

Humans, Machines, and the Future of Work

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The Automobile: Societal Costs

Worldwide:

- ◆ 1.25M deaths in 2013
- ◆ 20-50M are injured or disabled
- ◆ 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 > \$0.5T
- ◆ *Human error accounts for more than 90% of car crashes*

The Automation of Driving

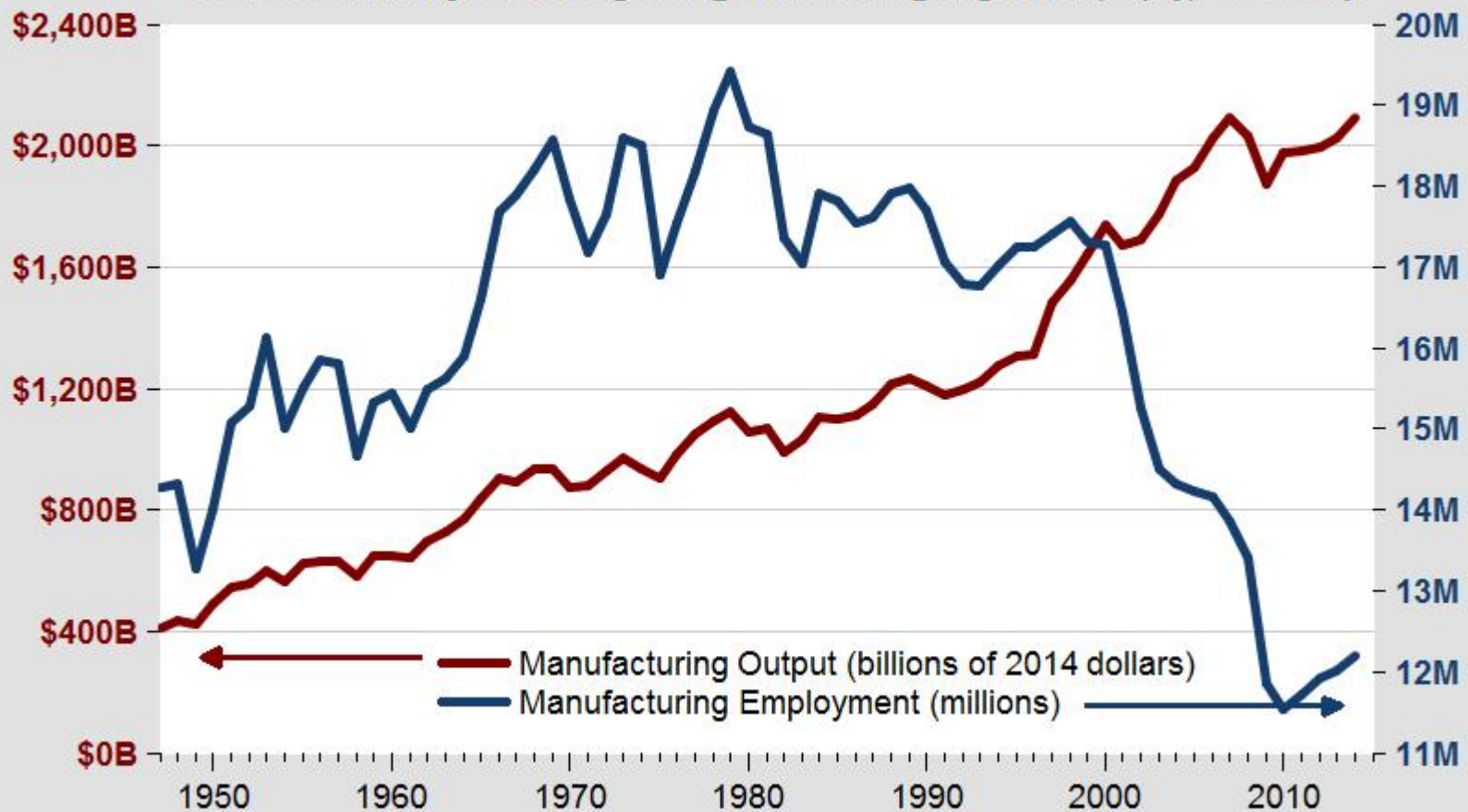
- ◆ 30 companies are now making self-driving cars
- *estimated market: \$2T over next decade*
- ◆ Technical issues to be resolved within 10 yrs
- ◆ Many legal issues need to be resolved
- ◆ Profound business disruption:
 - Major industrial contraction (cars are now idle 90% of the time)
 - "Major loss of business" for insurance, legal, and medical industry
- ◆ *Huge societal benefit: reduce accidents, liberate elders and the disabled*

What about the Drivers?

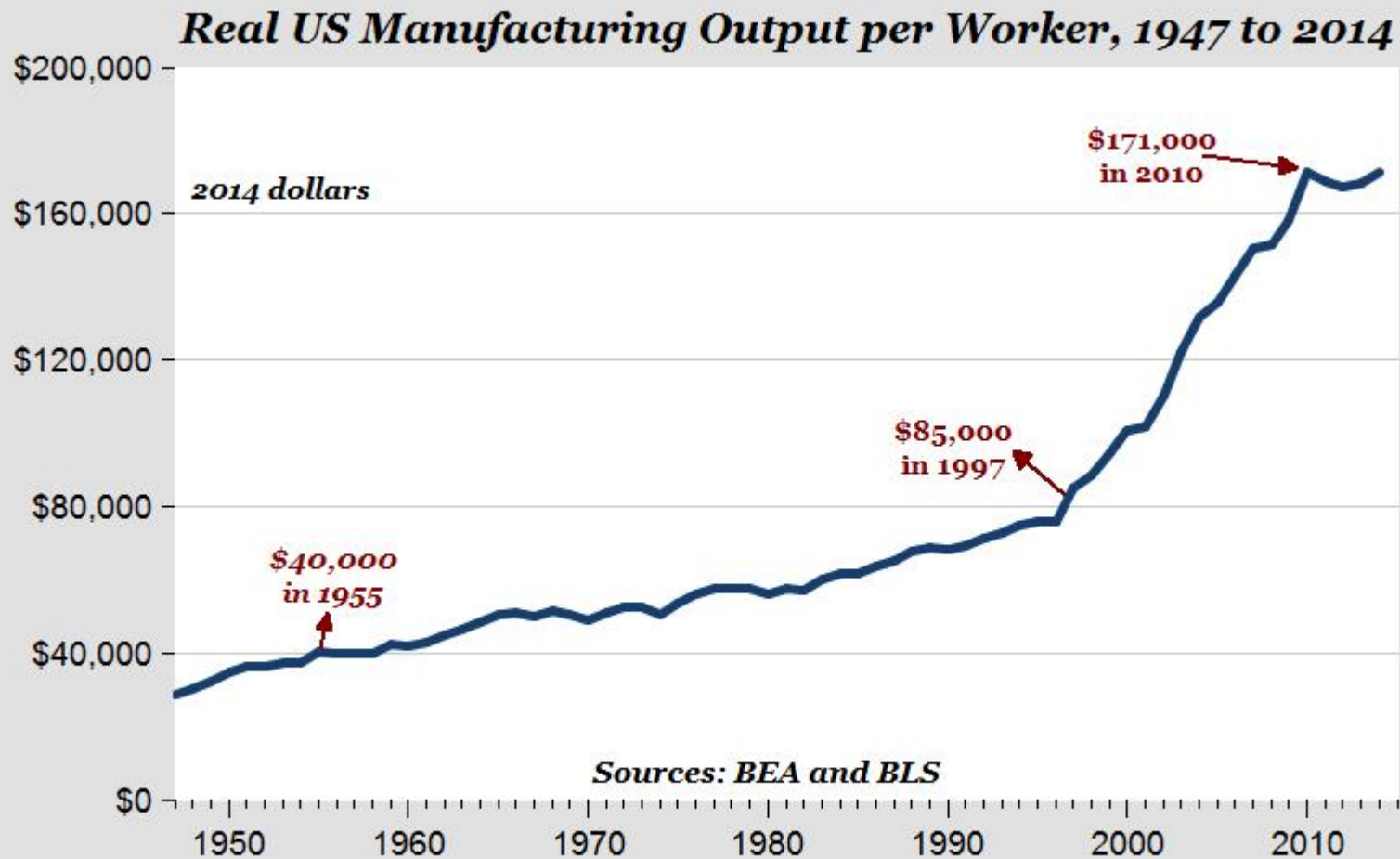
- ◆ 4M truck+taxi drivers in the US
- ◆ 10% of US jobs involve operating a vehicle
- ◆ Automation of the whole supply chain is expected: *cargo ships, ports, trucking, warehouses, delivery, ...*
- ◆ ***Bottom Line:*** Massive loss of jobs!
 - But, new jobs will be created. Right?
- ◆ ***Comparison:*** Driving vs Manufacturing

Decoupling in US Manufacturing

US Real Manufacturing Output vs. Employment, 1947 to 2014



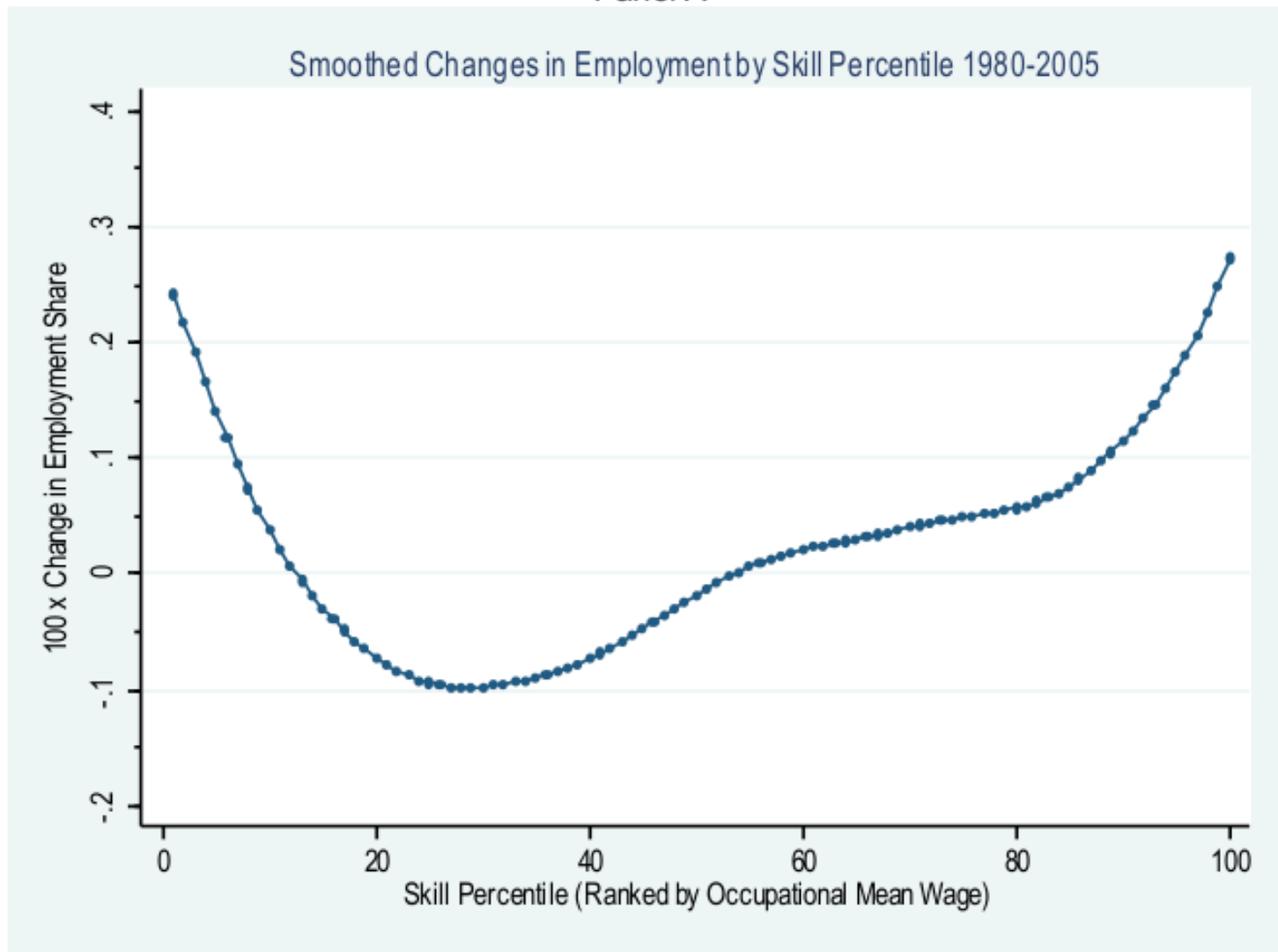
Driving Force: Automation



Tesla Model S Factory Floor



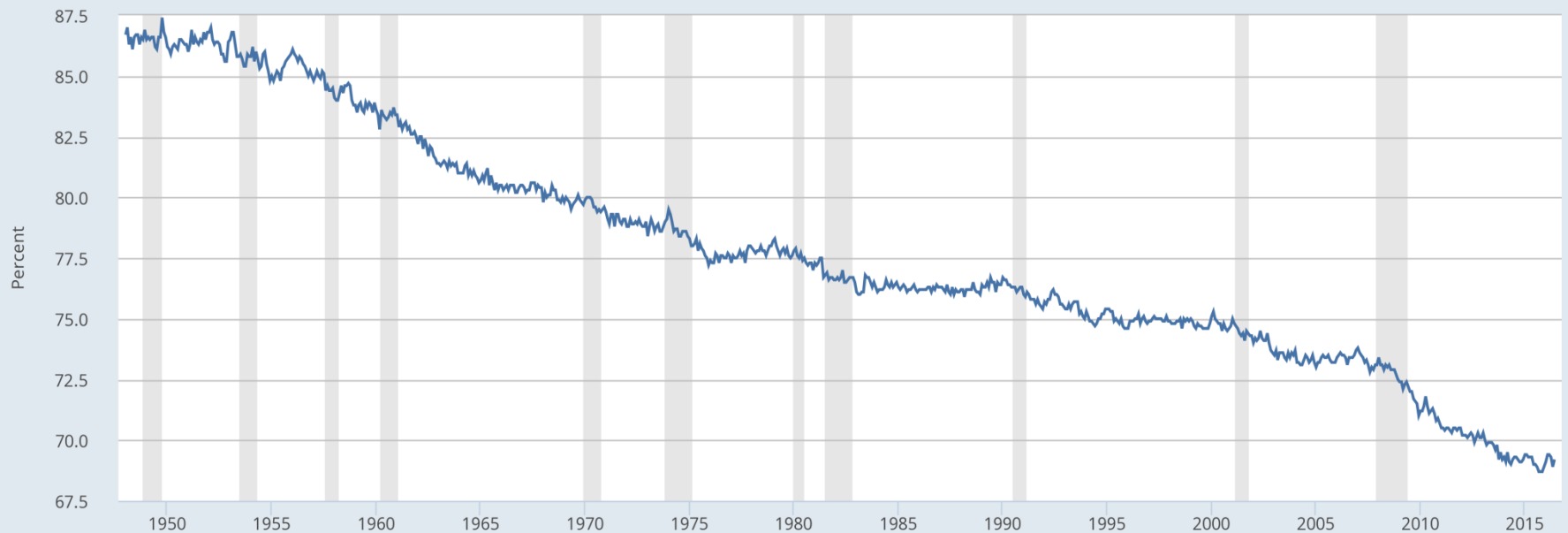
Job Polarization



Labor-Force Participation - Men

FRED 

— Civilian Labor Force Participation Rate: Men



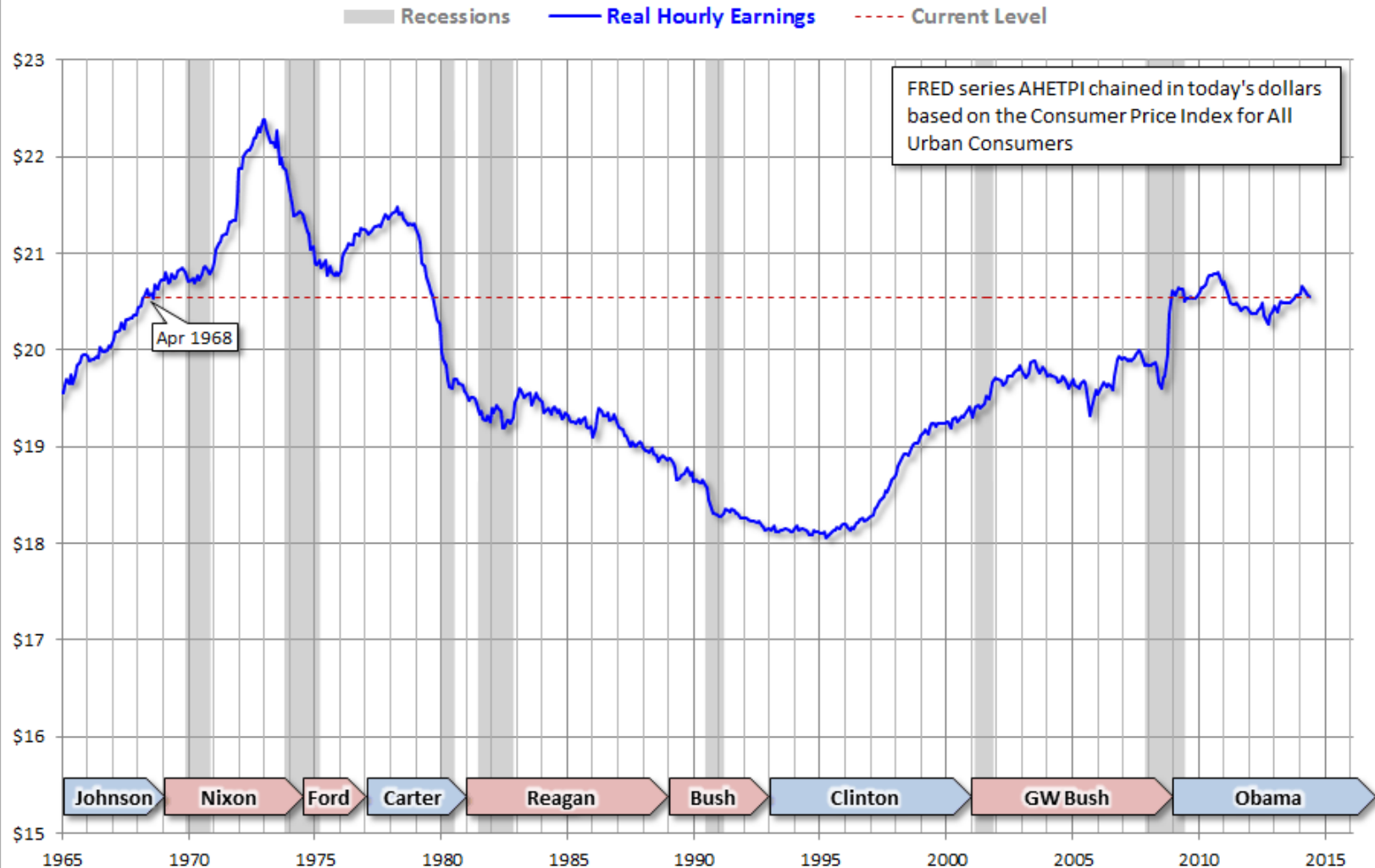
Source: US, Bureau of Labor Statistics
fred.stlouisfed.org

myf.red/g/5iMa

Real Hourly Earnings

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

dshort.com
June 2014
Data through May



The Future is Now!

- ◆ Over the past 40 years, automation has had a very harsh impact on middle- and working-class Americans!
- ◆ William Galston, WSJ, July 6, 2016: *"Educated professionals—including most politicians—live in an economic and cultural bubble, and they all too easily assume that what they see and hear around them represents the entire country."*



Questions for the Panel

1. What is the current state of the art in your field in terms of ability to substitute for human work?
2. How do you see your field progressing in the next 25 years with respect to human work?
3. What is our responsibility as computing researchers in dealing with the issue of technology's impact on the workforce?

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- ◆ A conference at Rice University
- ◆ Dec. 5-6, 2016
- ◆ delange.rice.edu