The Mysterious Disappearance of Productivity Growth in U.S. Manufacturing: Was It the China Shock?

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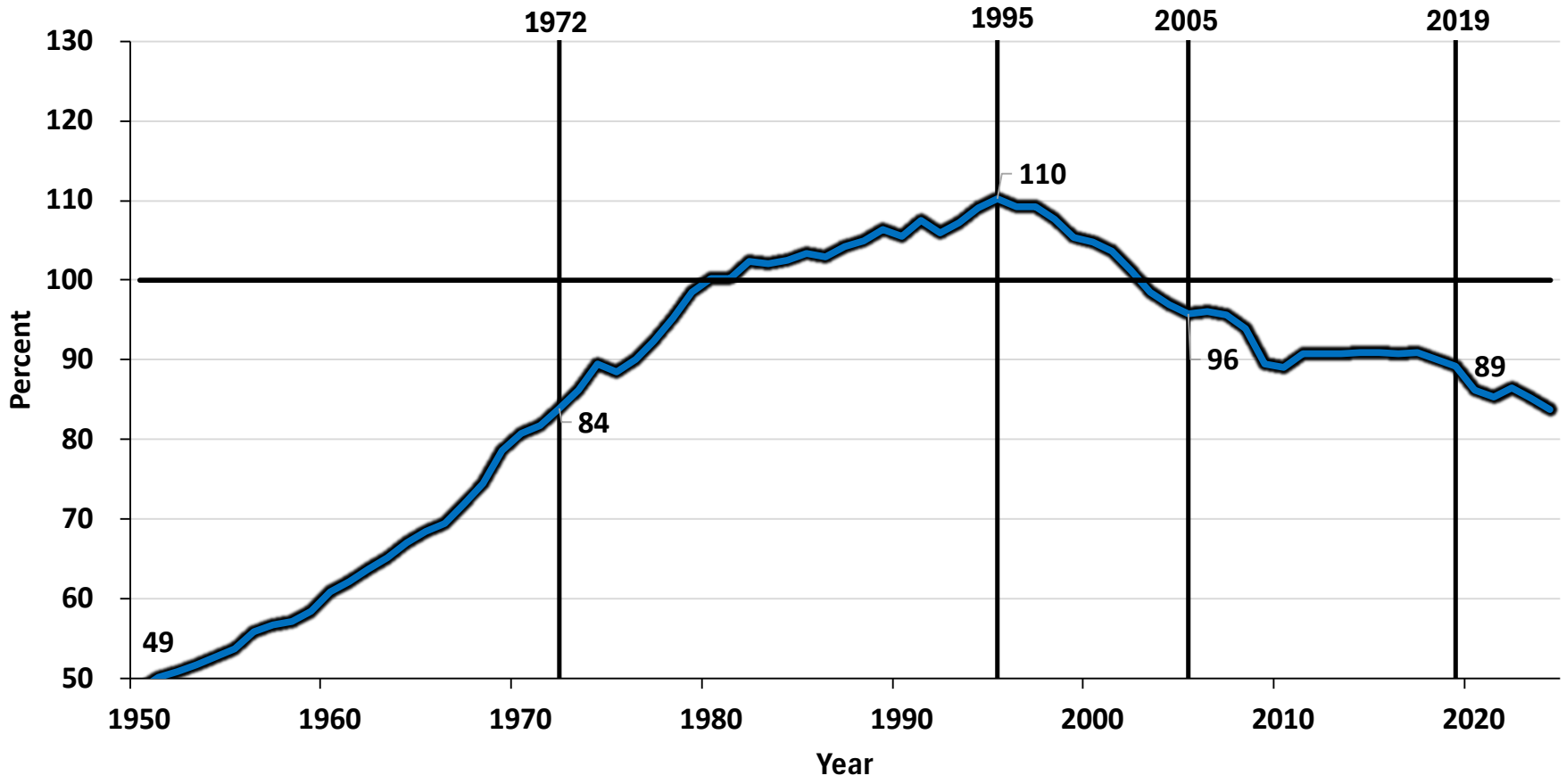
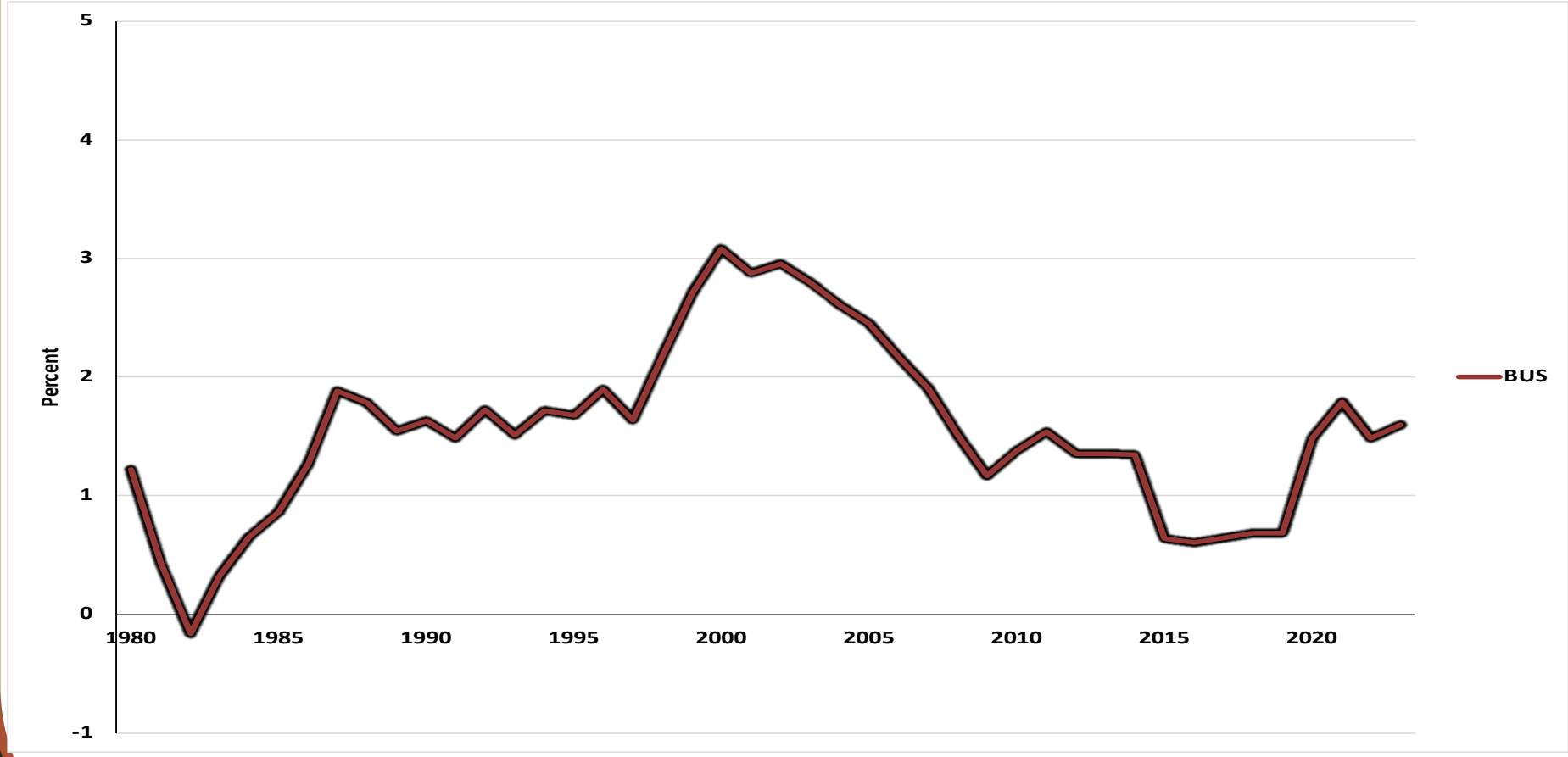
Roaring Ahead or Falling Behind?

- **The *Economist* last year called the U.S. economy the "Envy of the World"**
- **Important new 12/25 paper by Baily & Byrne:**
  - The reasons for U.S. productivity leadership go to both the remarkable engine of innovation represented by public and private sector research and development and to the economic dynamism that promotes the adoption of new technologies, the introduction of new business models, the entry of innovative firms, and reallocation of labor and capital to their best uses.

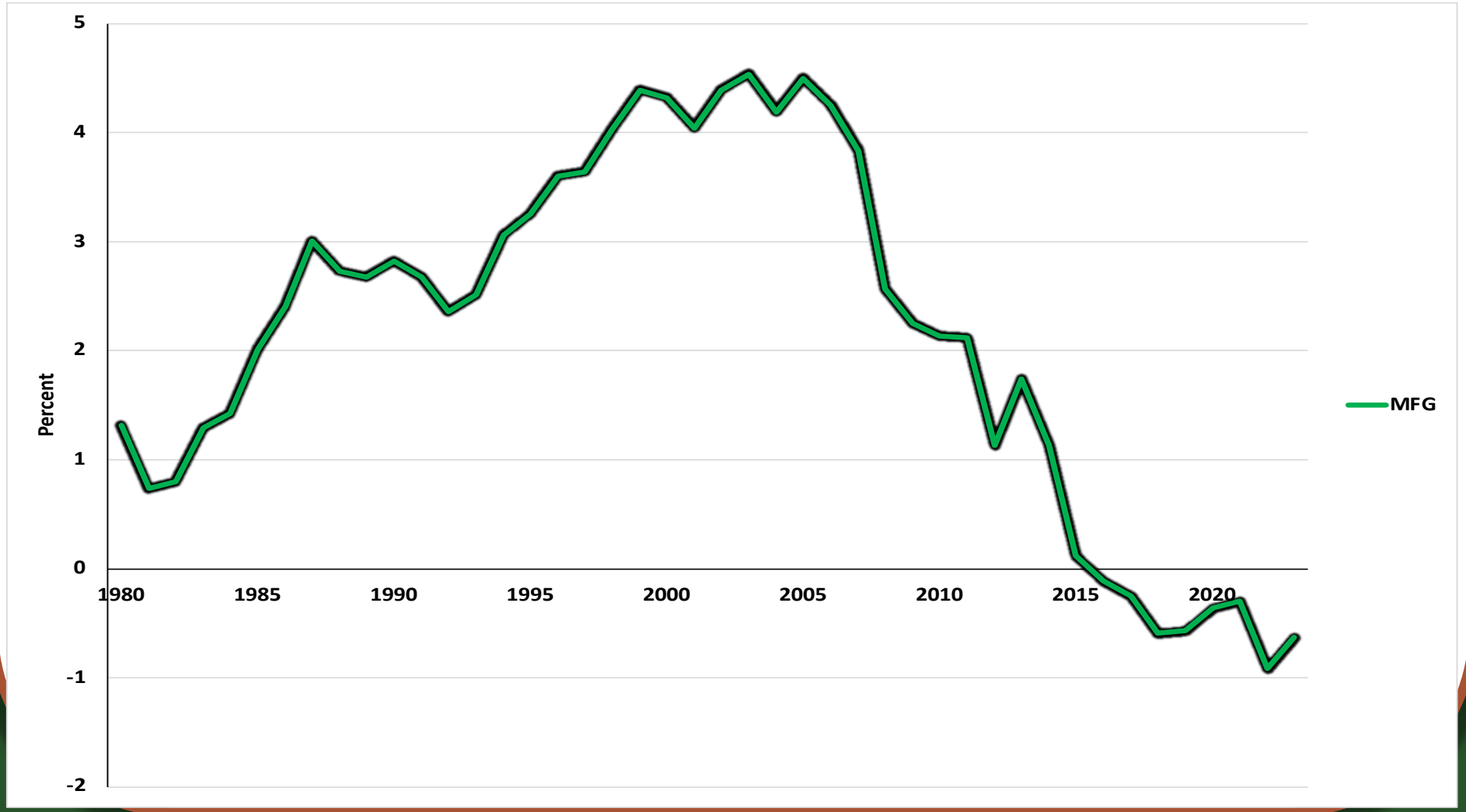
Ratio of E17 to US Output per Hour, 1950 – 2024 (Average of BCL and TED)



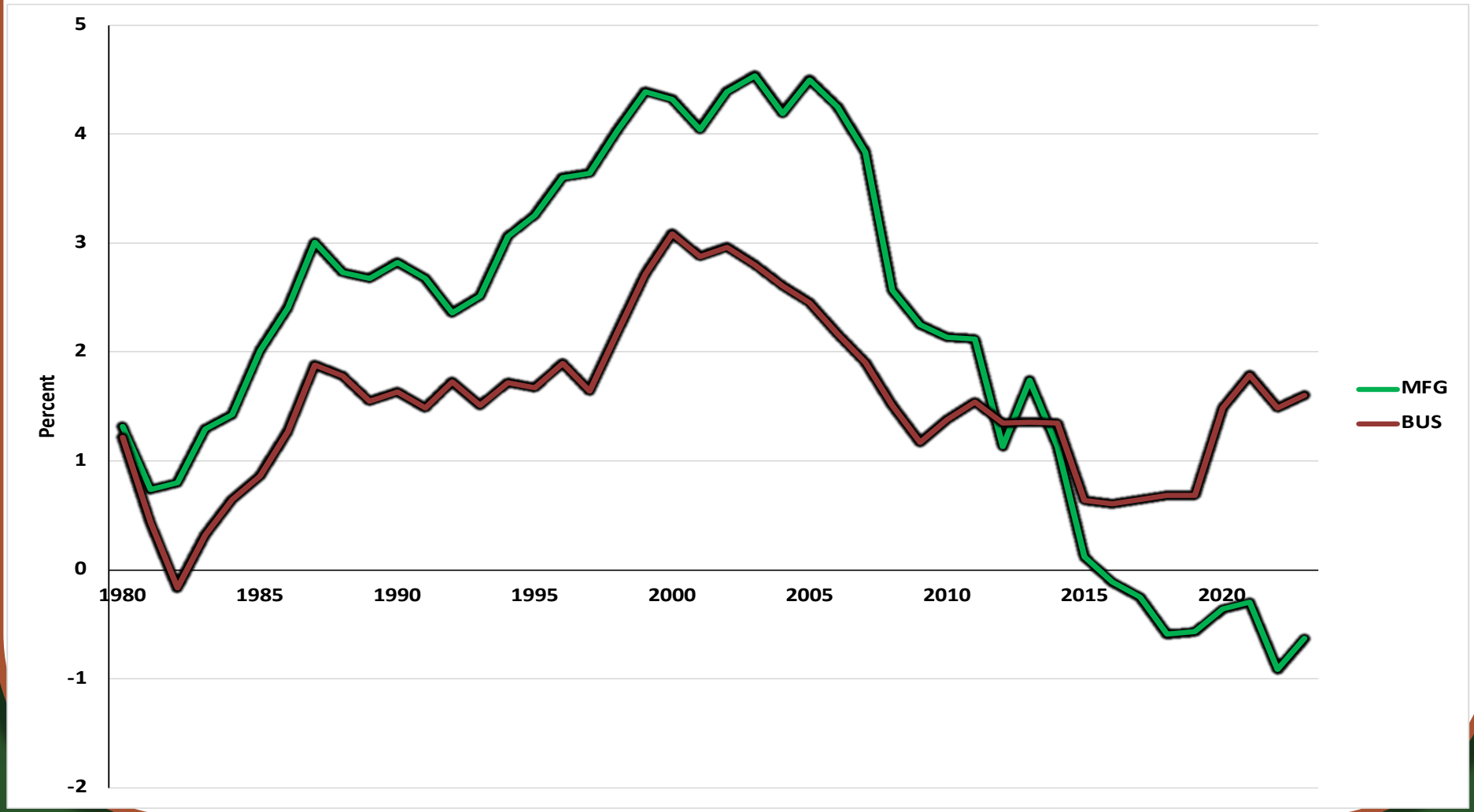
5-Year Moving Average Growth of Private Business Productivity, 1980 - 2023



5-Year Moving Average Growth of Manufacturing Productivity, 1980 - 2023



Comparison of Manufacturing and Private Business Productivity Growth, 1980 - 2023



Productivity Growth in Manufacturing With and Without Computers (NAICS 334), 1980 - 2023

Productivity Growth in Manufacturing without Computers vs. Private Business, 1980 - 2023

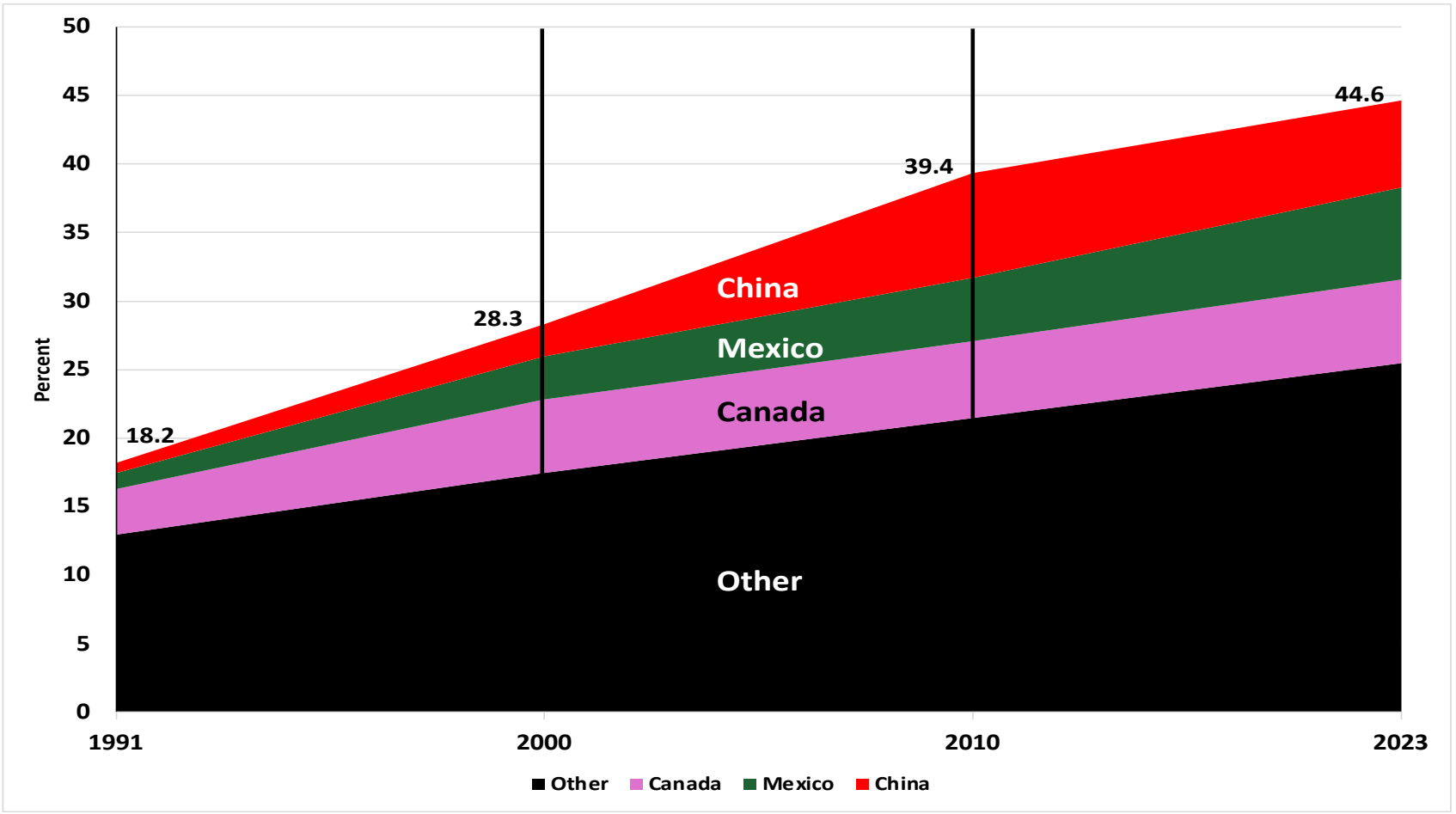
Manufacturing Negative? Why Should We Care?

- We lead the world in info tech, we have the "Magnificent 7," don't need to be #1 in all
- Manufacturing is only 10% of GDP
- Job losses? Until recently U = 4%
- **But . . .**
- NYT headline "U.S. Can't Build What the Defense Department Needs"
- Workers laid off from plant closings can't find jobs or afford to move. U, disability, D of D
- Hot topic: can Trump's tariffs revive US manufacturing?

Looking for Clues – How Is Manufacturing Different?

- **REGULATIONS** affect manufacturing more than they affect most other sectors
  - Anti-pollution, environmental, safety, and fuel economy regs aimed at mfg firms
  - Also utilities, mining, but not most services that make up 79% of GDP
- **IMPORTS OF GOODS MAKE MFG DIFFERENT**
  - Compete with US-made goods, not services
  - US trade as % of GDP in 2024
    - Goods Deficit -4.4% Service Surplus +0.8%

Import Share of US Manufacturing Gross Output, 1991 - 2023



Import Penetration and Limits of the Import Explanation

- In that chart China accounted for 48% of worldwide growth in IM/GO 2000-2010
  - But only 22% 1991-2023
- So read “China shock” = “Import shock”
- “Import Penetration” IP = IM / (IM + GO)
  - Grew 13% 1988 to 28% 2018
  - 2018 range: 5% petroleum, 97% apparel
  - Second rank: computers 84%
- Correlation -67% across 18 industries between 1987-2005 growth in IP and 2000-10 growth in output

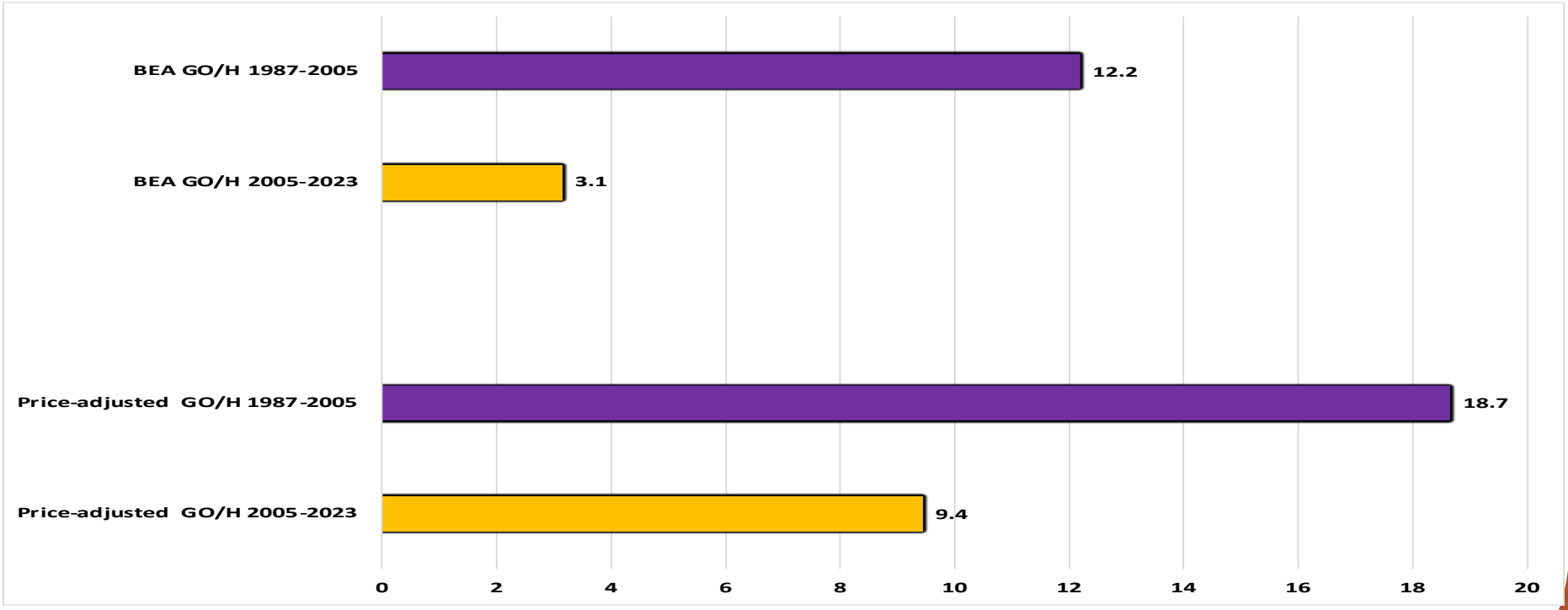
Was it the Import Shock?

- China entered the WTO in 2001 and accounted for 48% of 200-2010 increase in IM/GO
- Few mention another big event of 2001:
  - Mfg output STOPPED GROWING
  - Output: 1948-2000 3.2% 2000-23 -0.1%
  - More details about 2000-23
    - Unweighted average -0.9%
    - 12/19 industries negative growth
    - Range: -7% for apparel to +1.7% for computers (all BEA numbers)

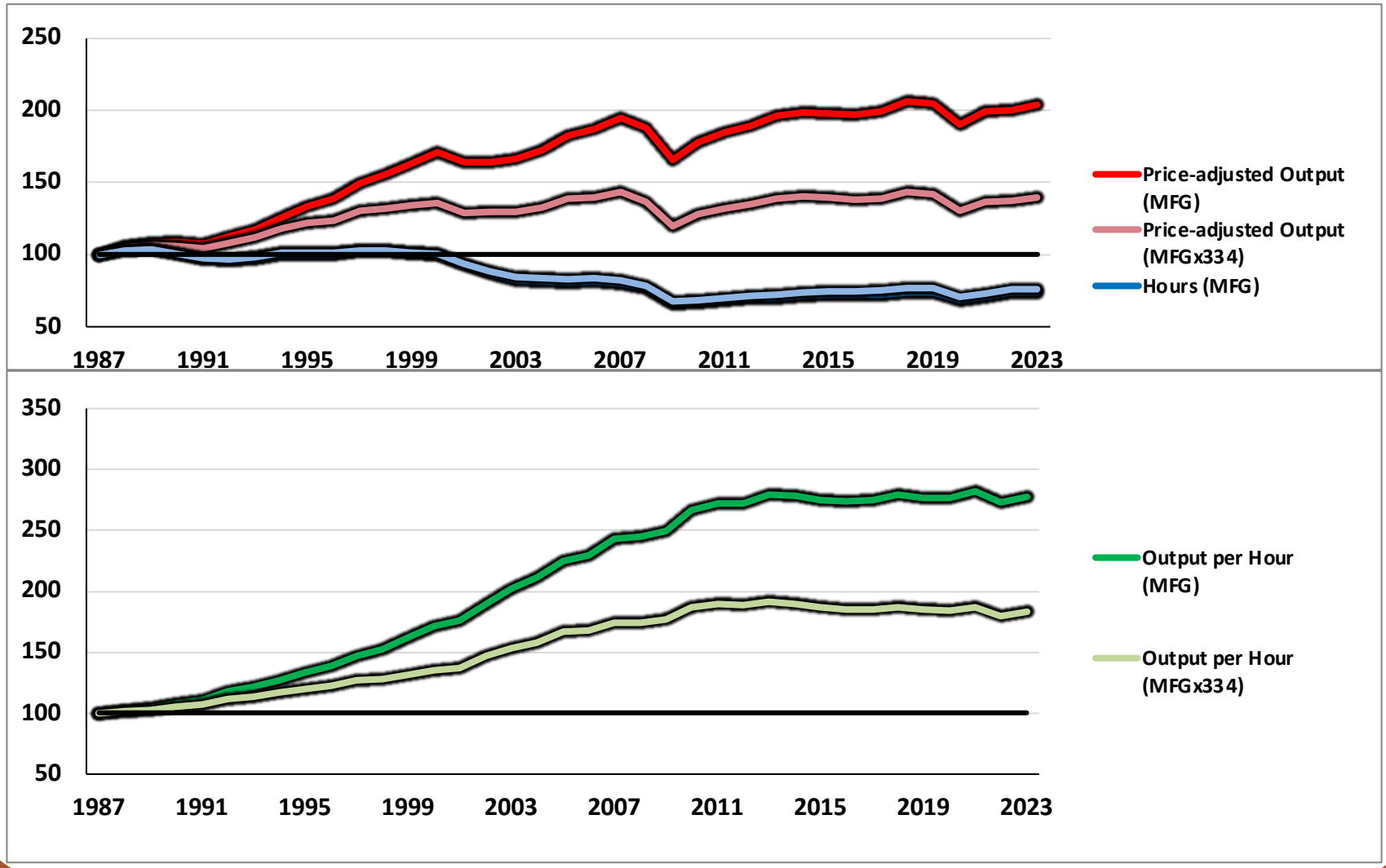
Measurement Issues

- Offshoring bias, like outlet substitution bias
  - Link cheap imported inputs to expensive domestic inputs they replace
  - Up bias input prices, down bias input quantities, up bias RVA
  - Even more up bias TFP if K down bias
- To avoid RVA & TFP bias, here all is GO/H
- Atalay price adjustments with Byrne
- All measures with and without computers
- Why 2005 instead of 2010 for break year

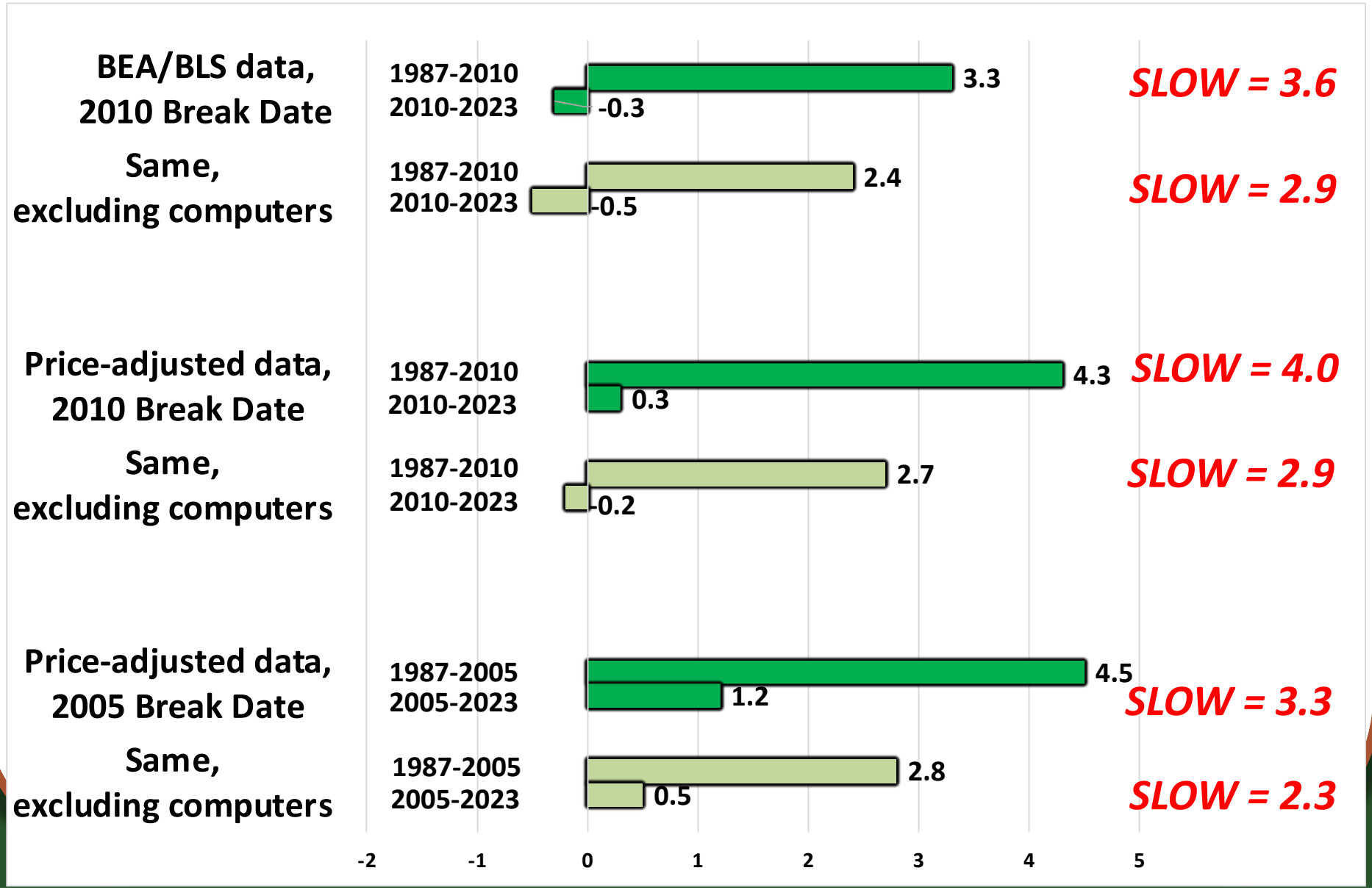
Why NAICS Industry 334, "Computers and Electronic Products" Has Such a Big Influence on Growth Rates of Total Manufacturing



Index Numbers (1987 = 100) of Price Adjusted GO, H, and GO/H, with and without Computers



Slowdown Magnitude: Price Bias, Excluding Computers, Break Year



Look More Closely at 2000-10

- Output growth with price adj data x334
  - 2000-10 High IP -2.5% Low IP -0.1%
- Productivity Growth
  - 2000-10 High IP 4.5% Low IP 3.3
- Most High IP Industries x334 had rapid productivity growth 2000-05. Unweighted average:
  - Output -0.8, Hours -5.9, Productivity +5.1
- Why? Some combination of
  - Reallocation within industries
  - Continued innovation, lagged I effects

Cross-Industry Aspects of Post-2005 Slowdown

- Of the 19 industries, all but 1 experience post-2005 slowdown. Of the 18 industries:
  - 4 slowdowns between -1 and -2
  - 6 slowdowns between -2 and -3
  - 7 slowdowns between -3 and -6
  - 1 slowdown of -9 (Computers)
- For durables largest slowdowns are industries with complex products
- No pattern for nondurables (petroleum, apparel, textiles)

Channels by Which Imports Worsened the Post-2005 Slowdown

- We survey literature that finds:
  - End of output growth reduced capacity utilization, reduced investment, starving industry of new more efficient capital. Missed automation opportunities
    - I for 334: 1987-2000 +8.8% 2000-05 -4.2%
  - Closing of most inefficient plants raises productivity within industries
  - Impacted industries moved R&D abroad
  - Innovation activity shifted from manufacturing to services

A Broader Set of Effects

- Asian process innovation started with Japanese autos “just in time” in 1980s
- Electronics: Labor cost only 5%
  - Asian firms pioneered continuous improvement and defect detection
  - Asian supply chain leadership with suppliers clustered near final assembly
  - Asian subsidies and infrastructure
  - Labor: Asian firms building US plants have to import Asian labor to build them
  - US underinvestment, share buybacks

It's Not All About Imports: Declining Innovation

- Decline public R&D from 2 to 0.7% of GDP
- Short time horizon of US private R&D
  - End of Bell Labs, Dupont, Xerox
- Obstacles to startups: funding, competition
- Special cases of diminishing returns
  - Bloom et al: given increase in Moore's Law or drug discovery now requires many more R&D workers than 40 years ago
  - Complex autos => more recalls (CR)
  - Food: shift from process innovation to product design of brand extensions

A Catalog of Other Causes

- US Firms' Short-run Profit Maximization
  - "Downsize and Distribute"
- Robots? Only 4% of mfg equipment I in 2021
  - Auto body & paint shops vs human senses
- Regulation: Diverts investment from productivity to abiding by regulations
  - Petroleum, chemicals, autos
  - Food safety, machinery product liability
- Irony of skilled labor shortage vs. -44% 2000's
  - Retirements, less training, culture for college, automation requires technicians

Conclusions

- "China shock": shorthand for import invasion
- Output stopped growing 10 years before GO/H
- Imports diverted demand, plant closings, lower utilization, decline of investment stalled automation, less R&D and innovation
- Asia emphasis on process efficiency vs. US on short-term profits, share buybacks, products
- Beyond imports, faltering innovation. Less public and private R&D, diminishing returns
- Regulations, robots, skilled labor shortages
- Policies? reverse some, too late for others