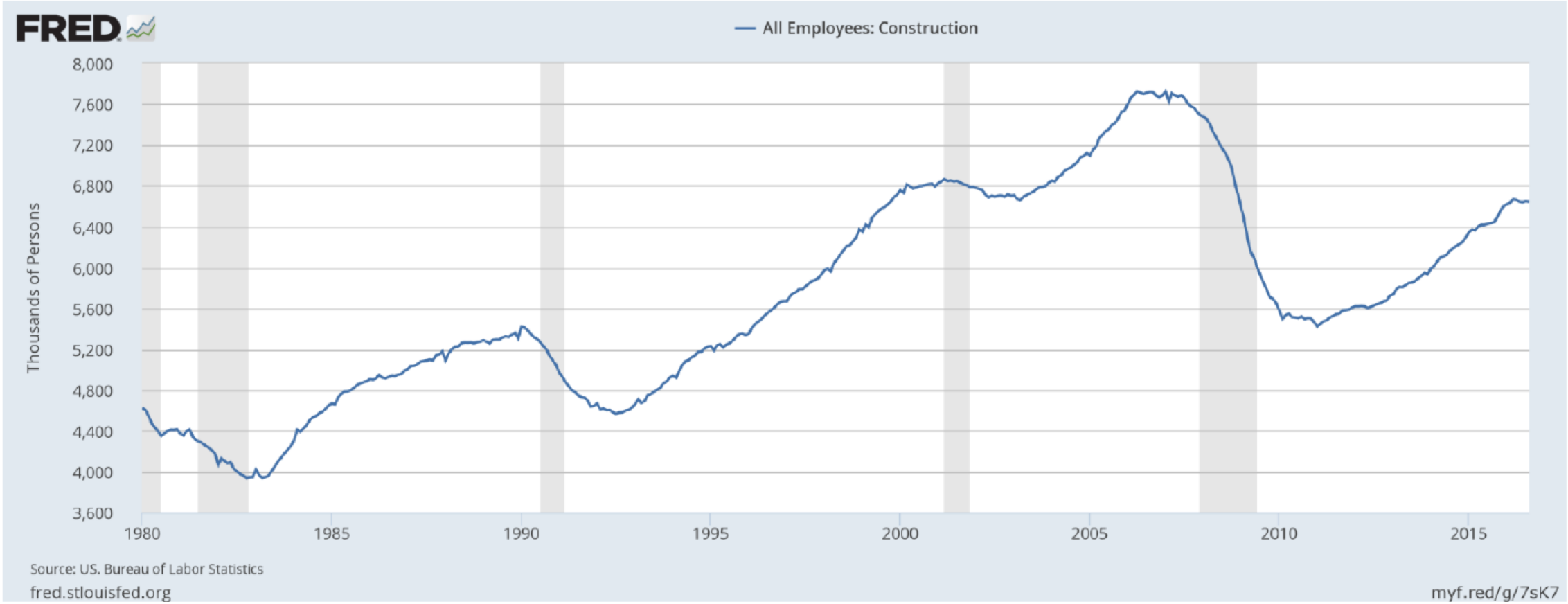
	Nonfarm Payrolls		Changes
	Original	Revised	difference
Apr-08	-20	-149	-129
May-08	-49	-231	-182
Jun-08	-62	-193	-131
Jul-08	-51	-210	-159
Aug-08	-81	-334	-253
April-August Average	-52.6	-223.4	-170.8

Payroll Surveys: Good Sectorial Breakdown

- The payrolls report provides estimates of:

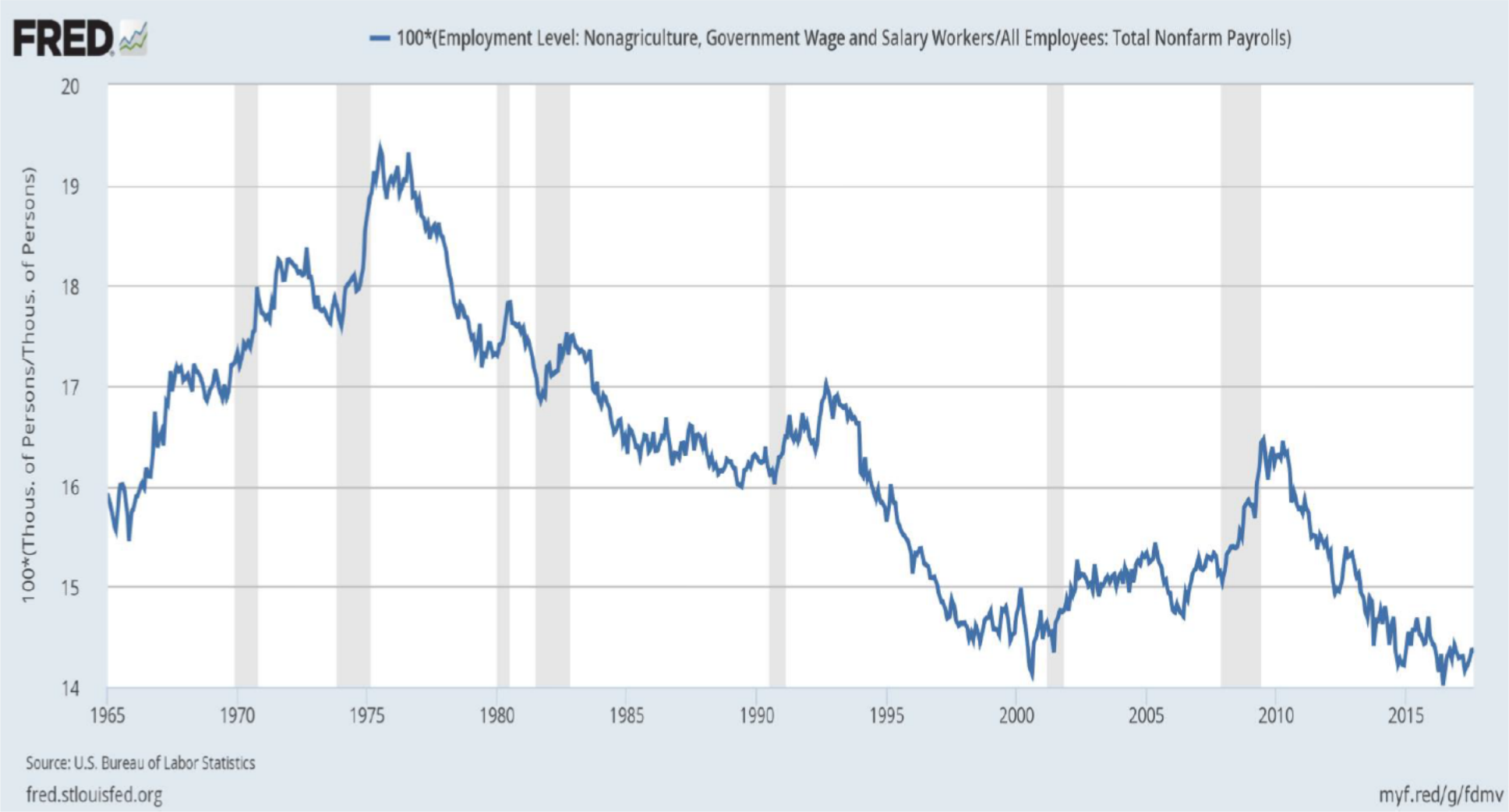
Private payroll jobs:	84.3% of total
Manufacturing jobs:	8.7% of total
Construction jobs:	4.4% of total
Private services:	70.5% of total
Government jobs:	15.7% of total

Construction Jobs: Still Depressed



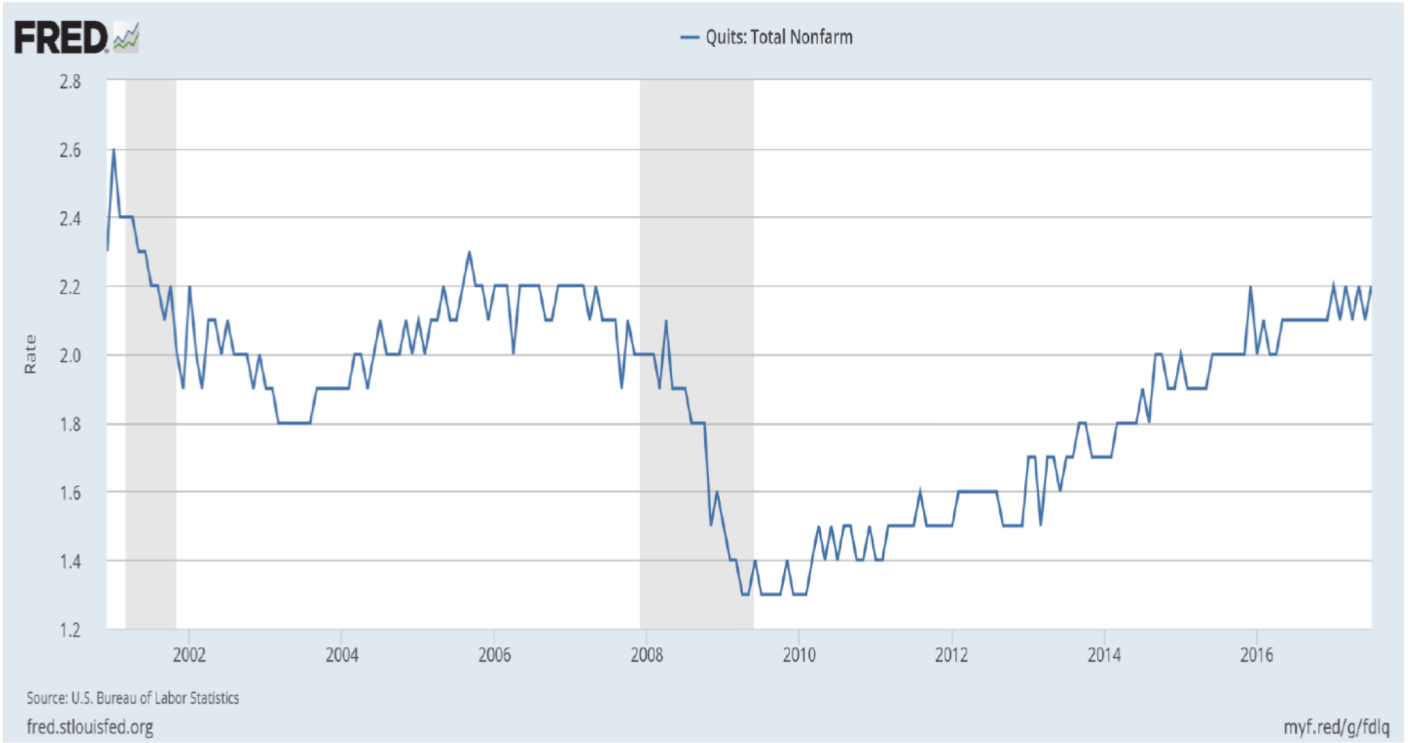
Manufacturing Job Losses: Productivity + Globalization?

Government Jobs as % of Non-Farm Workforce



A Good Measure of Labor Market Strength

- Job Openings and Labor Turnover Survey (JOLTS)
- The **quits rate** is the number of quits during entire month as a percent total employment



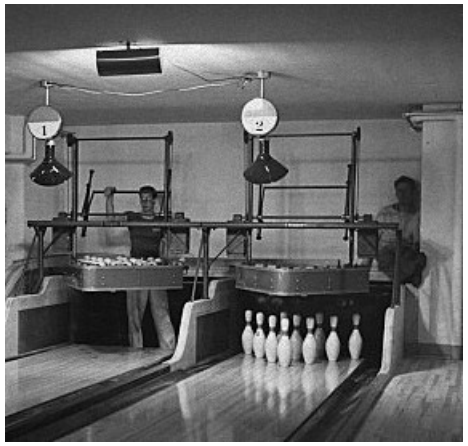
The JOLT Survey: Gross Hires and Separations

	MONTHLY HIRES	MONTHLY SEPARATIONS	HIRES-SEPARATIONS	JOB OPENINGS
	(MILLIONS)	(MILLIONS)	(THOUSANDS)	(MILLIONS)
2000	5.40	5.27	130	4.93
2005	5.32	5.04	280	4.05
2009:Q2	3.75	4.31	-560	2.36
2010:Q4	4.11	3.95	160	3.01
2015:Q2	5.09	4.87	220	5.34

Types of Unemployment

- Why the unemployment rate never falls to zero?

- **Frictional** Unemployment and Job Search
  - Matching process, seasonal unemployment ➞ seasonally adjusted
  - New worker entering the labor force, construction workers
- **Structural** Unemployment
  - Permanent mismatch between skills and requirements
  - Bowling alley pinsetter
- **Cyclical** Unemployment
  - Deviation of unemployment from its natural rate ➞ Caused by a recession



Natural Rate of Unemployment

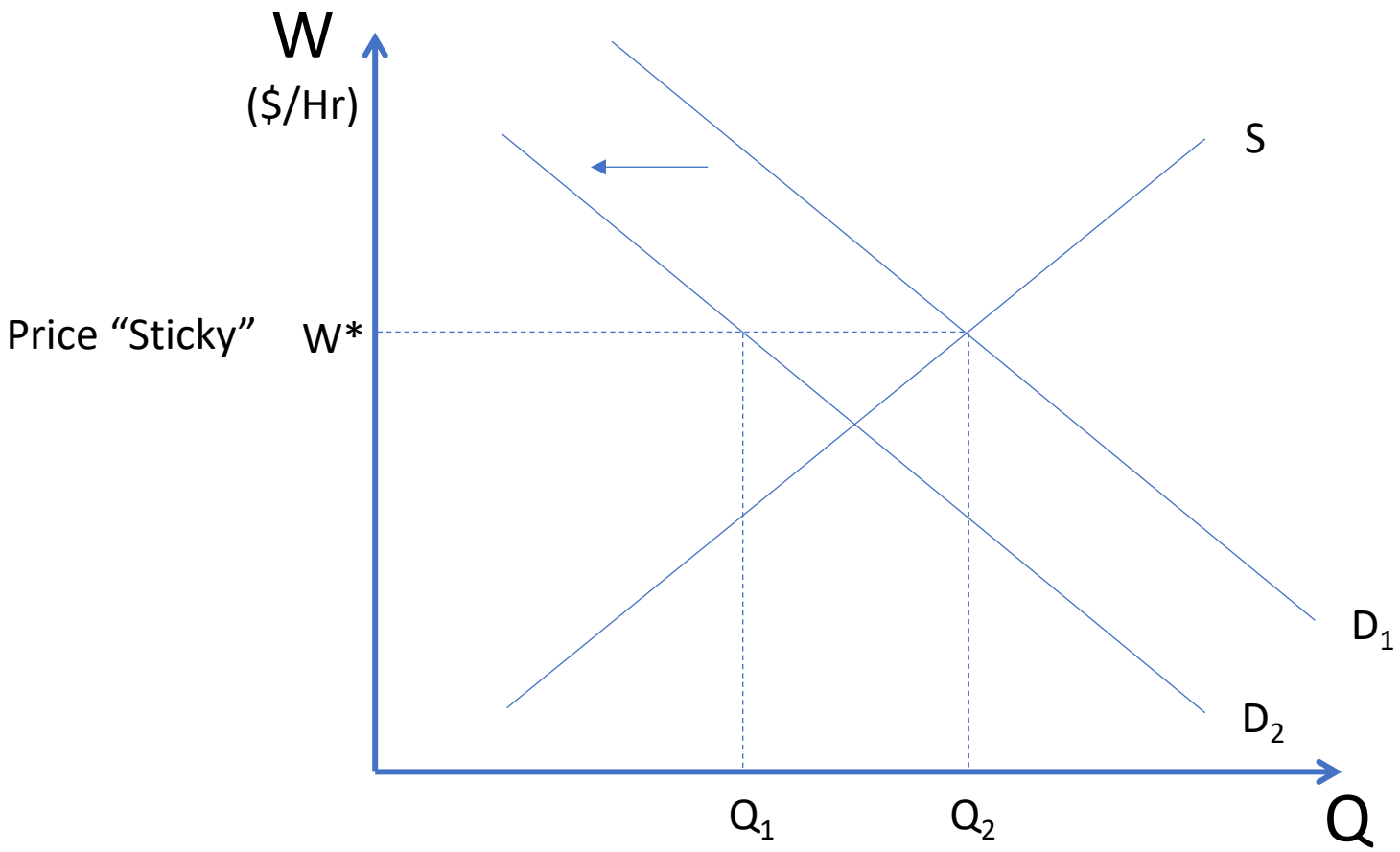
- As expansion continues, *cyclical* unemployment drops to zero but unemployment rate will not be zero, why?
- When the only remaining unemployment is **structural and frictional**, the economy is said to be at **full employment**
- The underlying level is the **natural rate of unemployment**
  - It is likely it does not remain constant over long periods (decade)
- Economists disagree on the exact value, most between 4% and 5%

Explaining (Frictional and Structural) Unemployment

- **Government policies**
  - Training programs for workers
- **Unemployment insurance**
  - Helps reduce the severity of recessions
- **Minimum wage laws**
  - Economists disagree on the amount of unemployment that has resulted
- **Labor unions**
  - Bargain with employers for higher wages
- **Efficiency wages**
  - A higher-than-market wage that a firm pays to increase worker productivity

Explaining (Cyclical) Unemployment

- **Sticky wages** go a long way to explain the boom/bust pattern in the jobs market

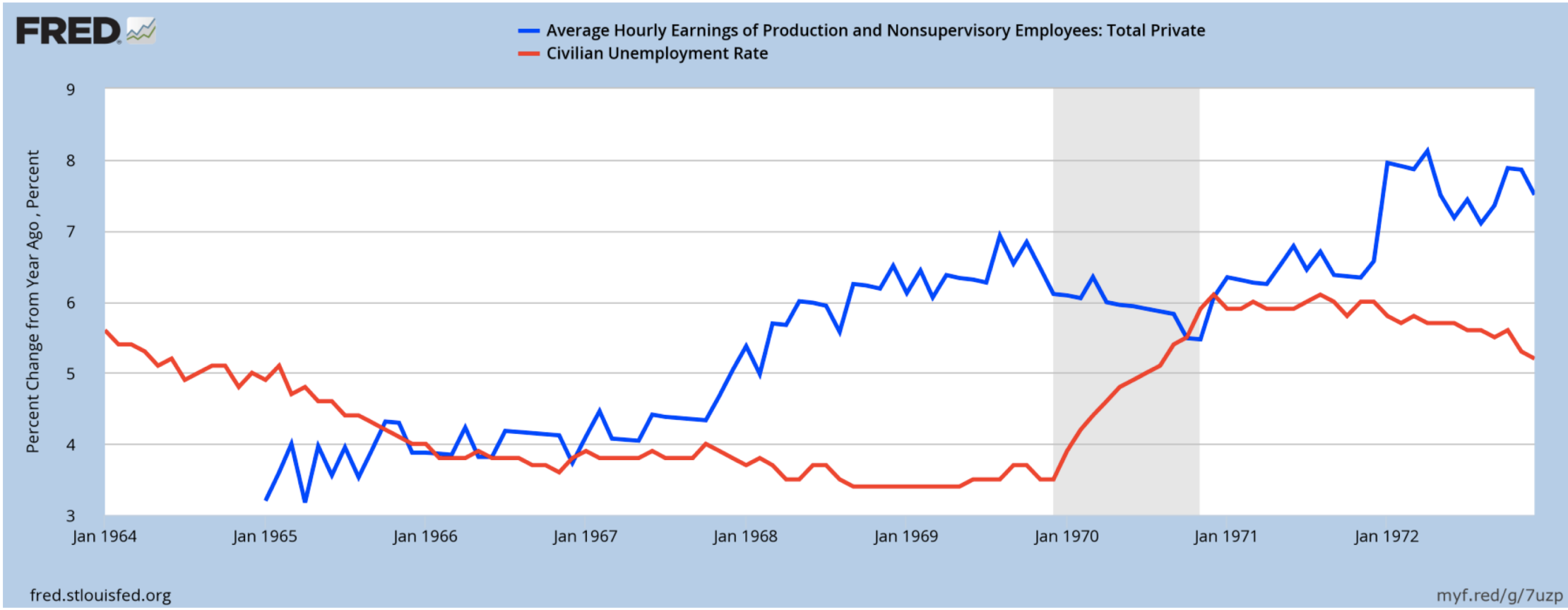


We Don’t Like High Nor Low Unemployment

- **Overheating**: Producing more than your potential, employing more than the economy’s natural rate

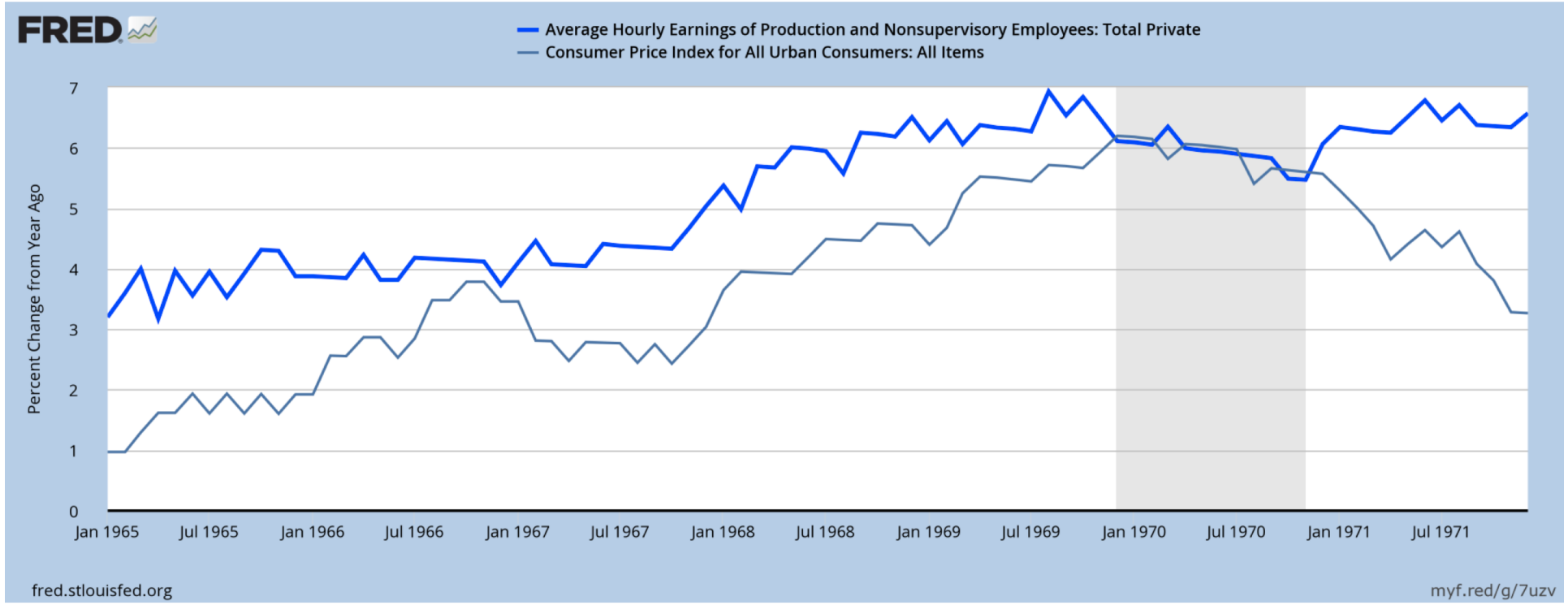
- How can too many people working be bad?

When U_t Gets Very Low, We Bid Up Wage Rates



What If We Bid Up Wage Rates?

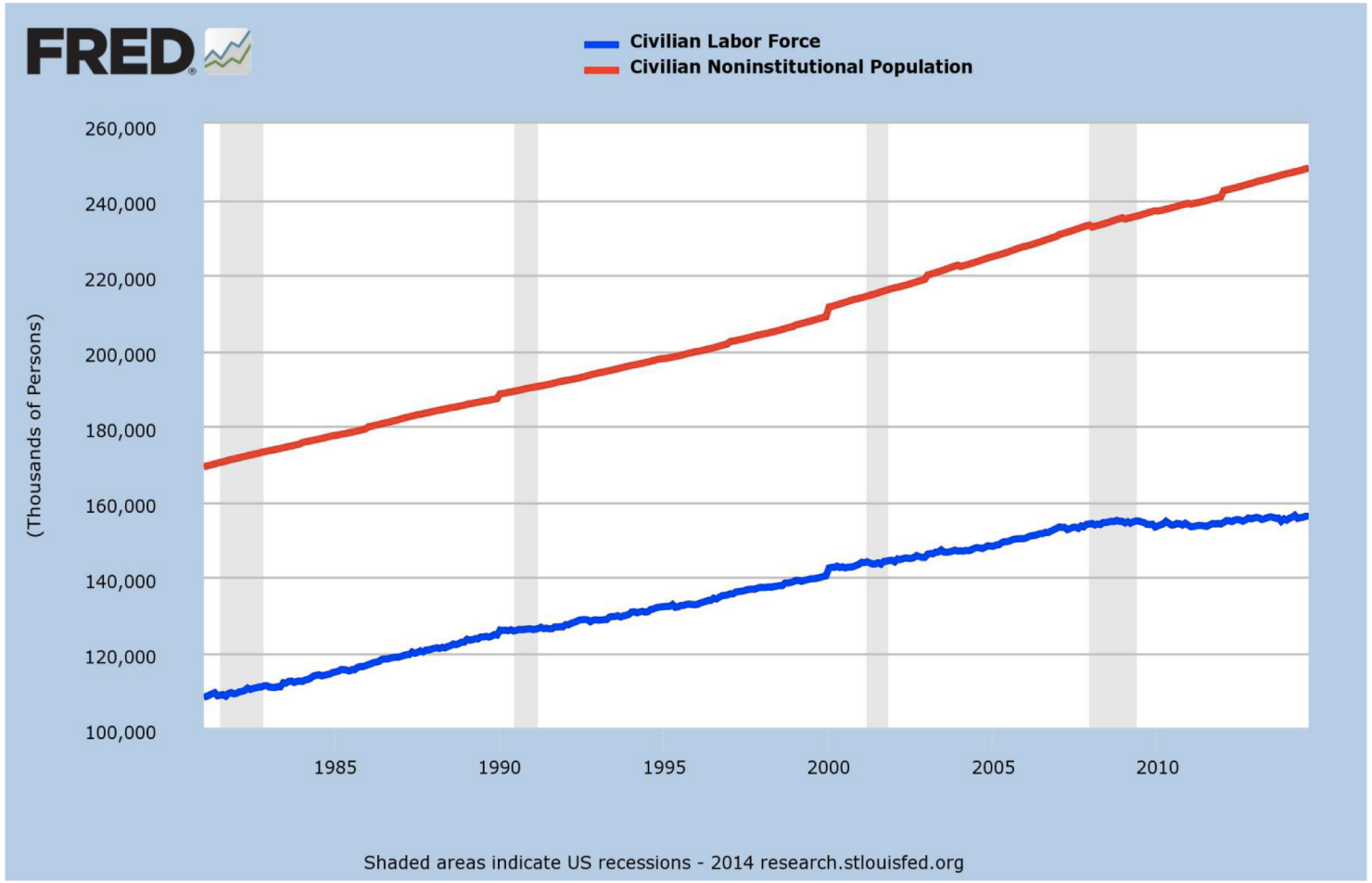
- Accelerating wage increases labor costs, so firms raise prices more quickly and inflation accelerates



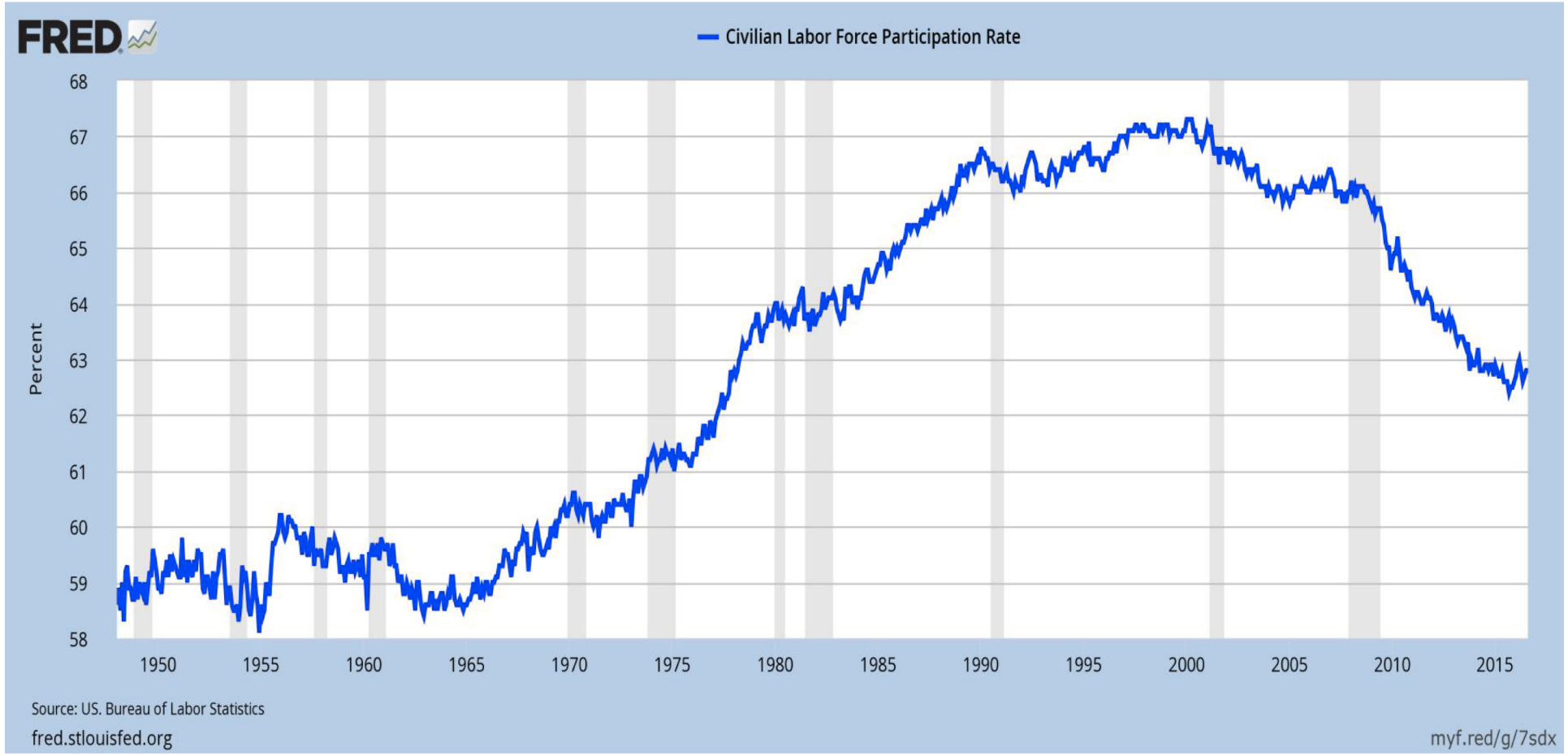
- Economists disagree on the strength of the wage-inflation link

Application

- What change is evident in this picture?



Answer: Participation Has Fallen Dramatically



LFPR By Age Cohort

	2000	2004	2014	2015	2020*
Total 16 and over	67.1	66	62.8	62.6	62.5
16-24	65.4	61.1	54.5	55.1	48.2
25-54	84	82.7	81.1	80.9	81.3
55-64	59.3	61.9	63.9	64.2	68.8
65 and older	12.5	14.5	18.3	19.0	22.2
*BLS Forecast					

Why Is This Important?

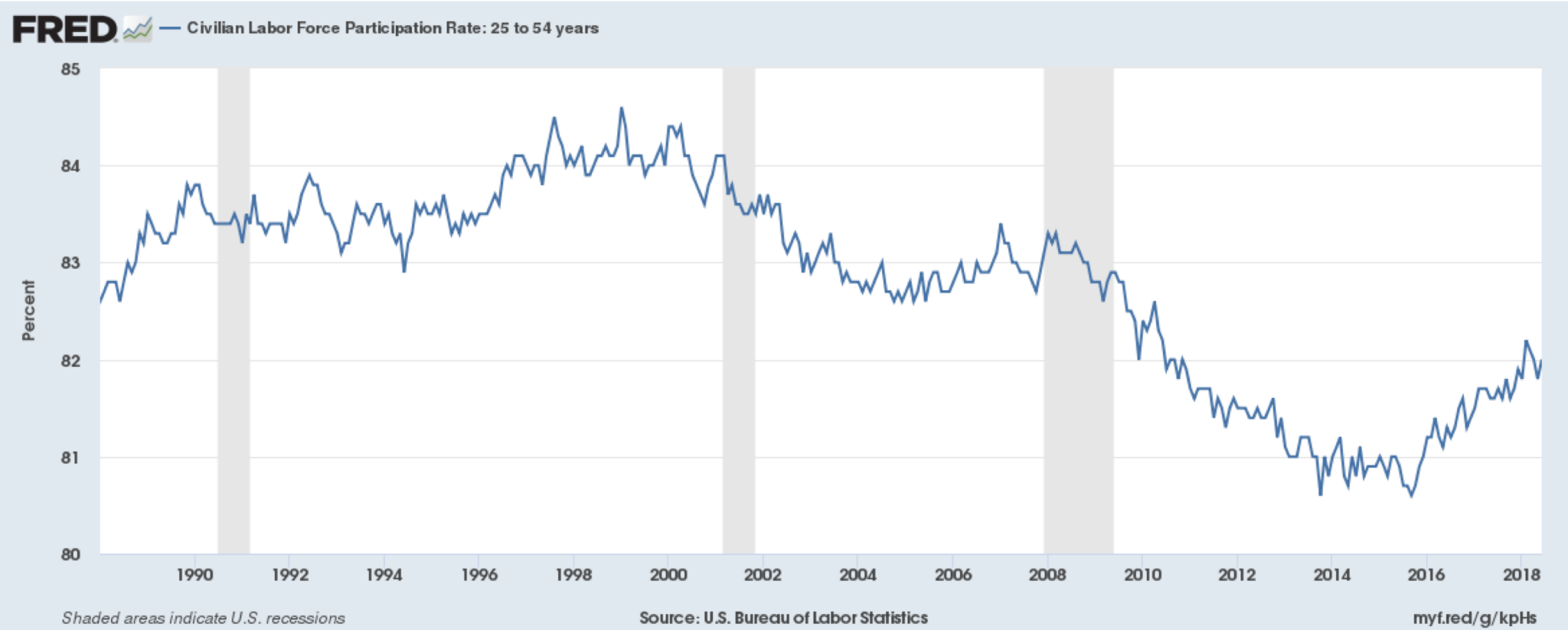
	gains for non-farm payroll employment[1]	gains for household employment[1]	gains for household labor force[1]	jobless rate	labor force participation rate
8/14 to 8/15	238,000	193,000	58,000	6.2% to 5.1%	62.9% to 62.6%
8/15 to 8/16	204,000	198,000	183,000	5.1% to 4.9%	62.6% to 62.8%

1 monthly average

- Despite a comparable job growth, why U_t declined so much?
  - Change in performance for the LFPR
- In 2015, some economists feared a jump in inflation
  - Population growth of 1% but LF growing by **less** → aging population
  - So 200,000 per month climb for employment → U_t sharply lower
- If wanted to stabilize U_t at 4.5% → big **SLOWDOWN** for jobs growth

But Good News on Participation

- Prime age workforce is mounting a rebound for LFPR



How Much Room Is There to Grow?

- In 2016, the prime age (25-54 yr) workforce participation rate registered its first year of rebound since the onset of recession

- This propelled a rise for the *overall* participation rate, and a healthy rise in the labor force

- If the rebound in participation rates continue, possible to support more years of 100,000-200,000 per month jobs gains before U_t falls dramatically further

A Challenge for Policy Makers

- U_t has fallen to 4% from 10% since the peak in 2009
  - **Part-time employment** explains some of the decline
  - **Falling participation** explains some of the decline

- Some argue that weak job growth reflects demographic and schooling changes
  - We only need modest job growth, so **no more** stimulus is needed

- Others argue that weak job growth reflects the fact that large numbers of workers have given up looking
  - Therefore, weak jobs growth numbers suggest we need **more** stimulus

Application: Forecasting Job Gains

- We need to forecast:
  - Working-age population ➞ Distribution of population by age cohorts
  - What percent of the population will be in the labor force?
  - What percent of the population will be employed vs unemployed?

- What drives population?
  - (Births – Deaths) + (Immigrant arrivals – Emigrants exits)

- Let's assume net immigration inflows are zero

BLS Population Forecast

		BLS		
		pop growth		Population
	2016 population	forecast	2026 Population	Growth
16 and over	253724		276896	23172
16-24	38469	-0.28%	37405	
25-54	125675	0.32%	129755	
55-64	41378	0.32%	42721	
65 and over	48202	3.35%	67015	

If We Assume No Change in the LFPRs

				Labor Force	
		Labor force	2026 Labor force	Growth	2026 total
	2016 LF	2016 lfpr	assume steady LFPR		LFPR
16 and over	158757		166018	7261	60.0%
16-24	21197	55.1%	20611		
25-54	101944	81.1%	105254		
55-64	26369	63.7%	27225		
65 and over	9299	19.3%	12928		

- BLS suggests 23 million population gain but only 7.3 million gain for the labor force, why?
  - There is nearly 19 million increase in people over 65

How Many Net New Jobs?

- Let's assume an unemployment rate of 4.4%
- Therefore, over 10 years

$$\text{Net New Jobs} = 0.956 \times 7.261 = 6.9 \text{ million}$$

- Way less than Trump Administration's goal of 25 million jobs over 10 years

Another Scenario

- Let's use LFPRs maximum recorded values for all age cohorts

	LFPR 2016	LFPR 2026 assume maximum for each age cohort	**2026 Labor force** assume maximum for each age cohort	**Labor Force Growth**	**2026 total LFPR**
16 and over	62.6%		175141	16384	63.3%
16-24	55.1%	66.0%	24688		
25-54	81.1%	84.4%	109513		
55-64	63.7%	65.4%	27940		
65 and over	19.3%	19.4%	13001		

- Leaving U3 at 4.4% yields

  Net New Jobs = 0.956 x 16.384 = 15.663 million

- Better but still well below 25 million

Conclusion

- We could allow for even higher LFPRs and lower unemployment rate to try to get a better picture than 6 million
- But 25 million seems nearly impossible
- Only if you embrace widespread welcoming of immigrants!

Application: The Government Deficit Problem?

- Decades ago it was agreed that retirees deserve Medicare and social security
- No one count on them living so long
- As baby boomers retire, they are promised benefits
- Plus health coverage?
  - Health costs have relentlessly risen, relative to other costs in the economy

What Do Demographics Do to Size of the Budget Deficit?

- 100 million population in 2020
- 16-64 population: 80 million — 16-64 LFPR = 80%
  - Will remain stable
- ≥65 population: 20 million — 65 LFPR = 25%
  - Will grow 10 million over 10 years
- U = 10%

- Revenues = $1,000 x (# of employed)
- Payments = $3,000 x (≥65 population)

Economy in 2020 vs in 2030

- What is the LFPR?
- What it the labor force?
- How many people unemployed?
- How many people employed?

The Government Budget in 2020 vs 2030

- Revenues = $1,000 x (# of employed)
- Payments = $3,000 x (≥65 population)
- Revenues – Payments = Balance (Surplus or Deficit)

- Revenues?
- Payments?
- Balance?

What Might Be Done to Avoid This Calamity?

- We can raise taxes to raise revenues
  - Risk?
  - Adversely affect the economy
- We can cut payments to oldsters
  - Issue?
  - Fairness/social equity
- A program for young immigrants?

Long Run Economic Growth

Technological Change Battles Resource Scarcity

Outline

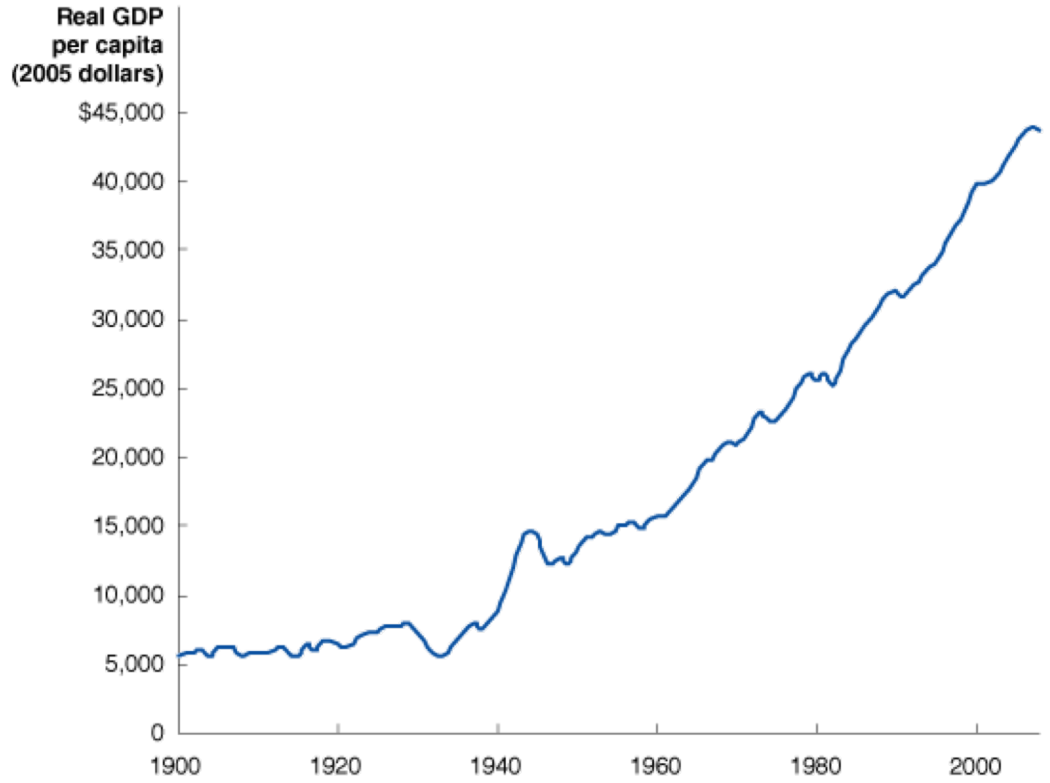
1. Productivity
2. Technological Change
3. Potential GDP

- Textbook Readings: Ch. 10 pp. 318-328, Ch. 11

From Macro Statistics to Macro Models

- Macro variables **quantify** the performance of the economy
- Decisionmakers use them to **monitor** changes in the economy and formulate **policies**
- Economists use them to develop and test **theories** about how the economy works
  - **Models** that explain how the variables are determined and how policy affects them

Output Growth: The Reality Since Industrial Revolution



- **Income/capita**
  - has been rising over most of modern history
  - vary significantly across countries and over time

The Malthusian Dilemma

- Thomas Malthus (1826) suggested that **population growth will strain the natural resources** necessary to produce food
  - No more new land to cultivate, population growth pushing for more food
  - Starvation will curtail population in this world of diminishing returns

- **Technology and the entrepreneur**: The antidote to the Malthusian dilemma

Example: Farming Trends in the U.S.

	1948	2004
output (Y)	100	270
labor input (L)	20	5
output per hour (Y/L)	5	54

- U.S. farm output **grew 1.8%** per year
- U.S. farm labor **contracted 2.5%** per year
- Thus U.S. farm **output is 2.7 times higher**
- U.S. **labor input is 75% lower**

From Farming Trends to A Labor Productivity Measure

			annualized
	1948	2004	growth rate
output	100	270	1.7%
labor input	20	5	-2.0%
output per hour	5	54	4.4%

Output Growth: Evaluating the Drivers

- Growth in population [and net immigration] generally drives the **labor force** higher
- As **labor's input** rises, output rises
- Growth in output/capita –growth in Y for a given labor input– is driven for the **quality of the labor input**

What Determines the Rate of Long-Run Growth?

- A country's standard of living depends on its ability to **produce** G&S

- Increases in real GDP/capita depend on increases in **productivity**!
  - Labor productivity: Quantity of G&S produced in one hour of work
  - Why the standard of living in Denmark is higher than in Nigeria?
  - Why the standard of living in Japan has grown faster than in Argentina?

- **Economic growth**: The process by which rising productivity increases the average standard of living
  - What causes labor productivity to increase?

How Can We Make Laborers' Input More Productive?

- We can **train and educate** laborers (human capital)
  - Knowledge and skills that workers acquire (high school vs college)
- We can give them **more tools** (physical capital)
  - Increase the capital stock (computers, trucks, factory buildings)
- We can invent **better tools** (technological change)
  - Technology: Process a firm uses to turn inputs into outputs
  - Technological change: Increase in quantity of output produced using a given quantity of inputs

Economic Growth Model

- Model **explains** growth rates in real GDP/capita over long run

- We looked at increases in real GDP ***per hour worked*** (Y/L) and increases in capital ***per hour worked*** (K/L)

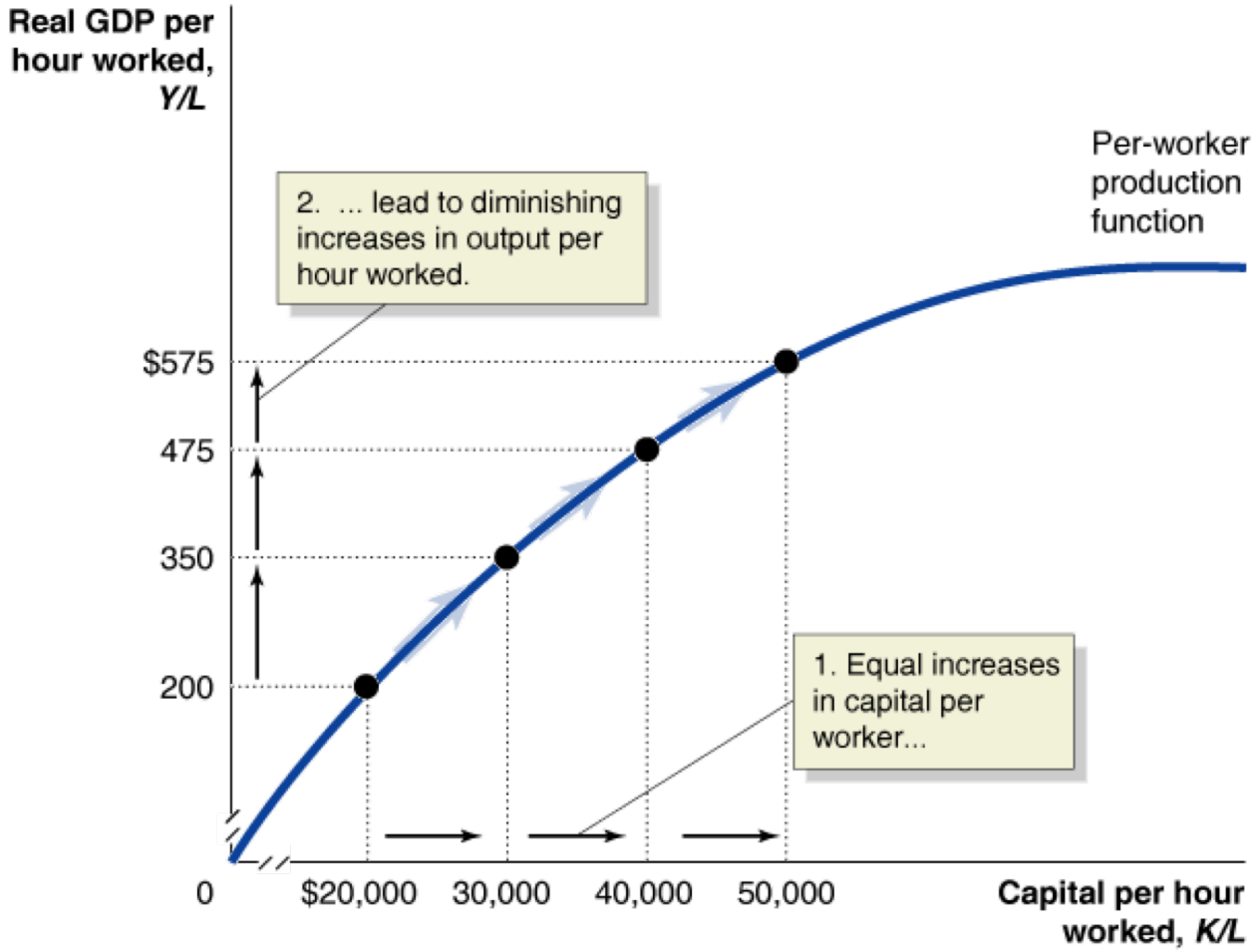
- We illustrate the economic growth model using the **per-worker production function**
  - Relationship between K/L and Y/L, holding the level of technology constant

Capital Deepening: Diminishing Returns

	original company	investment round # 1	investment round # 2	investment round # 3
Number of workers	4	4	4	4
Number of machines	2	4	8	10
Number of lawns mowed	5	8	10	10.05
capital/worker	0.5	1.0	2.0	2.5
output/worker	1.25	2.00	2.50	2.51

Capital Deepening: Great Source of Developing World Growth

The Per-Worker Production Function



Why Are There Diminishing Returns to Capital?

- When workers already have a large amount of capital to produce G&S, if they are given an additional unit of capital, their productivity increases only a little

- **Implications** of diminishing returns to capital:
  - Increasing the saving rate (and so K) increases growth **temporarily**
  - **Catch-up**: **Income per capita in poor countries will grow faster** than in rich countries

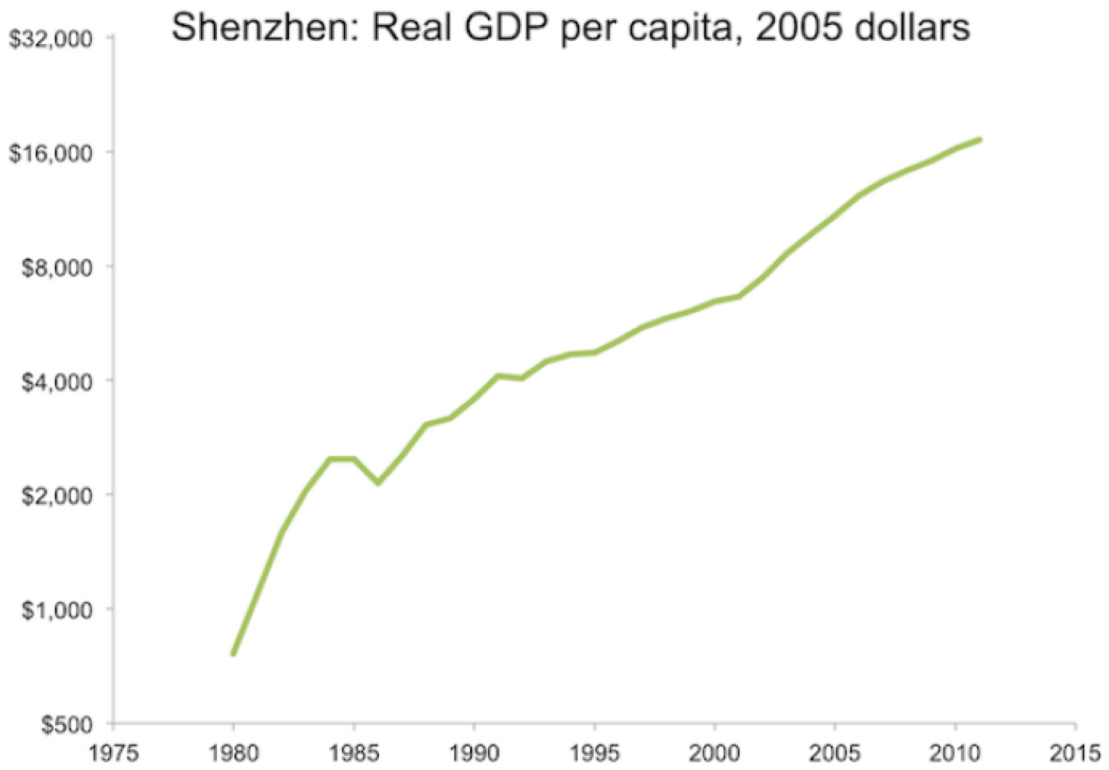
Paul Krugman and the Asian Miracle

- In 1990s, fascination with booming **Asian Tigers**: Korea, Taiwan, Hong Kong, Singapore, Thailand
- The Asian Tigers were **growing at 5% to 6%** per year, and Wall Street gurus declared they had a 'new model' for growth
- 'No!' said Krugman. They are simply **capital deepening**
- Once they **catch-up** to Western K/Y ratios (once they have the same machines per worker that the Western laborers have) their growth rates will slow sharply and they will look like the West
- What happened? The **Tigers caught up** and the **Tigers slowed**!

Capital Deepening in China

- It offered opportunities for catch-up growth

  1980-1985 ➞ 23%/year, 1985-2011 ➞ 7%/year



More Capital or Technological Change?

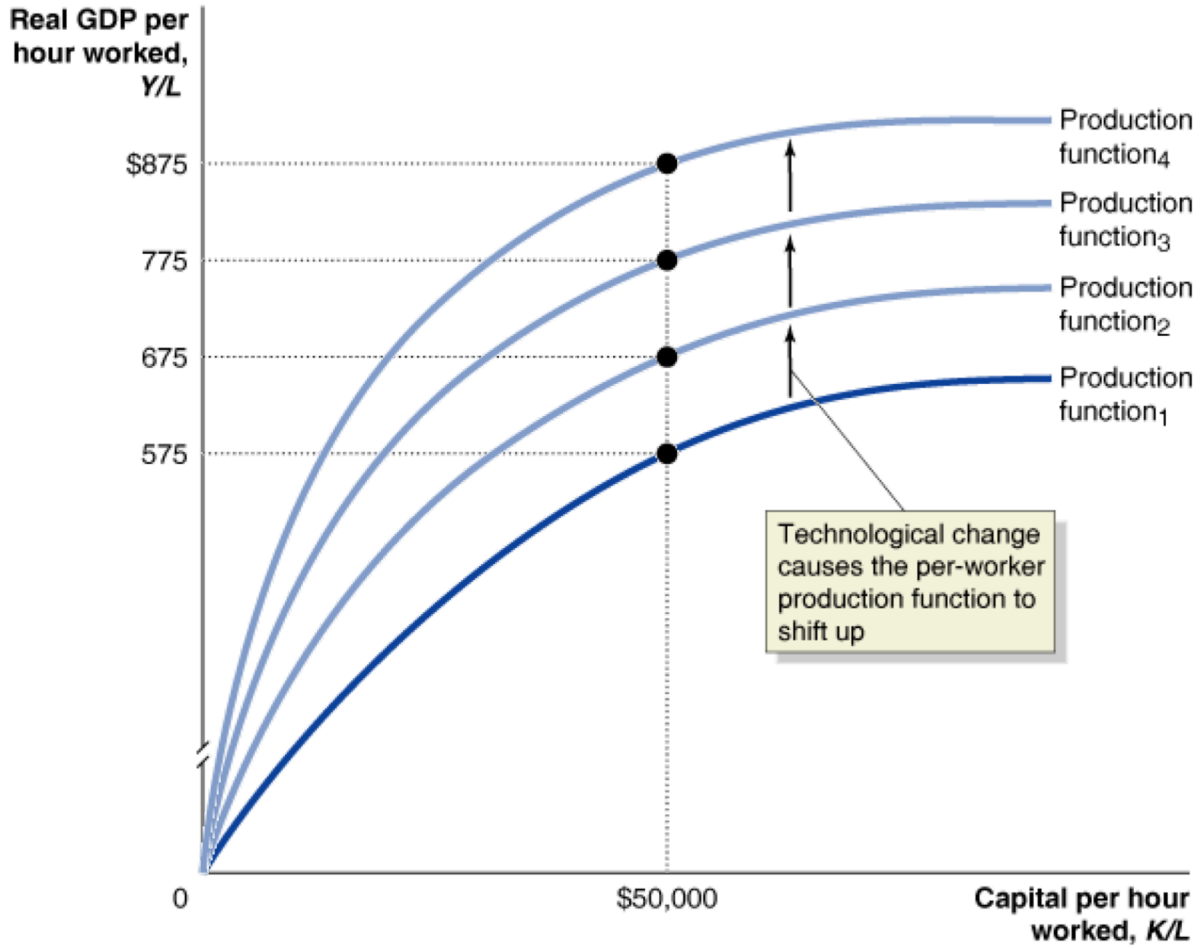
- Just accumulating more inputs **does not** ensure more production
  - Capital deepening works for developing countries
  - What about advanced countries? Is cap. dep. only way to sustain growth?

- If a country is relatively **lacking in capital**, increase in capital will be very effective at increasing real GDP per capita

- In countries where the amount of **capital is already high**, technological change becomes a more effective way to increase output per hour

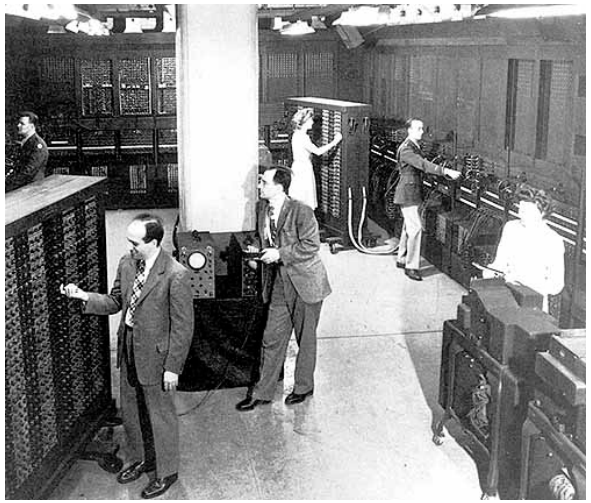
The Key to Sustaining Economic Growth

Technological Change



Technological Change

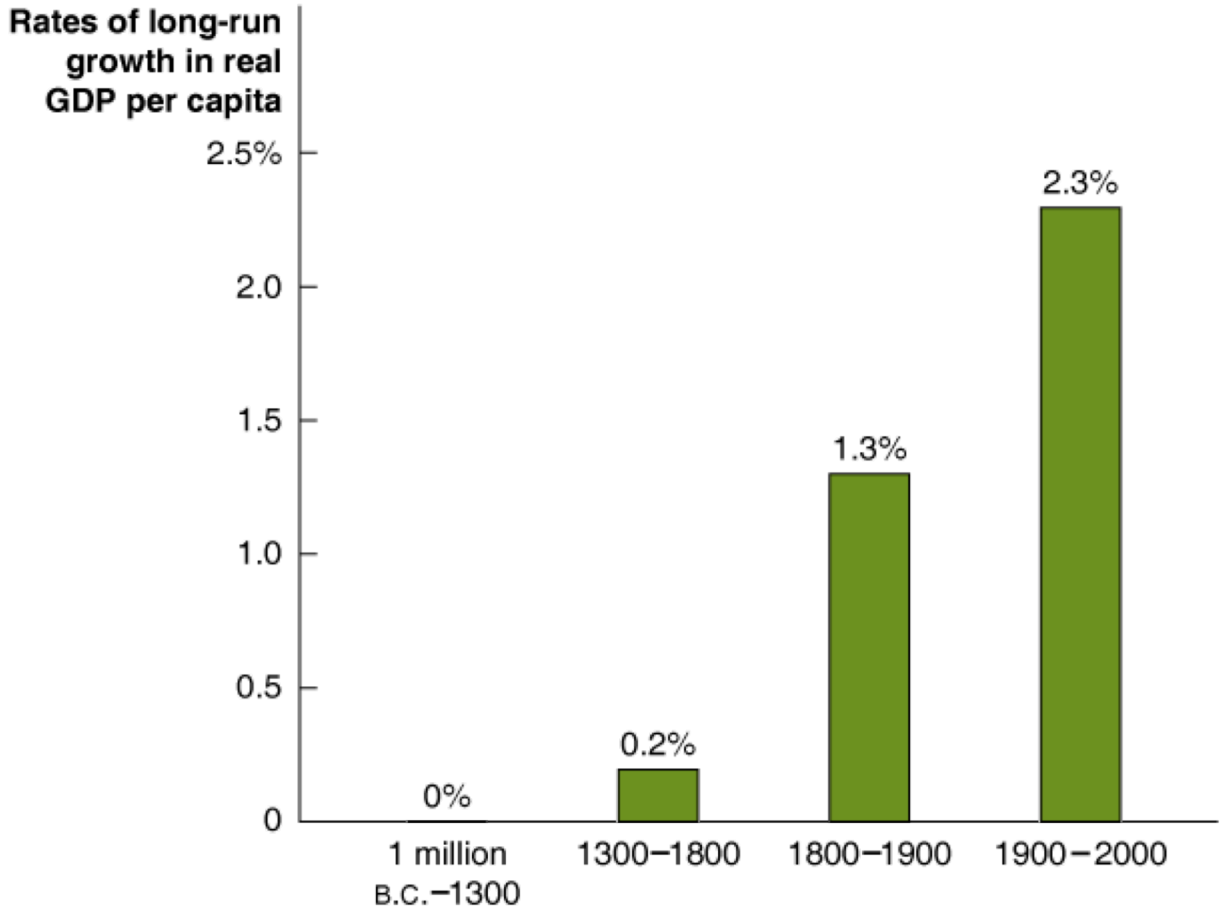
- **Technological change** helps economies **avoid** diminishing returns to capital
  - Efficiency of Capital: Not more machines—smarter machines



- **Solow growth model** (1954): Once capital deepening is done, **technological innovation drives productivity** and growth

Economic Growth from 1,000,000 B.C. to the Present

Average Annual Growth Rates for the World Economy



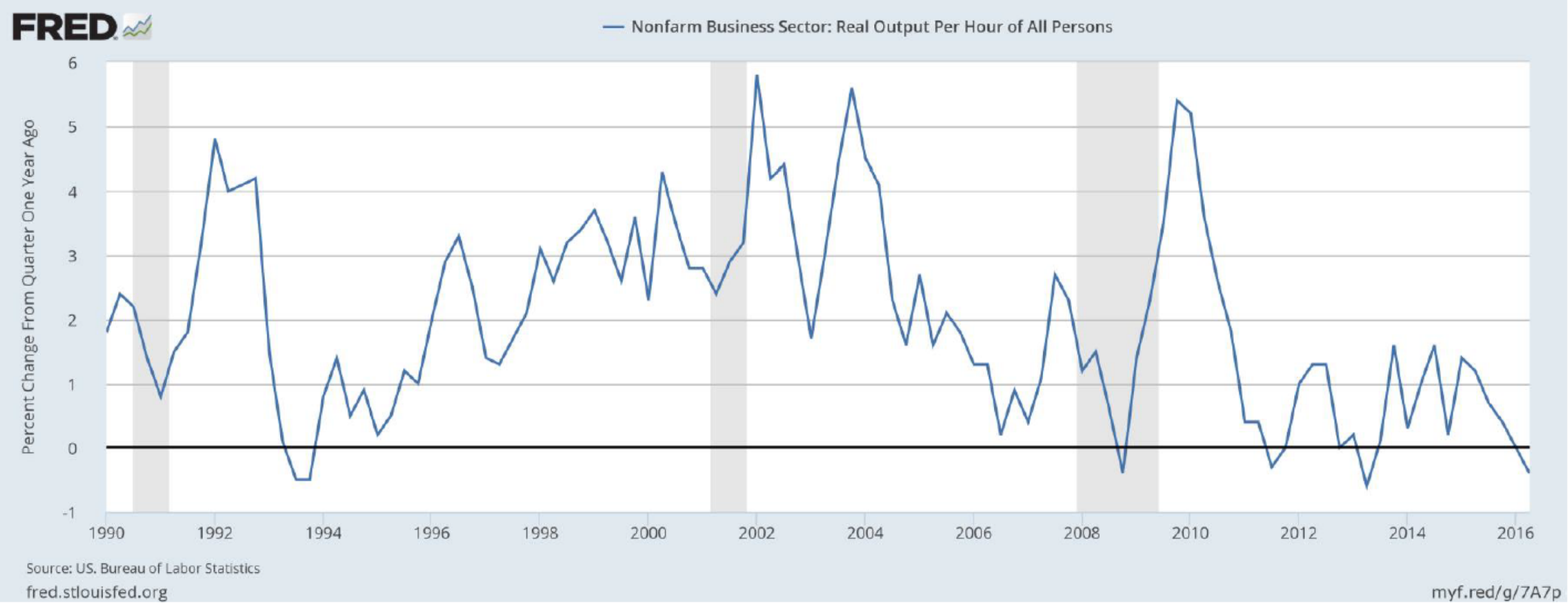
U.S. Labor Productivity: 200 Years of History

	Average Annual Productivity Growth	Percent Due To Technological Advance	
	(Percent %)		
1800-1855	0.4	51	
1855-1890	1.1	35	Industrial
1890-1929	2.1	69	Revolution
1929-1966	2.5	83	Motor Vehicle Age
1966-1989	1.2	54	
1990-1995	1.6	33	
1995-2007	2.7	54	Information Age
2007-2011	2.0	25	Big Cyclical Squeeze

Deconstructing Recent US Productivity Performance

	1987-2015	1995-2000	2000-2007	2007-2015	2014-2015
OUTPUT PER HOUR	2.0	2.9	2.6	1.2	0.6
CAPITAL DEEPENING	0.8	1.2	1.0	0.5	0.1
LABOR COMPOSITION	0.3	0.2	0.2	0.3	0.3
MULTI-FACTOR PRODUCTIVITY	0.9	1.5	1.4	0.4	0.2

Labor Productivity Growth

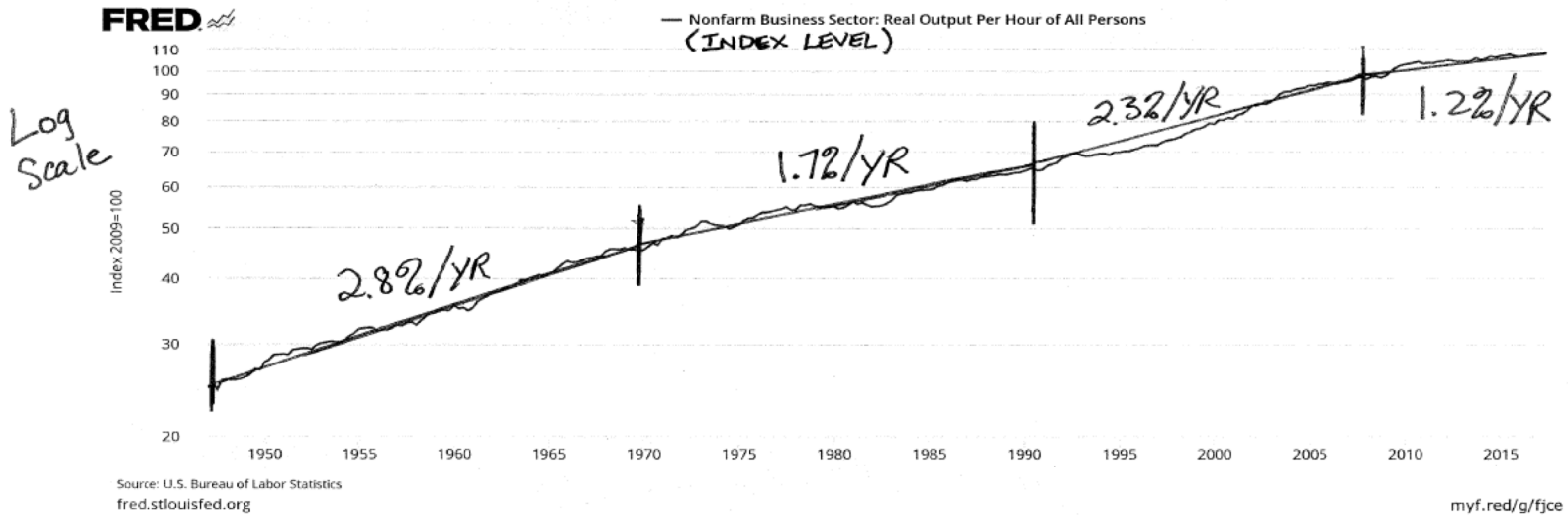


Labor Productivity

- Labor productivity = How much stuff you make per hour of work effort
- Labor productivity = Output/hour
- If everyone can produce 25% more per hour, then we will have 25% more stuff to spit

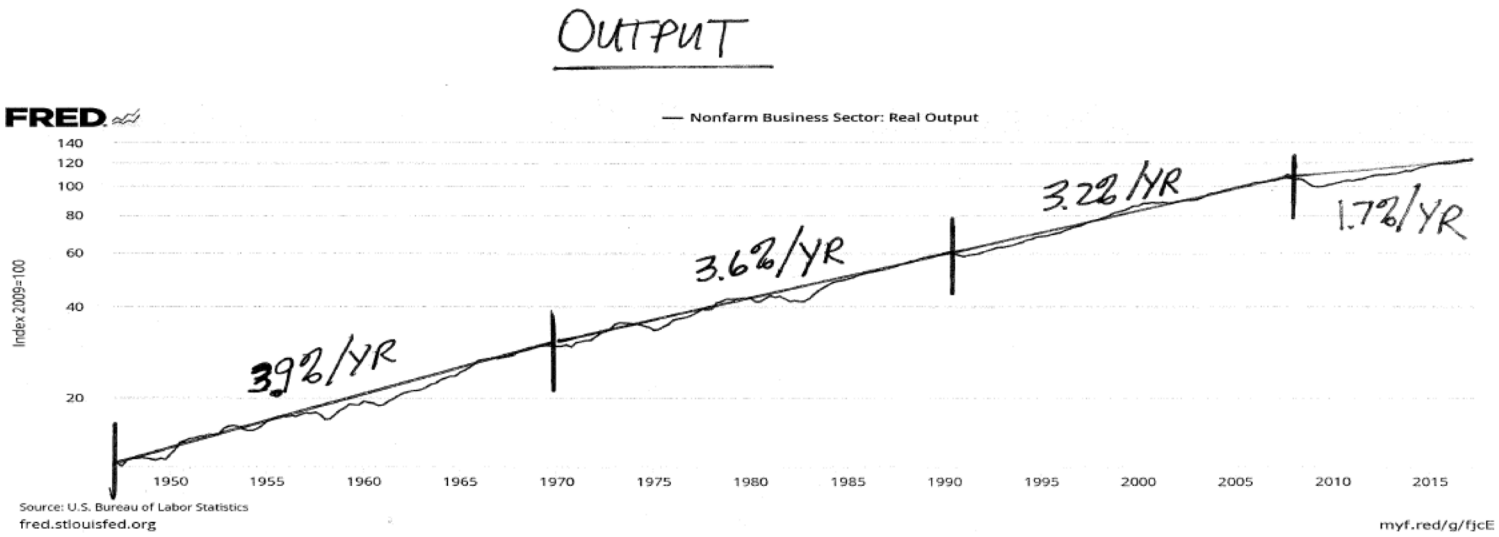
US Post-WWII Labor Productivity

Output/Hour



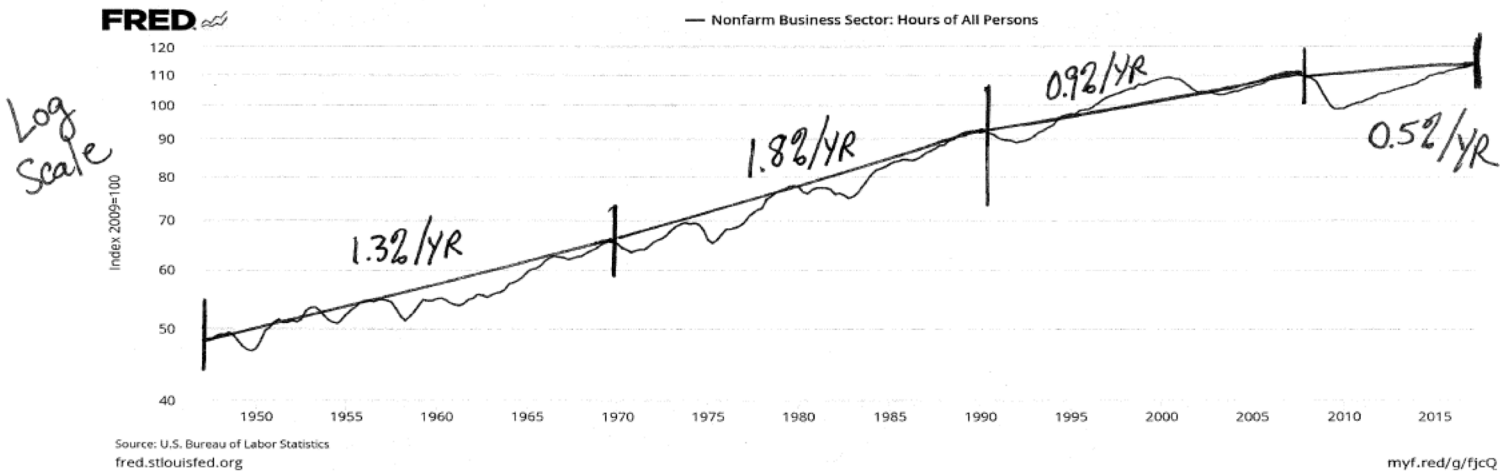
$\frac{Q2:2017}{108.1}$ $\frac{Q2:2008}{97.2}$ $\left(\frac{108.1}{97.2}\right)^{(\frac{1}{9})}$

US Post-WWII Output



US Post-WWII Total Hours

TOTAL HOURS



Average Workweek ≡ # of hours, on average, workers were on the job

Number of workers → Non-farm payroll level

(Average workweek) X (Number of workers) = TOTAL HOURS WORKED

[INDEXED: 2009 value is set equal to 100]

Summary Table

	1947:Q2 through 1970:Q2	1970:Q2 through 1990:Q2	1990:Q2 through 2008:Q2	2008:Q2 through 2017:Q2
$\frac{OUTPUT}{HOUR}$	2.8%/YEAR	1.7%/YEAR	2.3%/YEAR	1.2%/YEAR
REAL OUTPUT	3.9%/YEAR	3.6%/YEAR	3.2%/YEAR	1.7%/YEAR
TOTAL HOURS	1.3%/YEAR	1.8%/YEAR	0.9%/YEAR	0.5%/YEAR

ROW GDP/Capita 1960-2011: Success Stories Closed Gap

	U.S.A.	KOREA	IRELAND	FRANCE	AUSTRALIA
Real GDP Per capita In 1960	$15,000	$2,000	$6,000	$10,000	$15,000
Annualized Real growth 1960 to 2011	1.8%	5.5%	3.1%	2.2%	1.9%

ROW GDP/Capita 1960-2011: Success Stories Closed Gap

	U.S.A.	KOREA	IRELAND	FRANCE	AUSTRALIA
Real GDP Per capita In 1960	$15,000	$2,000	$6,000	$10,000	$15,000
Real GDP Per capita In 2011	$37,250	$30,650	$28,500	$30,300	$39,200

Post-WWII ROW Stagnation Stories

	Niger	Venezuela	Columbia	Argentina
Real GDP Per capita In 1960	$1,000	$7,000	$4,000	$6,000
Annualized Real growth 1960 to 2011	-1.1%	1.1%	2.1%	1.8%

Secular Stagnation: A Fear that Grips the World

- Global growth has been very weak following the 2008-2009 Great Recession
  - US real GDP growth has been weak
  - Japan, after its financial market crisis 1989-1990, has been locked in slow growth
- Are the US and the ROW trapped in a long term slow growth zone?
- Or are there policies that can return higher growth rates?

If Stagnation Persists, Is It Supply or Demand?

- Many Keynesians say **Demand**
  - The world is saving too much: households, firms, governments
  - We face a global paradox of thrift: consumer spending, corporate investment and government investment are all weak

- Many GOP Conservatives say it is from curtailed **Supply**
  - Regulatory excesses stifle risk taking
  - High corporate tax rates stifle investment
  - Productivity is weak due to these government interventions

Why So Much Worry About Growth Rates?

- How long does it take to double the flow of output?

- A rough rule for growth rates

  Divide the growth rate into 70

• **2% growth**	70/2 = **35 years**	$(1.02)^{35} = 2$
• **3.5% growth**	70/3.5 = **20 years**	$(1.035)^{20} = 1.99$
• **5% growth**	70/5 = **14 years**	$(1.05)^{14} = 1.98$

Paul Romer on the Magic of Compounding

- How many squares on a chessboard?
  - 64
- How many white squares?
  - 32
- Place a penny on the first square, 2 pennies on second, 4 pennies on the third, …
- How many dollars on the 32 white square?

$21,474,836

64 Squares Like 64 Years of Adult Life

- A penny doubled each white square is a world in which output doubles every two years
- How does that compare to a world in which output doubles every year?
- Year 33, we double **$21,474,836**
- We continue to double squares 34, 35, …, 64
- How many dollars on the 64th square?

$92,233,720,368,547,800

($92 quadrillion)

Prospects for Future Productivity

- Robert Gordon: **Great inventions** (electricity, urban sanitation, combustion engine, modern communication) **belong to the past**

- Brynjolfsson and McAfee: During "first machine age" (Ind. Rev.) → physical power (ie. internal combustion), whereas **second machine age** (now!) characterized by "**mental power**" (i.e. big data, AI, etc.)

Robert Gordon: The Good Times Are Over

- The economy over the next 25 years will have room to grow only **1.5%** per year
- The 1.5% growth rate is for **potential GDP**
- It is not that demand is too weak
- We simply won't have the capability to grow faster

What Does the Data Say?

	1995-2007	2007-2015
LABOR PRODUCTIVITY	2.4%	1.2%
CAPITAL INTENSITY	0.9%	0.5%
LABOR COMPOSITION	0.3%	0.3%
MULTIFACTOR	1.2%	0.4%

R. Gordon: The Prospects for Very Weak Growth

- Labor productivity prospects are weak
  - For 500 years we had slow productivity
  - For 100 years we had strong productivity
  - We have run out of stuff to invent
  - Look for a return to low productivity
- The economy confronts four headwinds:
  - Demographics
  - Education
  - Inequality
  - Government debt

R. Gordon: The Drag from Demographics

- US growth of 3.5% reflected strong growth in the labor force
- Labor force growth involved women entering the workforce and elders working longer
- Prime age workforce participation is in retreat
- Conclusion? 0.4% growth in labor force, this reduces potential GDP growth by nearly 1%

R. Gordon: The Drag from Inequality

- Salaries for CEOs and celebrities march ever upward

- Below the 90th percentile, corporations
  - Work overtime to reduce wages
  - Reduce benefits
  - Convert defined benefit pension plans to defined contribution
  - Use Obamacare as an excuse to convert full-time jobs to part-time status

William Nordhuas Review of Gordon's Book

- Real GDP per capita misses a great deal
  - Candles to light bulbs to LEDs
  - Abacus to slide rule to calculator

- Also misses
  - Pollution
  - Geo-politics
  - Social cohesion

Imagine Gross Social Welfare per Capita

- Gross Social Welfare/Capita =
  - GDP/Capita +
  - Gross changes in distribution of GDP/Capita +
  - Gross changes in geo-politics and risk of war
  - Gross changes in environmental conditions
  - Gross changes in the social civility of societies

Did per Person Growth Over History Speed Up or Down?

PRODUCTIVITY GROWTH RATES FOR LEADING COUNTRIES

Lead Country	Interval	Annual Average Compound Growth Rate of GDP per Man-Hour (%)
Netherlands	1700–1785	−.07
United Kingdom	1785–1820	.5
United Kingdom	1820–90	1.4
United States	1890–1979	2.3

SOURCE.—Maddison (1982).

Romer's Thought Experiment

- Growth rates must have been accelerating
- GDP per capita growth rate today = 2%
- Income per capita in 2015 = $40,000
- Income per capita in 1015 = $??

Too Small to Be Possible

- If growth had been steady at 2%

$(1.02)^{1,000}$ x $?? = $40,000

$(1.02)^{1,000}$ = 398,264,652

$?? = $40,000 / 398,264,652

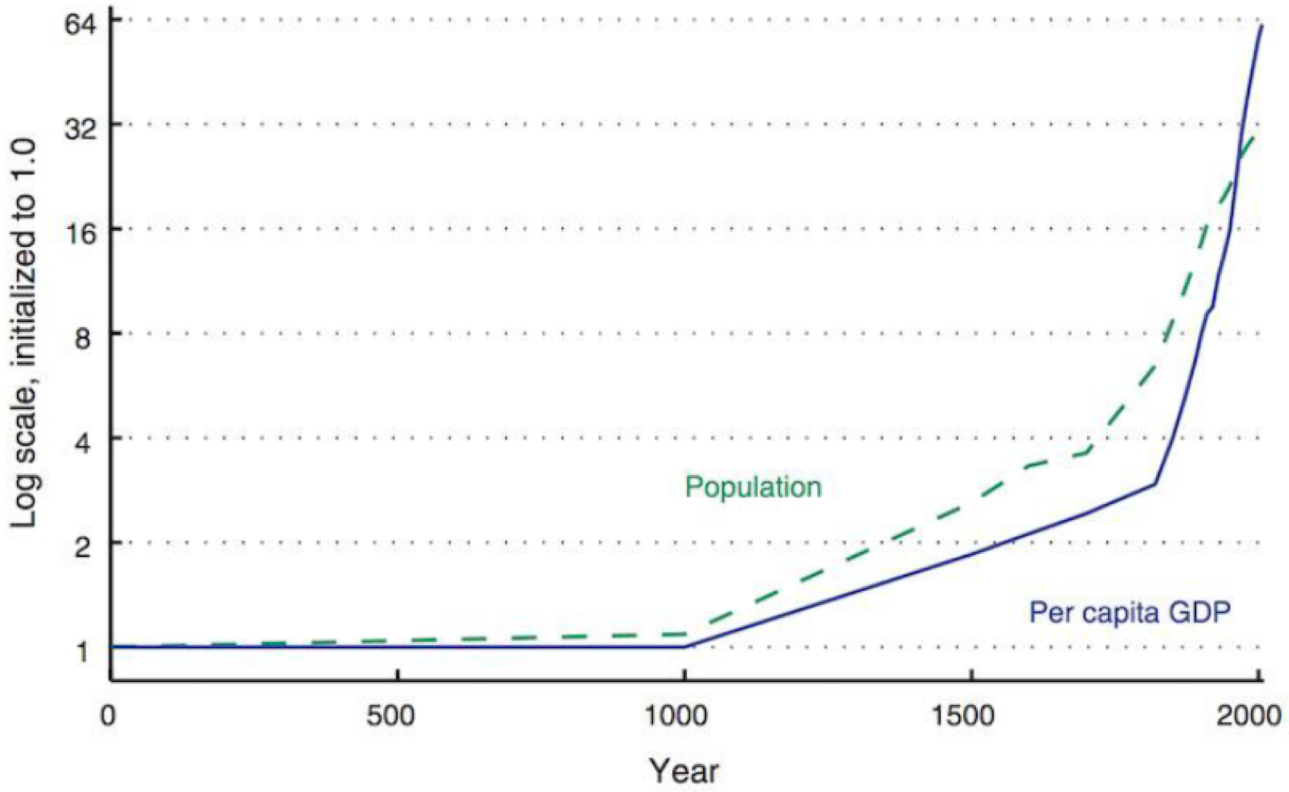
Income per capita in 1015 = $?? = $0.0001

- Annual income per capita would be 0.01 cents
  - Impossible, everyone starves

History Lesson

- History suggest that the growth rate continues to accelarate

(source for chart:Paul Romer blog, *Economic Growth*, October 12th, 2015)



A Positive Prospect for Productivity

"Every generation has perceived the limits to growth that finite resources and undesirable side effects would pose if no new recipes or ideas were discovered"

"The difficulty is the same one we have with compounding: possibilities do not merely add up: they multiply" (Romer's blog)

- Example: Periodic table has 100 different types of atoms
- Mix tin + copper together, you get bronze
- How many two-element combinations? 100 x 99 possibilities
- Betting on future growth is a bet on ever more ingenious recipes
  - It has been the correct bet for 1,000 years

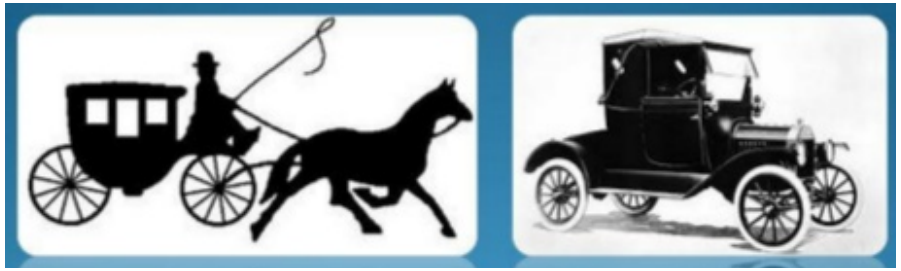
Is Productivity Always Good?

- Innovation kills jobs in the short run
  - ATM and bank clerks
  - Expedia.com and travel agents
- Question is how and whether workers can successfully shift toward other jobs
- In this sense there is a role for government in ensuring a smooth transition
  - Training programs

Joseph Schumpeter and 'Creative Destruction'

- Schumpeter saw the **economy as very volatile**
  - The economy does not 'carefully adjust' to find new equilibrium

- **Entrepreneurs** periodically revolutionize businesses
  - Bankruptcies, job losses, recessions are inescapable as new technologies rendered existing companies obsolete



- To Schumpeter, **recessions** and **large scale bankruptcies**, reflecting '**creative destruction**', are the **price of progress**
  - Austrians argue against government intervention to thwart recessions

Keynes: Financial System Flaws and Need of Intervention

- Keynes looked at major economic declines differently
- **Mistakes in financial markets** and dashed expectations can throw the economy into **deep recessions**
- Collapsing banks ≠ collapsing candy stores
- Governments can and should help **minimize/reverse** such declines

But What Are the Sources of Technological Change?

- Paul Romer (1980): Accumulation of knowledge is key to growth
  - Knowledge capital has **decreasing** returns **at the firm level** but **increasing** returns **at the economy level**
  - Example: Chemical formula for a drug that cures X

Policies to Increase Accumulation of Knowledge Capital

- Protect intellectual property → Patents, copyright
- Support R&D → Directly, subsidies, tax benefits
- Subsidizing education → K-12, public colleges

Why Doesn't Capital Flow from Rich to Poor Countries?

- May be the **return on capital is not higher** in poor countries, why?
  - Misallocation and bad composition of investment (e.g. **lack of physical infrastructure**)
  - Misappropriation of investment (e.g. **corruption**)
  - Lack of "human capital" in the workforce (**education**/**skills**/**health**)
  - Deficiency in contractual environment (**property rights**, **rule of law**, etc.)

Why Did the Industrial Revolution Begin in England?

- For economic growth, government needs to provide the necessary type of **institutional framework**

- The British government's guarantee of **property rights** set the stage for the Industrial Revolution

Potential GDP

- Level of real GDP when firms produce **at capacity** (not 24/7)
- Increases over time as LF grows, capital stock grows, tech. change

Policy Implications of Estimates of Long Run Growth

- Suppose we want to forecast the value of real GDP in 25 years from now

- We need to forecast
  - Labor productivity growth (LPG) rate
  - Labor force growth (LFG)

- Long-term sustainable growth (LTSG) rate:

$$LTSG = LFP + LFG$$

What Will Real GDP Equal in 2043?

- Scenario 1
  - Expectations: LPG = 1.7%, LFG = 0.5%
  - LTSG = 1.7% + 0.5% = 2.2%
  - $(1.022)^{25}$ x \$17.3 trillion = **\$29.8 trillion**
- Scenario 2
  - Expectations: LPG = 2.2%, LFG = 1.0%
  - LTSG = 2.2% + 1.0% = 3.2%
  - $(1.032)^{25}$ x \$17.3 trillion = **\$38 trillion**
- Critical for assessment of **public budget sustainability** (Debt/GDP)

Budget Deficit and Long-Run Projections

- Congressional Budget Office
- Baseline forecast

$$LTSG = 1.5\% + 0.5\% = 2\%$$

  - Debt as a share of GDP in 2040? 104%

- If, instead

$$LTSG = 2.0\% + 0.7\% = 2.7\%$$

  - Debt as a share of GDP in 2038? 68%