CENTRE FOR MACROECONOMICS

Department of Economics

Department of Economics and Centre for Macroeconomics public lecture

The Rise and Fall of American Growth

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The Current Growth Slowdown from the Perspective of the Special Century

Robert J. Gordon

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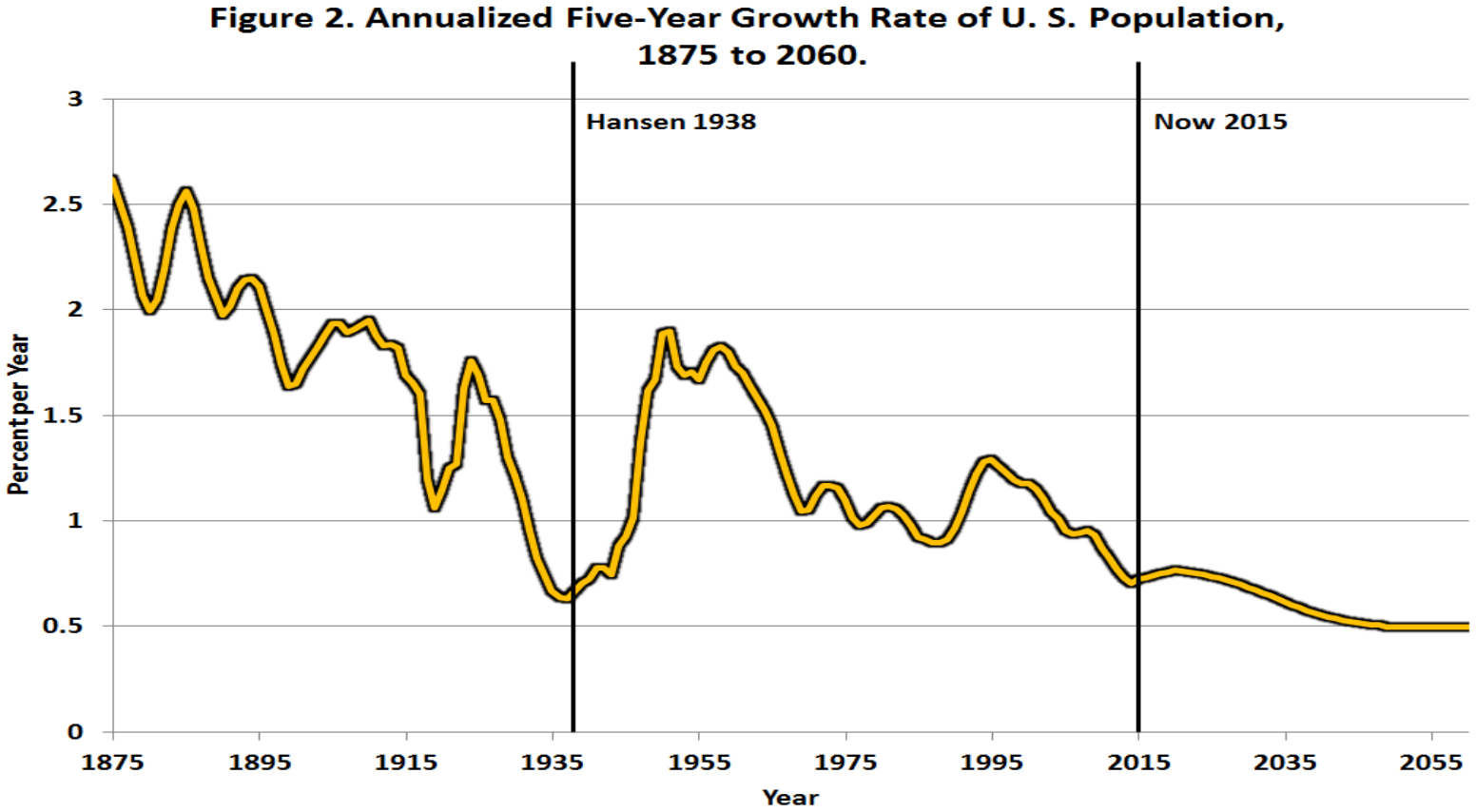
May 11, 2016

Secular Stagnation: The Perspective in 2016

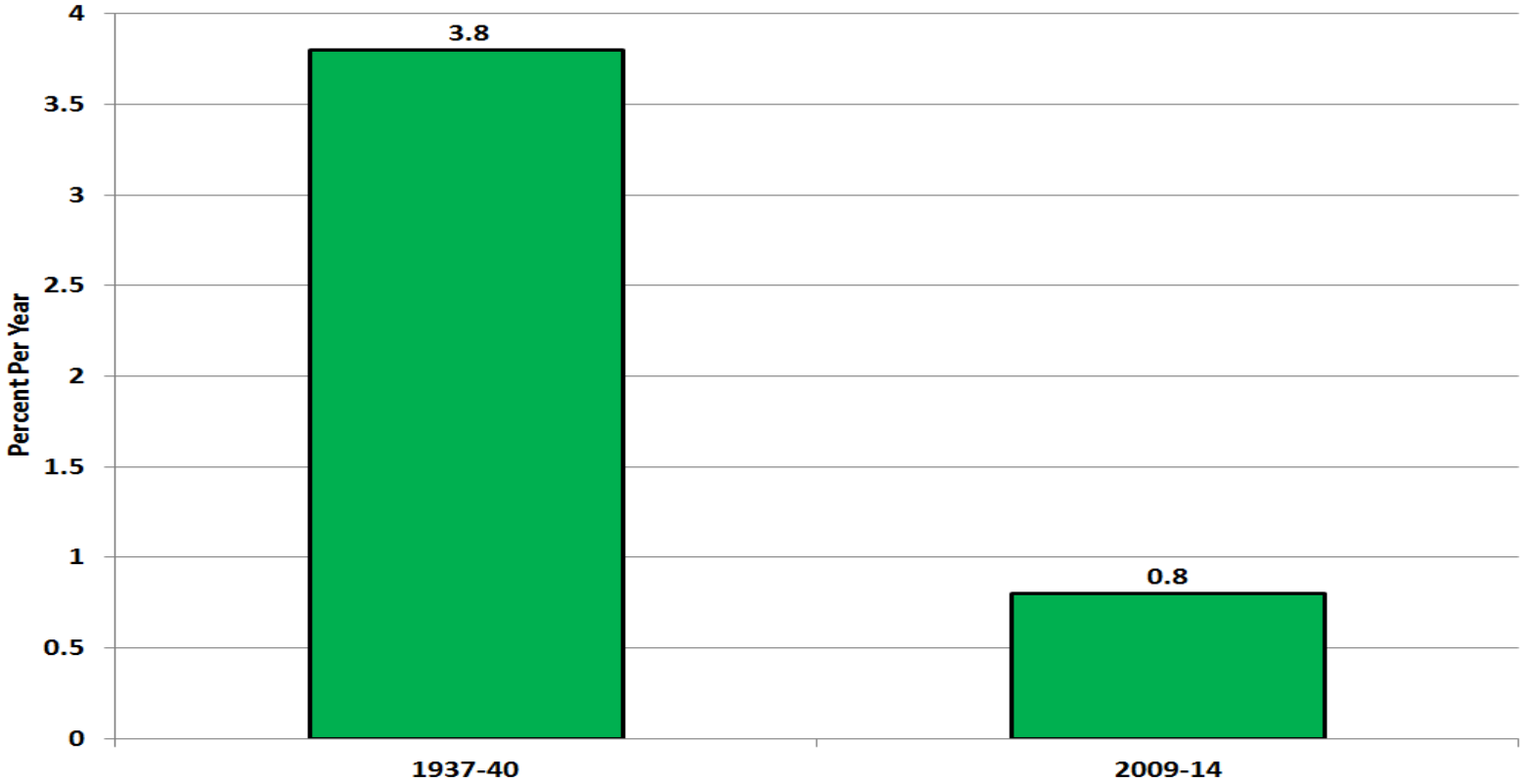
- Today 2015: slowing potential GDP growth
  - Potential Output per Hour
  - Potential Hours of Work
    - Working-age Population
    - Falling Labor-force Participation Rate (LFPR) reduces Hours per capita
- Actual real GDP growth: 1974-2004 3.12, 2004-15 1.56

Decline in Population Growth
As Seen From 1938 and 2015



Productivity Growth, 1937-40 vs. 2009-14

Figure 3A. Annual Growth Rate of Output per Hour, 1937-40 vs. 2009-14



Preview: Primary Source of Secular Stagnation is Slowing Productivity Growth

- **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**

The 2nd IR occurred 1870-1920, continued impact through 1970

- **Electricity, light, elevators, machines, air conditioning**
- **Internal combustion engine, vehicles, air transport**
- **Telephone, phonograph, movies, radio, TV**
- **Running water, sewer pipes, and the conquest of infant mortality**
- **Chemicals, plastics, antibiotics, modern medicine**
- **Utter change in working conditions, job & home**

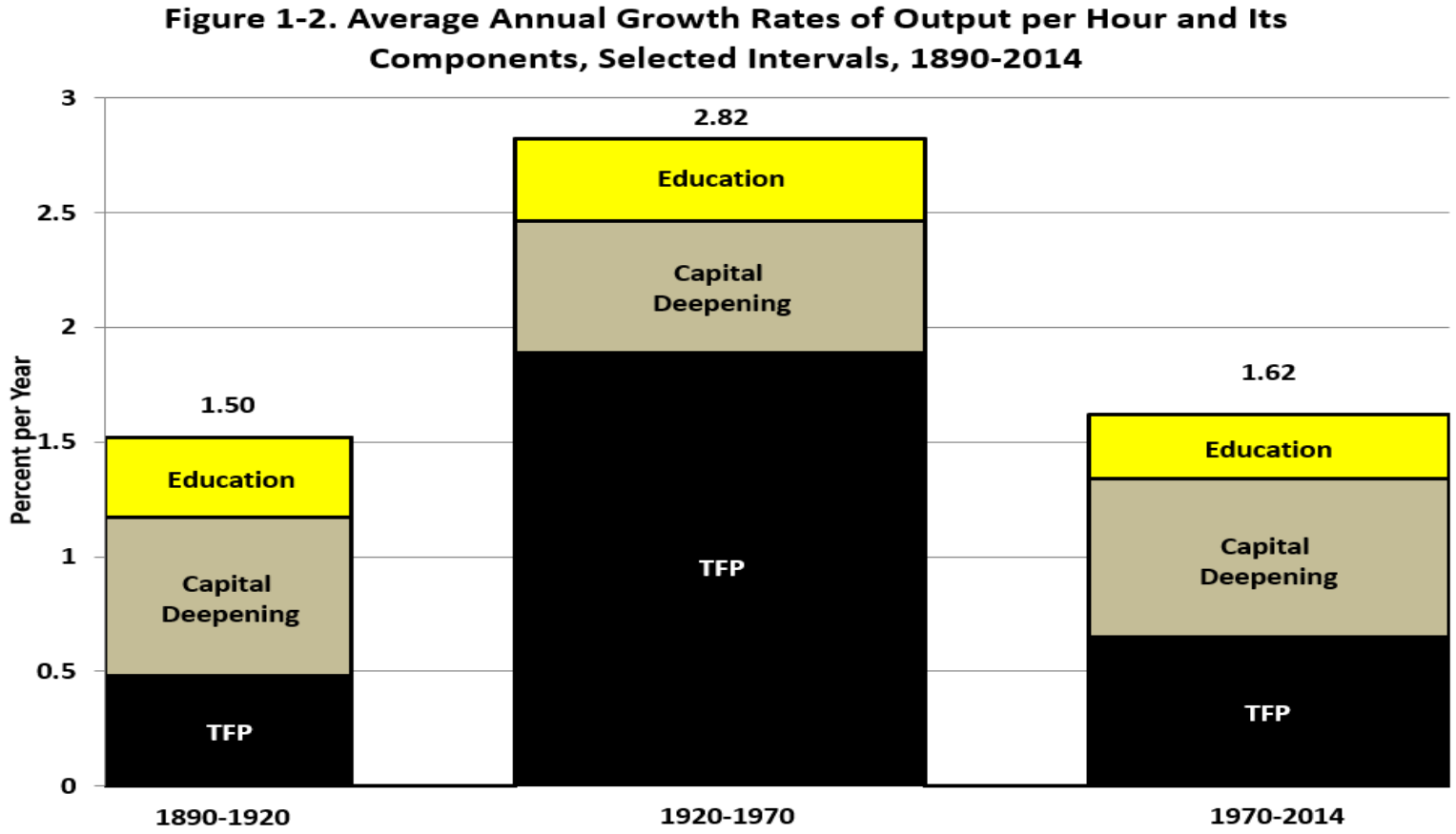
Why Did Productivity Grow Faster In the Century Before 1970? The One-Time-Only Inventions

- Polluting flames for light >> instant on-off electric light
- Factory power with steam engines and belts >> electric machine tools and hand tools
- Offices and home cold and hot >> central heating and air-conditioning
- Horses >> motor vehicles and air travel
- Mainly rural 1870 >> mainly urban 1950

Third Industrial Revolution

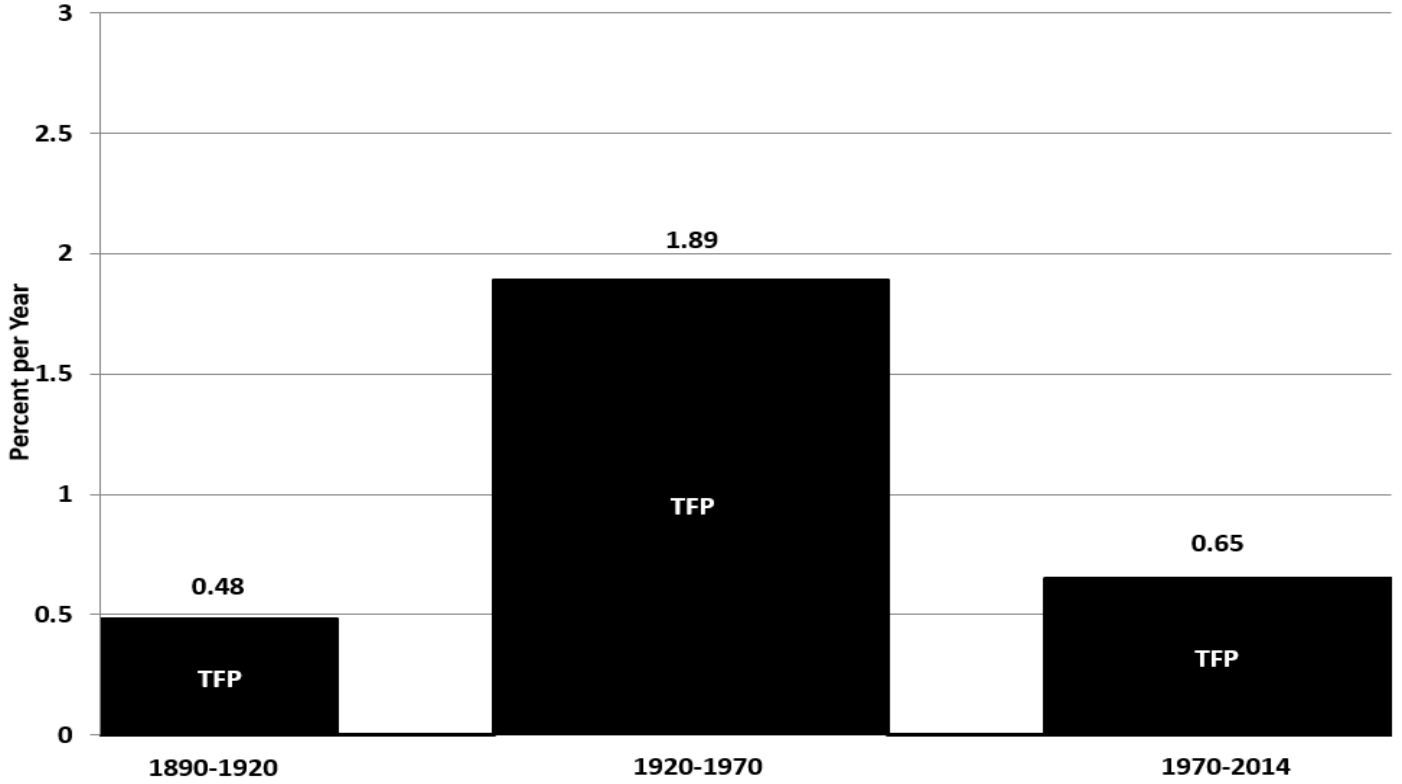
- Since 1960 the “EICT” Revolution
  - Entertainment: the evolution of TV from color to time-shifting and streaming
  - Information Tech – the evolution from mainframes to PCs, the web, and e-commerce
  - Communications: mobile phones, smart phones
  - Productivity enhancers: ATM, bar-code scanning,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

The Three Eras of Productivity Growth

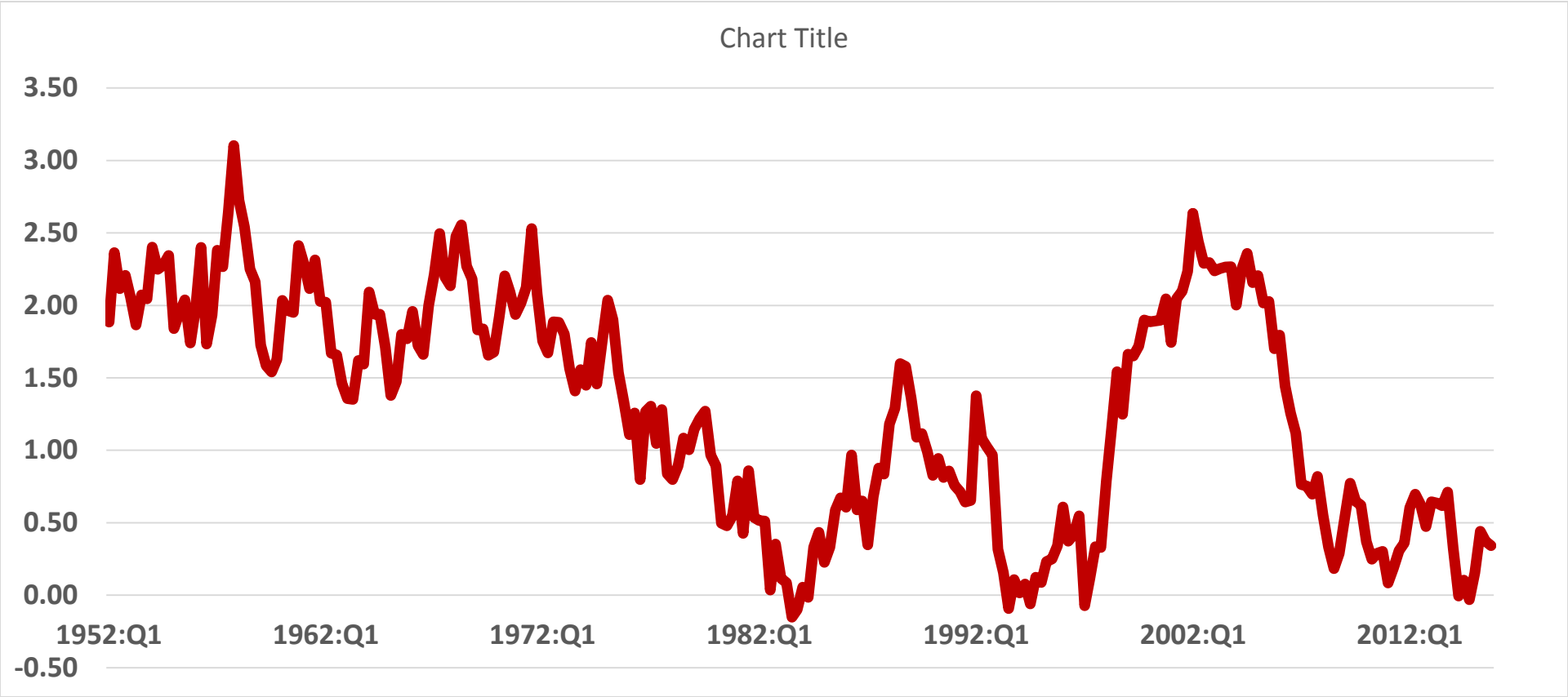


The Three Eras of TFP Growth

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



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 CONCLUSION: HAS 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. E-mail, electronic catalogs, T-1 lines, 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

Eliminating the Middle in Publishing

- Newspaper publishing circa 1994
  - A newsroom of PC screens (not flat)
  - By then no linotype operator
  - Replaced by linked word processing and publication software
- Newspapers, magazines, books, academic papers
- The whole layer of secretaries, typesetters, middlemen had been eliminated before web browsers arrived

Paper to Electronic Catalogs

- Transformation from 1985 to 2005
  - University and public libraries
  - Parts departments at auto dealers
  - Ordering items at hardware stores
  - Selecting plants at nurseries/ garden shops
- All of these uses have in common
  - Not only are items listed and pictured
  - Available inventory, out-of-stock is indicated
  - Same information available at home as in the library or in the store

Transformation in Retailing Completed by 2005

- 1980s and 1990s Wal-Mart led big box revolution with innovations in supply chain and inventory management
- Check-out revolution: bar-code scanners, credit/debit card authorization technology
- Impact of self check-out surprisingly small (is it surprising?)

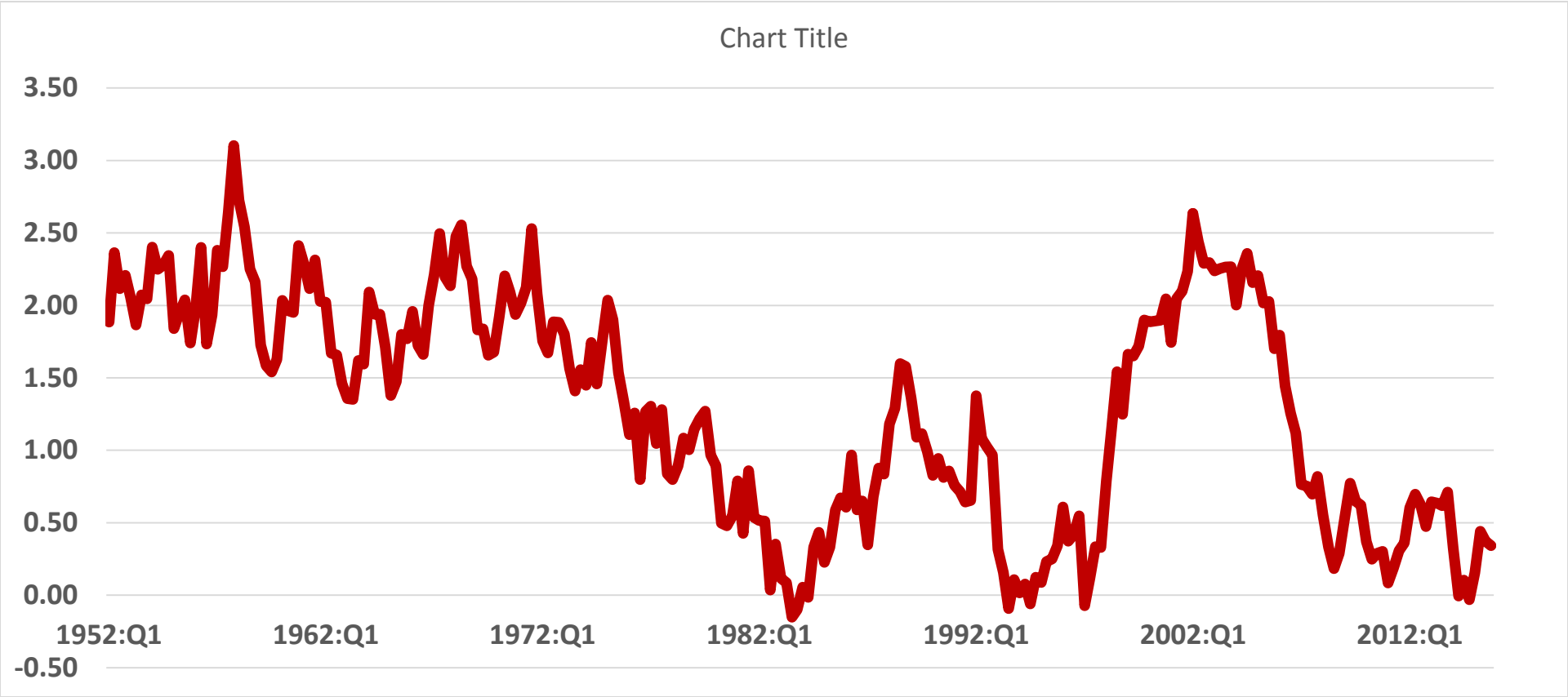
More Achievements Completed by 2005

- **Finance and Banking**
  - **1970s and 1980s, ATM machines**
  - **1980s and 1990s. Transition from multi-million share trading days to multi-billion share days**
  - **Commonplace now: empty bank branches**
- **How Long Ago Were the Creations:**
  - **Amazon 1994, Google 1998, Wiki and i-tunes 2001, Blackberry 2003, Facebook 2004, iPhone 2007**

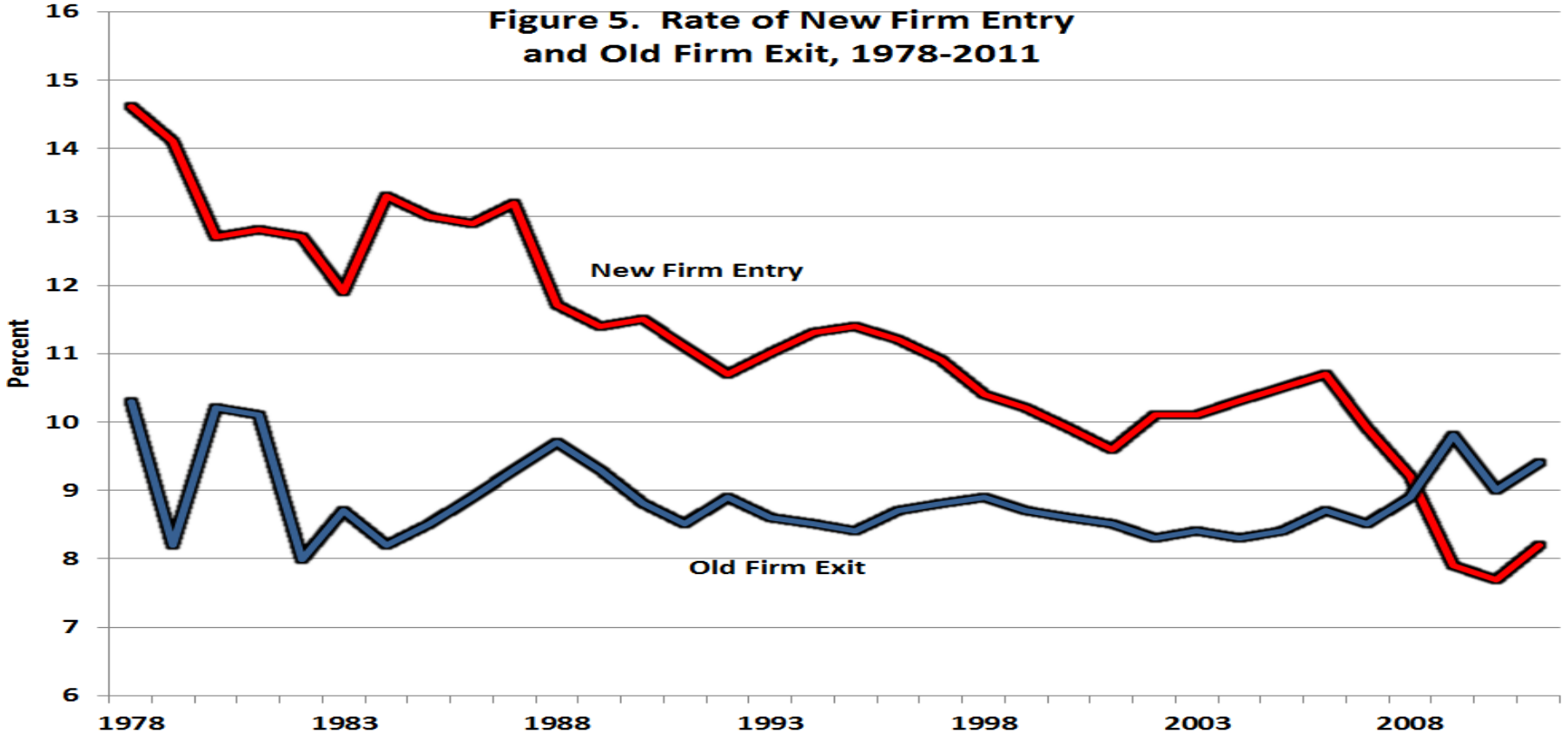
Summary: Stasis Everywhere You Look

- **Offices use desktop computers and proprietary information as they did 10-15 years ago**
- **Retail stasis. Shelves stocked by humans, meat sliced at service counters, checkout bar-code scanning.**
- **Medicine: electronic medical records largely rolled out, little change in what nurses and doctors do**
- **Higher Education: cost inflation comes from rising ratio of administrative staff to instructional staff**

TFP Growth 1952-2015, Five-Year Moving Average

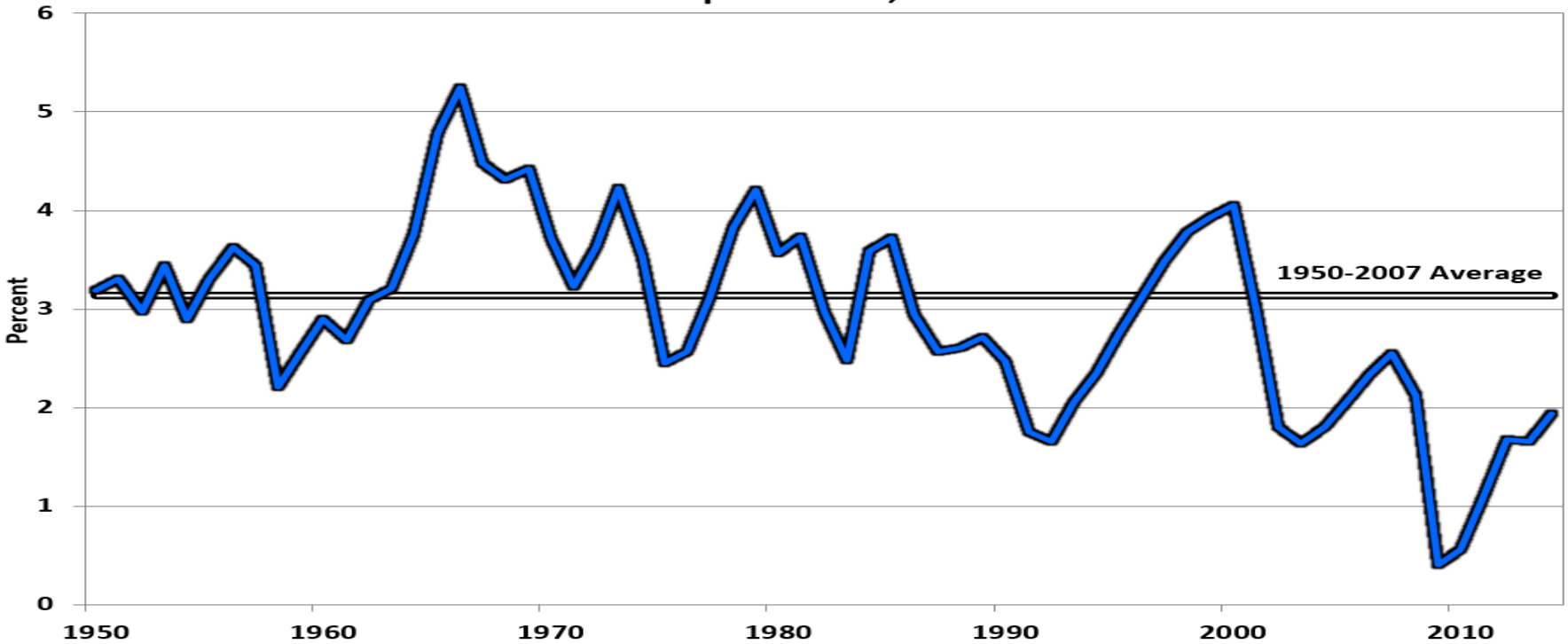


Declining Business "Dynamism" Measured by New Firm Entry



Stagnation Symptom #2:
Declining Rate of Net Investment

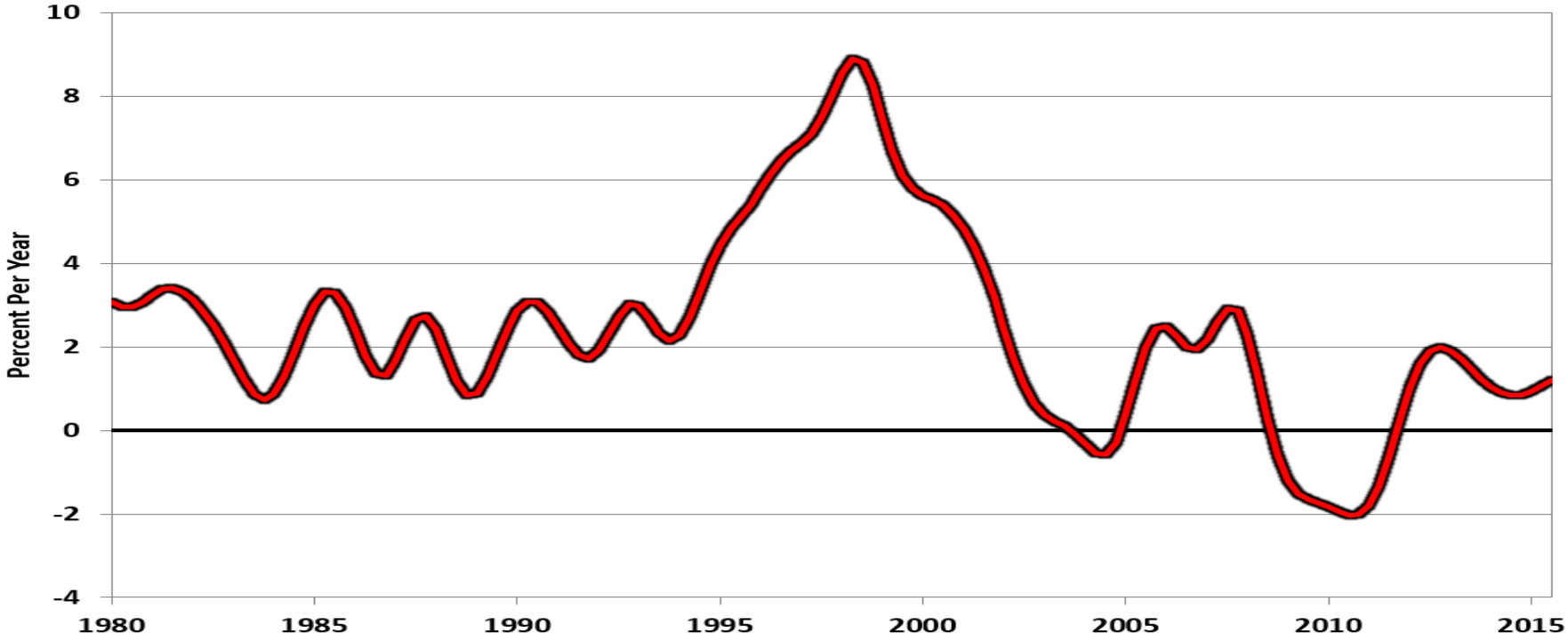
Figure 17-6. Annual Ratio of Net Private Business Investment to Private Business Capital Stock, 1950-2014



Sources: BEA Fixed Assets Accounts, Tables 4.1, 4.4, and 4.7.

Stagnation Symptom #3:
Growth in Manufacturing Capacity

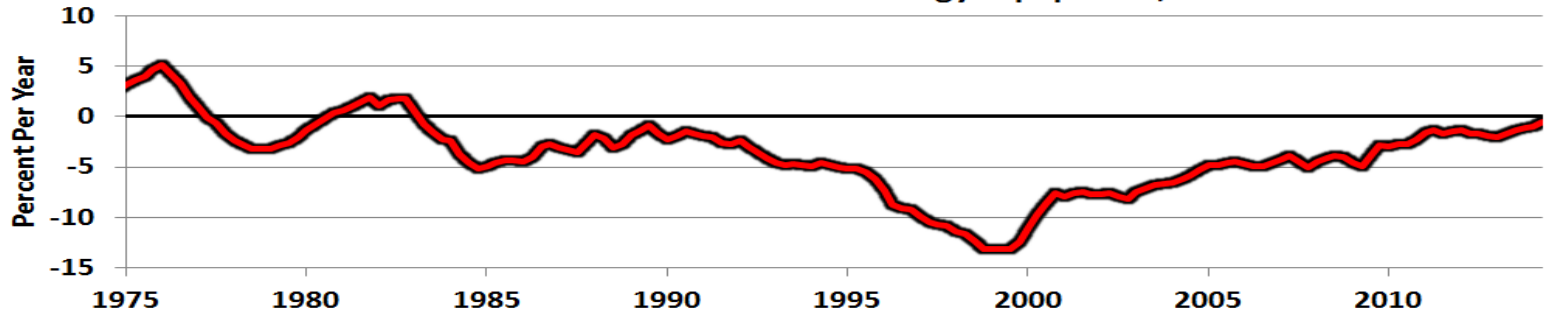
Figure 17-5. Quarterly Annualized One-Year Change in Manufacturing Capacity, 1980-2015



Source: www.federalreserve.gov/datadownload/default.htm, G.17.

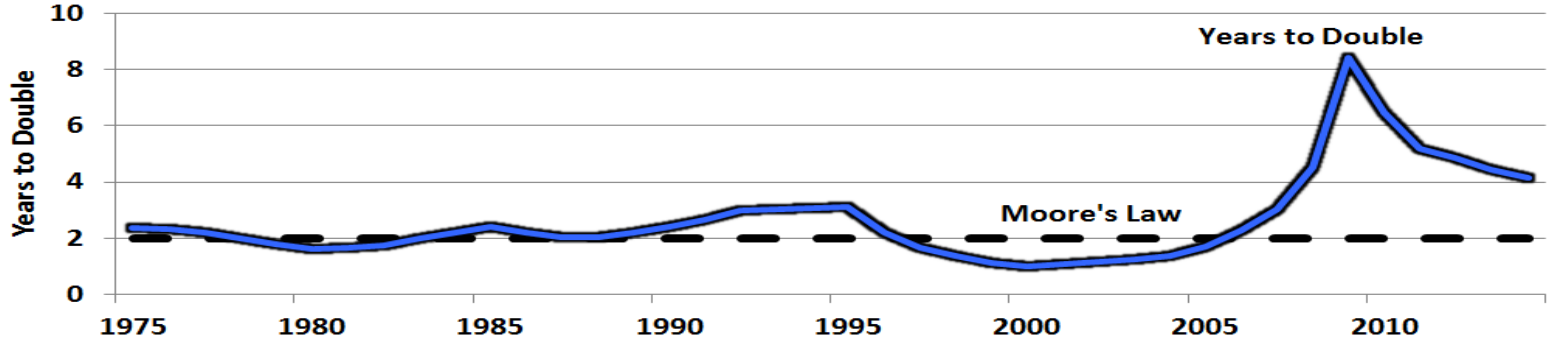
#4 and #5: Computer Prices and the Demise of "Moore's Law"

Figure 9a. Rate of Change of Deflator for Information and Communications Technology Equipment, 1975-2014



Source: NIPA Table 5.3.4

Figure 9b. Years Taken for Number of Transistors on a Chip to Double



Source: Intel Corporation website

Innovations Continue But How Important Are They? (I only look ahead 25 years)

- **Medical Care**
  - **Life expectancy fell 2015 vs. 2014**
    - **US lower than Canada, Europe, and Japan**
  - **Stunning new report on death rates of whites aged 45-54**
  - **Life expectancy gap rich vs. poor (87 vs. 73)**
  - **Coming collision between physical wellness and mental illness (Alzheimers)**

Innovations Continue But How Important Are They?

- **Small Robots**
  - **Robots date back to 1961, continued development is evolutionary not revolutionary**
  - **Robot description from *NYT***
- **3-D Printing**
  - **Greatly speeded up speed and efficiency of designing prototypes, not mass production**

Innovations Continue But Are Evolutionary Not Revolutionary

- **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"
- **Driverless Cars and Trucks**
  - **Truck drivers don't just drive trucks, they unload them and stock the shelves**
  - **Evaluation from *Consumer Reports* (May 2016)**

Slower Growth Goes Beyond Innovation: The Four Headwinds

- The slowing contribution of education to economic growth
- The demographic headwind
- Rising inequality, bottom 99% vs. average including top 1%
- The fiscal headwind

First 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**
  - **High cost, growing indebtedness**

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 -0.3 percent per year compared to the contribution of education to 20th century growth**

Demographic Headwind: Decline in Hours per Person

- Retirement of Baby-Boom Generation
- Reduction of Participation of Prime-Age Males
- Youth
  - Employment/Population Ratio 65% in 1988 to 46% in 2012. Only about 1/3 of this decline is accounted for by increased school participation
- Females 20 and Over
  - Labor Force Participation Rate rose 35% in 1968 to 58% in 2000, then fell back to 55% in 2012

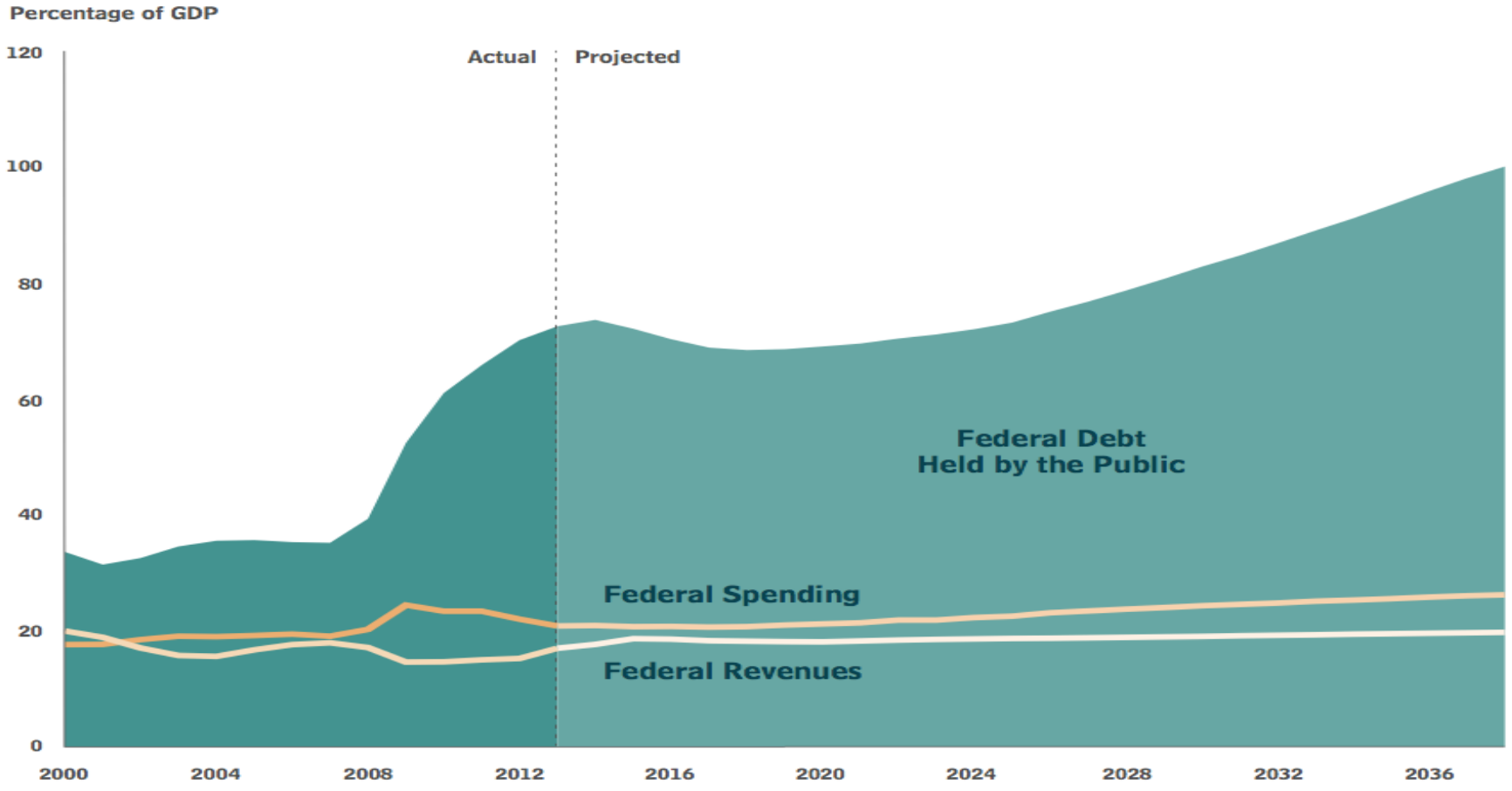
Third Headwind: Inequality

- **For 1993-2012 the gap between average real income growth of total vs. bottom 99% is**

  -0.53 percent per year.

- **This is continuing, it's not over. Count the ways**
  - **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 to avoid paying medical care benefits**

The Fiscal Headwind: Future Debt-GDP Ratio



Socioeconomic Changes: The Decline in Marriage

- 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

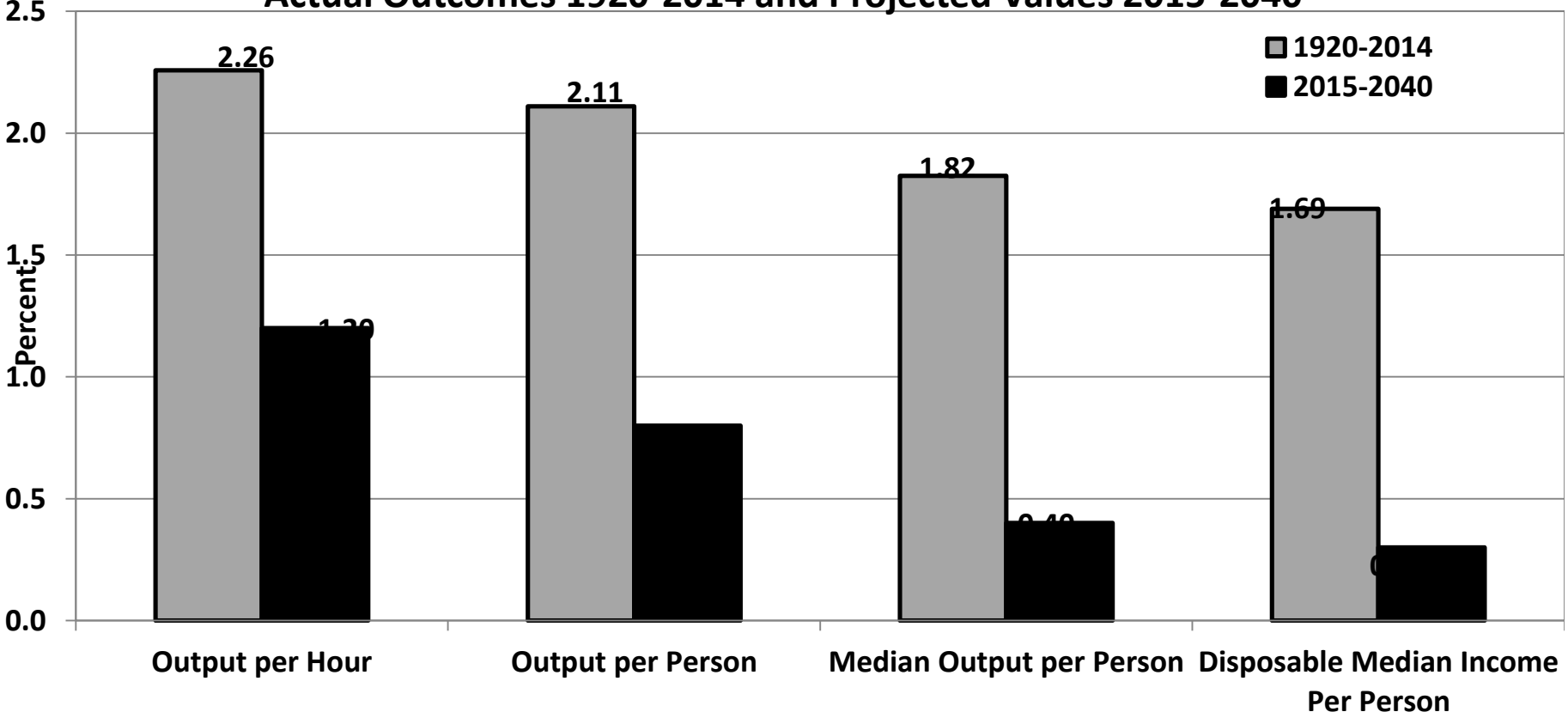
Adverse Future Implications

- **Future consequences of single-parent households**
  - **More children growing up in poverty**
  - **Greater likelihood of future high-school dropping out**
  - **Less likelihood of completing college**
- **Additional adverse effects:**
  - **46 percent of 20-24 age black males in Chicago are neither at work or in school (NY & LA 32 percent)**
  - **1979-2009 percent of white high school dropouts with prison records 4 to 28 percent**
  - **Blacks 15 to 68 percent**

Combined Effects of Headwinds

- **Education headwind reduces productivity growth**
- **Demographic headwind reduces hours per person**
- **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.

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 is less important**
- **Much of the slowdown in future growth is caused by the headwinds**
- **A moderate pace of innovation means that jobs will not disappear *en masse* as predicted by the techno-optimists**

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