The Case Against a Major Revival of Productivity Growth

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Defining a "major revival of productivity growth"

- Productivity growth in the U.S. and EU-15 has been 0.5 percent per year since 2010

- A "major" revival of productivity growth would achieve
  - 2.5 to 3.0 percent growth as in U.S. 1996-2004
  - 2.5 to 3.0 percent growth as in the EU-15 1980-1995

- A "minor" revival would achieve 1.0 to 1.5 percent
  - This may already be happening in the U.S. due to tight labour markets and recovering investment

- My case is against the likelihood of a "major" revival as defined here, not denying a "minor" revival

Preview of the argument

- **Digitalisation, Robotisation, and AI are nothing new**
  - Digitalisation dates back to 1950s mainframes
  - The first robot was introduced in 1961
  - AI has been here for at least 20 years

- **All are part of the "Third Industrial Revolution"**
  - Less important than the Second
  - Much of it has already happened
  - Hasn't prevented slowdown in productivity growth

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, railroads, steamships
    - Cotton spinning and weaving

IR #2: five dimensions of revolutionary change

- **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

- **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, running water, waste disposal

- Life expectancy improved twice as fast 1900-1950 as 1950-2000

IR #3: the digital revolution started in 1960

- 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

- STARTLING QUESTION: HAS MOST OF THE PRODUCTIVITY IMPACT OF THE 3RD IR ALREADY HAPPENED?

IR #3 changed business practices, many of them before the internet arrived in 1995

- From repetitive retyping to word processing on PCs

- From mechanical calculators and slide rules to spreadsheets on PCs

- From file cabinets of paper to megabytes and then gigabytes of computer storage

- From library catalogues in card boxes to screens showing real-time book availability

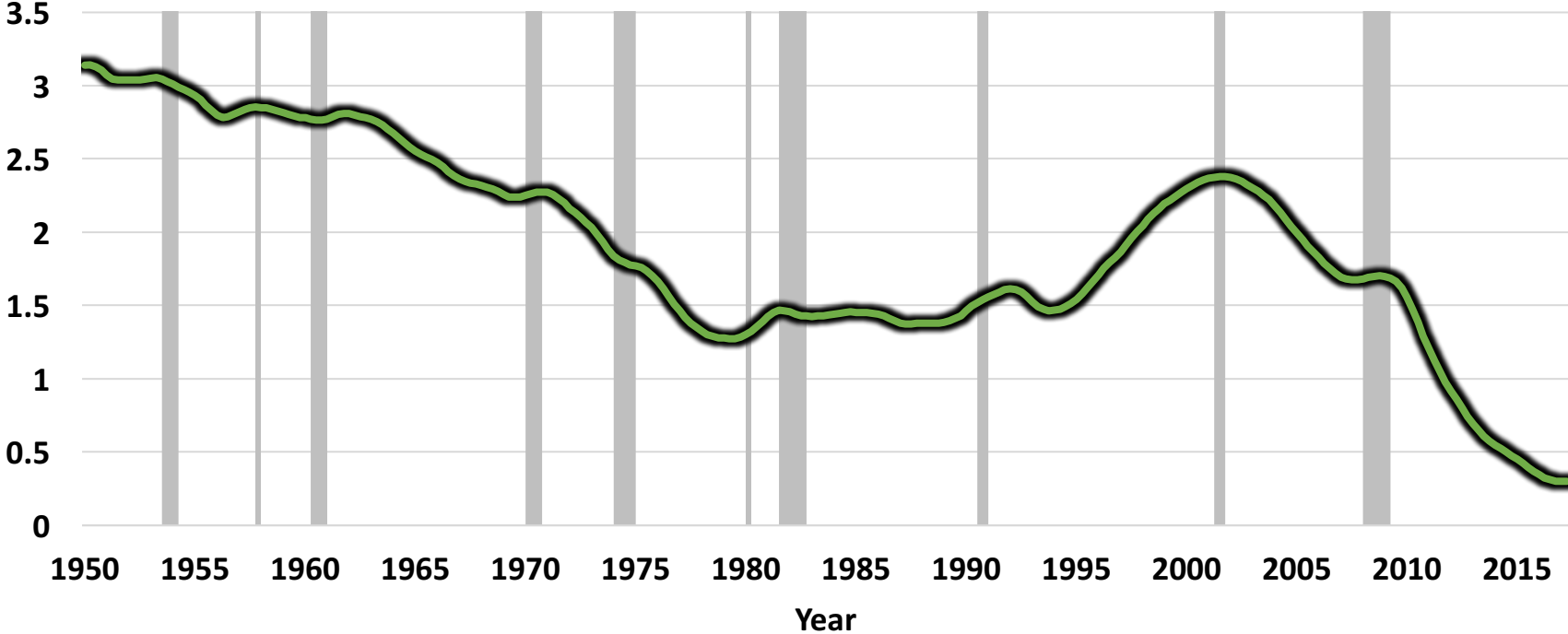- Instant communication by fax and e-mail predated the internet

The three eras of productivity growth

Figure 1-2. Average Annual Growth Rates of Output per Hour and Its Components, Selected Intervals, 1890-2014
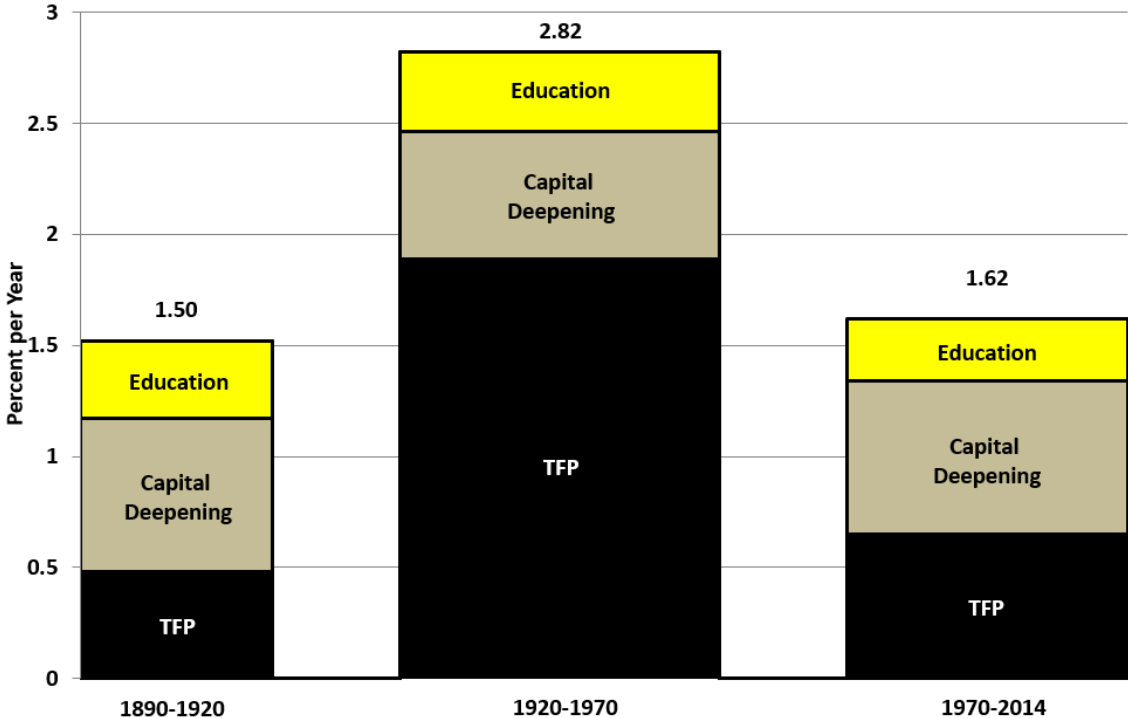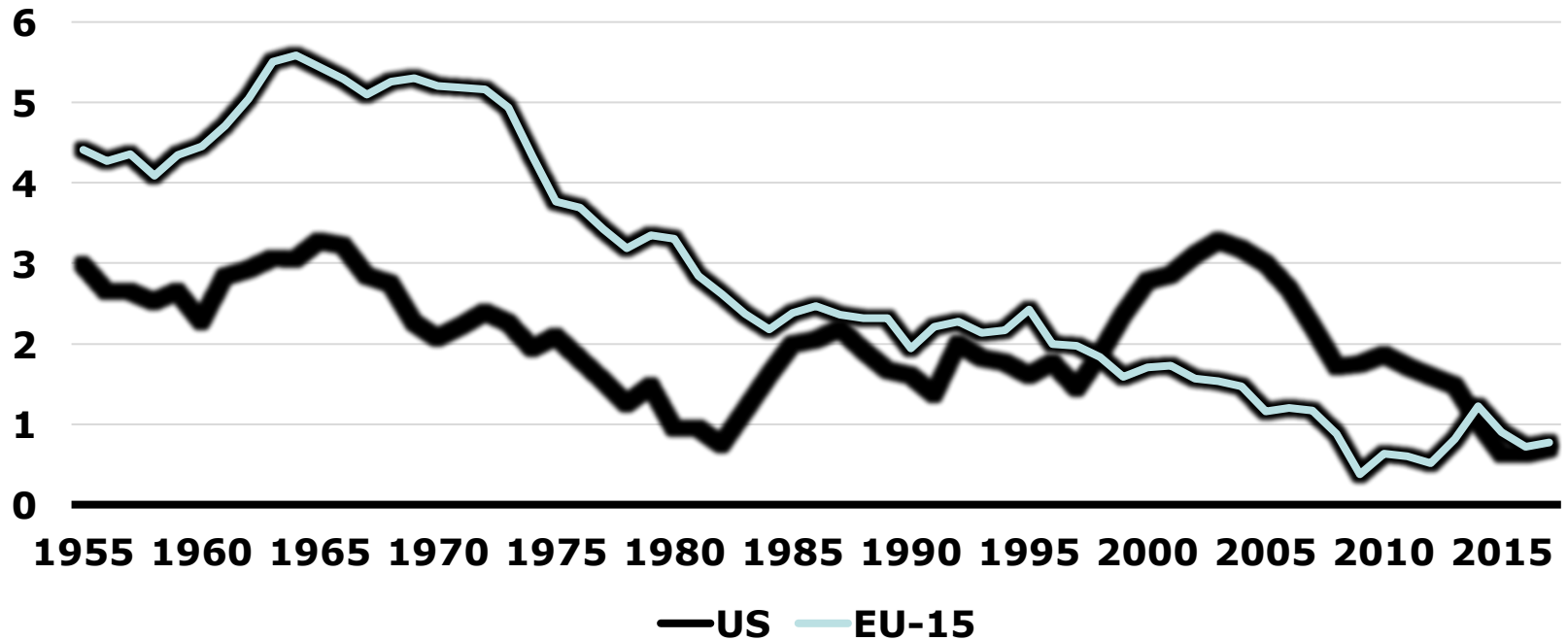
U. S. productivity growth at a constant unemployment rate

Productivity growth, US vs. W. Europe (EU-15), 1955-2017

US vs. EU-15 Labor Productivity Growth, 1955-2017

How revolutionary are robots and AI?

- **Robots were introduced by General Motors in 1961**
    - By the 1990s were pervasive in auto factories
- **Lots of jobs have physical aspects that robots struggle with**
    - Walking down stairs, turning handles, folding laundry
    - Two robots were taught to assemble an IKEA chair but it took 3x as long as a human
- **AI excels at abstract cognitive tasks like board games**
- **AI works by recognizing massive numbers of patterns, can't reason exceptions**
    - Autonomous vehicles have trouble foreseeing unusual situations
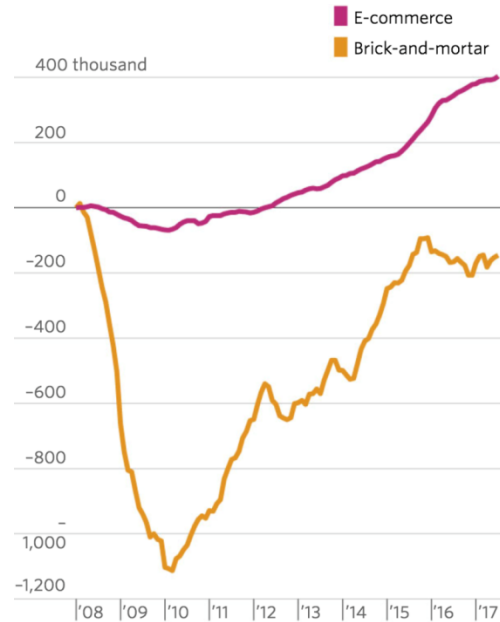
AI job displacement is nothing new

- Airline and hotel reservations system replaced most travel agents

- Voice recognition and language translation have replaced many transcribers and translators

- Computer phone menus replaced some customer service agents

- Yet productivity growth has slowed

- Most spending on AI is in marketing, but marketing analyst jobs have flourished

- *McKinsey Quarterly* survey

ATM machines and bank teller jobs
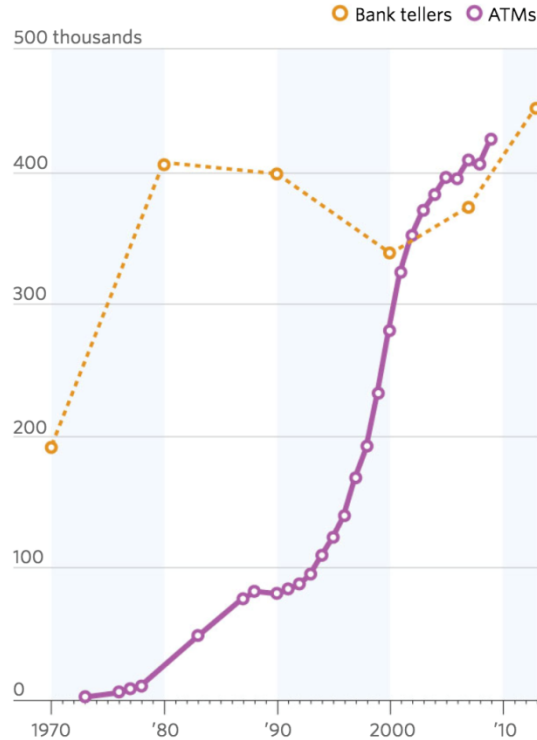
Source: James Bessen, Boston University School of Law

Brick and mortar retail job losses versus e-commerce job gains

E-commerce
Brick-and-mortar

400 thousand
200
0
-200
-400
-600
-800
-1,000
-1,200

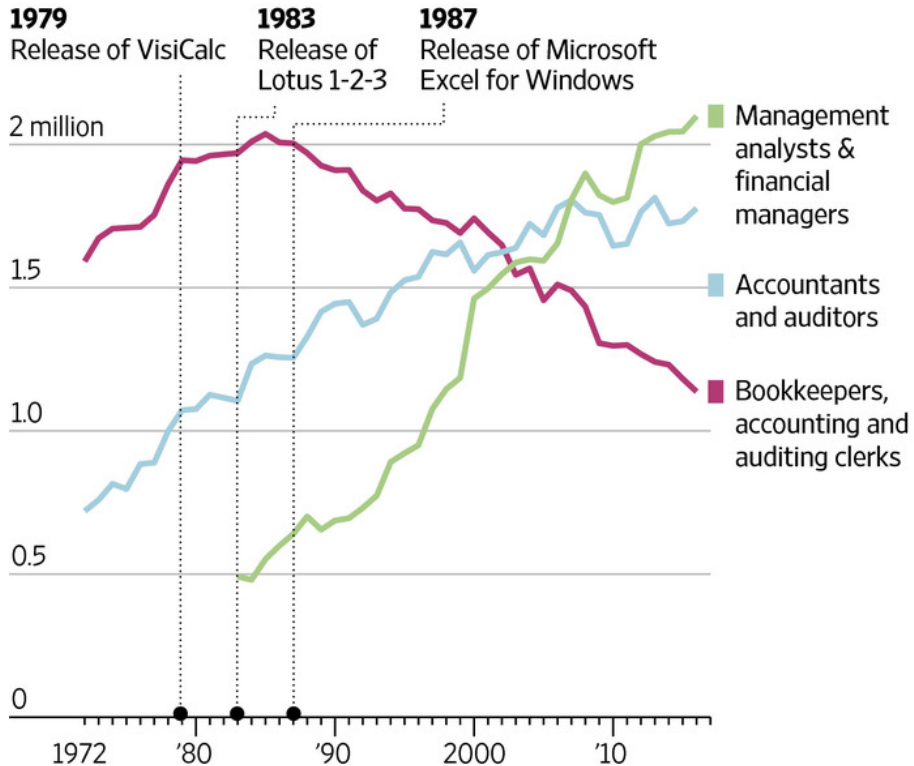'08 '09 '10 '11 '12 '13 '14 '15 '16 '17

Note: Full-time equivalent employment, three-month average. E-commerce includes electronic shopping and mail-order houses; and warehousing and storage.

Source: Michael Mandel, Progressive Policy Institute

The Spreadsheet Apocalypse, Revisited

Jobs in bookkeeping plummeted after the introduction of spreadsheet software, but jobs in accounting and analysis took off.

1979
Release of VisiCalc

1983
Release of Lotus 1-2-3

1987
Release of Microsoft Excel for Windows

Management analysts & financial managers

Accountants and auditors

Bookkeepers, accounting and auditing clerks

2 million

1.5

1.0

0.5

0

1972   '80   '90   2000   '10

Notes: There is no data for 1982. Changes in occupational definitions in 1983, 2000 and 2011 mean that data is not strictly comparable across time. There was no category for management analysts or financial managers prior to 1983.
Source: Bureau of Labor Statistics

THE WALL STREET JOURNAL.

Conclusion about AI and jobs

- AI has been around for the last 20 years

- AI has already displaced some jobs, adding to labour market churn

- Spreadsheet example pervasive – easy to predict jobs to be destroyed, harder to predict those to be created

- AI has not prevented the U.S. economy from creating 16 million new jobs since 2009

  - Today there are over million job openings, widespread labour shortages

- The evolution of AI over the past decade has been accompanied by the slowest sustained productivity growth in American history

Conclusion about the conjectured "major" productivity growth revival

- Sources of slower productivity growth are shared in common by all developed countries
- The third (digital) industrial revolution was less important than the second
  - Compare U. S. growth 1920-70 with post-1970
  - Compare EU-15 growth 1945-70 with post-1970
- Most of the impact of IR #3 on business methods and practices had already occurred by 2005
- Robots have been around for 50 years, AI for 20 years but have not prevented the productivity slowdown
  - Robots lack the physical dexterity needed for many jobs
  - AI excels at pattern recognition but is not good at recognizing ord dealing with exceptions