

# The Rise of Artificial Intelligence

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## Implications for Jobs and the Economy

Martin Ford

IRPA Automation Innovation Conference, December 3, 2015

# Labor hours in the U.S. business sector

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1998: 194 billion hours of labor

2013 -- 15 years later:

- Business output up by 42% or \$3.5 trillion
- U.S. population up by over 40 million people

# Labor hours in the U.S. business sector

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2013: 194 billion hours of labor

“***no growth at all*** in the number of hours worked over this 15-year period, despite the fact that the U.S population gained over 40 million people during that time, and despite the fact that there were thousands of new businesses established during that time.”

-- U.S. Bureau of Labor Statistics, May, 2014

# What makes IT different?

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- Exponential -- at least 27 doublings
- Delivers machine intelligence -- substitutes for cognitive labor
- General purpose technology -- invades every business and economic sector

# New industries not labor intensive

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## ■ General Motors 1979 (Peak Jobs)

- 840,000 workers

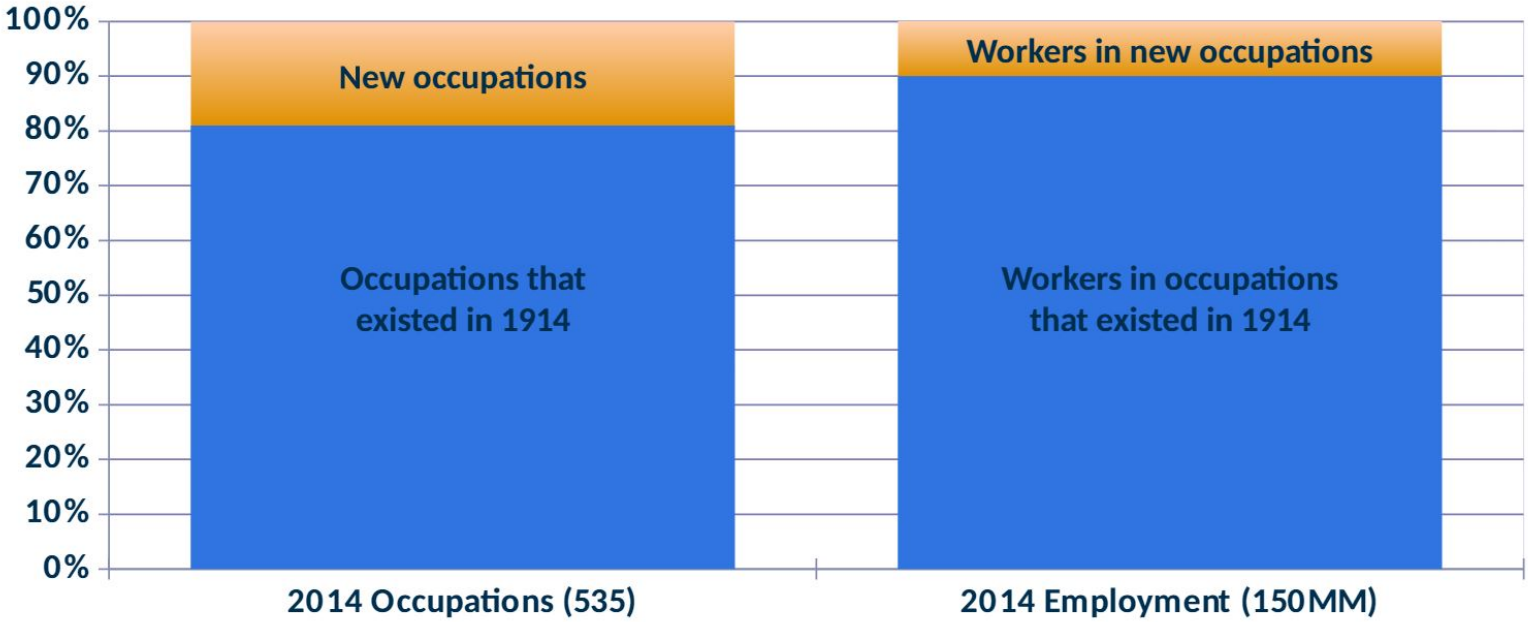
- \$11 billion in earnings (2012 dollars)

## ■ Google 2012

- 38,000 workers (4.5% of GM)

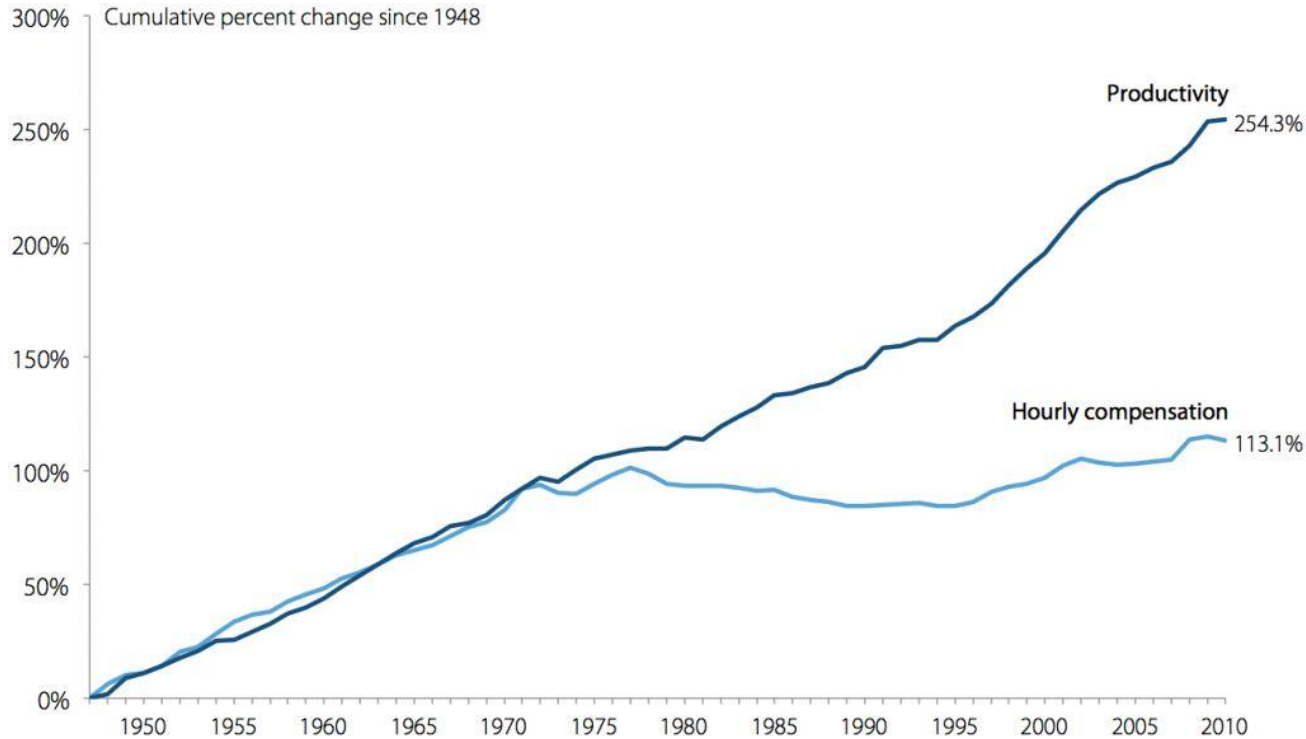
- \$14 billion in earnings (20% > GM)

# Old vs New: Occupations & Jobs



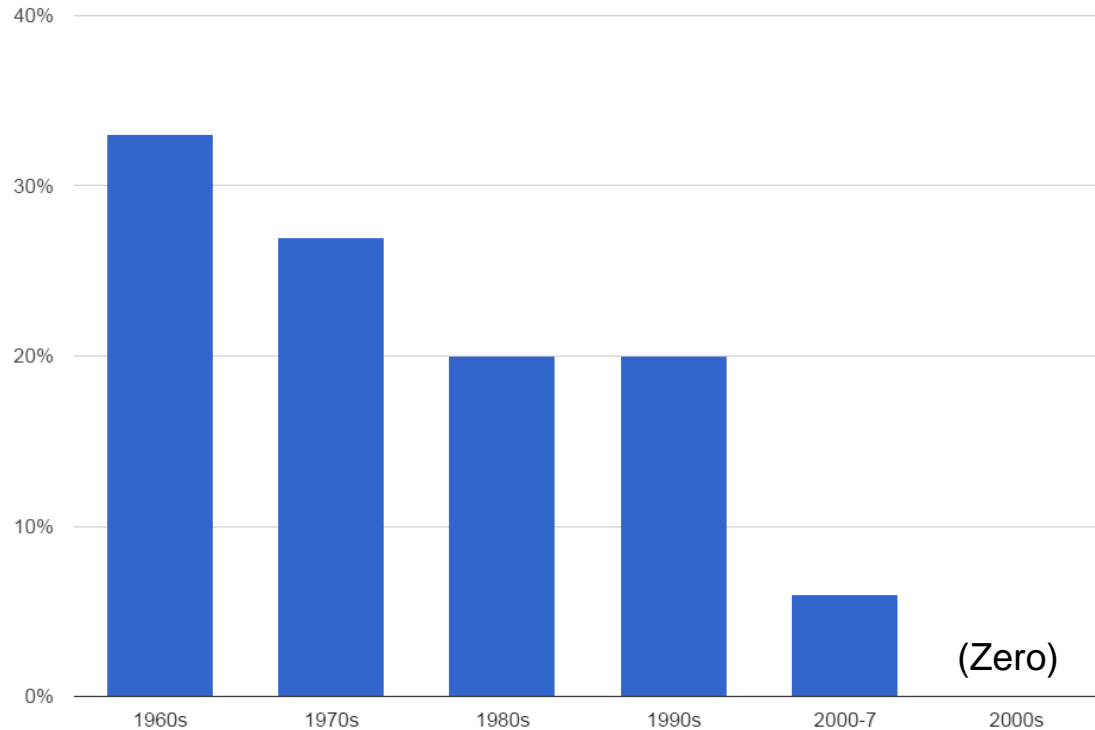
Source: Gerald Huff, based on an analysis of BLS data

# Productivity vs. Compensation



Source: Economic Policy Institute

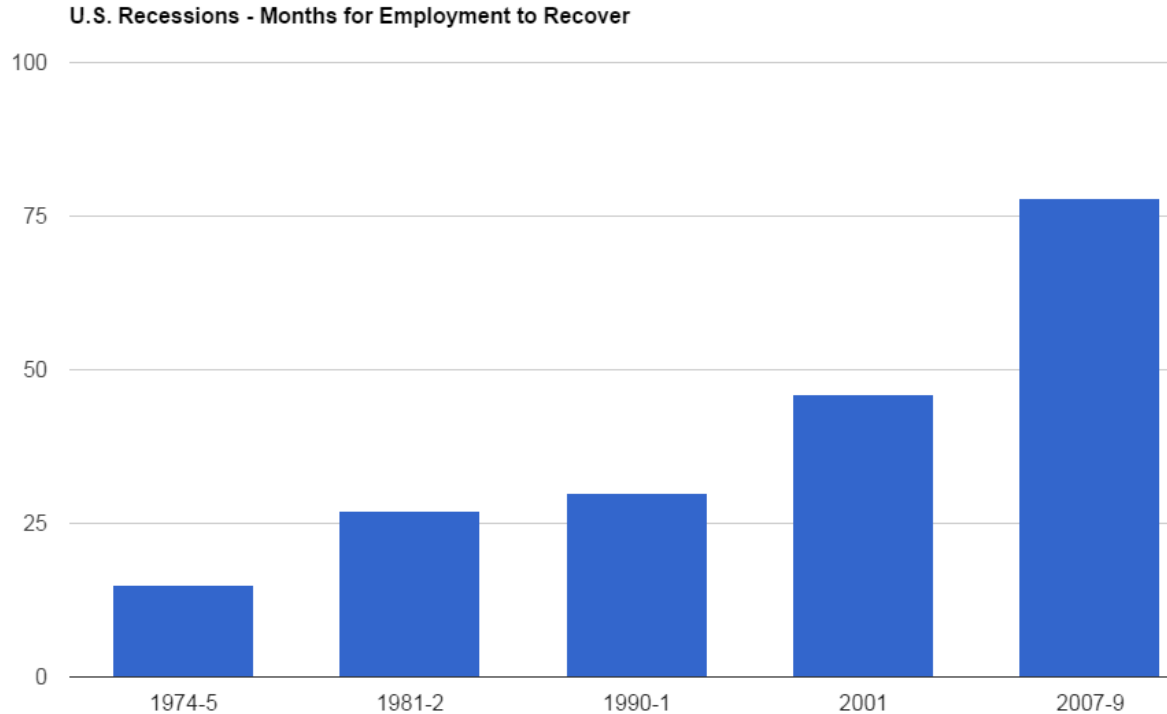
# U.S. Job Creation by Decade



Source: Bureau of Labor Statistics, St. Louis Federal Reserve



# U.S. Jobless Recoveries & Polarization



Source: Bureau of Labor Statistics, St. Louis Federal Reserve

# Innovations in Robotics

- Industrial Perception
  - 3D Machine Vision, Dexterity
  - Moves up to 1 box every second
  - Never tires; no injuries



# White-collar Automation

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## The New Bookkeeper Is a Robot

In corporate finance departments, software does tasks that once took armies of people

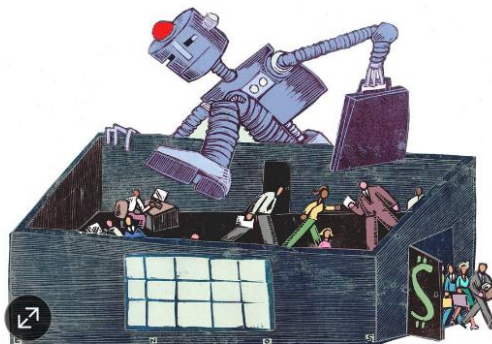


ILLUSTRATION: RANDALL ENOS

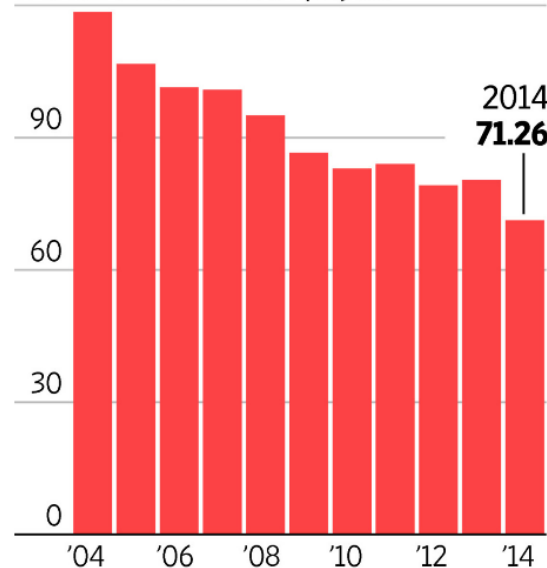
By **VIPAL MONGA**

Updated May 5, 2015 1:59 p.m. ET

Five years ago, 80 clerks and salespeople at Pilot Travel Centers LLC spent a combined 3,200 hours a week tracking and paying for orders for thousands of goods, ranging from candy bars to diesel fuel.

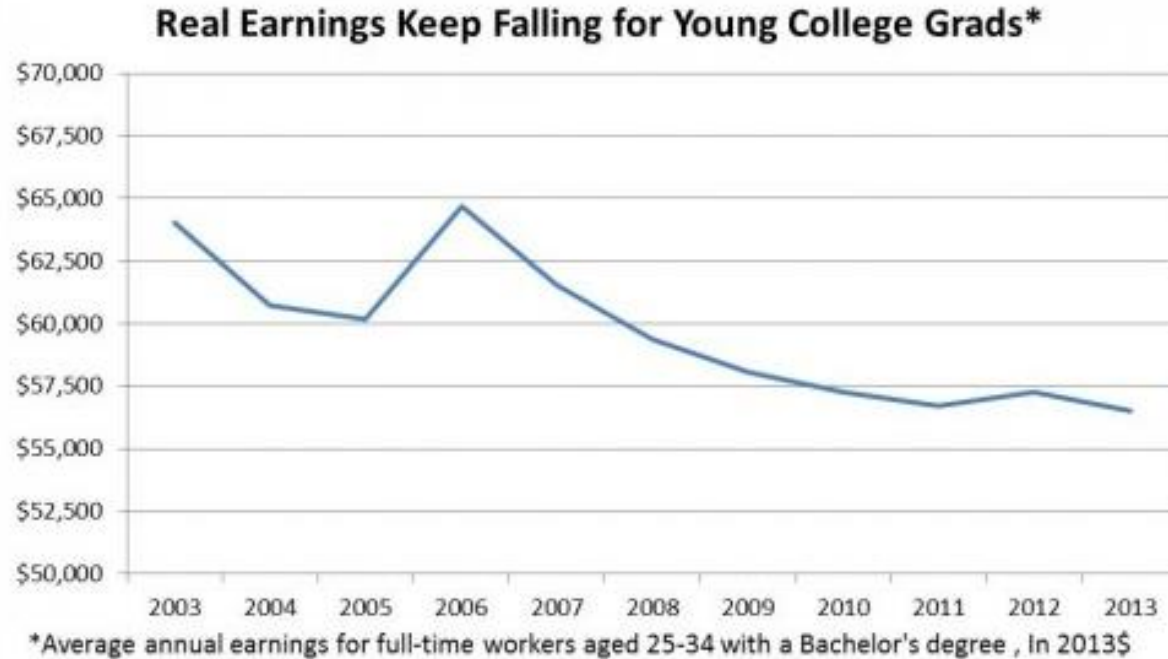
Median staffing in corporate finance departments per \$1 billion of revenue\*

120 full-time finance employees



Source: Hackett Group, Wall Street Journal

# Earnings for College Graduates 25-34

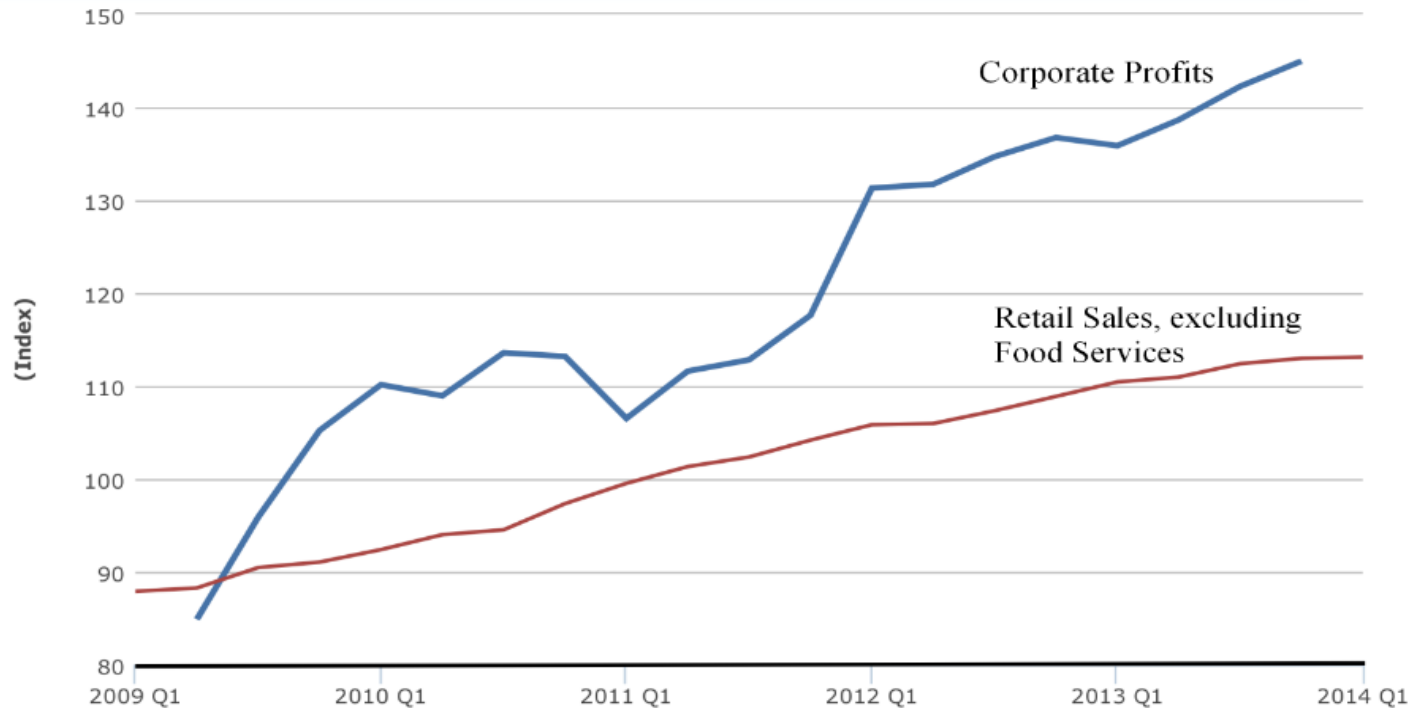


# Impact on Consumer Demand

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- Machines do not consume
- Only people and governments provide final demand for the economy
- Businesses must be able to sell their output
  - Global Impact

# U.S. Corporate Profits vs. Retail Sales



Source: St. Louis Federal Reserve

# What Should We Do?

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- Near Term: Enhance the Safety Net
- Longer Term: Decouple Jobs from Income
  - Guaranteed basic income
  - Incorporate incentives, especially for education