

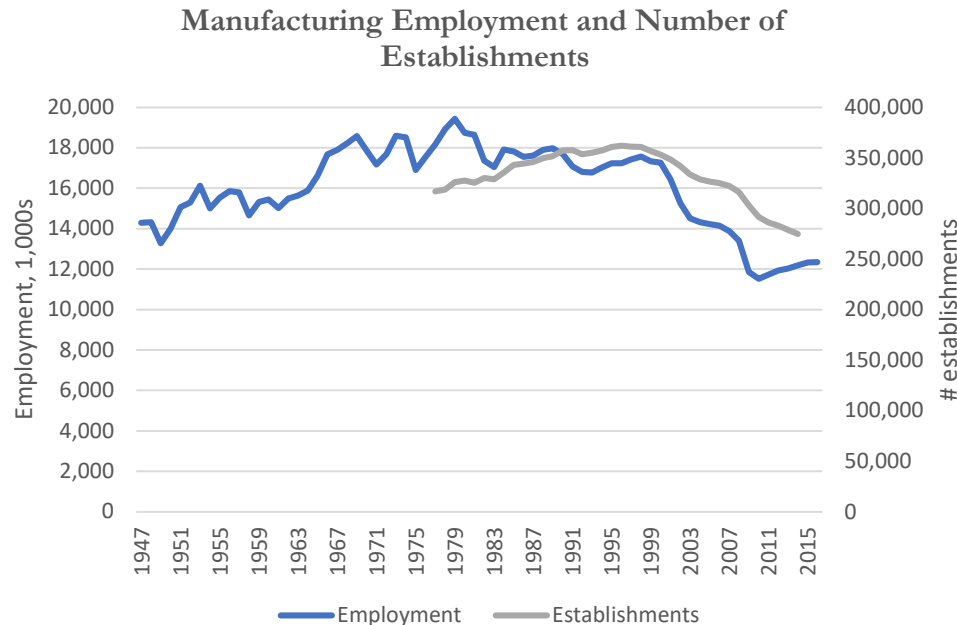
Understanding the Decline in Manufacturing Employment

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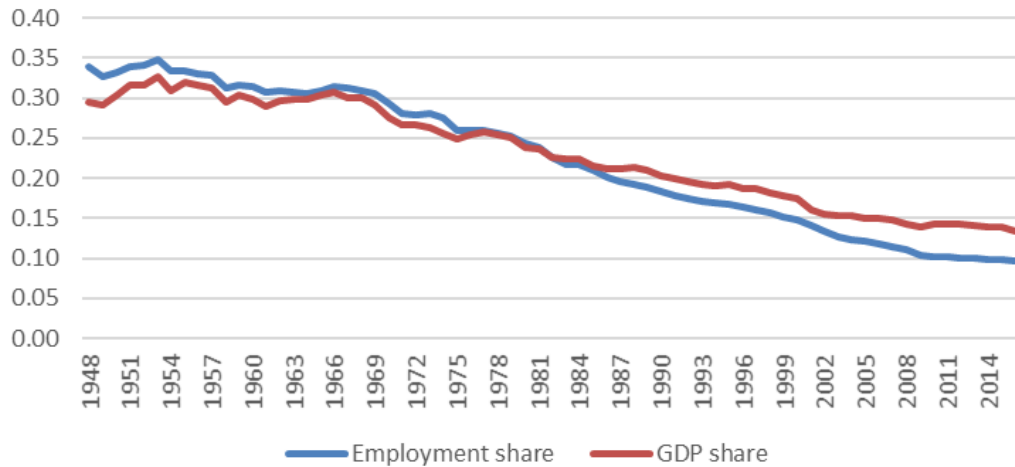
Precipitous and unprecedented decline in U.S. manufacturing employment in 2000s



Sparked debate over causes of the decline: trade v. automation. In this talk:

- Discuss misunderstanding & misrepresentation of mfg data
- Review research evidence on trade v. automation debate

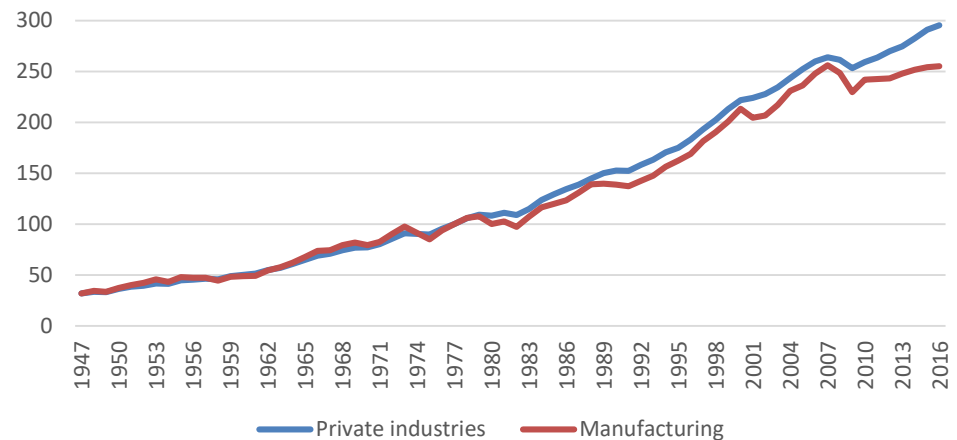
Manufacturing share of private industry employment and GDP

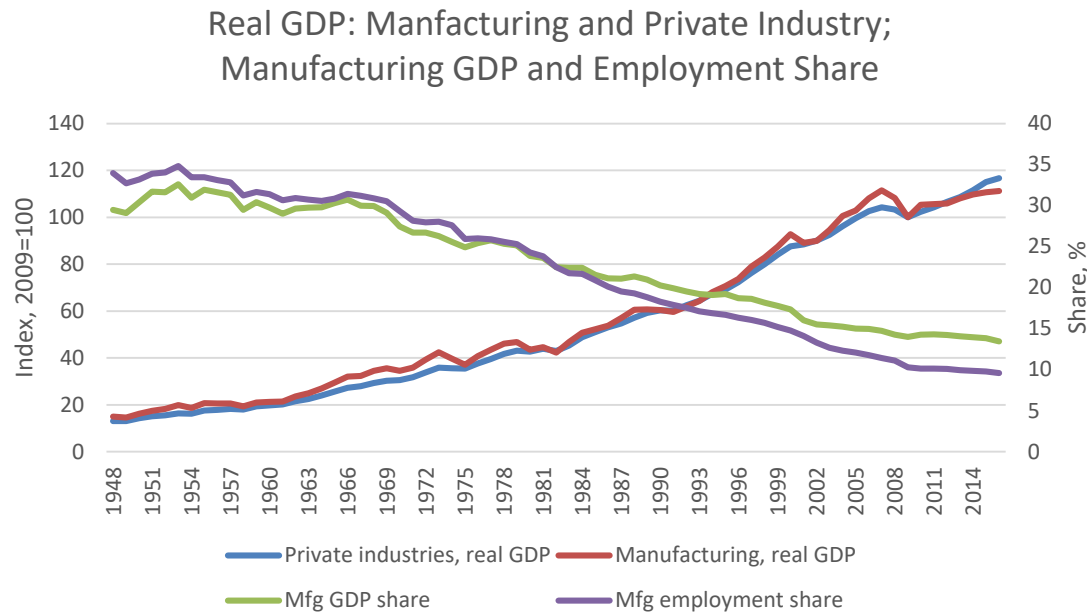


Decline in manufacturing output & employment shares especially prevalent since 1970s, track each other.

But, manufacturing real output growth kept pace with aggregate output growth in economy

Real GDP: Private Industry and Manufacturing, 1977=100





- **How to reconcile two pictures—Prevailing view:**
 - Prices of domestic manufactured goods falling relative to domestic services prices
 - Productivity growth much higher in manufacturing
 - Consumer demand for manufactured products limited

Prevailing view: Rapid productivity growth explains the decline in manufacturing employment share

- Labor productivity defined as output (value added) per unit labor input (workers or hours). It follows that:

$$e_m - e_p = (y_m - y_p) - (prd_m - prd_p)$$

Where e , y , and prd are employment, output, and labor productivity growth rates for manufacturing and the aggregate private sector.

- If the output growth rates in manufacturing and the private sector are the same, then productivity accounts for ALL of the decline in manufacturing's employment share.
 - Not a causal relationship, but descriptive evidence compelling
- **Conclusion:**
 - Productivity, in the form of automation, “caused” the relative (and absolute) decline in manufacturing employment
 - The decline was inevitable

Conclusion often repeated as fact in mainstream media

“From an economic perspective . . . there can be no revival of American manufacturing, because there has been no collapse. Because of automation, there are far fewer jobs in factories. But the value of stuff made in America reached a record high in the first quarter of 2016, even after adjusting for inflation.”

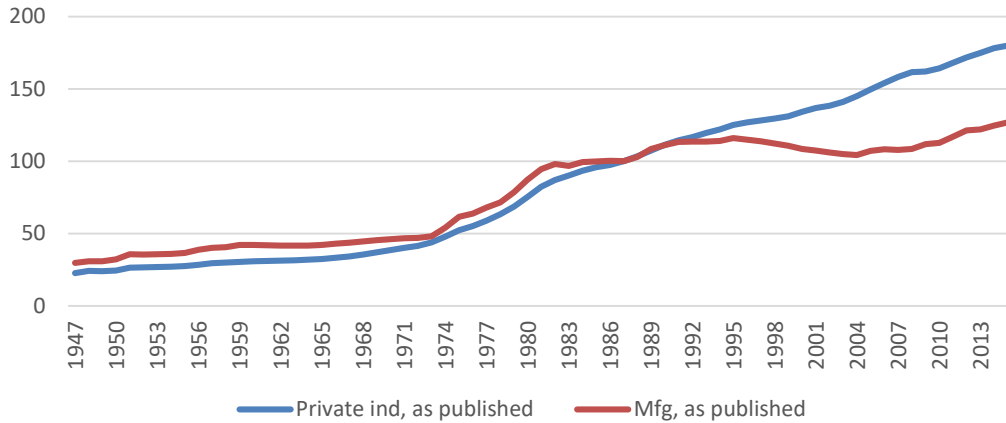
Binyamin Appelbaum, *New York Times*, 2016

Alternate (correct) reconciliation: Measurement issue

- Manufacturing's falling relative prices, robust output growth, and extraordinary productivity growth driven by one industry: computer and electronics products
- Computer industry accounts for less than 15% of manufacturing GDP
- Outsized effect reflects statistical adjustment of computers and semiconductor price deflators for improvements in product quality
- Extraordinary productivity growth in computer industry—by extension in manufacturing—reflects product improvements, *not* automation
- Skews statistics, gives misleading impression about sector's health

Manufacturing prices not falling relative to other industry prices outside computer industry

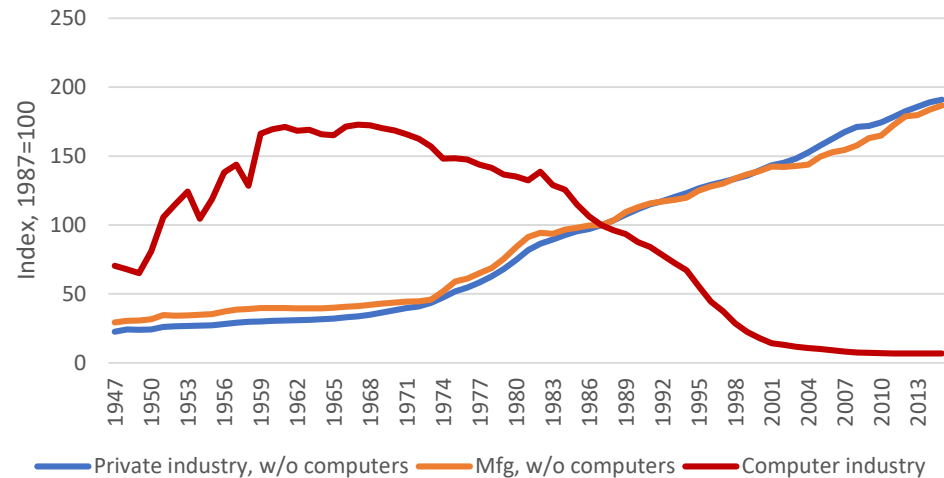
Price deflators, private industries and manufacturing, 1987=100



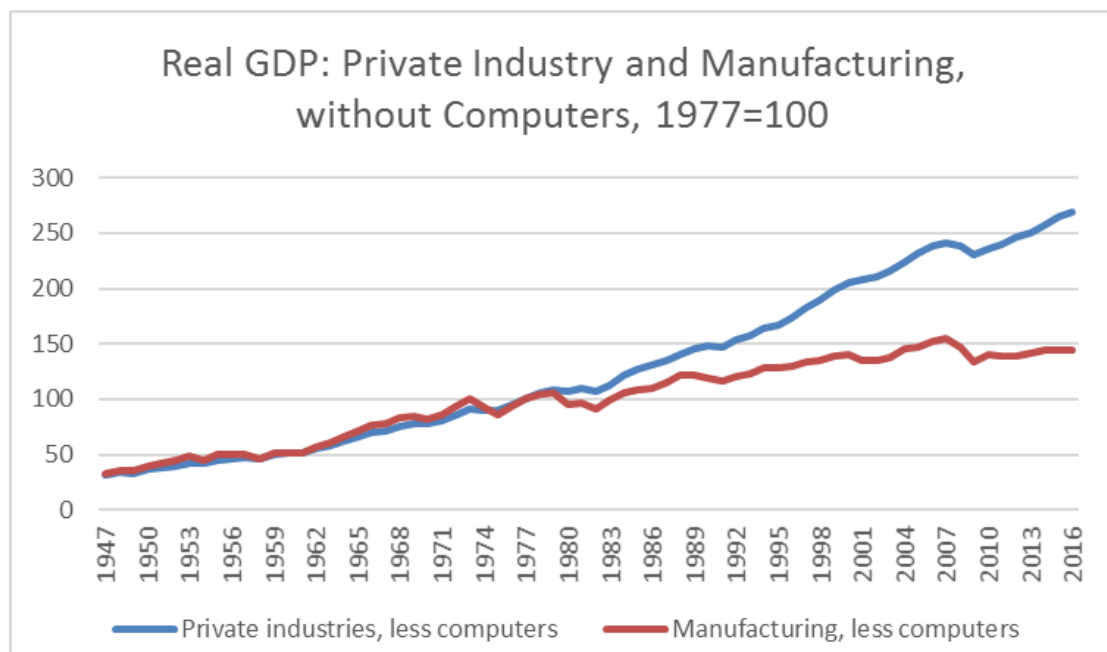
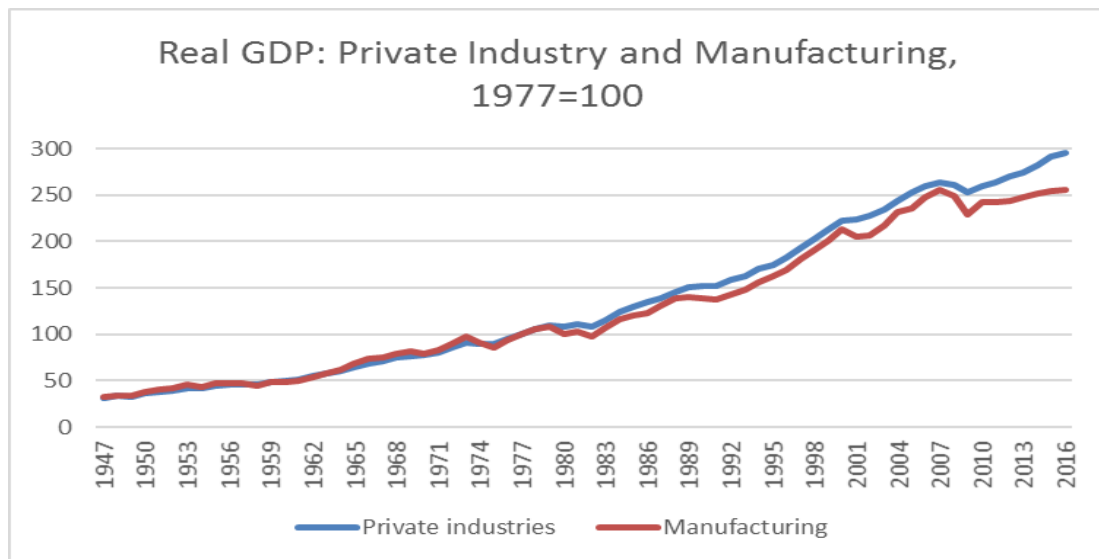
Price deflators for computer industry rapidly declining after 1960s, reflects quality adjustment for product improvements

Excluding computer industry, manufacturing prices are not falling relative to private sector prices.

Price Deflator Indices, Private Industry and Manufacturing Omitting Computer Industry, Computer Industry

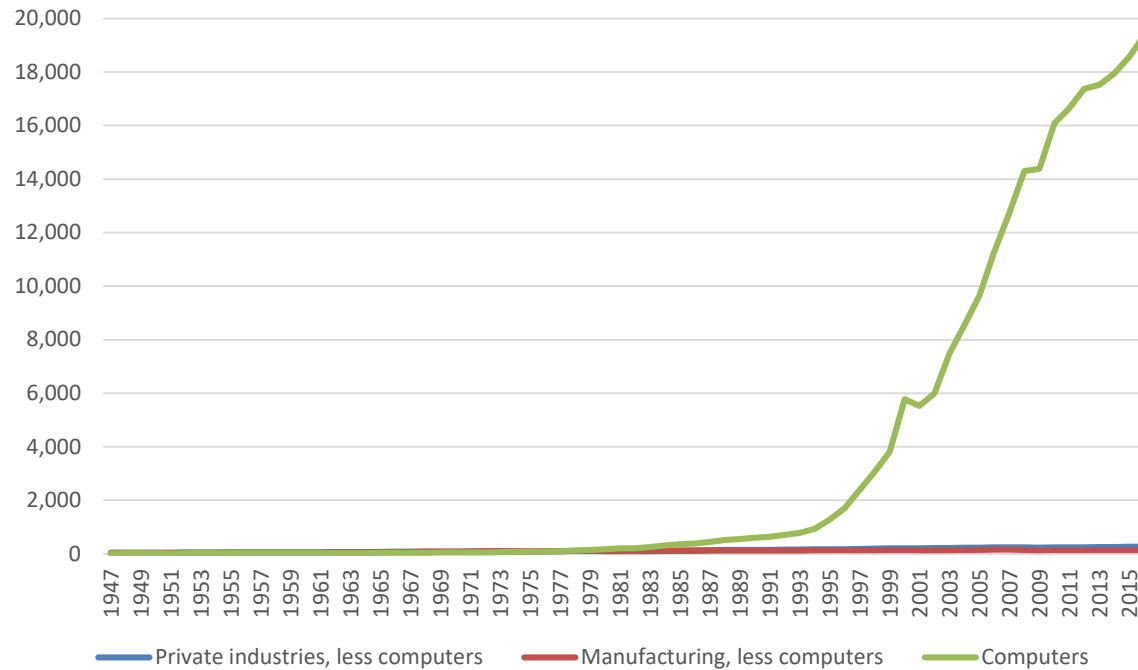


Manufacturing real GDP growth much slower without computer industry



- Mfg GDP growth 45% of private sector GDP growth, 1979-2000
- 12%, 2000-2016
- Manufacturing output less in 2016 than in 2007.

Real GDP: Private Industry and Manufacturing less Computers, Computer Industry, 1977=100



- **Despite driving apparent robust manufacturing growth, domestic manufacturing of computer & electronic products losing competitiveness Houseman, Bartik, Sturgeon (2016)**

Growth in domestic consumption for manufactured products has been greater than for services recently

- Since 2000, domestic real consumption of manufactured products (excluding computer and electronics products) grown at 2.8% per year, compared to 1.8% for services
 - Growth in domestic consumption of furniture especially high at 3.5%
 - Consistent with flood of cheap imported products increasing consumer demand

Manufacturing productivity growth not higher, or only somewhat higher, than that in private industry

- Without computer and electronics products industry, labor and multifactor productivity has been approximately the same in manufacturing and private industry, 1987-2011 (Baily and Bosworth 2015)
- If productivity growth the same, it can account for **NONE** of the decline in manufacturing's employment share
 - Lower output growth accounts for all of the decline in manufacturing's employment share
- **Alternate calculations, using historical employment data back to 1977:**
 - Slower output growth “accounts for” the majority of the decline in manufacturing's employment share historically.
- **No prima facie case that productivity growth caused relative employment declines in manufacturing**

Interpreting productivity growth

- **Productivity growth \neq automation**
- **Measured productivity growth may be capturing many things besides automation:**
 - Product improvements, as in computers and semiconductors
 - Changes in the composition of products produced: Productivity growth may be the consequence of trade competition if labor intensive processes move overseas.
 - Global supply chains and “slicing up of the value chain” may alter the stages of production done in U.S., raising productivity growth
 - International competition may spur automation
- **Productivity growth does not, per se, cause employment declines**
 - Strong argument that decline in manufacturing employment inevitable based on misreading of accounting identities
 - Accounting identities and other descriptive evidence cannot be interpreted as causal

Research finds large effects of international trade on manufacturing job losses in 2000s

- Exchange rates, industry subsidies and taxes, tariffs, non-tariff barriers affect relative competitiveness of manufacturing in U.S.
- Globalization may reduce domestic manufacturing output growth by:
 - Increasing growth in real imports
 - Slowing growth in real exports—companies choose to relocate or expand overseas
- No study captures all aspects globalization and its effects on manufacturing employment—but collectively research findings point to large adverse effects, operating through various mechanisms.

Selected study findings of effects of trade on manufacturing employment losses in 2000s

- Imports from China can account for $\approx 25\%$ of decline in manufacturing employment (Autor, Dorn, Hanson 2013)
- Changes in trade policy after 2000 caused increase in imports from China (both from Chinese exporters and U.S. based importers) and significant decline in manufacturing employment (Pierce and Schott 2016)
 - Shift to less labor-intensive also led to significant employment declines
- Imports from China have also depressed investment, R&D, and sales in domestic manufacturing (Autor et al. 2017, Pierce and Schott 2017)
- Appreciation of dollar and higher labor costs can explain more than two-thirds of decline in manufacturing employment in early 2000s, as well as declines in 1980s (Campbell 2016).

Research fails to find a causal link between technology and collapse of manufacturing employment in 2000s

- **Little evidence that IT investment and investment in advanced manufacturing technologies increased labor productivity, especially after 1990s (Acemoglu et al. 2014)**
 - Where correlations exist, associated with declines in output and even faster declines in employment (suggesting something besides technological displacement going on).
- **Industries experiencing increased competition from China had employment declines; industries susceptible to computerization of routine tasks experienced polarization of occupations, NOT employment declines (Autor, Dorn, Hanson 2015)**
- **Industrial robots have potential to displace many workers in future, but effect on manufacturing employment to date minimal (Acemoglu and Restrepo 2017)**
- **Rise of markups since 1980s and offshoring of labor intensive processes (not capital investment) account for rise of capital share (De Loecker and Eeckhout 2017; Elsby, Hobijn, Sahin 2013)**
 - inconsistent with large technology shock causing employment declines, rise in capital share

Why manufacturing matters

- **Number of workers engaged in manufacturing still large:**
 - About half of workers needed in manufacturing now employed outside the sector
- **Large spillover effects on local and national economy**
- **Plant closures have large adverse and lasting effects on workers and communities:**
 - Dislocated workers experience large, persistent earnings losses
 - Large adverse shocks can send regional economies into downward spiral, depress regions for decades (Dix-Carnairo and Kovak, 2017)
 - Collapse of manufacturing employment contributed to decline in employment rates, especially among less-educated men and women (Charles et al. 2016, Autor et al. 2016)
- **Loss of production leads to loss of R&D:**
 - Conclusion of MIT Production in the Innovation Economy project (Berger 2013)