The Past and Future of American Economic Growth

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Trump Boasted That He Will Boost Growth to 4% Per Year

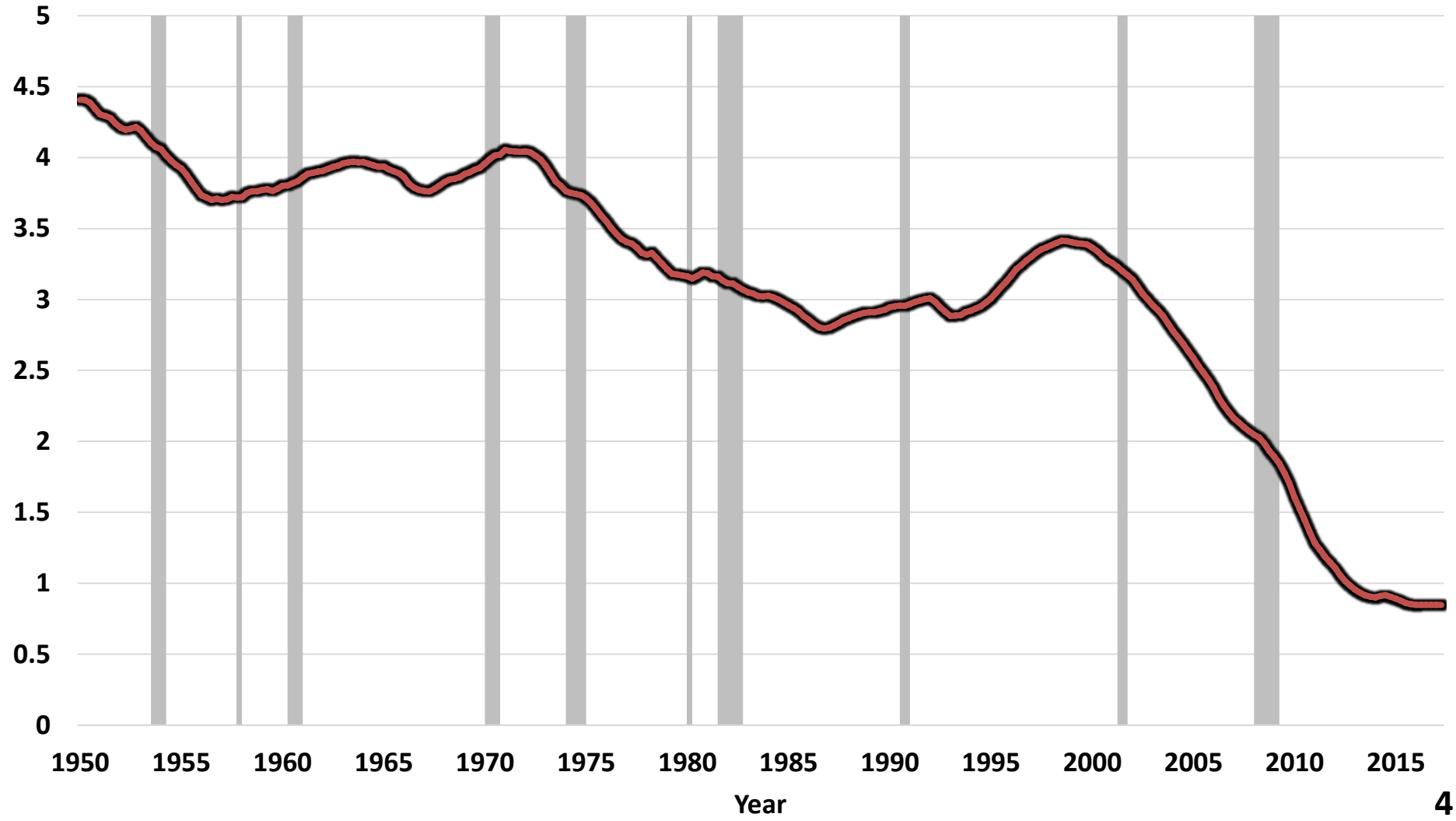
- Actual growth of 2% since 2009
- Made possible by decline in unemployment rate from 10.0% in late 2009 to 4.4% today
- Unemployment can't decline much further
  - (3.8% reached 2000, 4.4% reached 2007)
- How rapidly can output grow at a constant unemployment rate?

Growth with the Same Unemployment Rate

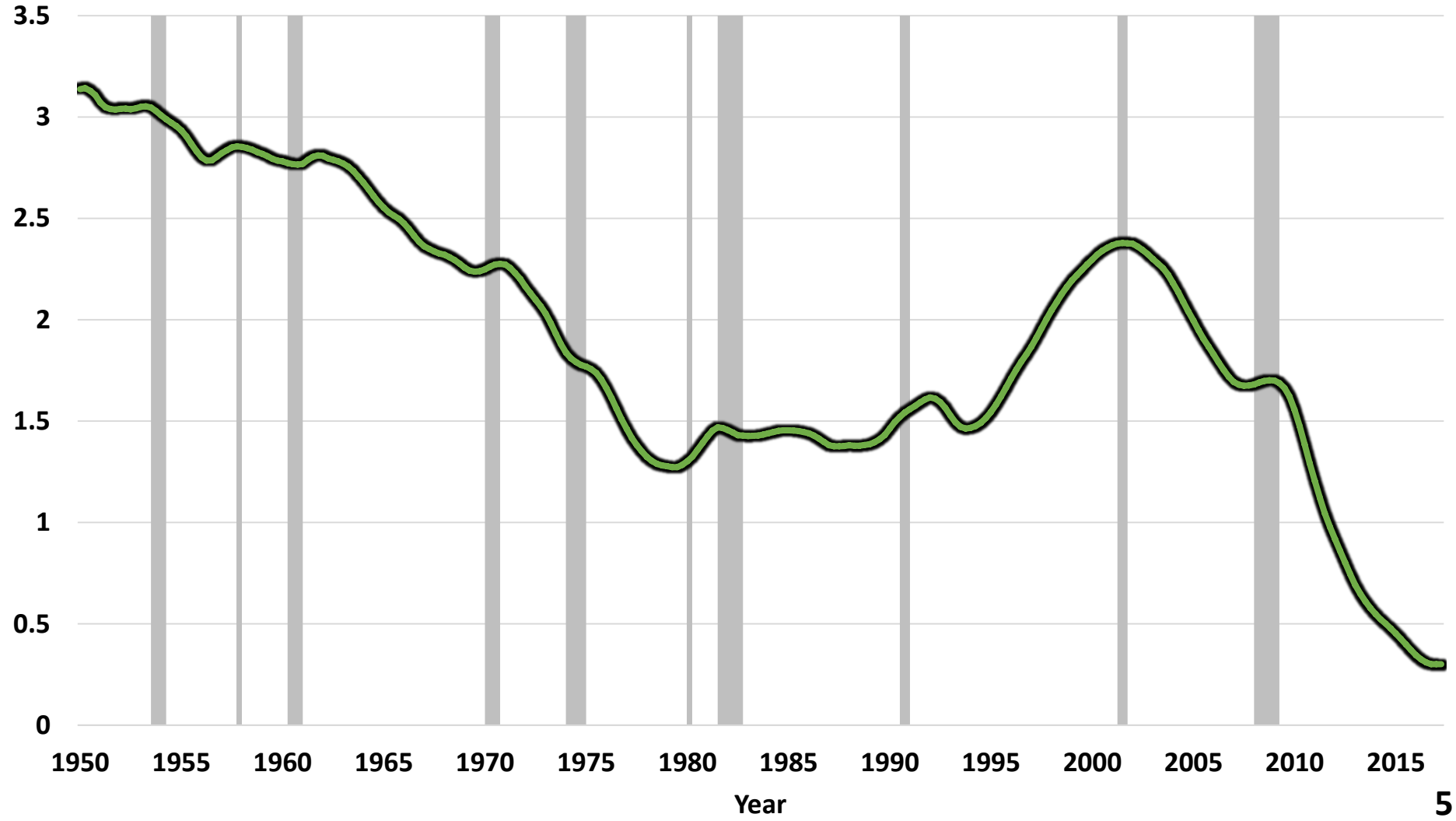
- Unemployment 4.7% in 1970:Q2, 1986:Q1, and 2016:Q4
- Actual real GDP growth:

  1970-2006 3.2 2006-16 1.3
- Sources of Slowing GDP growth
  - Output per Hour (1.8 to 0.9)
  - Hours of Work (1.4 to 0.4)
    - Population 16+ (1.4 to 1.0)
    - Hours per Person (0.0 to -0.6)

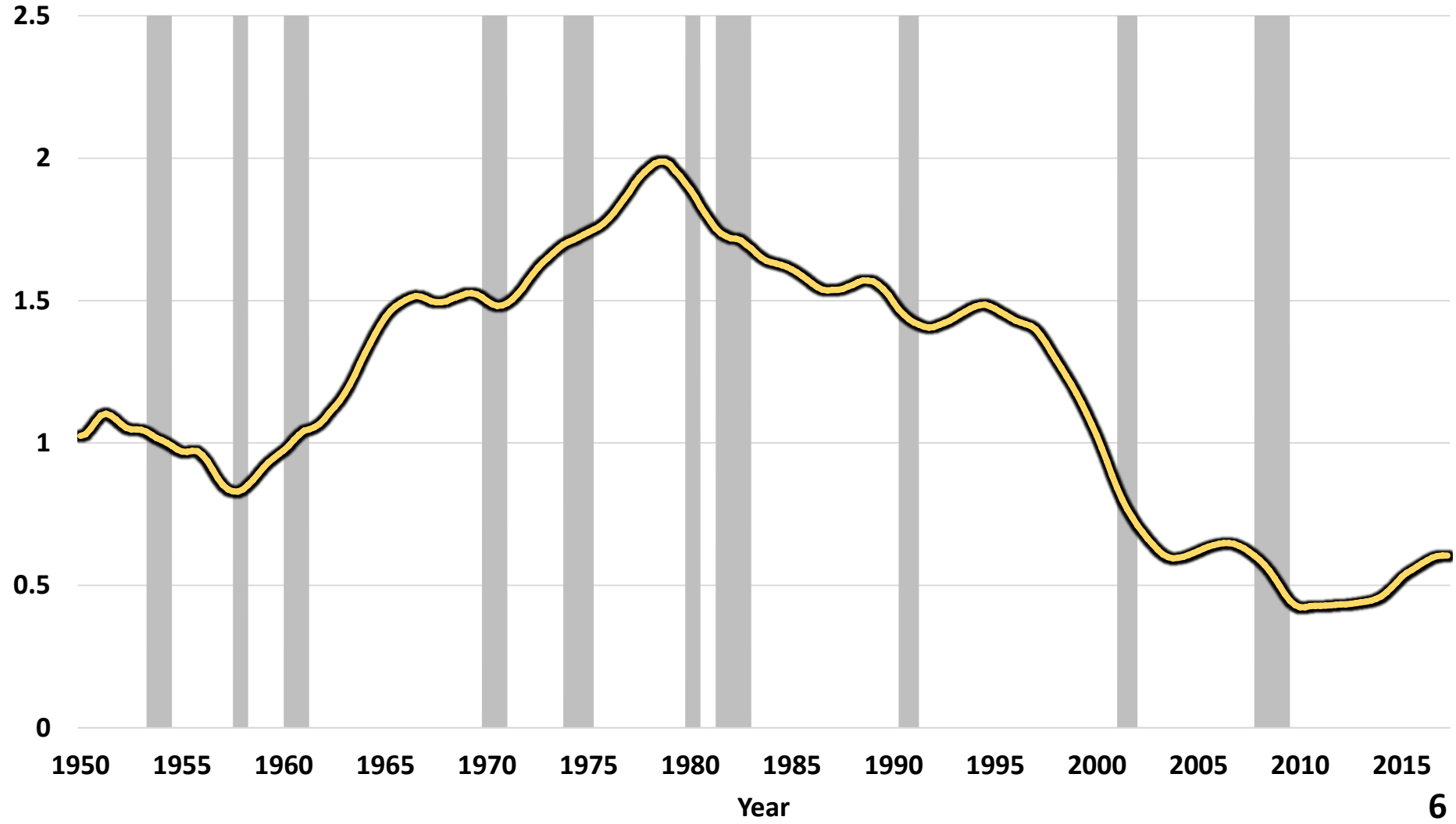
GDP Growth at a Constant Unemployment Rate



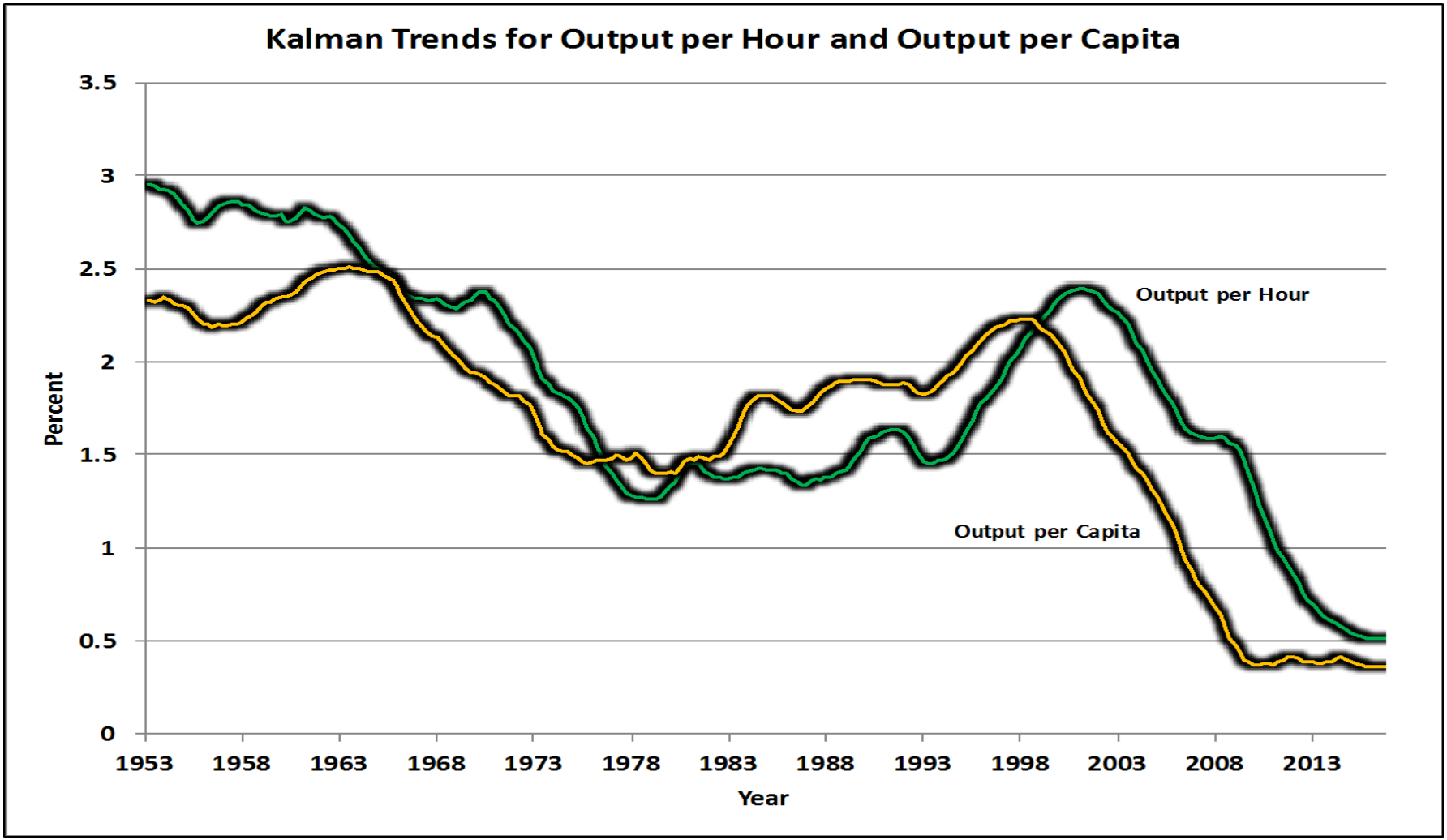
Productivity Growth at a Constant Unemployment Rate



Hours Growth at a Constant Unemployment Rate



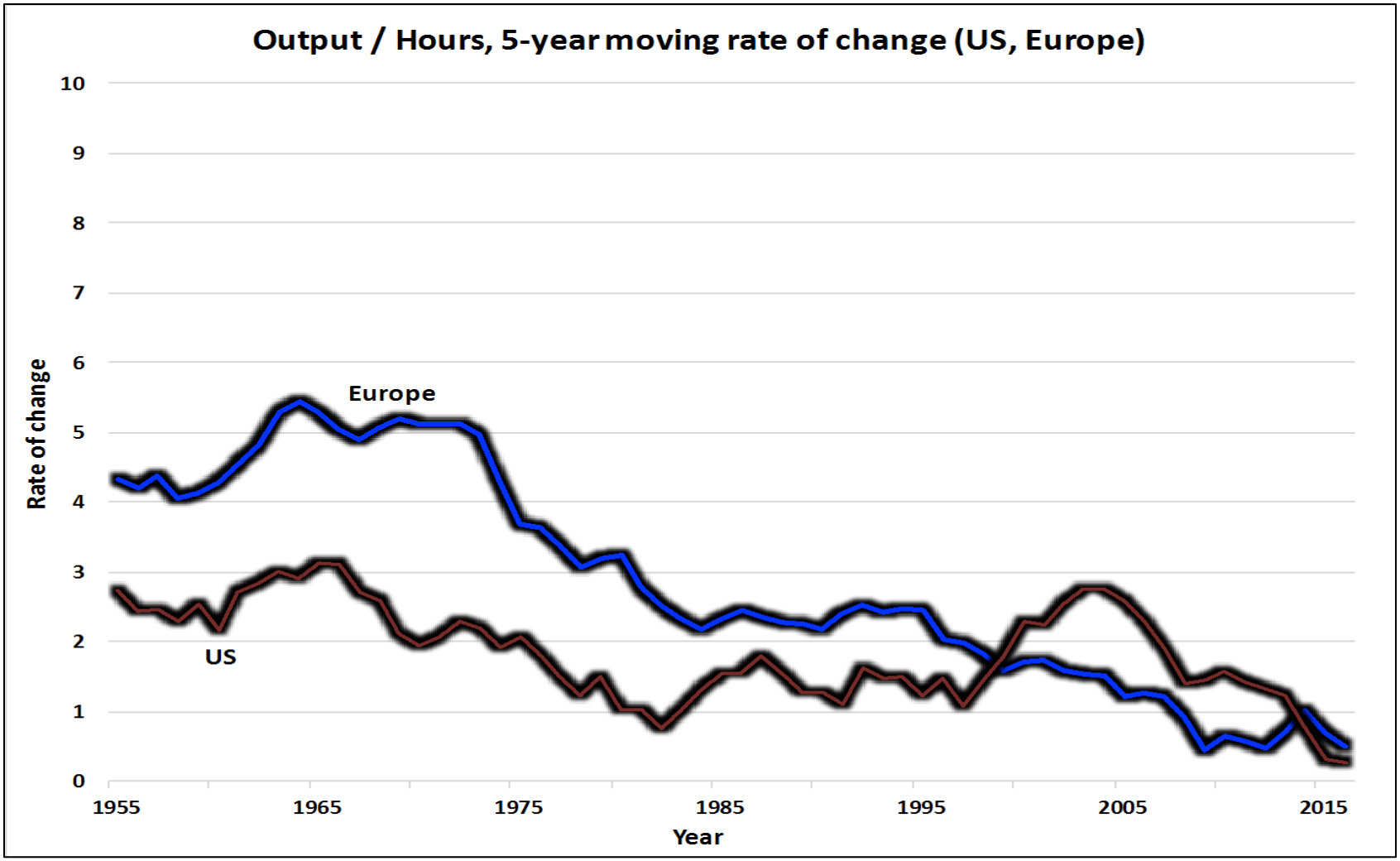
2% Growth Path for Output per Capita? No Longer



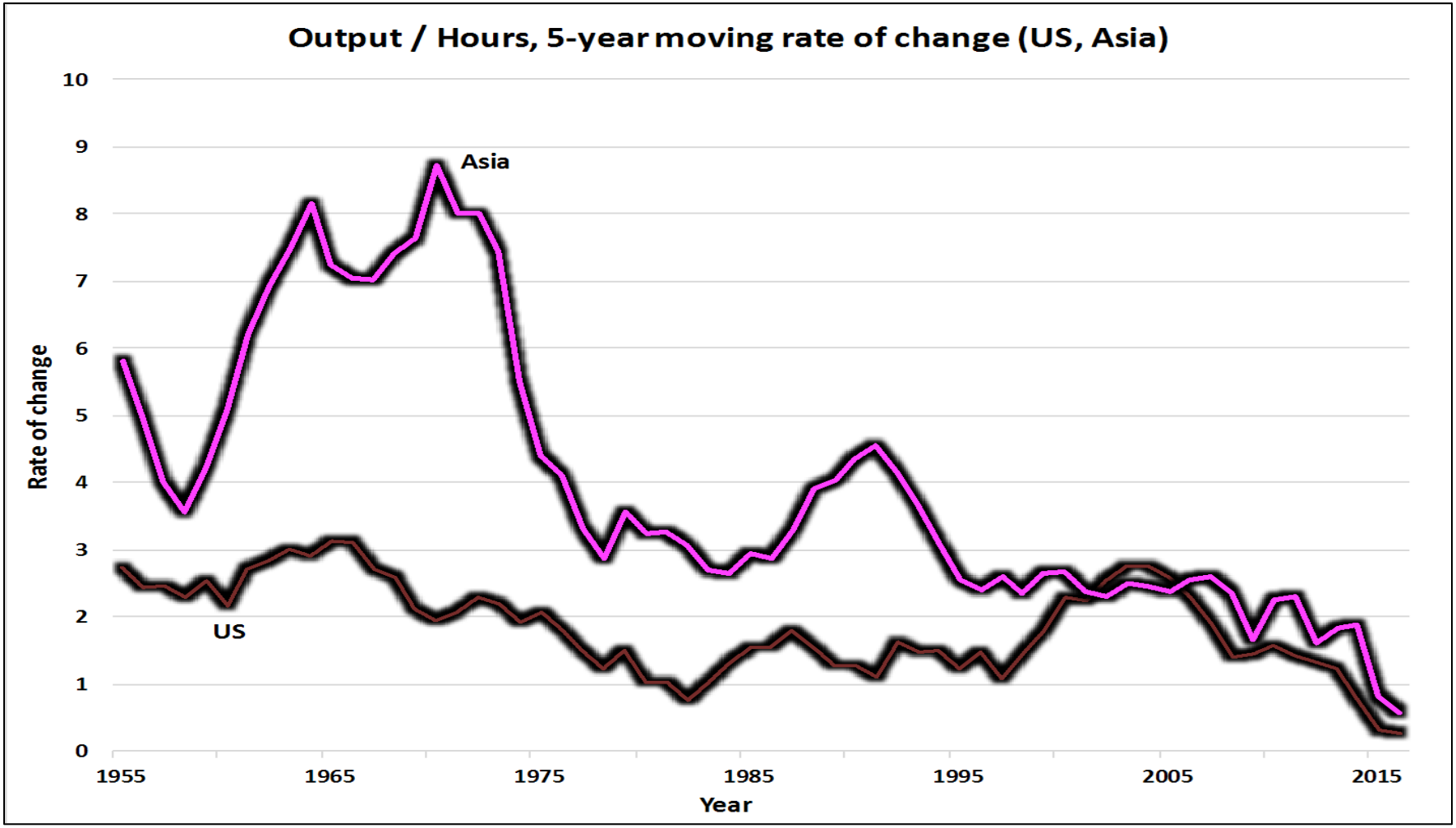
Sources of Slowdown: Universal vs. U.S. - Centric

- **Productivity Growth and Innovation**
  - **Shared by all nations in developed world**
  - **No mention here of catching-up process in emerging nations**
- **Headwinds: U. S. Falling Behind**
  - **Education**
  - **Inequality**
  - **Socioeconomic and welfare state issues**
    - **Job loss, decline of marriage, single-family homes**
    - **Life expectancy, mortality**

Productivity Growth, U.S. vs. Western Europe



Productivity Growth, U. S. vs. Developed Asia



Slowing Productivity Growth Reflects a Smaller Impact of Innovation

- **The best organizing principle to think about innovation is to distinguish among the industrial revolutions (IR #1, IR #2, IR #3).**
- ***The 1st IR occurred 1770-1840, continued impact through 1900***
  - **Steam engine, railroad, steamships**
  - **Cotton spinning and weaving**
  - **Transition from wood to steel**

Second Industrial Revolution: Six Dimensions of Growth

- **Electricity:** Light, power, elevators, streetcars, subways, fixed and portable electric machines, kitchen appliances, air conditioning
- **Motor Vehicles:** Cars and trucks replace horses, personal travel, commercial air transport
- **Running water and sewers:** Female liberation, conquest of infant mortality
- **Info/Communication/Entertainment.** Newspapers, telephone, phonograph, radio, motion pictures, TV
- **Chemicals.** Plastics, antibiotics, modern medicine
- **Change in working conditions:** from hot and dirty agriculture and industry to air-conditioned offices

All the Transitions That Could Only Happen Once

- Mainly Rural 1870 => Mainly Urban 1950
- Light: Polluting Flames to Instant On-Off
- Speed: “Hoof & Sail” => Boeing 707
- Inside Temperature: From Cold and Hot =>> Central Heating and Air Conditioning
- Instantaneous Communication: telegraph, telephone, radio, television
- Bathrooms and running water
- Life expectancy improved twice as fast 1900-1950 as 1950-2000

Third Industrial Revolution

- Since 1960 the "EICT" Revolution
  - Entertainment: the evolution of TV from color to time-shifting and streaming
  - Information Tech – the evolution from mainframes to PCs, the web, and e-commerce
  - Communications: mobile phones, smart phones
  - Productivity enhancers: ATM, bar-code scanning, fast credit card authorization

Retrospectives on the Revolutionary Century, 1870-1970

– Looking Back at 1867 from 1927

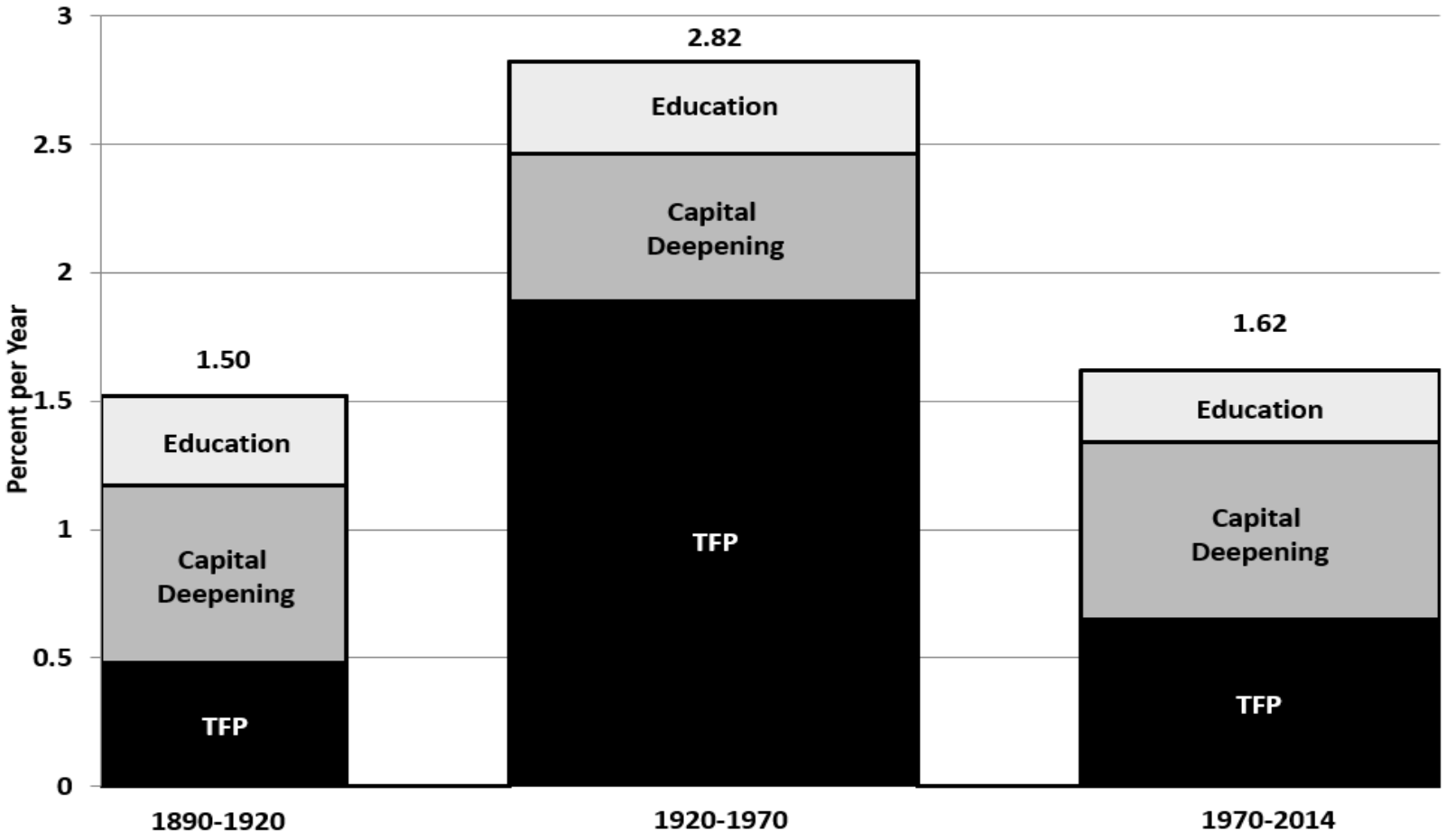
- Most of the progress had been made by 1939

– Looking Ahead to 2000 from 1939

– Looking Ahead to 1939 from 1878

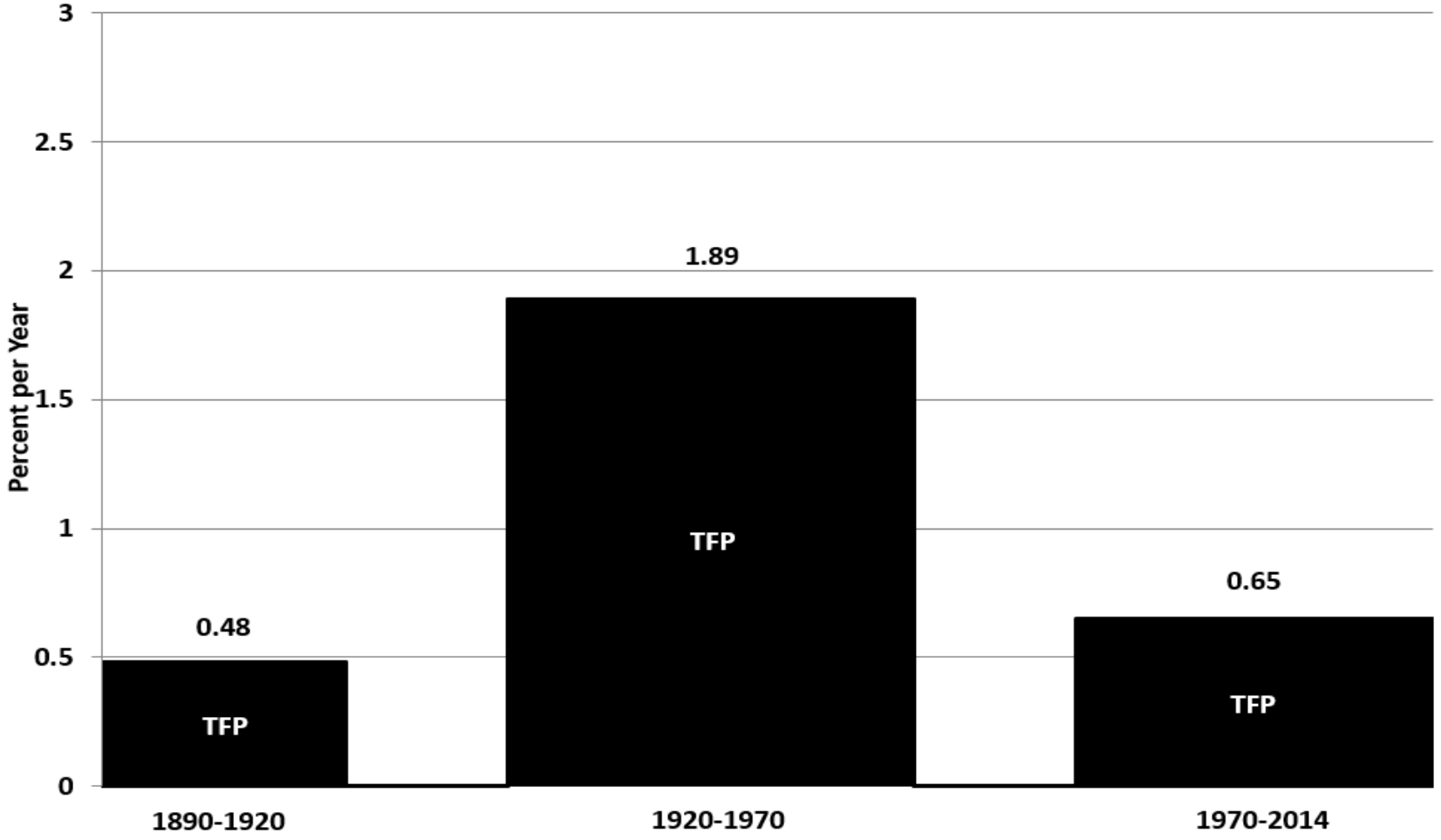
The Three Eras of Productivity Growth

Figure 1-2. Average Annual Growth Rates of Output per Hour and Its Components, Selected Intervals, 1890-2014



The Three Eras of TFP Growth

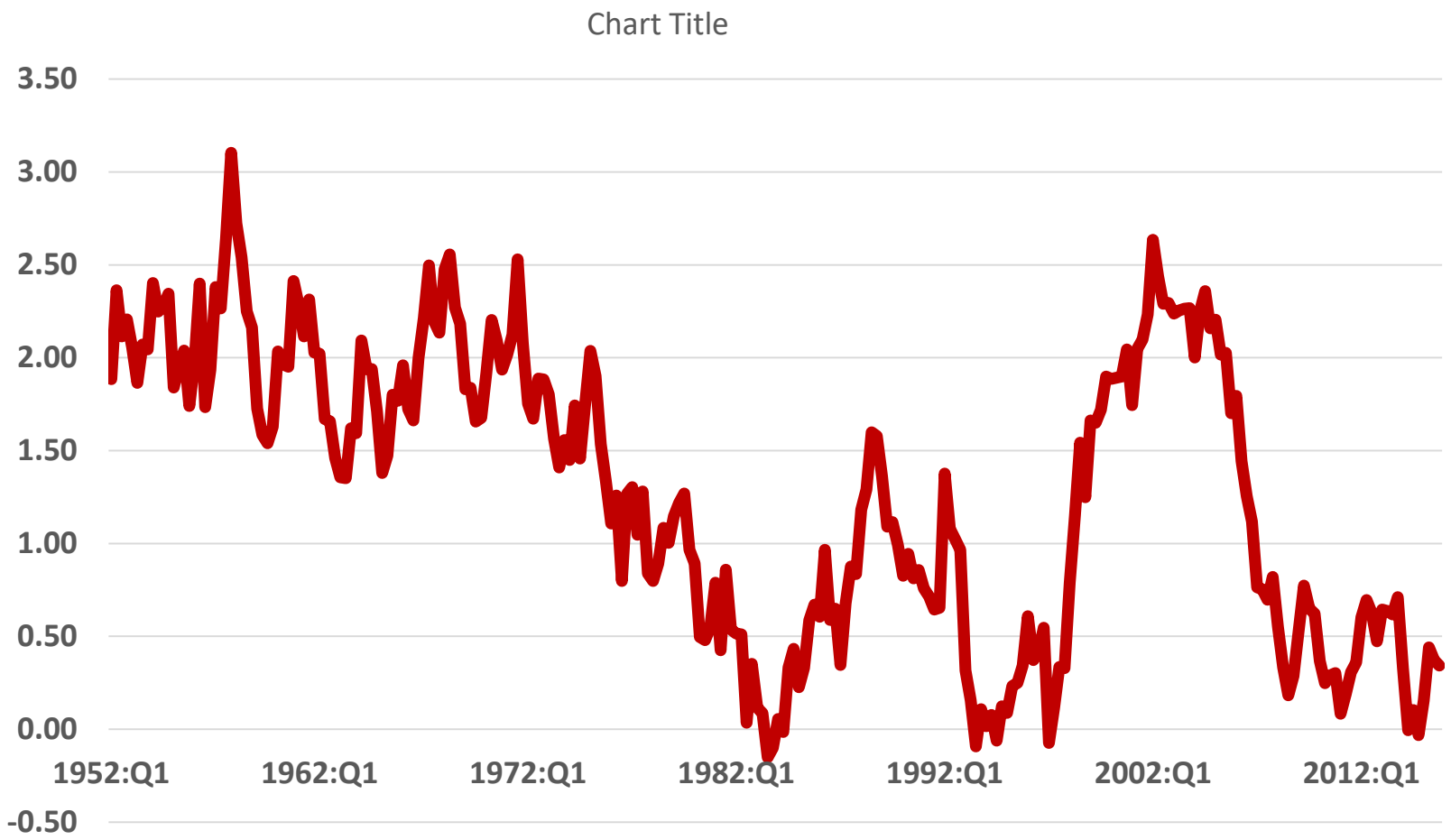
Figure 1-2. Average Annual Growth Rates of Total Factor Productivity, Selected Intervals, 1890-2014



What Happened to Make Productivity Growth So Rapid before 1970?

- ***The 2nd IR consisted of at least six dimensions of Great Inventions***
  - **Each invention had spinoffs developed over 1890-1970**
- **In contrast the 3rd IR has been limited to one dimension, the ICT revolution**
- **The 2nd IR altered every aspect of life for consumers and business, whereas the 3rd IR mainly mattered for business**

TFP Growth 1952-2015, Five-Year Moving Average



IR #3 Has Failed the TFP Test

- **Failure #1: TFP growth post-1970 barely 1/3 of 1920-70**
- **Failure #2: IR #3 boosted TFP growth only briefly 1996-2004**
- ***STARTLING QUESTON: HAS MOST OF THE PRODUCTIVITY IMPACT OF THE THIRD INDUSTRIAL REVOLUTION ALREADY HAPPENED?***

IR #3 Changed Business Practices, Pre-Internet Phase 1, 1970-1995

- 1970 mechanical calculators, repetitive retyping, file cards, filing cabinets
- 1970s. Memory typewriters, electronic calculators
- 1980s. PCs with word processing and spreadsheets
- Late 1980s, before the arrival of the internet.
  - E-mail, electronic catalogs, PCs connected inside firms, proprietary software

Completing the Change, 1995-2005

- Late 1990s. The web, search engines, e-commerce
- 2000-05 flat screens, airport check-in kiosks
- By 2005 the revolution in business practices was almost over

Summary: Stasis Everywhere You Look

- Offices use desktop and laptop computers much as they did 10-15 years ago
- Other than e-Commerce, Stasis in Retailing:

  Shelves stocked by humans, meat sliced at service counters, bar-code checkout
- Finance. ATMs, billion-share days
- Medicine: electronic medical records are here, little change in what nurses and doctors do
- Higher Education: cost inflation comes from rising ratio of administrative staff to instructional staff

Innovations Continue But How Important Are They?

- 3-D Printing
  - Greatly speeded up speed and efficiency of designing prototypes, not mass production
- Robots
  - Robots date back to 1961, by mid-1990s were welding and painting auto bodies
  - Robot description from *NYT*

Innovations Continue But Are Evolutionary Not Revolutionary

- **Driverless Cars and Trucks**
  - **Truck drivers don't just drive trucks, they unload them and stock the shelves**
  - ***Consumer Reports***
- **Artificial Intelligence**
  - **Predominant uses of big data are in marketing, zero-sum game**
  - **Evolutionary change: legal searches, radiology reading, voice recognition, language translation, "Robo-advice"**

How Big is the Impact?

Will Computers Take Away All the Jobs?

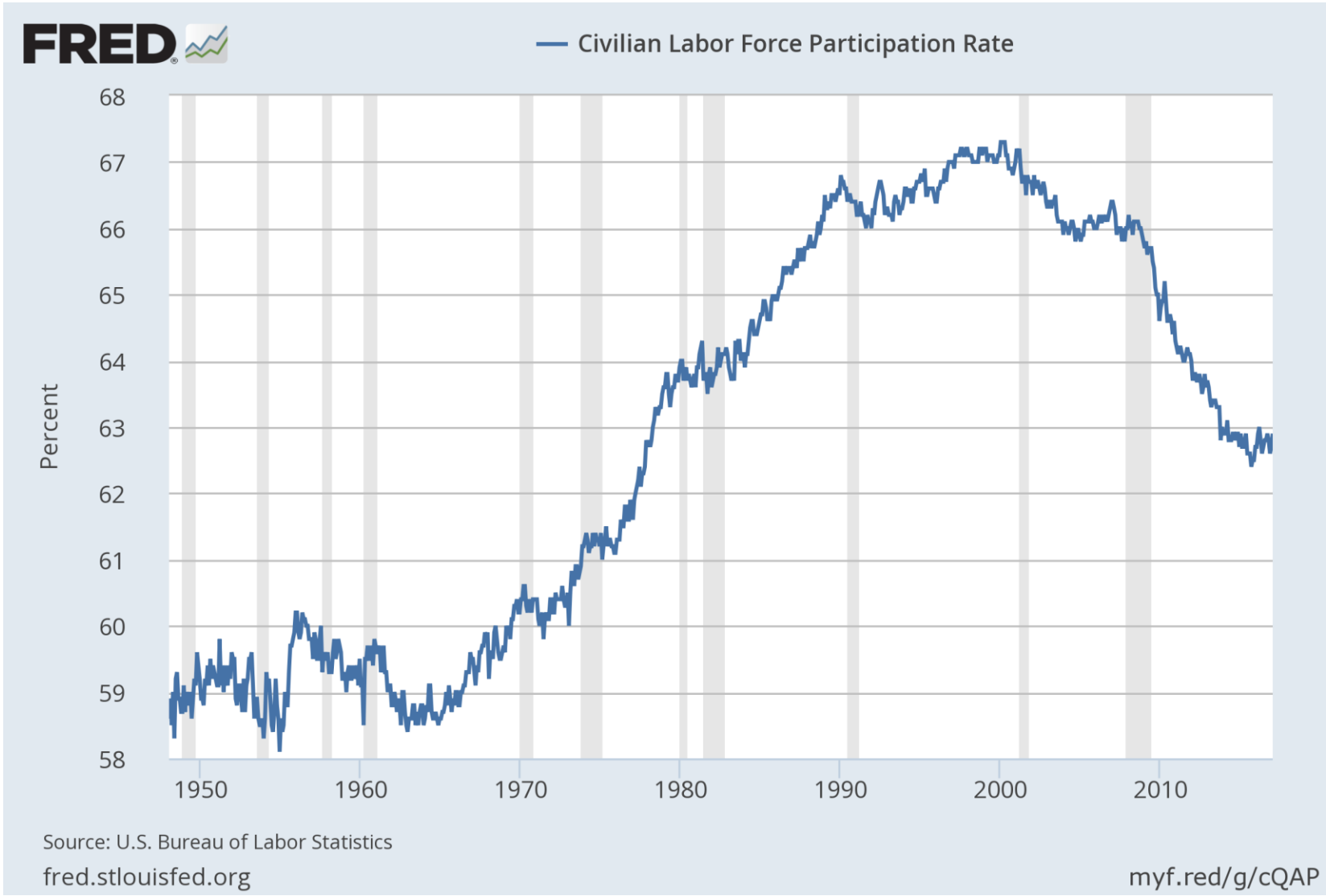
- **Famous Study by Frey and Osborne in 2013**
  - **Computers will replace 47% of jobs within the next decade**
  - **Let's look at some of their examples**
- **Real world: Computers are often complements not just substitutes, reallocate rather than eliminate**
  - **ATMs did not make bank tellers disappear**
  - **Bar-code scanning did not make check-out clerks disappear**
  - **Radiologists have not disappeared, their work has become more accurate**

Genuine Reasons for Worry

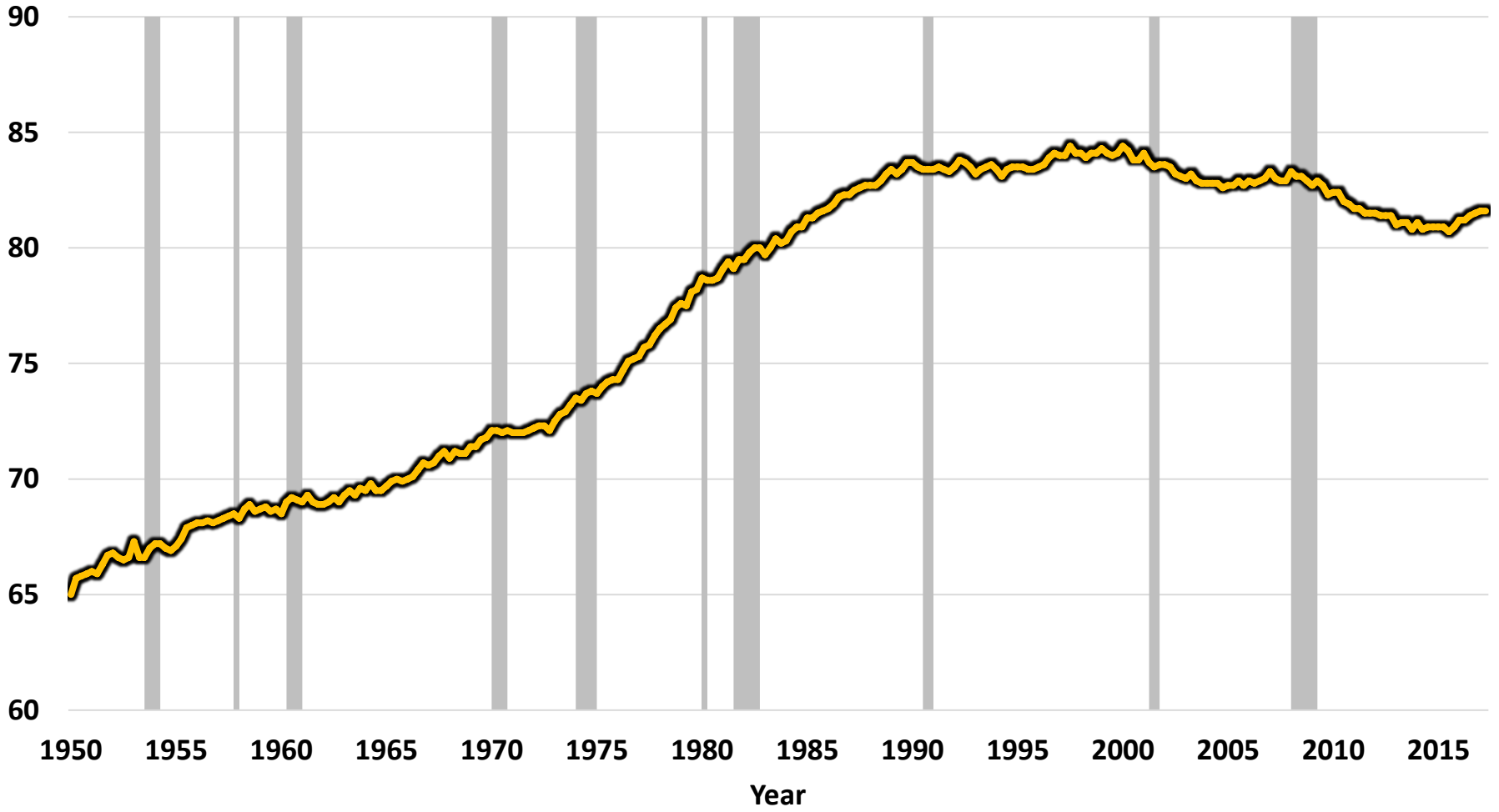
- Job "Polarization" Fosters Rising Inequality
  - Increased demand for highly skilled technical jobs
  - Increased demand for low-skilled jobs, flipping burgers and making beds, personal trainers and in-home care
  - Decreased demand for middle-skill blue-collar and clerical workers
- Social and Economic Consequences for Middle-Aged Men

Middle-Skill Job Loss, Particularly for Men

- **Multiple Consequences of Middle-Skill Job Loss**
  - **Clash of actual outcome vs. expectations for a better life**
  - **Labor-force drop outs**
  - **Males are less attractive marriage partners, decline of marriage**
  - **Consequences of single-family homes for behavior and outcomes of children**
  - **Health and mortality consequences**


FRED
Civilian Labor Force Participation Rate
Percent
68
67
66
65
64
63
62
61
60
59
58
1950
1960
1970
1980
1990
2000
2010
Source: U.S. Bureau of Labor Statistics
fred.stlouisfed.org
myf.red/g/cQAP

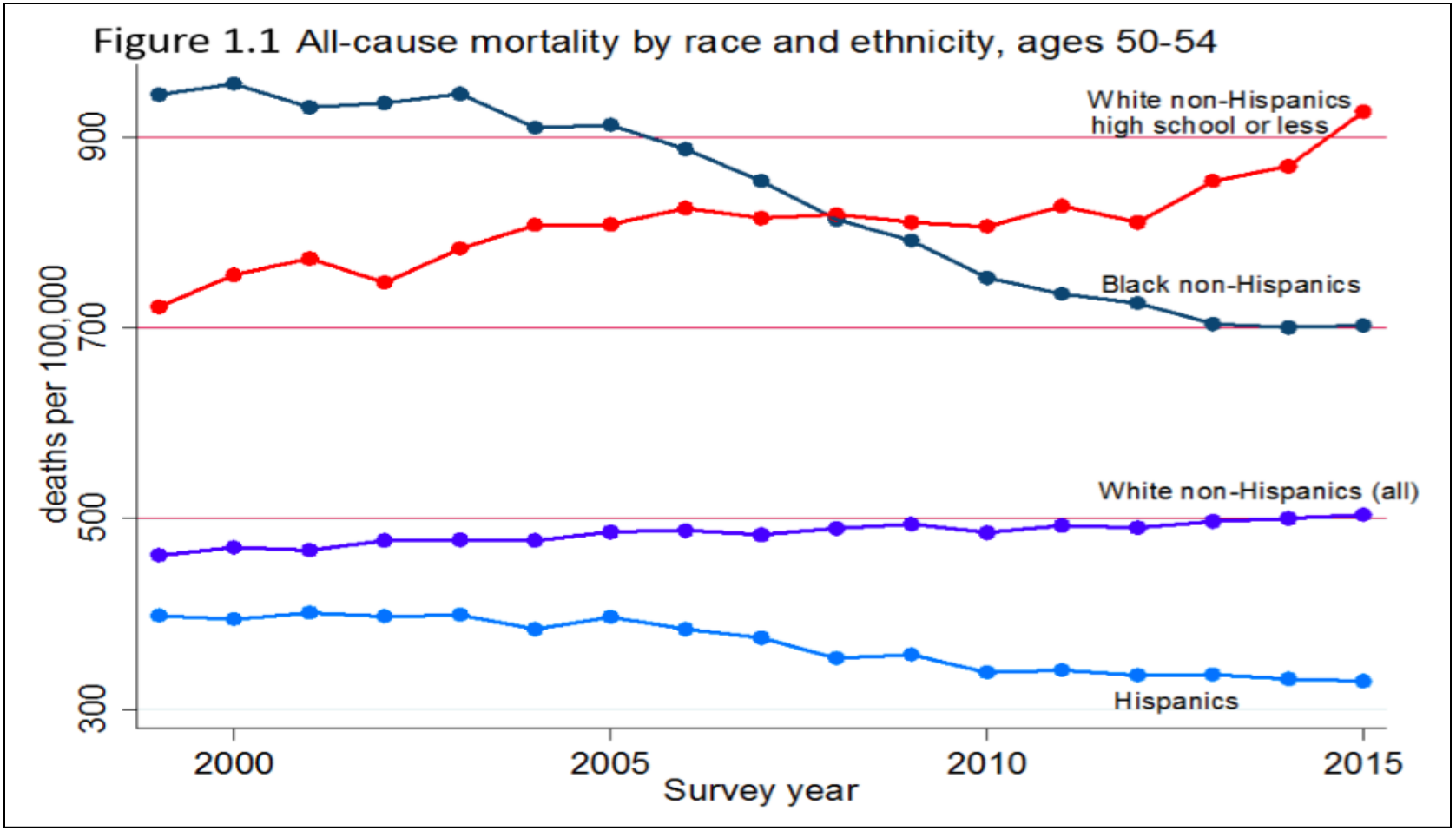
Prime-Age Participation Rate



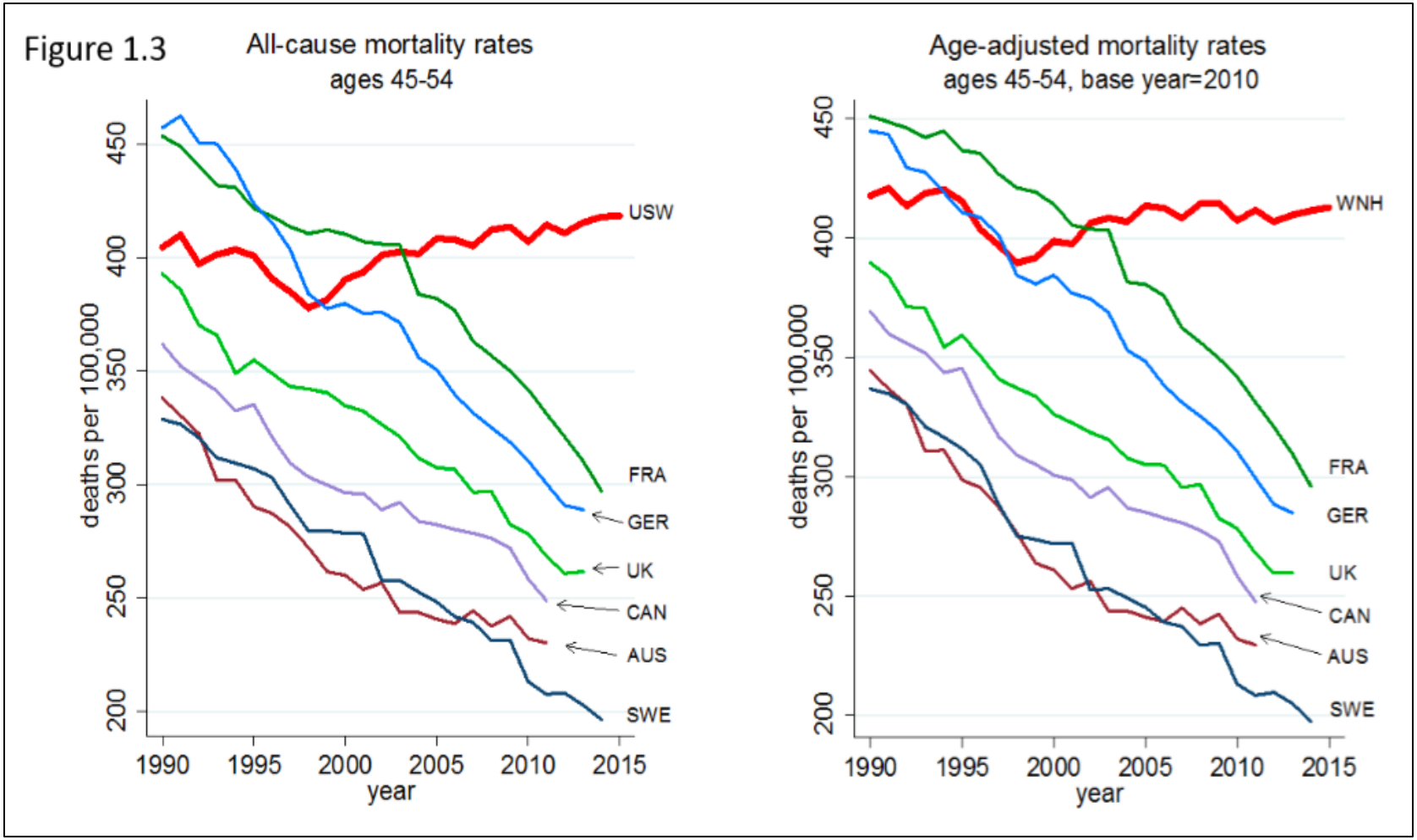
Consequences of Job Loss, Labor Force Dropping Out

- Loss of protective institutions
  - Unions
  - Catholic Church
  - Comraderie with co-workers at nearby bar
  - The compliant wife
- Non-college males 51 percent divorce rate
  - Main reasons: infidelity, domestic violence, substance abuse
- Loss of "civilizing influence" of marriage and children

Mortality Outcomes for Middle-Aged Whites (Case-Deaton)



A Leading Puzzle:
The Contrast with Other Countries

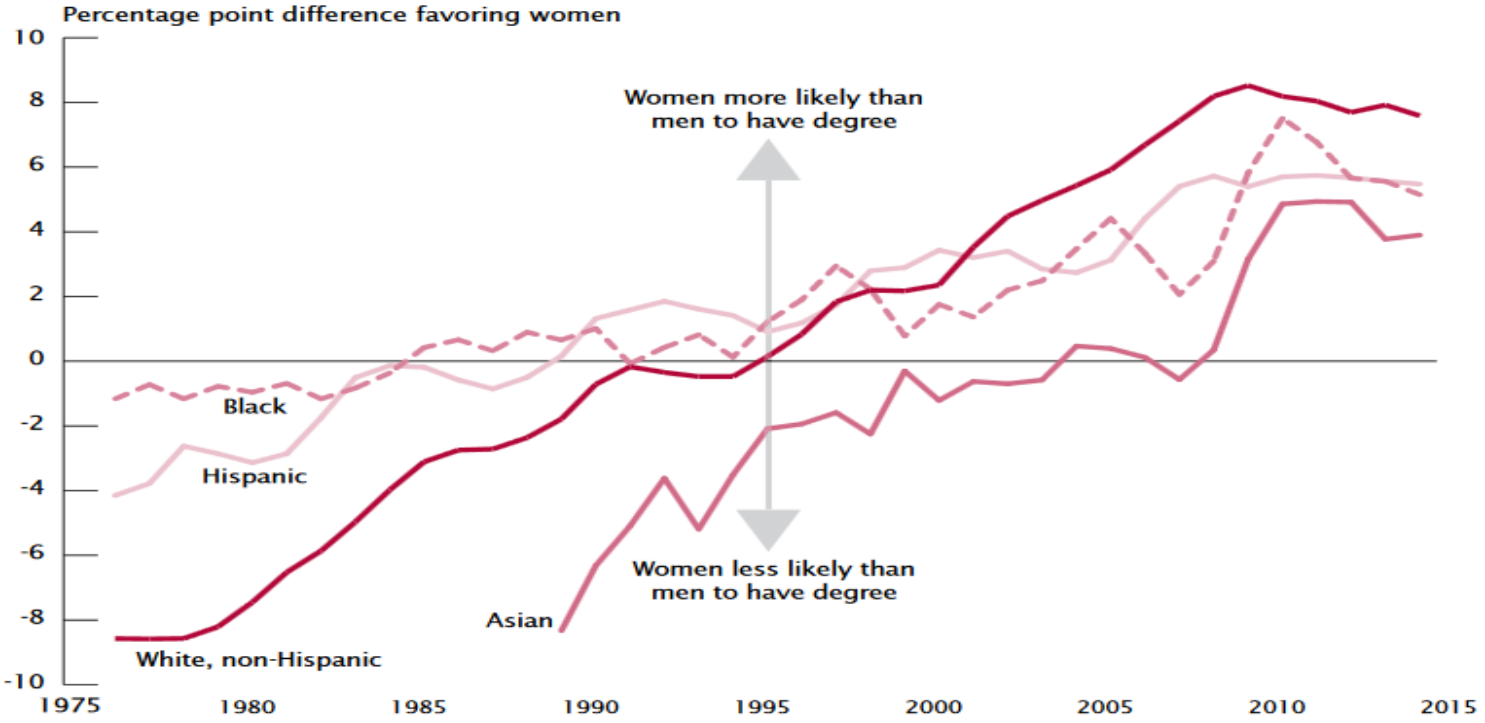


The Decline in Marriage

- Women don't want to marry men who are less well-educated, less successful than they are
- Changes 1982 to 2008, children born out of wedlock
  - White high school grads 4 to 34 percent
  - Black high school grads 48 to 74 percent
- Change 1960-2010, bottom 1/3 of white population
  - For 40-year-old women percent of children living with both biological parents declined from 95 to 34 percent

Growing Imbalance of College Completion by Sex

Figure 8.
Percentage Point Difference Between Bachelor's Degree Attainment of Women and Men Aged 25 to 34, by Race and Hispanic Origin: 1976 to 2015 (3-Year Running Average)



Source: U.S. Census Bureau, 2015 Current Population Survey.

This Extended View of the Demographic Headwind: Consequences for Growth

- Declining participation reduces growth in hours of work and GDP
- Decline and postponement of marriage reduces fertility rate and population growth
- Health consequences raise mortality rate
- Consequences of single-parent families for children cast shadow on future educational attainment and employability

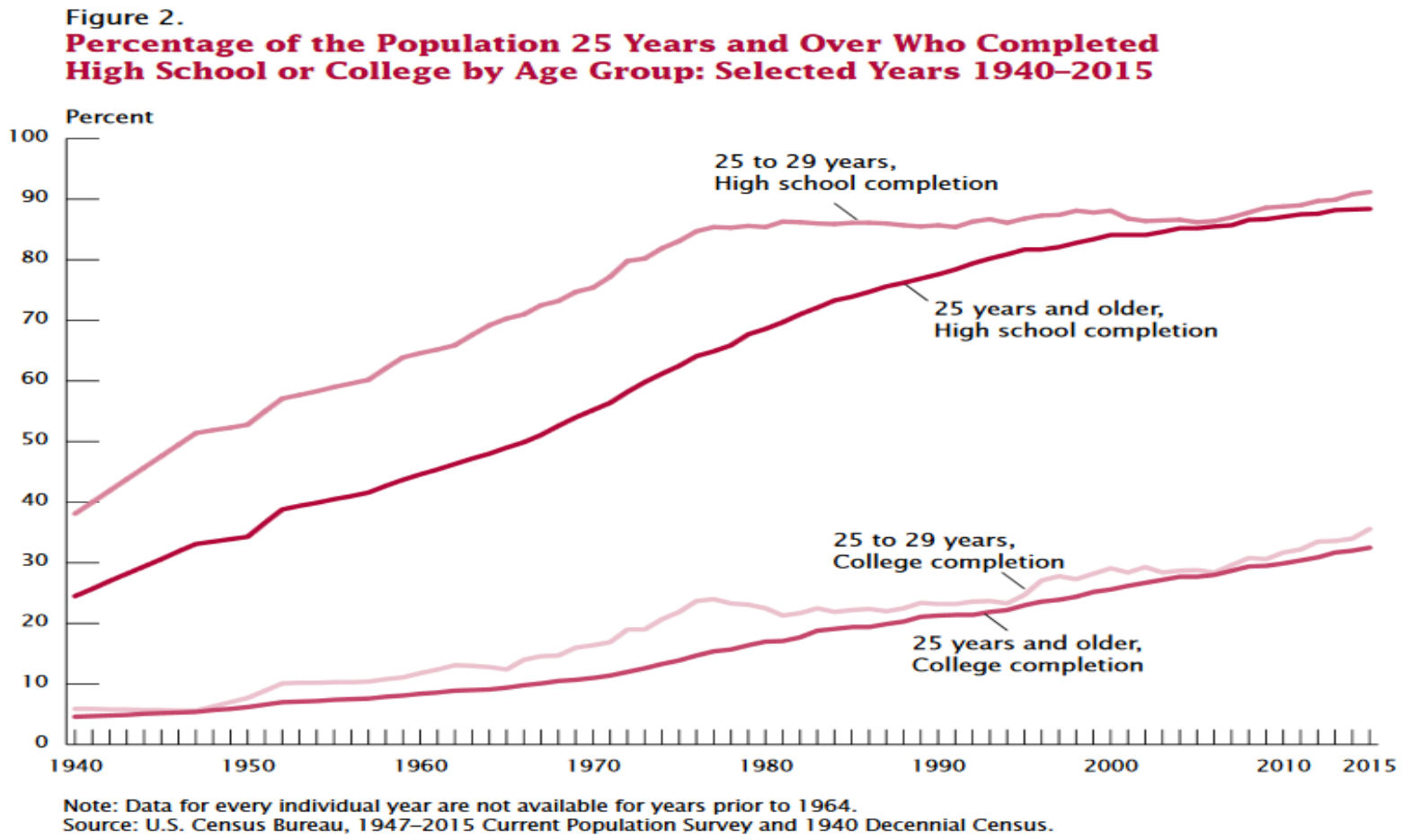
Slower Growth Goes Beyond Innovation: The Four Headwinds

- As above, the demographic headwind
- The education headwind
- The inequality headwind
- The fiscal headwind

Second Headwind: Education

- **A major driver of that epochal 20th century productivity achievement was education**
  - **High school completion rate has barely changed since 1970.**
  - **Most people drop out of 2-year community colleges**
  - **College completion is increasing but 40% of recent graduates are in jobs that do not require a college education**
  - **Since 2000 reduced employment and wage premium in "cognitive" jobs that require a college education**
  - **High cost, growing indebtedness**

The Education Plateau



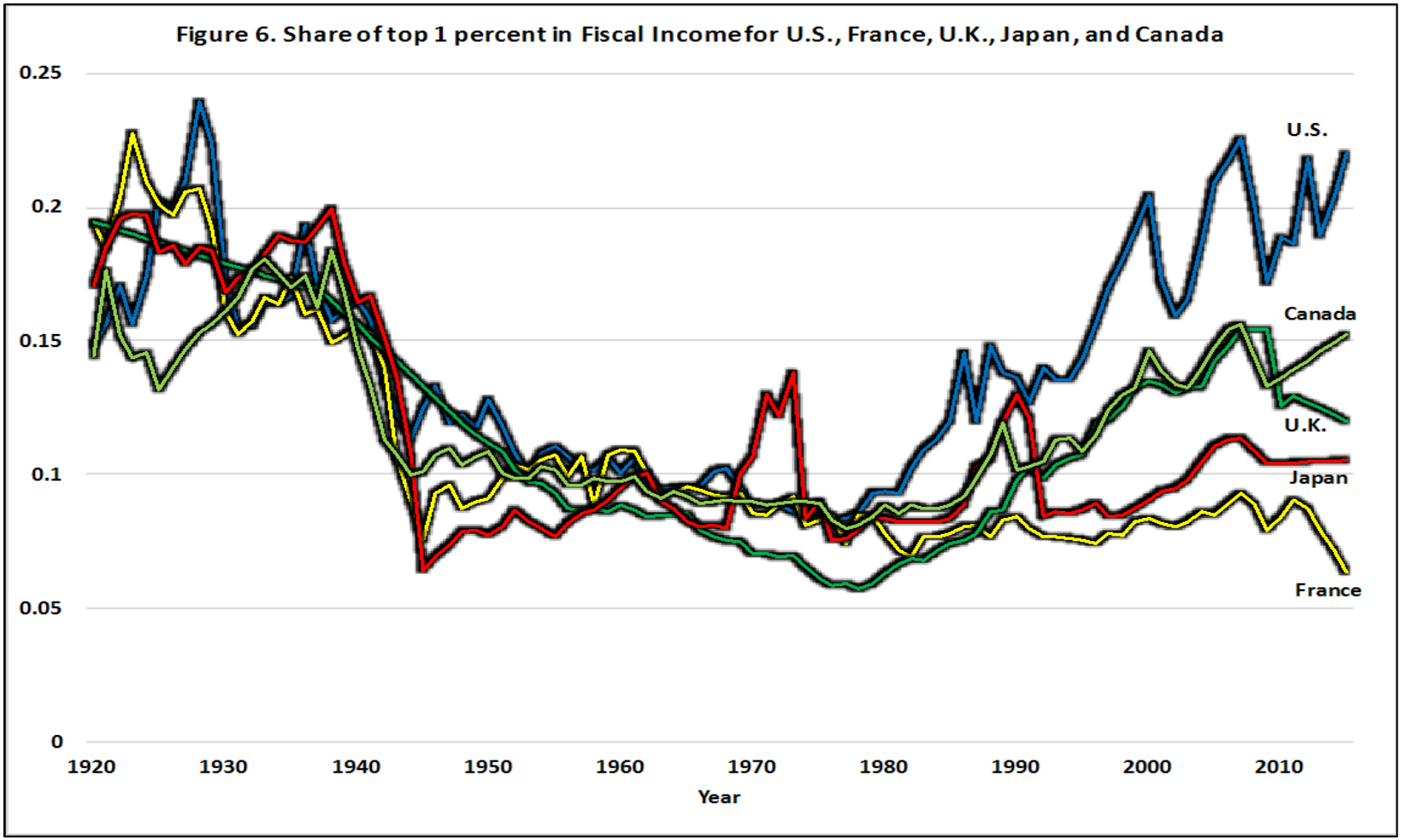
Education: International Comparisons

- **Poor preparation for college. International PISA test scores rank out of 34 OECD countries: US #17 in reading, 20th in science, 27th in math**
- **U.S. has dropped from #1 to #16 in college completion as percent of population; same for high-school dropouts**
- **This will reduce future economic growth by -0.2 percent per year compared to the contribution of education to 20th century growth**

Third Headwind: Inequality

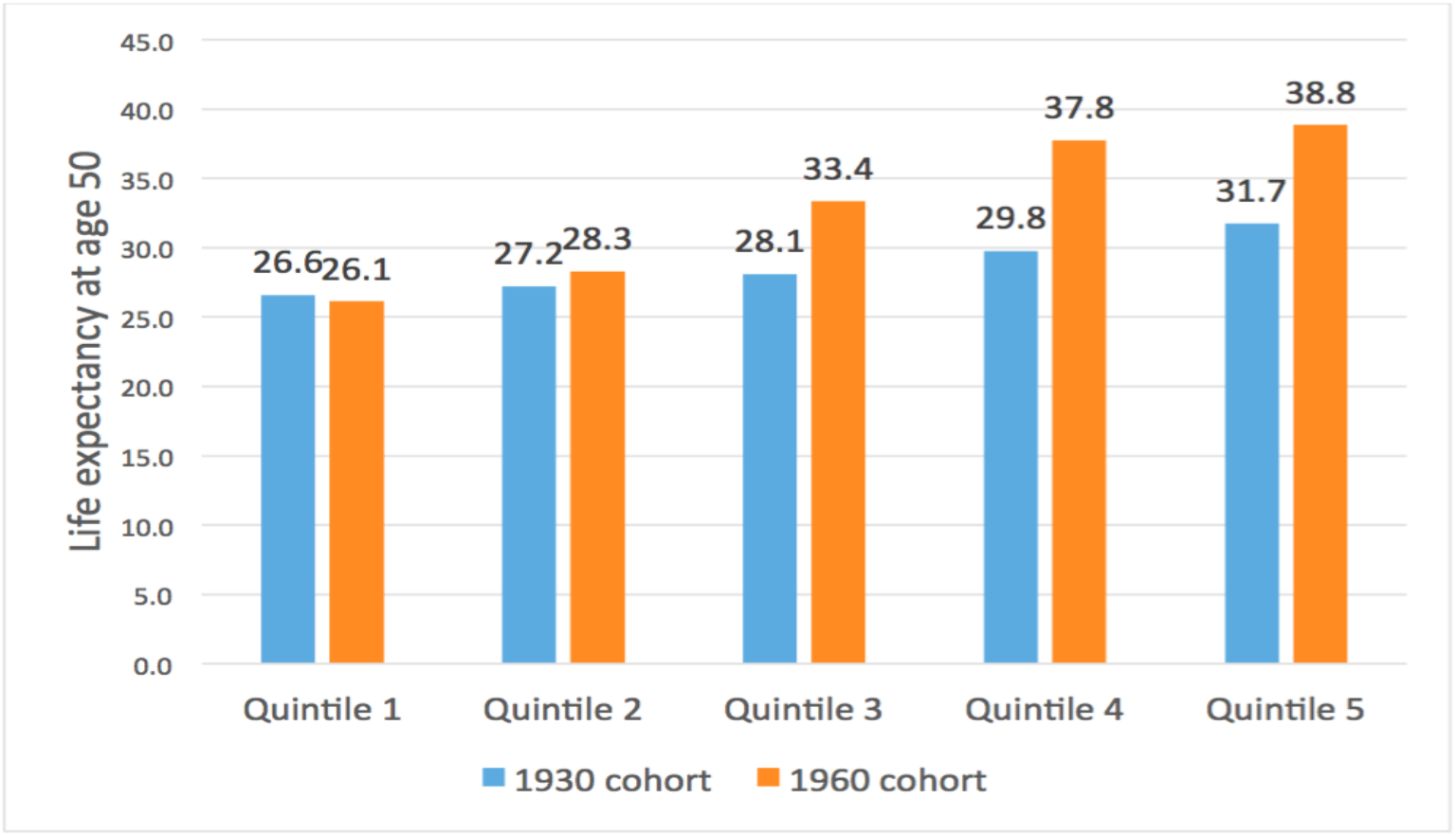
- For 1993-2015 the top 1% earned 52 percent of the total income gain
- Bottom 90% annual income growth 0.5 percent slower than the average
- This is continuing, it's not over.
  - CEO pay, sports and entertainment stars. ($10-15 million)
  - Wage pushbacks – lower wages, two-tier wages, shaving pension and medical care benefits
  - Firms pushing employees into part-time work, hiring "contract workers" instead of employees

The Income Share of the Top One Percent Since 1920

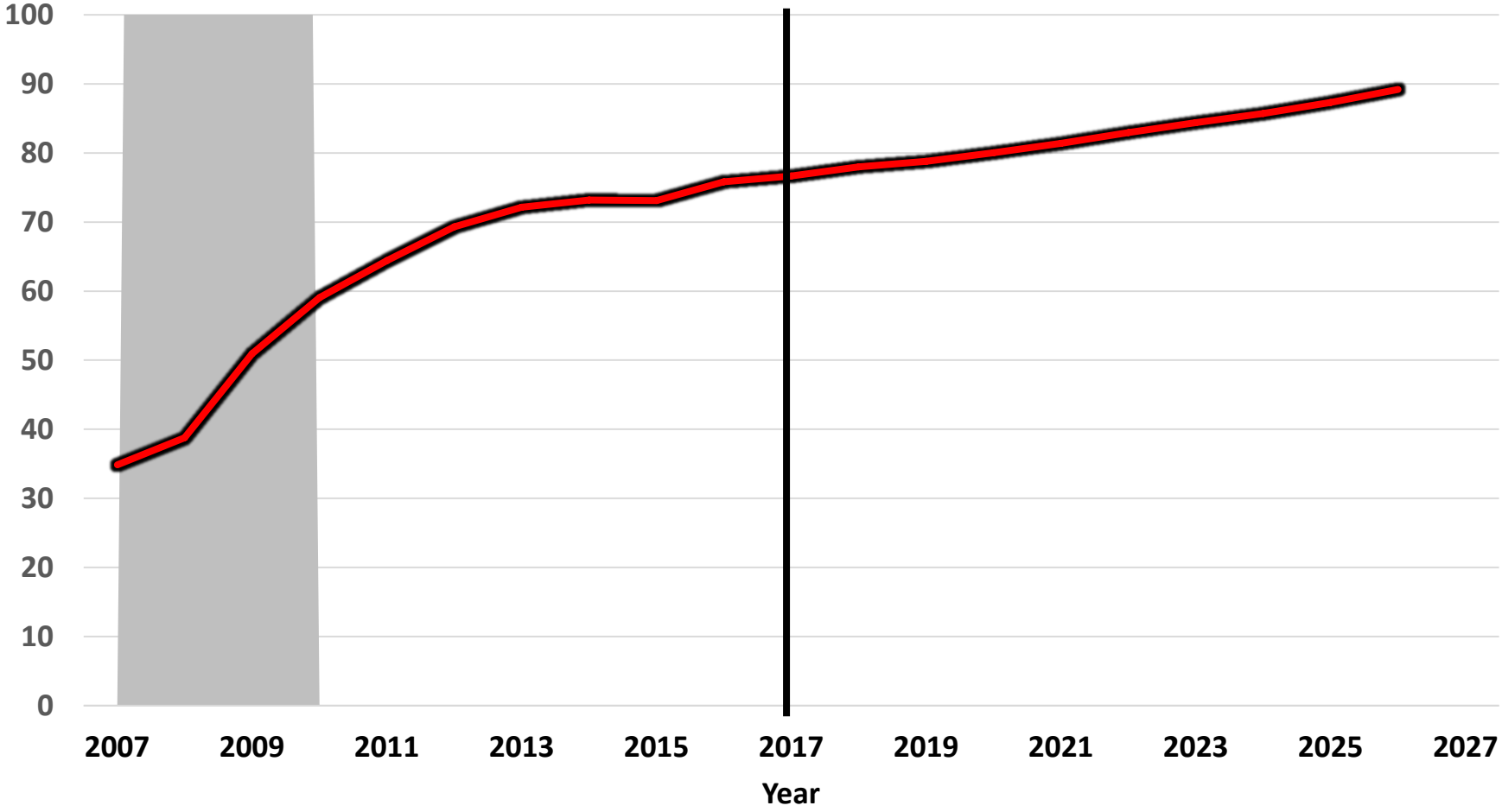


The Life Expectancy Gap by Income Quintile

Figure 1: Life expectancy for men at age 50, actual and projected, for birth cohorts of 1930 and 1960, by income quintile



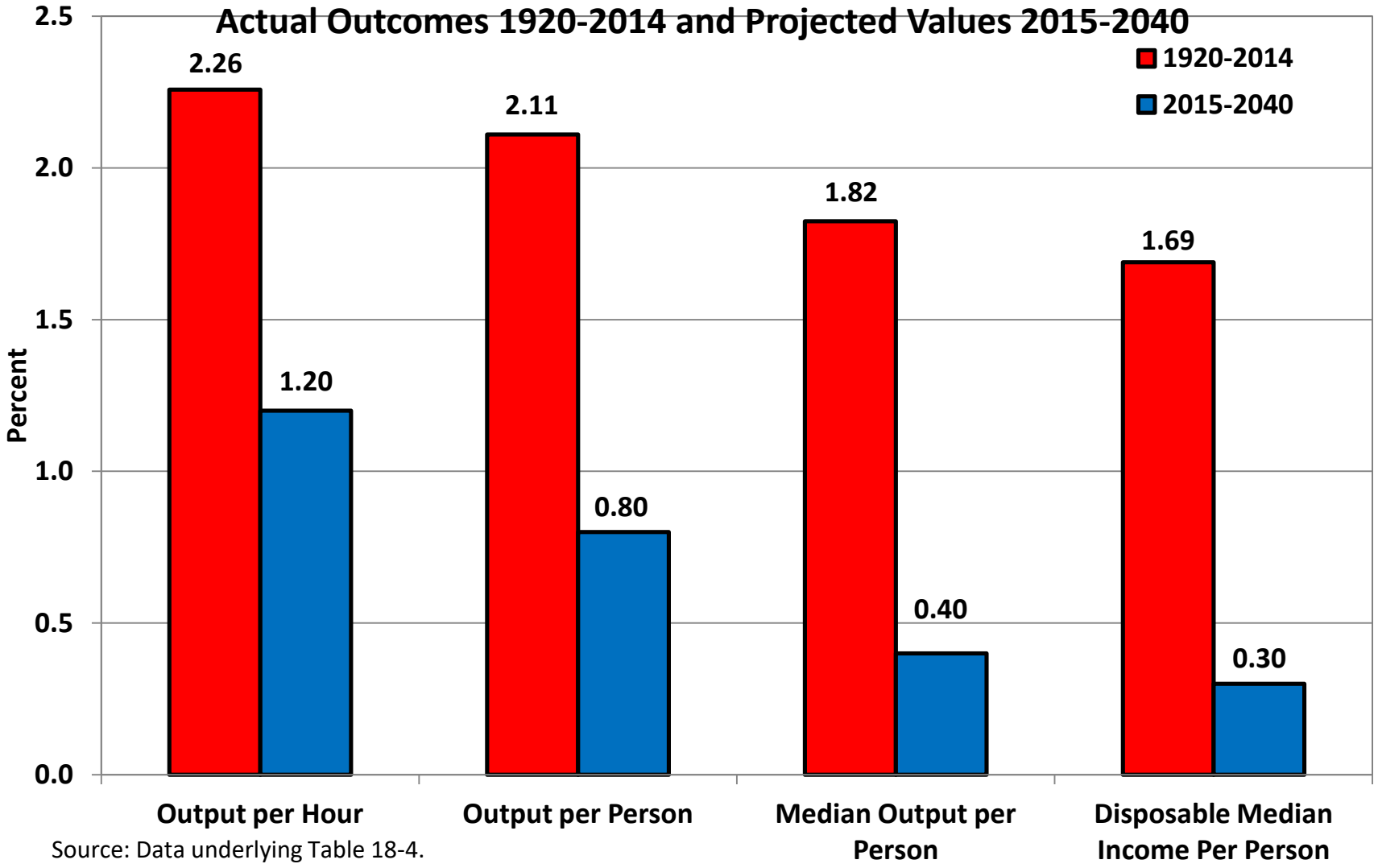
The Fiscal Headwind: Debt/GDP, 2007-2027



Combined Effects of Headwinds

- Demographic headwind reduces hours per person
- Education headwind reduces productivity growth
- Inequality headwind reduces median growth below average growth
- Fiscal headwind raises taxes or reduces transfer payments

Figure 18-5. Annual Growth Rate of Alternative Real Income Concepts, Actual Outcomes 1920-2014 and Projected Values 2015-2040



Source: Data underlying Table 18-4.

Policy Issues for Q&A

- Trump wants faster growth, 3.5 to 4%
- But strong forces will push growth down, not up
  - Growth to date made possible by declining unemployment – how much longer?
  - Continuing retirement of baby boom generation
  - Deportations reduce employment & hours of work
  - Continuation of slow productivity growth
    - Limited room for response to deregulation
- Tax cuts and reform won't boost growth if they're deficit neutral

Conclusions

- **70 percent of all TFP growth since 1890 occurred 1920-70, attributed to IR #2**
- **The big impacts on TFP of IR #3 were largely completed by 2005**
- **Innovation continues but has less impact**
- **Much of the slowdown in future growth is caused by the headwinds**
- **Slowing innovation shared across countries, but aspects of headwinds are U.S.-centric**
- **A moderate pace of innovation means that jobs will not disappear *en masse***