Secular Stagnation: A Supply-Side View

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Definitions: Supply and Demand

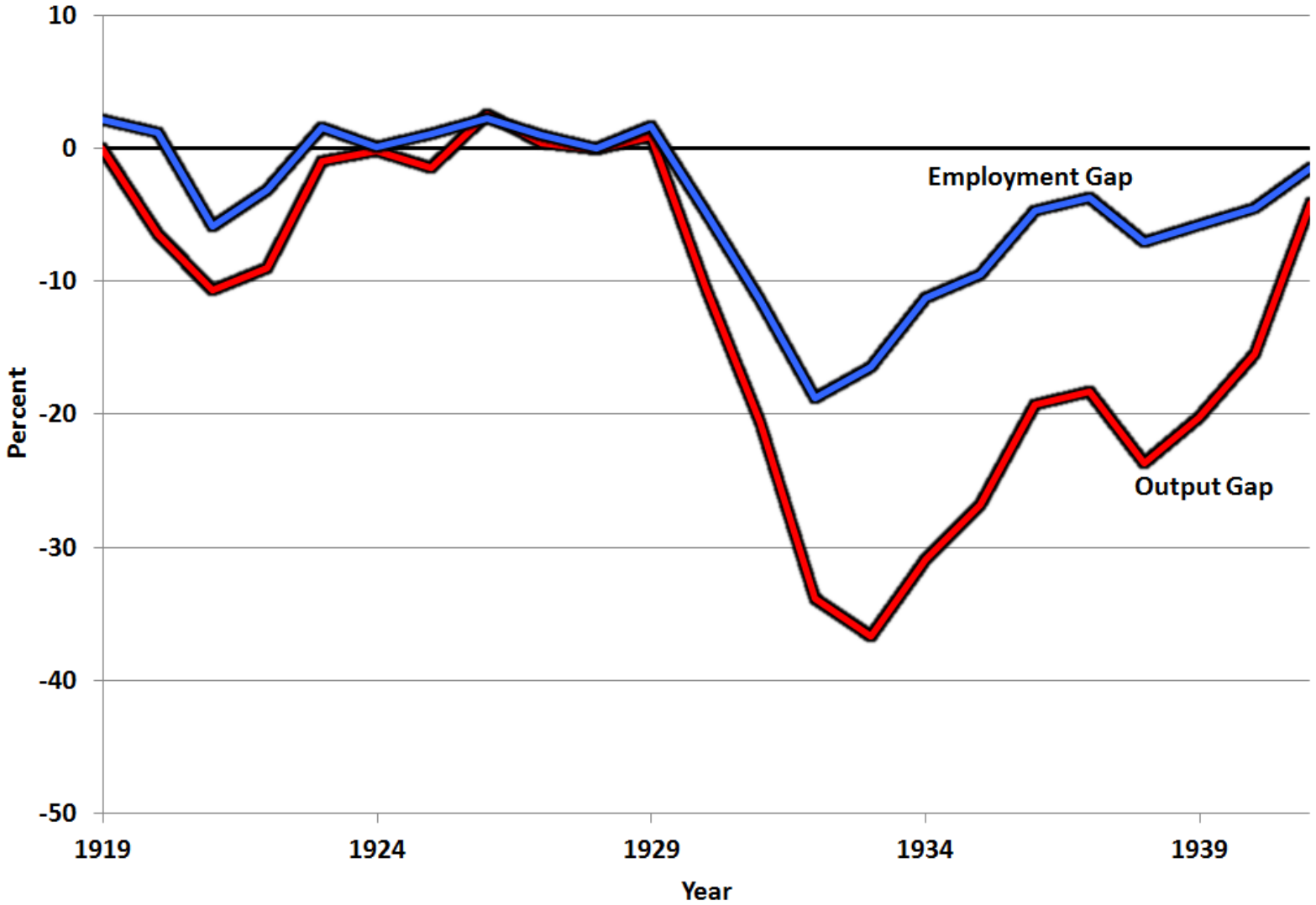
- Secular Stagnation: slow not no growth
- Sources emanate from supply side:
  - Hansen in 1938: slowing population growth
  - Today 2015: slowing potential GDP growth
    - Potential Output per Hour
    - Potential Hours of Work
      - Working-age Population
      - Labor-force Participation Rate (LFPR)
- Difference for Hansen: Productivity growth in late 1930s was very fast, hence the concern about population growth

Why Secular Stagnation Matters

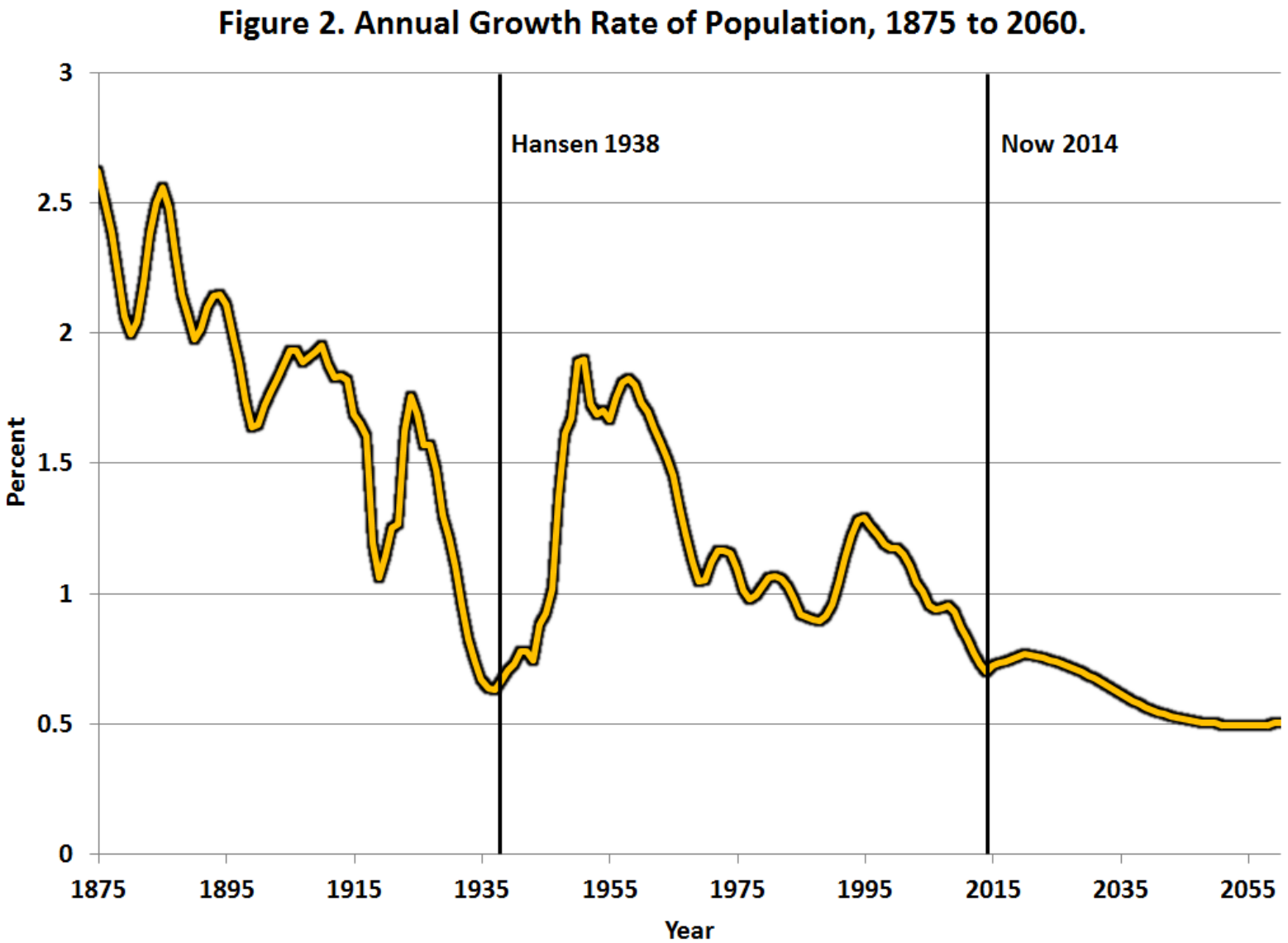
- **Direct AS Effects: low productivity growth, declining LFPR reduce growth in output per capita**
- **Indirect Effects: any source of slow potential output growth reduces net investment**
  - **Basic idea: steady state with fixed long-run capital-output ratio**
  - **Slower output growth means slower growth in capital**
- **Lower net investment: reduces aggregate demand and feeds back to lower productivity growth**
- **Hansen 1938: the AD channel from population**
- **Today 2015: the AS channel from LFPR and slow productivity growth**

For Hansen the Problem Was Inadequate Aggregate Demand

Figure 1. Output Gap vs. Employment Gap, 1919 to 1941.

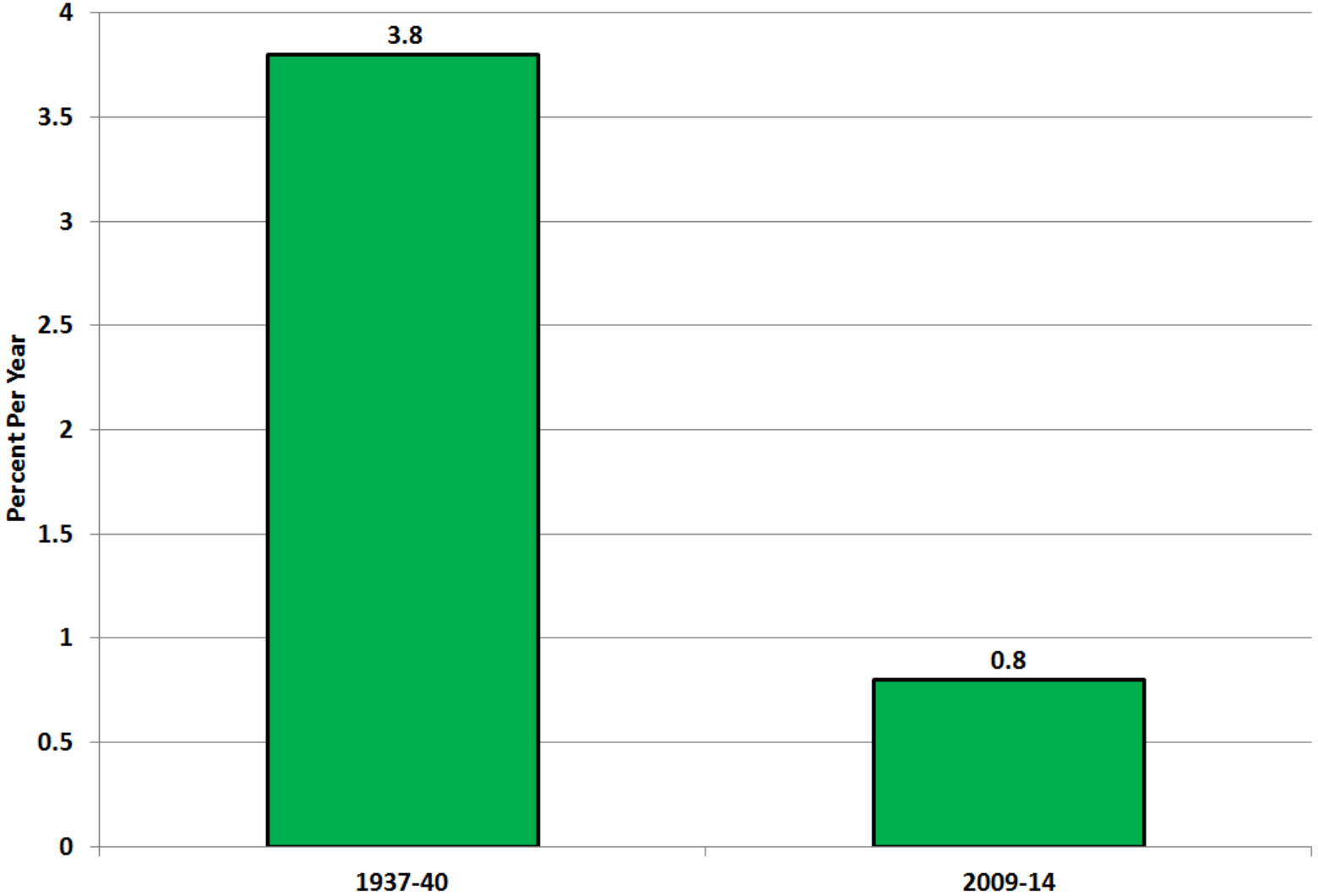


Population Growth 1875-2060



Why Hansen Wasn't Worried About Productivity Growth

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

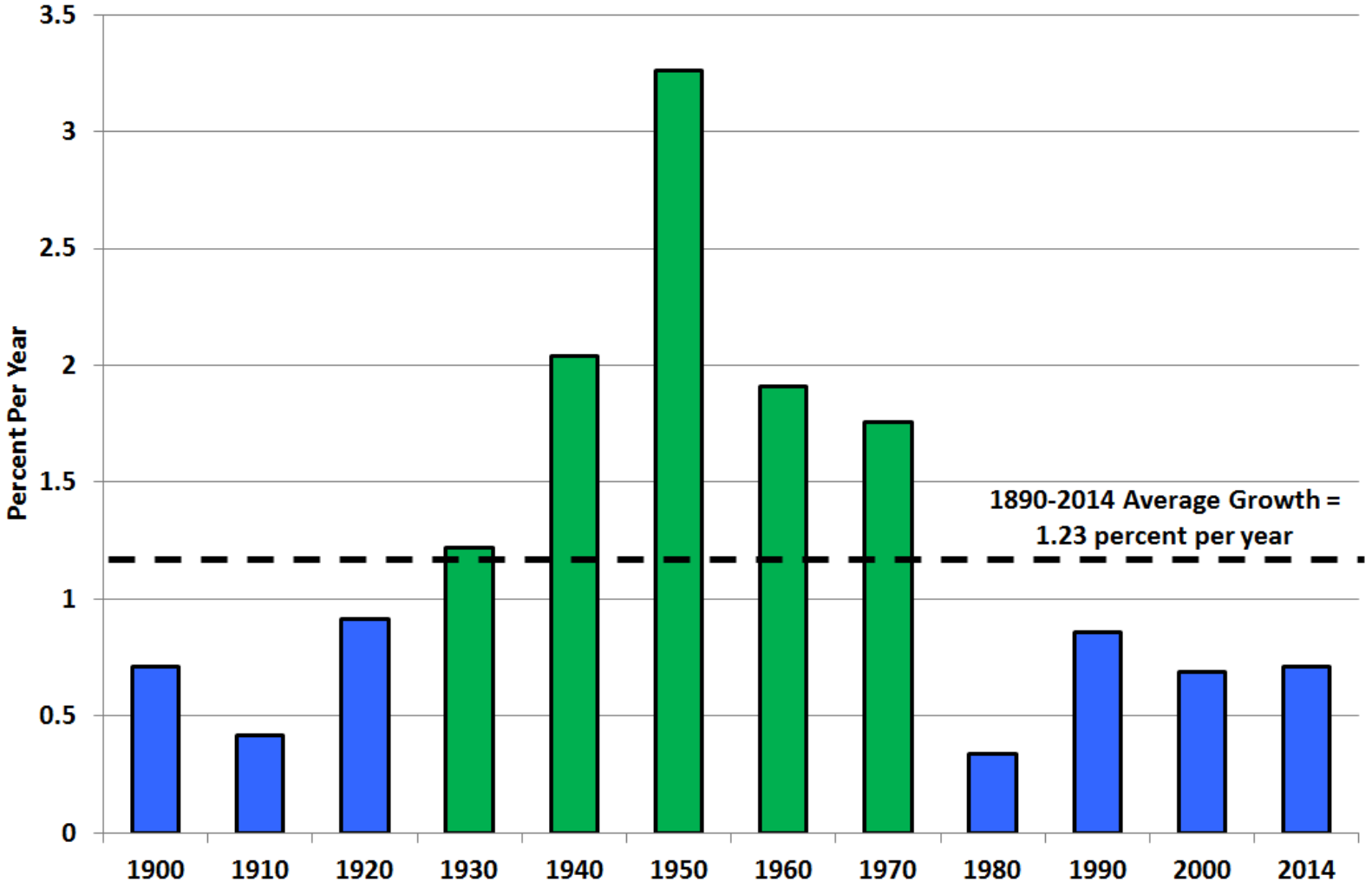


The Dynamics of TFP Growth Since 1890

- 1st Industrial Revolution (IR #1), 1770-1830
  - Benefits Continued Until 1900
- 2nd Industrial Revolution (IR #2), 1870-1930
  - Benefits Continued Until 1970
  - Electricity, internal combustion engine, telephone, wireless, chemical engineering, conquest infectious diseases, antibiotics, foundations modern medicine
- Paul David "delay" hypothesis about IR #2
  - Developed for electricity
  - Also applies to motor vehicles, many other inventions

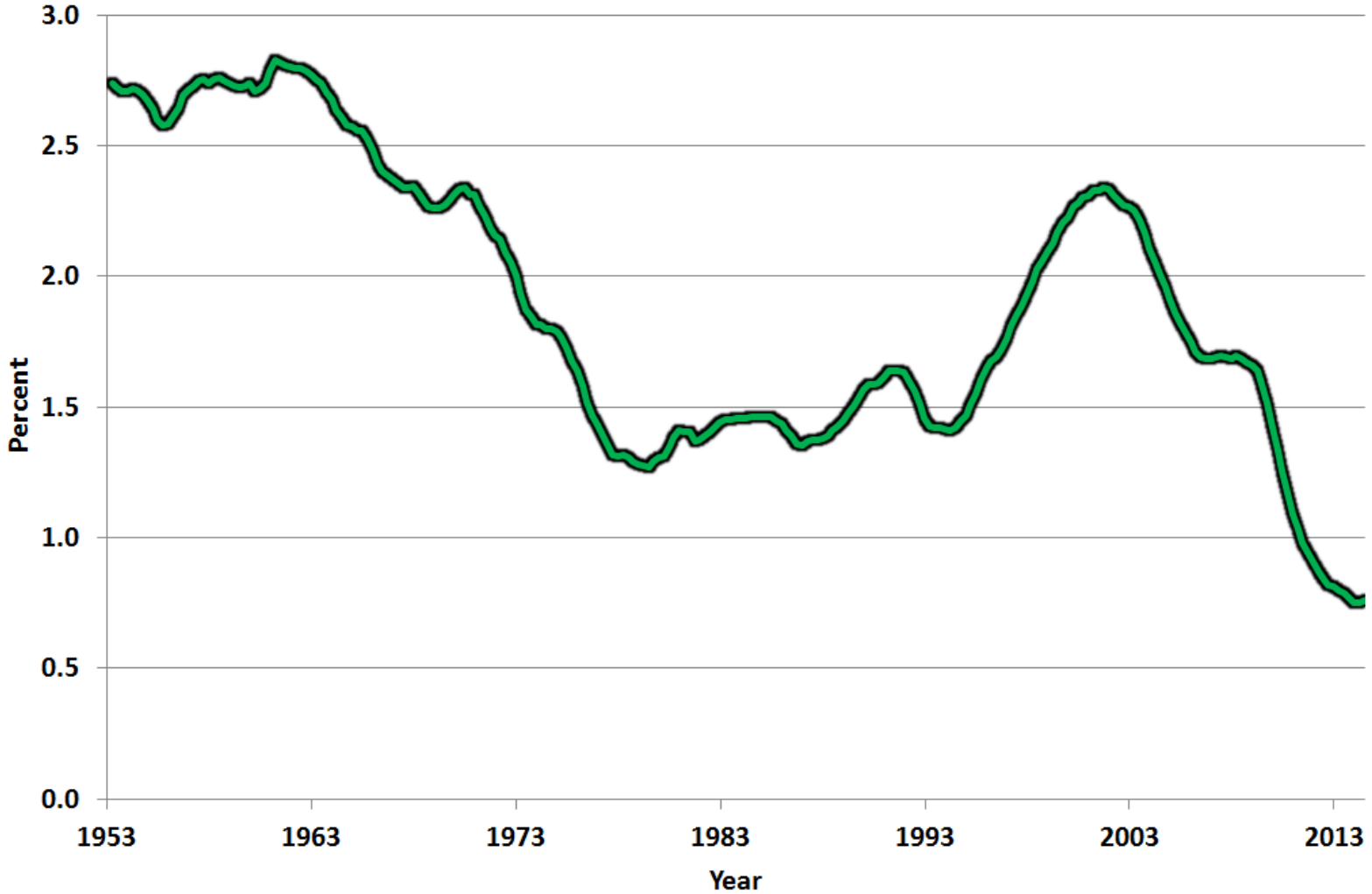
The Powerful But Delayed Impact of IR #2 on TFP Growth

Figure 3. Annual Growth Rate of Total Factor Productivity for Ten Years Preceding Years Shown, Years Ending in 1900 to 2014



Could IR #3 Be Almost Over?
Output per Hour Growth Since 1953

Figure 4. Four-year Moving Average Annual Growth Rate, Total Economy Output per Hour, 1953:Q1 to 2014:Q3.



The IR #3 Changed Business Practices Completely 1970-2005

- **Transformation in offices completed by 2005.**
  - **1970 mechanical calculators, repetitive retyping, file cards, filing cabinets**
  - **1970s and 1980s. Memory typewriters, electronic calculators, PCs with word processing and spreadsheets**
  - **1990s. The web, search engines, e-commerce**
  - **2000-05 flat screens, revolution in business practices was over**
- **Transformation in retailing completed by 2005**
  - **1980s and 1990s Wal-Mart led big box revolution in supply chain, inventory management, dynamic pricing**
  - **Check-out revolution: bar-code scanners, credit/debit card authorization technology**

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**
  - **By 2005 the technology was in place to create:**
  - **Sub-prime lending, MBS, layers of leverage, housing bubble, financial crisis**
- **How Long Ago Were the Creations:**
  - **Amazon 1994, Google 1998, Wiki and i-tunes 2001, Facebook 2004**

Further Evidence of Diminishing Returns

- **Consumer Electronics Show 2014, NYT quotes**

  "This show was a far cry from the shows of old . . . Over the years it has been the place to spot some real innovations. [VCR 1970, CD player 1981, HD TV 1998, Xbox 2001] This year's crop of products seemed a bit underwhelming by comparison."

- **Decline in Business "Dynamism"**
  - **Decline over last 30 years in creation of new firms**
- **Decline in labor market "Fluidity"**
  - **Decline in job and worker reallocation rates**

Declining Contribution of Education to Productivity Growth

- Goldin and Katz 0.35 percent contribution of education
- Increase in educational attainment coming to an end
- Jorgenson -0.30 downward adjustment to education's contribution, i.e., close to zero
- U.S. steady decline in league tables of high-school completion, four-year college completion
  - Poor preparation for college. International PISA test scores rank out of 34 OECD countries: US #17 in reading, 20th in science, 27th in math
- New issues of college affordability and $1 trillion of student debt

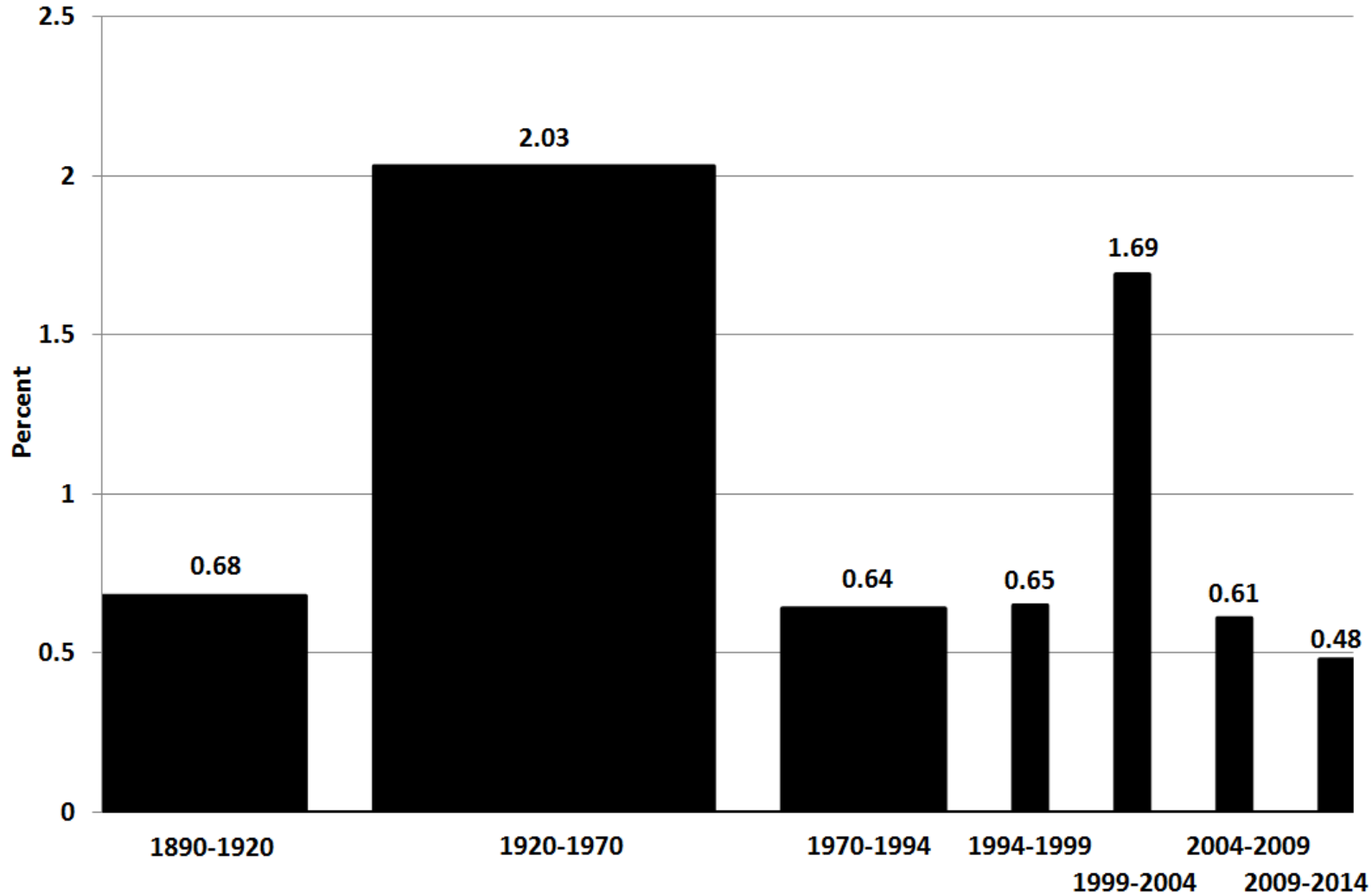
Socioeconomic Changes with Adverse Future Implications

- Changes 1982 to 2008, children born out of wedlock
  - White high school grads 4 to 34 percent
  - White high school dropouts 21 to 42 percent
  - Black high school grads 48 to 74 percent
  - Black high school dropouts 76 to 96 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
- Future consequences of single-parent households
  - More children growing up in poverty
  - Greater likelihood of future high-school dropping out
- Additional adverse effects: 1979-2009 percent of white high school dropouts with prison records 4 to 28 percent;

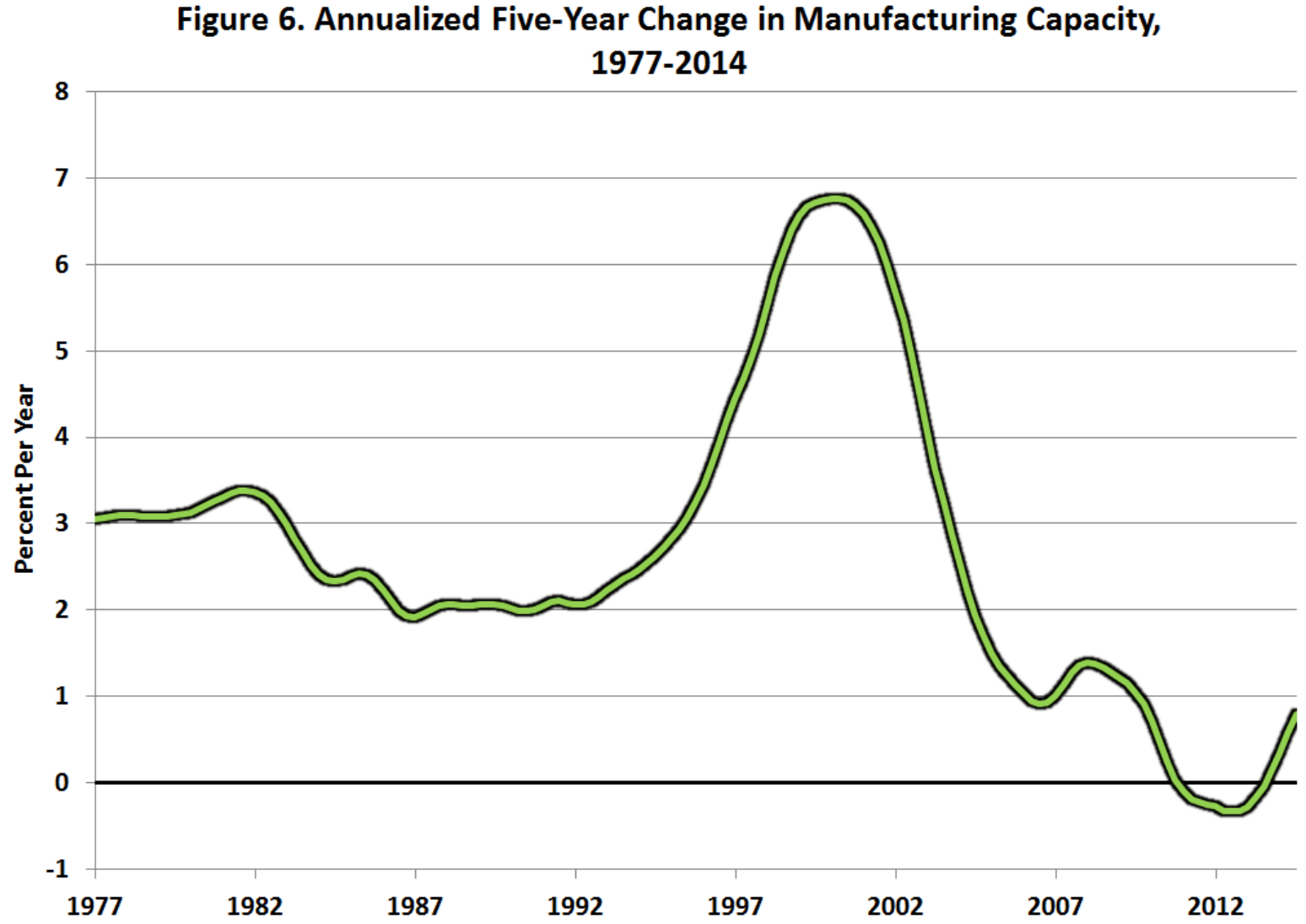
  blacks 15 to 68 percent

Will the Productivity Revival of the Late 1990's Be Repeated?

Figure 5. Average Annual Growth Rates of Total Factor Productivity, Selected Intervals, 1890-2014

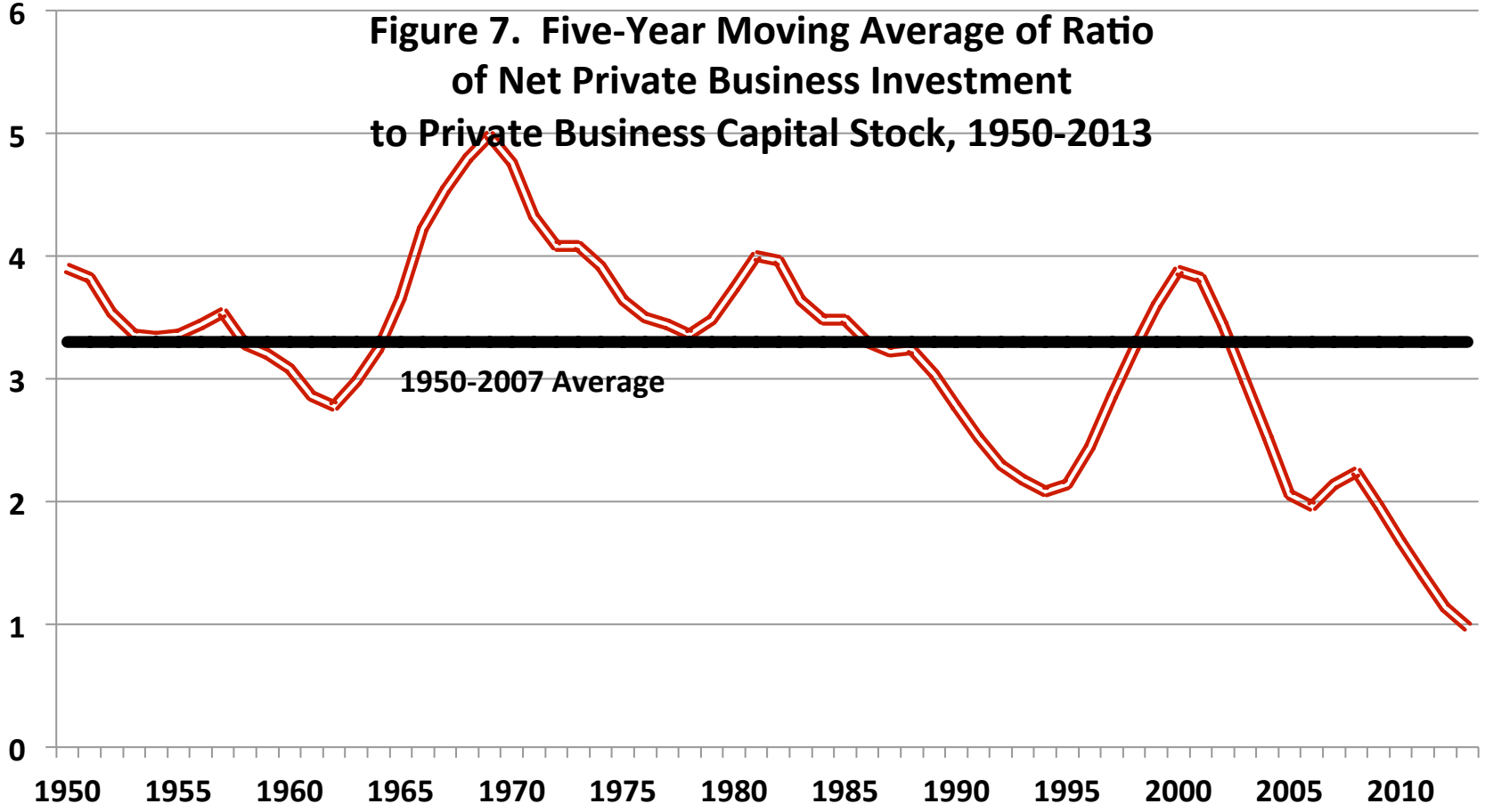


Growth of Manufacturing Capacity, 1977-2014



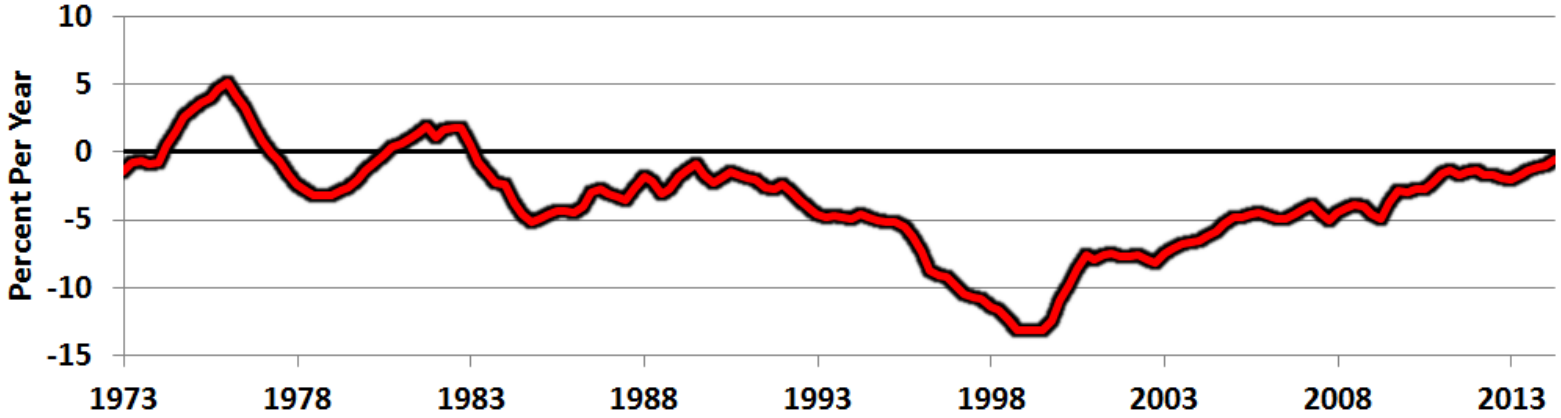
Source: www.federalreserve.gov/datadownload/default.htm, G.17

Ratio of Net Investment to Capital Stock, 1950-2013



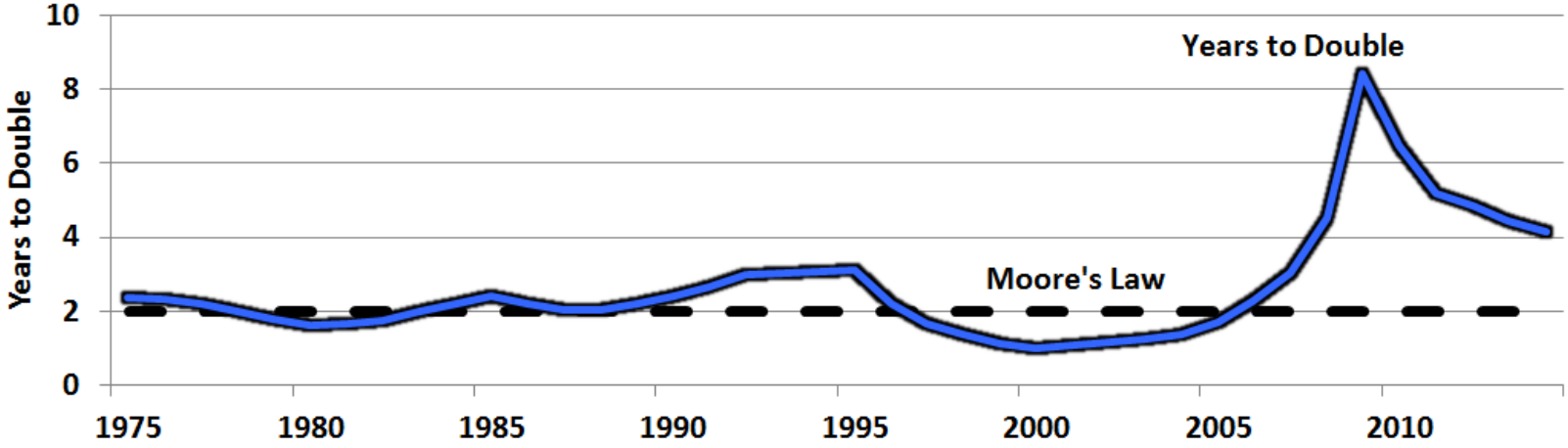
Price Deflator for ICT Equipment and the Demise of Moore's Law

Figure 7a. Annual Change of Price Index for Information and Communication Technology, 1973-2014



Source: NIPA Table 5.3.4

Figure 7b. Years Taken for Number of Transistors on a Chip to Double



Source: Intel Corporation website

Innovations Continue But How Important Are They?

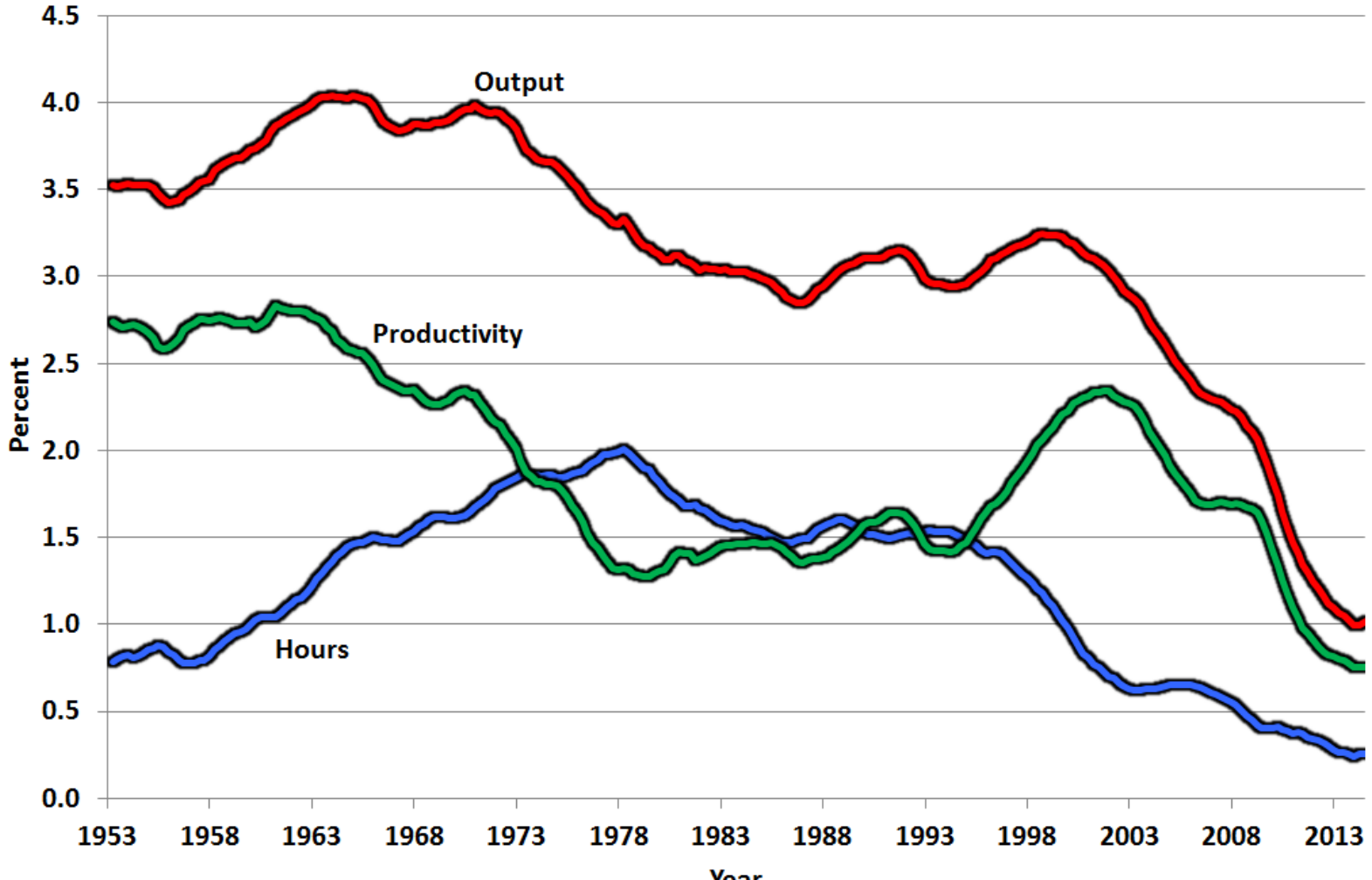
- **Medical and Pharmaceutical**
  - **Continuous progress in advancing life expectancy**
  - **Coming collision between physical wellness and mental illness (Alzheimers)**
  - **Increasing costs of drug development, fewer important new drugs**
- **Small Robots and 3-D Printing**
  - **Robots date back to 1961, continued development is evolutionary not revolutionary**
  - **3-D printing useful for development prototypes, not mass production**

Innovations Continue But How Important Are They?

- **Big Data and Artificial Intelligence**
  - **Predominant uses of big data are in marketing, zero-sum game**
  - **Application to legal searches, radiology reading evolutionary, not revolutionary**
- **Driverless Cars and Trucks**
  - **Truck drivers don't just drive trucks, they unload them and stock the shelves**
  - **Wholesale trade isn't just gee-whiz Amazon warehouses. Most of it involves delivering bread, coke, and beer**

Slowing Potential Output Growth: The Role of Productivity vs. Hours

Figure 8. Kalman Growth Trends of Output, Hours, and Productivity, 1953:Q1 to 2014:Q3



Comparing the Last 5 Years to the Last 10 Years

Table 1 Annual Growth Rates, Selected Intervals, 2004-14			
	Real GDP	Aggregate Hours	Real GDP per Hour
2004:Q3 - 2009:Q3	0.81	-0.77	1.58
2009:Q3 - 2014:Q3	2.31	1.49	0.82
2004:Q3 - 2014:Q3	1.56	0.36	1.20
Future Trend	1.60	0.40	1.20
Memo: 1974-2004	3.12	1.40	1.72

Conclusions

- ¾ of TFP growth since 1890 occurred 1920-70
- The big impacts on TFP of IR #3 were largely completed by 2005
- Educational plateau and socioeconomic decay subtract from feasible future productivity growth
- The productivity revival of 1996-2004 was temporary
- Innovation continues but is less important in its impact on labor productivity and TFP
- Even if productivity growth returns to its 2004-14 average of 1.2, potential output growth is only 1.6
- Growth in real GDP per capita only 0.7 compared to 2.1 continuously from 1890 to 2007