

Humans, Machines, and Work: The Future is Now

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The Automobile: Societal Costs

Worldwide:

- ◆ 1.25M deaths in 2013
- ◆ 20-50M are injured or disabled annually
- ◆ More than half of all road traffic deaths occur among young adults ages 15-44
- ◆ Road crashes are the leading cause of death among young people ages 15-29,
- ◆ Road crashes cost annually > \$0.5T
- ◆ *Human error accounts for more than 90% of car crashes*

The Automation of Driving

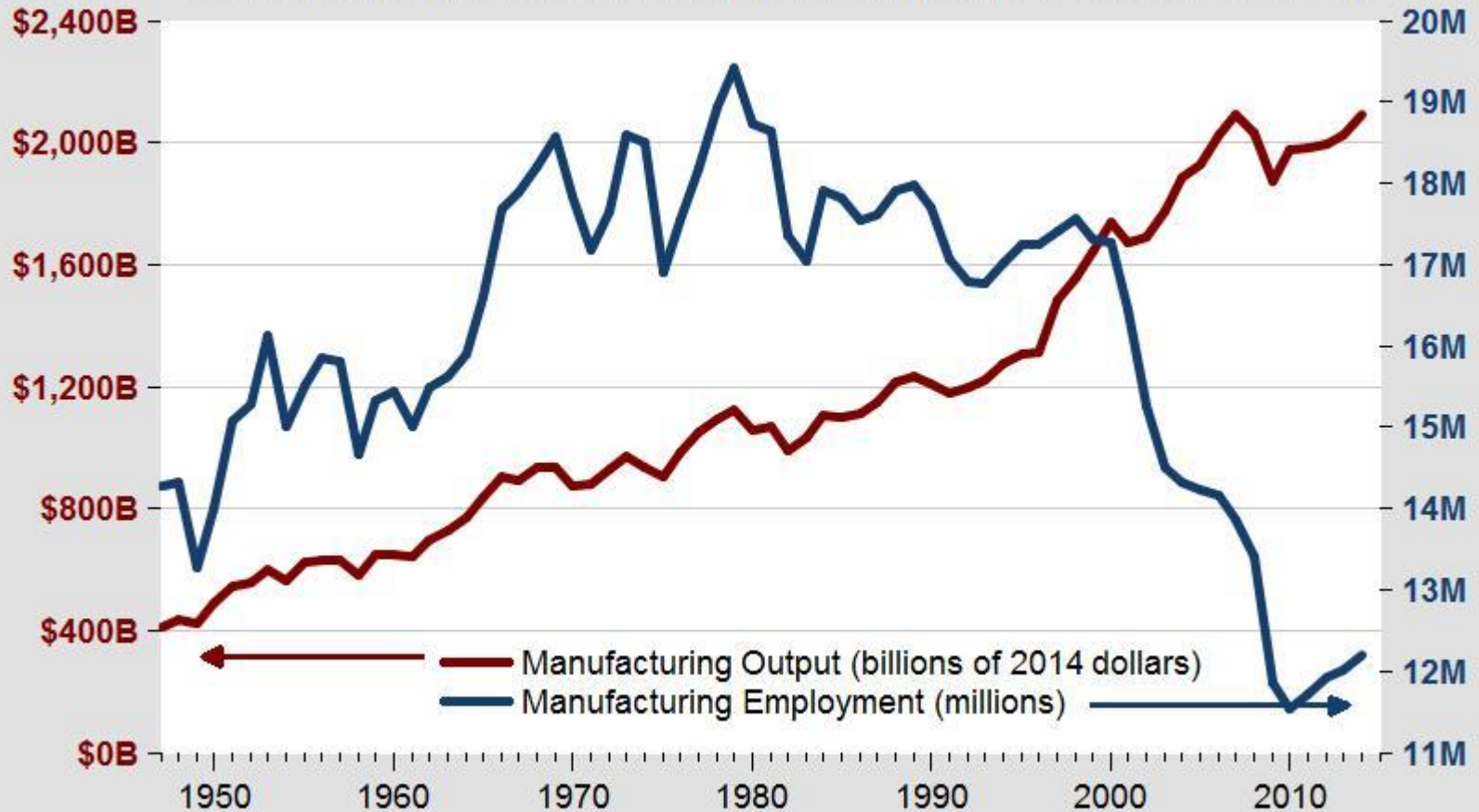
- ◆ 250 companies are working on self-driving cars
- estimated market: \$2-5T over next decade
- ◆ Technical issues to be resolved within 5-15 yrs
- ◆ Many legal issues need to be resolved
- ◆ Profound business disruption:
 - Major industrial contraction (cars are now idle 90% of the time)
 - "Major loss of business" for insurance, legal, and medical industry
- ◆ *Huge societal benefit: reduce accidents, liberate elders and the disabled*

What about the Drivers?

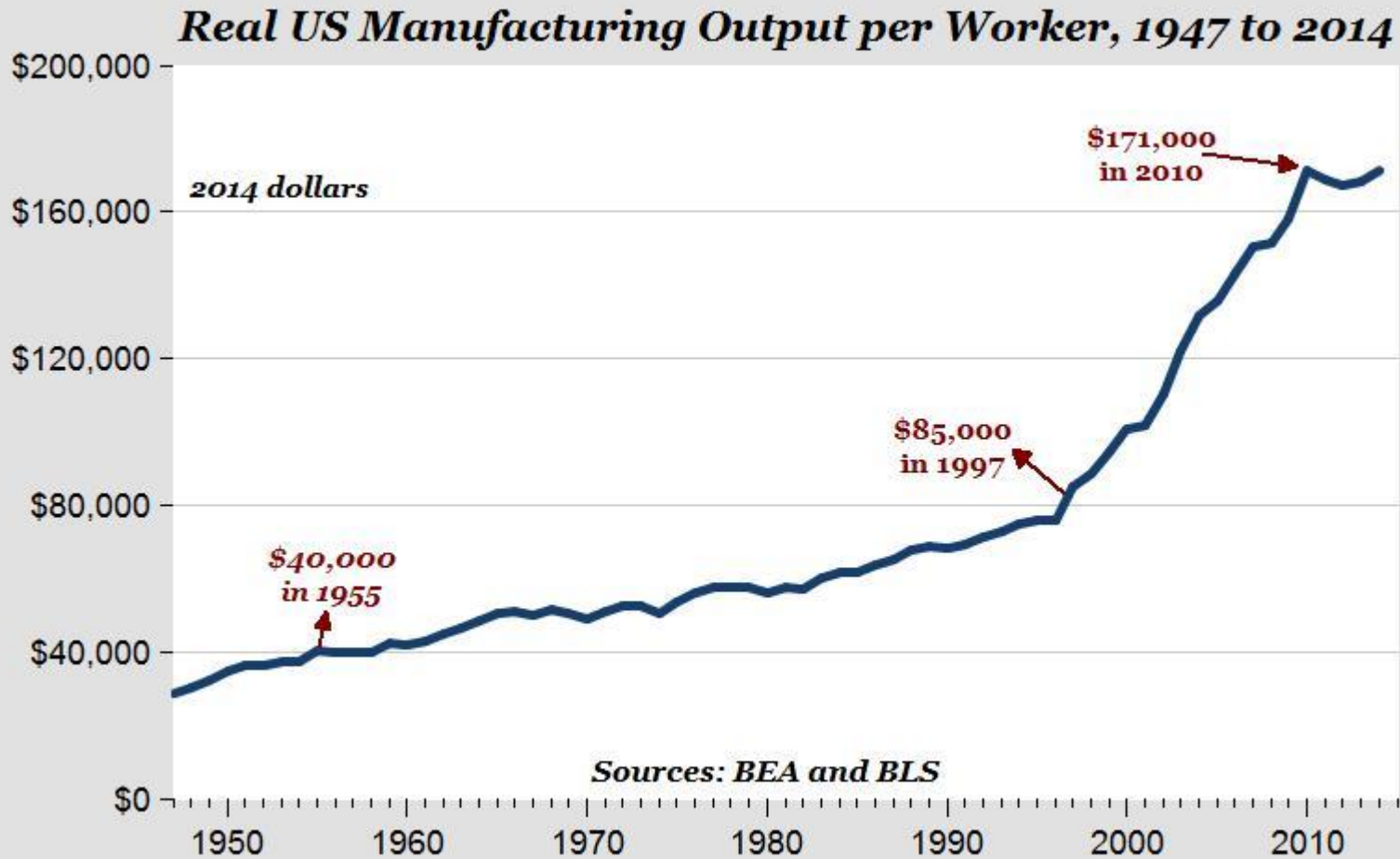
- ◆ 4M truck+taxi drivers in the US
- ◆ 15M US jobs involve operating a vehicle
- ◆ Automation of the whole supply chain is expected: *cargo ships, ports, trucking, warehouses, delivery, ...*
- ◆ **Bottom Line:** Massive loss of jobs!
 - But, new jobs will be created. Right?
- ◆ **Comparison:** Driving vs Manufacturing

Decoupling in US Manufacturing

US Real Manufacturing Output vs. Employment, 1947 to 2014



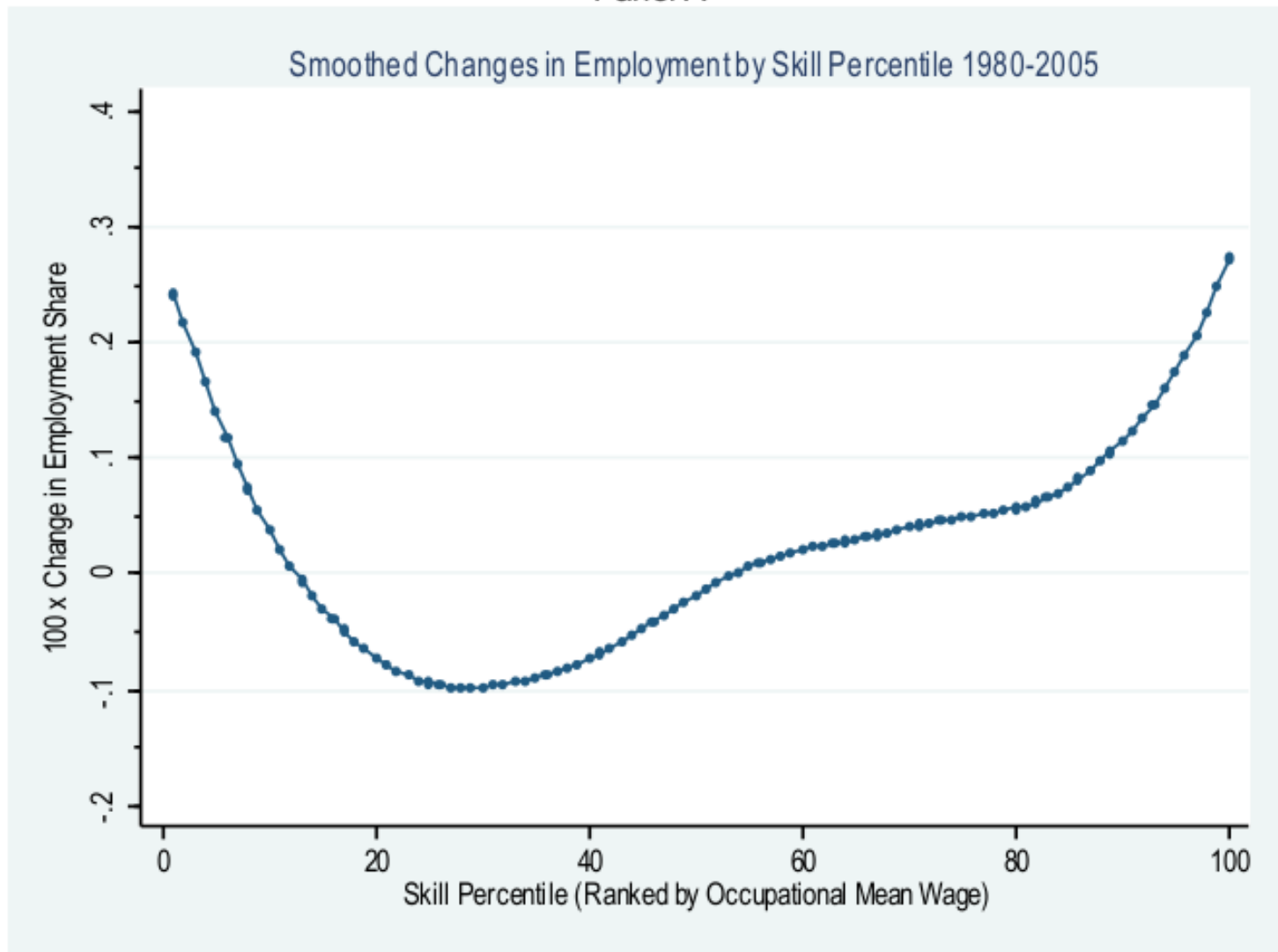
Driving Force: Automation



Tesla Model S Factory Floor

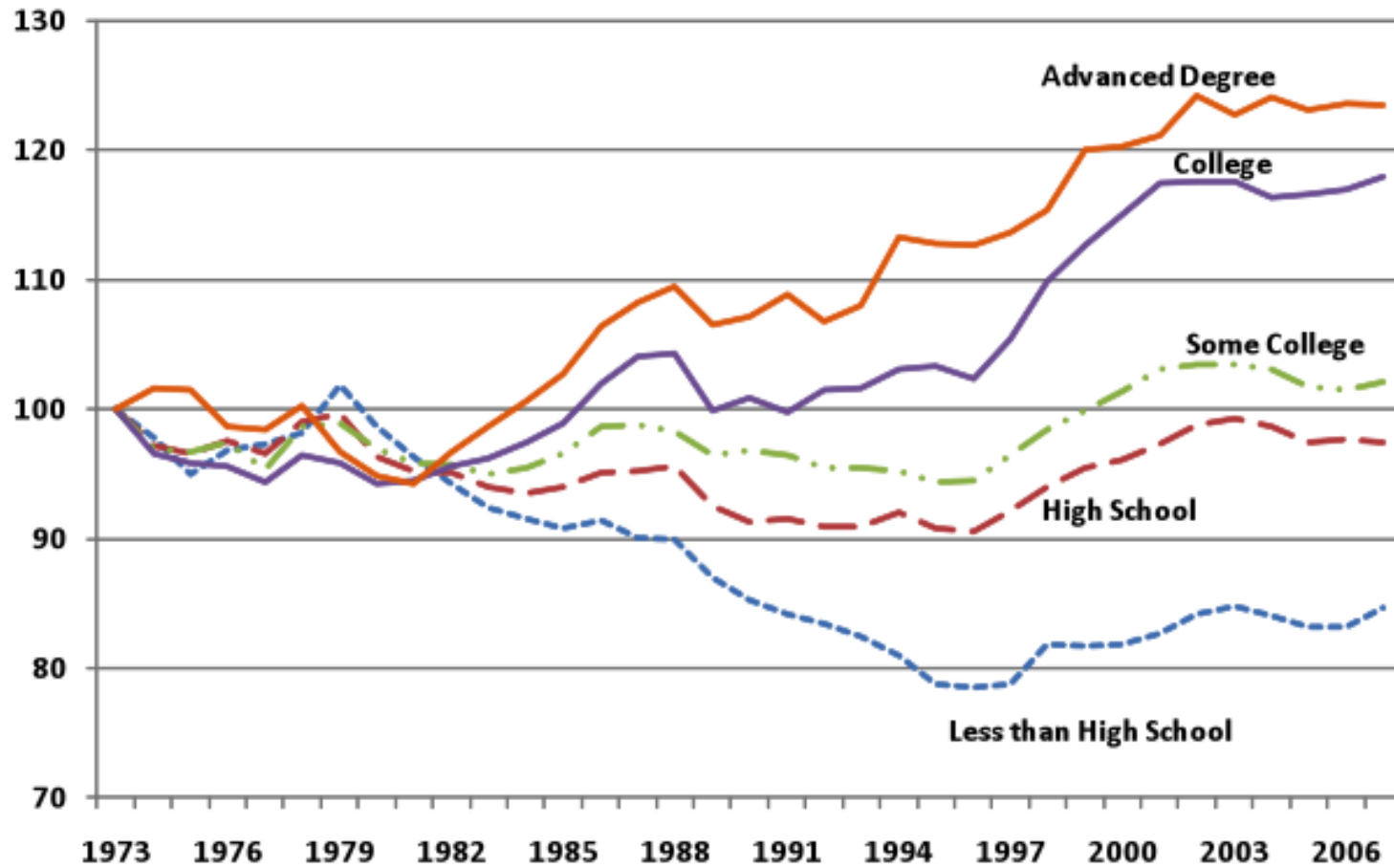


Job Polarization



Real Hourly Wages by Education

Figure 4 - Real Hourly Wages by Education, 1973 - 2007
(all workers, normalized 1973=100)

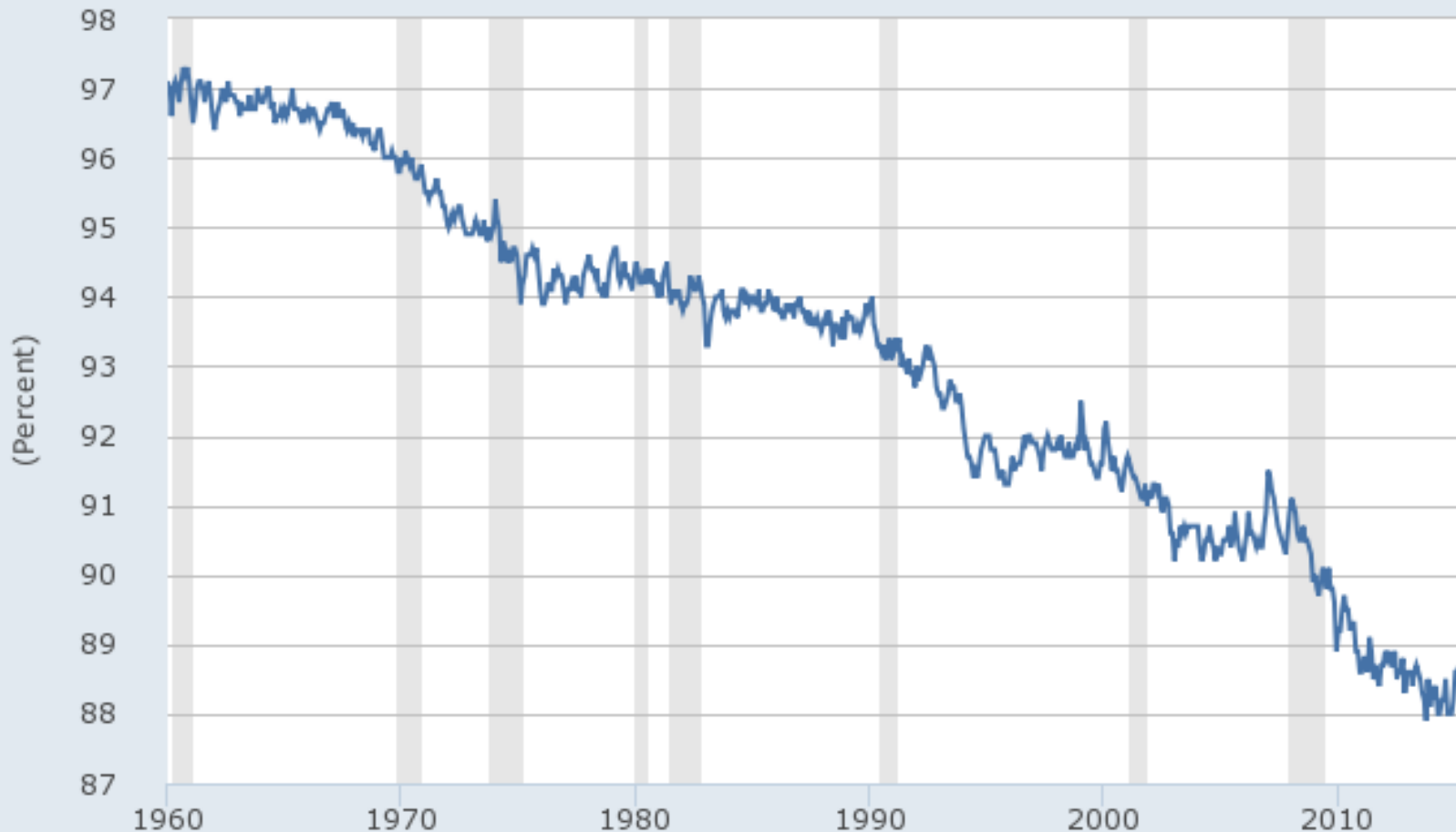


Source: Economic Policy Institute

Labor-Force Participation - Men

FRED 

— Activity Rate: Aged 25-54: Males for the United States©



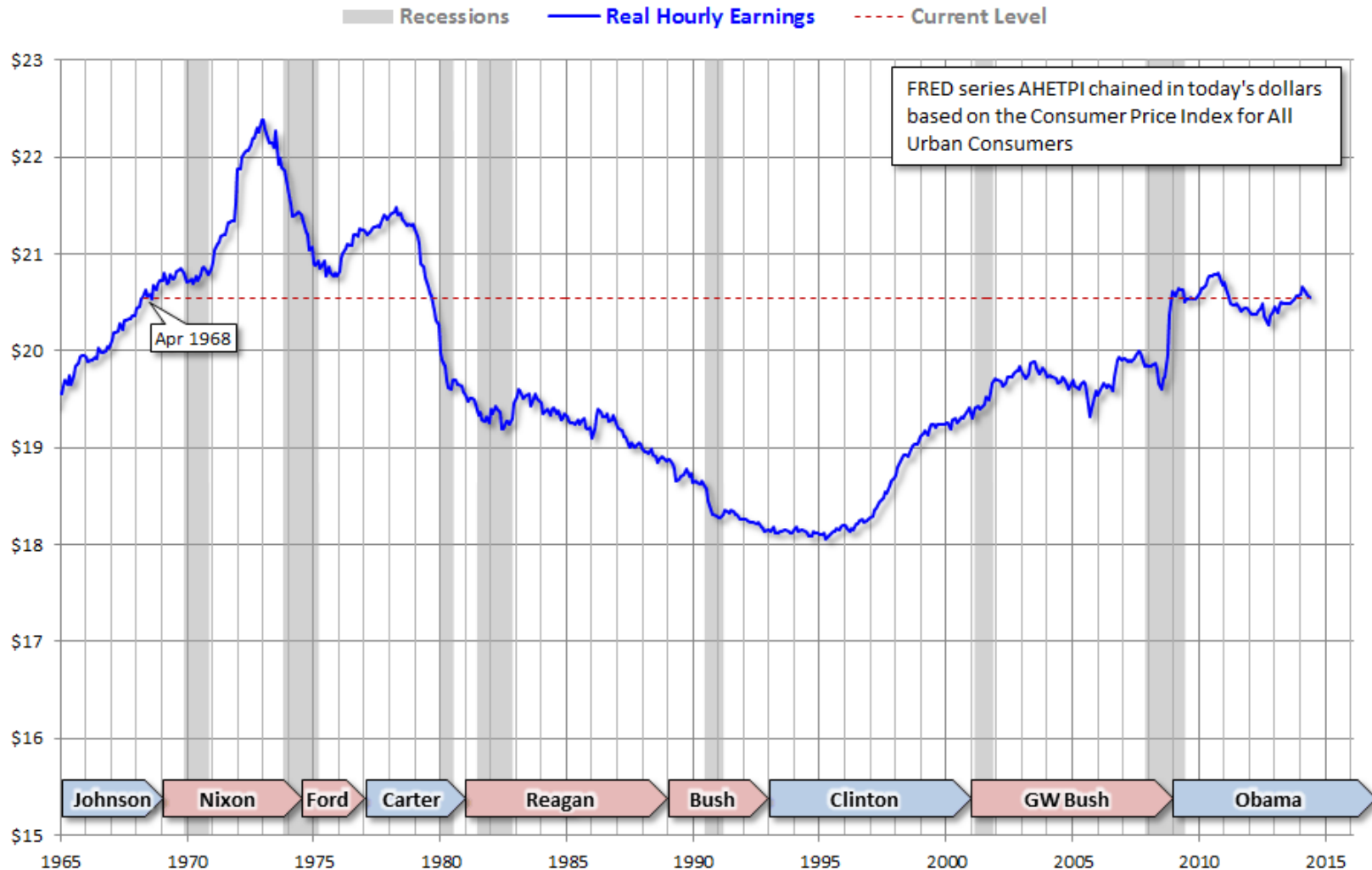
Source: Organization for Economic Co-operation and Development

Shaded areas indicate US recessions - 2015 research.stlouisfed.org

Real Hourly Earnings

Real Average Hourly Earnings of Production and Nonsupervisory Employees: Total Private

dshort.com
June 2014
Data through May



Technology and Work

Threefold Impact:

- ◆ **Substitution:** replacement of human labor by machines
- ◆ **Unbundling:** replacement of "jobs" by collection of "tasks"
- ◆ **Disintermediation:** elimination of intermediaries

Unbundling of Jobs

- ◆ **R. Coates, 1937: "The Nature of the Firm"**
 - Firms hire workers to reduce transaction costs
- ◆ **Conclusion:** If transaction costs can be reduced, then firms should contract out and not hire.
- ◆ **Job:** an organizational role to perform a set of tasks
- ◆ **Conclusion:** If transaction costs are low enough, then jobs can be broken into their constituent tasks and contracted out.

The Contingent Workforce

- ◆ US GAO, May 2015 -- *Contingent Workforce: Size, Characteristics, Earnings, and Benefits:*
 - "We estimate that contingent workers comprised 35.3 percent of employed workers in 2006 and 40.4 percent in 2010."
- ◆ McKinsey, Oct. 2016 -- *Independent work: Choice, necessity, and the gig economy:* "1 in 3 workers employed in Gig Economy, but not all by choice"

Disintermediation

- ◆ *The removal of intermediaries from a supply chain in connection with a transaction or a series of transactions.*



The Platform Economy

- ◆ Uber, Lyft
- ◆ Airbnb
- ◆ LinkedIn
- ◆ Amazon, Google, Microsoft
- ◆ TaskRabbit, UpWork, Fiverr

Question: What does the job market look like after automation, gigification, and disintermediation?