

November 15, 2011

Innovation in Manufacturing: Driving Growth and Competitiveness

Presentation at Rockwell Automation

Manufacturing Perspectives

Chicago, Illinois

Dr. Robert D. Atkinson

President

Information Technology and Innovation Foundation

The Information Technology and Innovation Foundation (ITIF) is a Washington, D.C.-based think tank at the cutting edge of designing innovation policies and exploring how advances in technology will create new opportunities to boost economic growth and improve quality of life. ITIF focuses on:

- National economic competitiveness;
- Innovation processes, policy, and metrics
- E-transformation (e.g., health, commerce, e-government)
- IT and economic productivity
- Science and technology policy
- Innovation and trade policy

■ Today's Presentation

1

Where Are We in U.S. Manufacturing?

2

Why Innovation is Key to Manufacturing Renewal

3

Why is IT Driving Manufacturing Innovation?

4

Key Trends in IT Evolution and Intersection with Manufacturing

5

What Should Washington Do?

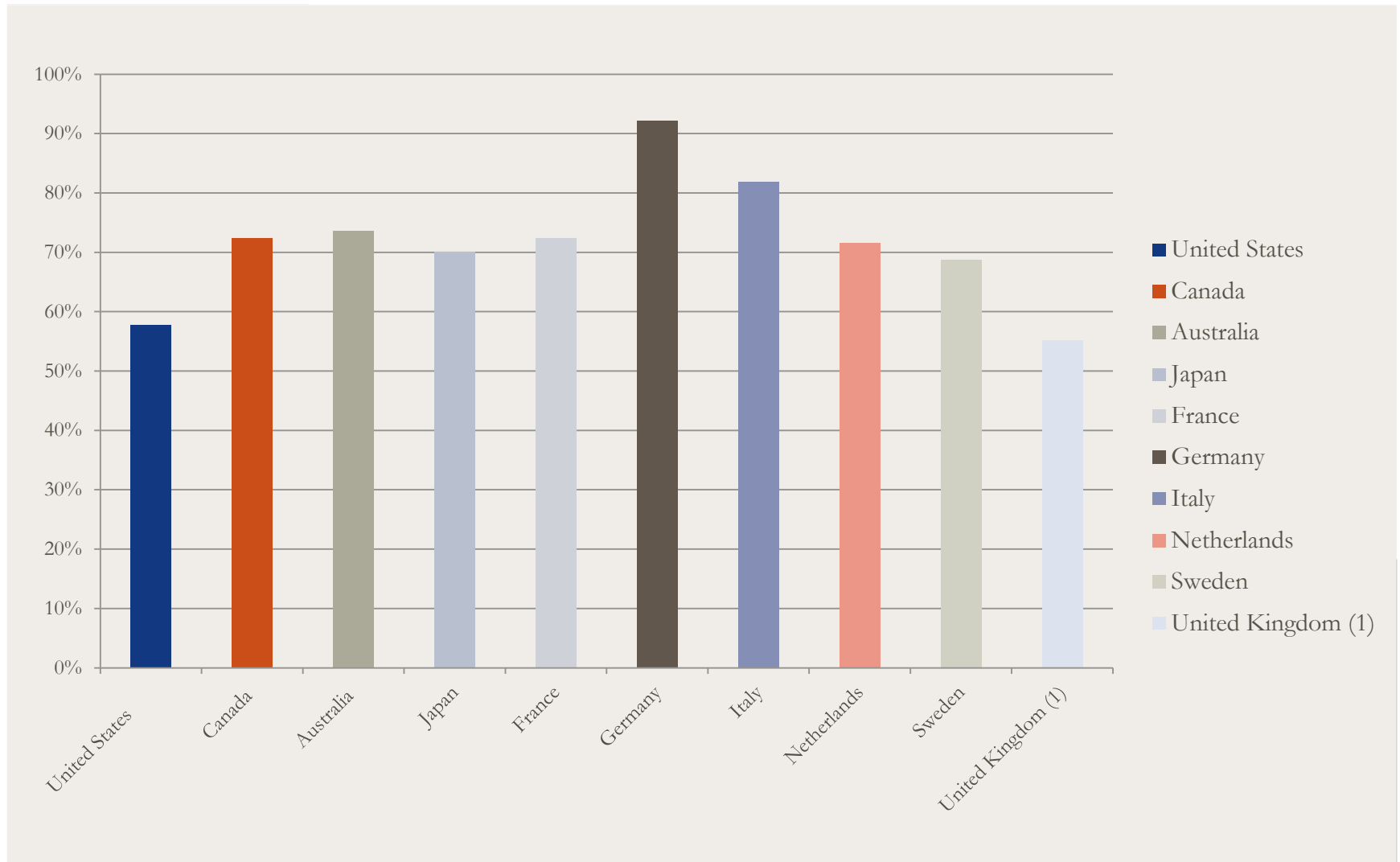
6

Why Hasn't Washington Done More?

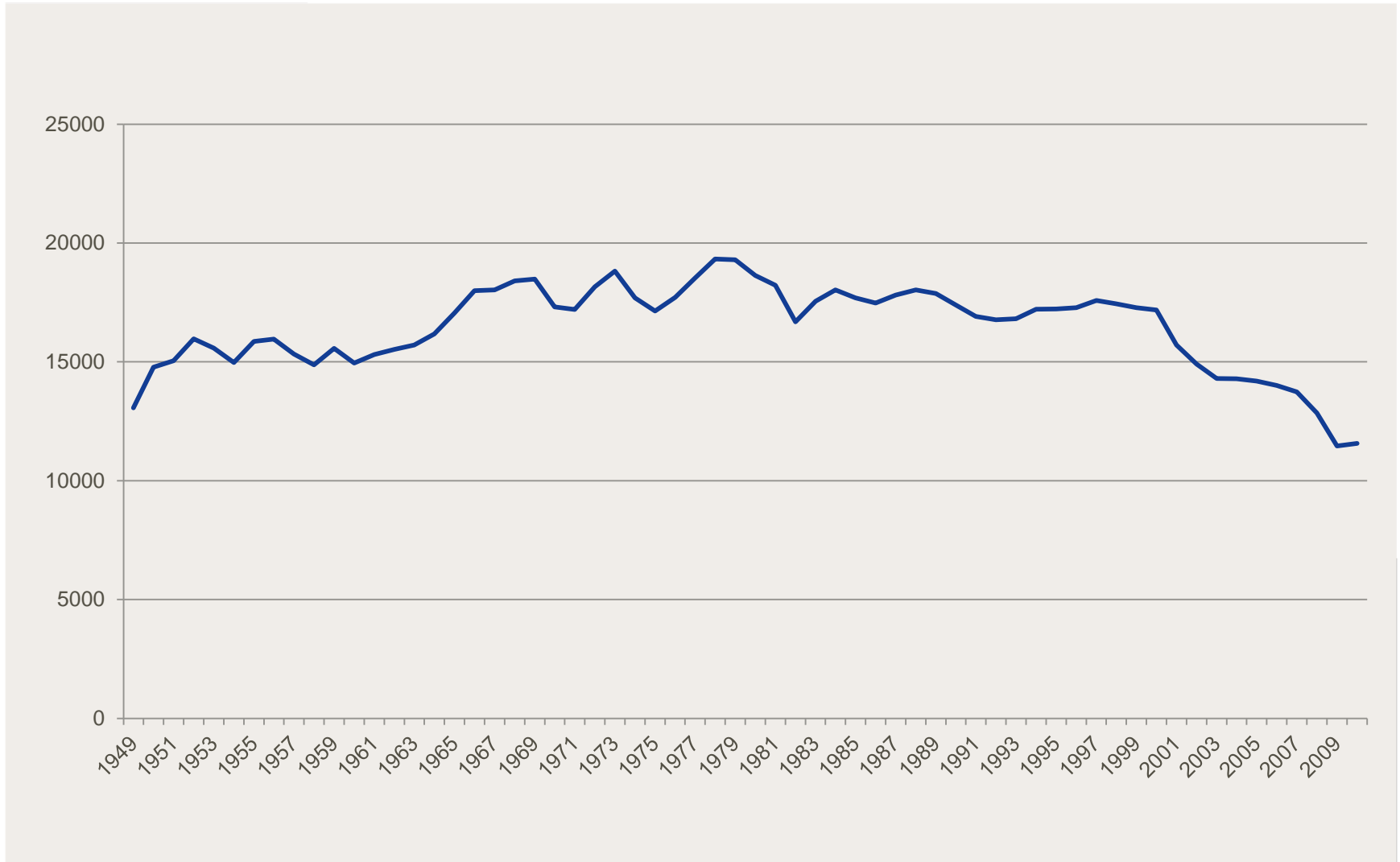
■ Manufacturing is a Key Driver of U.S. Economic Growth

- Had U.S. manufacturing grown at the same rate as the overall economy over the past decade, the economy would have as many as 8 million more jobs.
- Manufacturing jobs pay 9% more than jobs in the overall economy.
- Manufacturing accounts for 57% of U.S. exports. A 10% increase in sales due to exports produces twice as many jobs as a 10% increase in domestic demand.

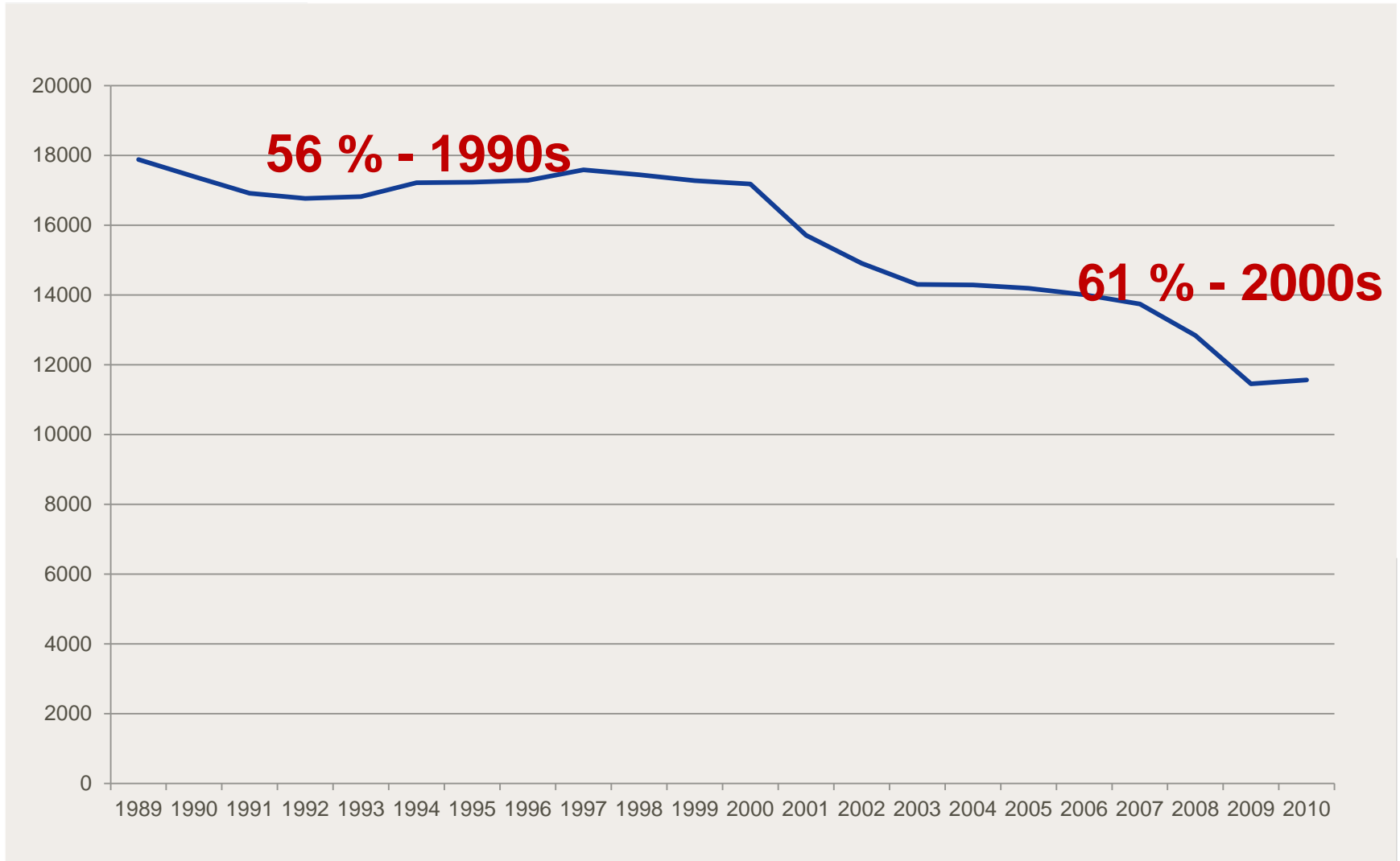
■ U.S. Manufacturing Job Growth Was the Worst of A Sample of OECD Nations



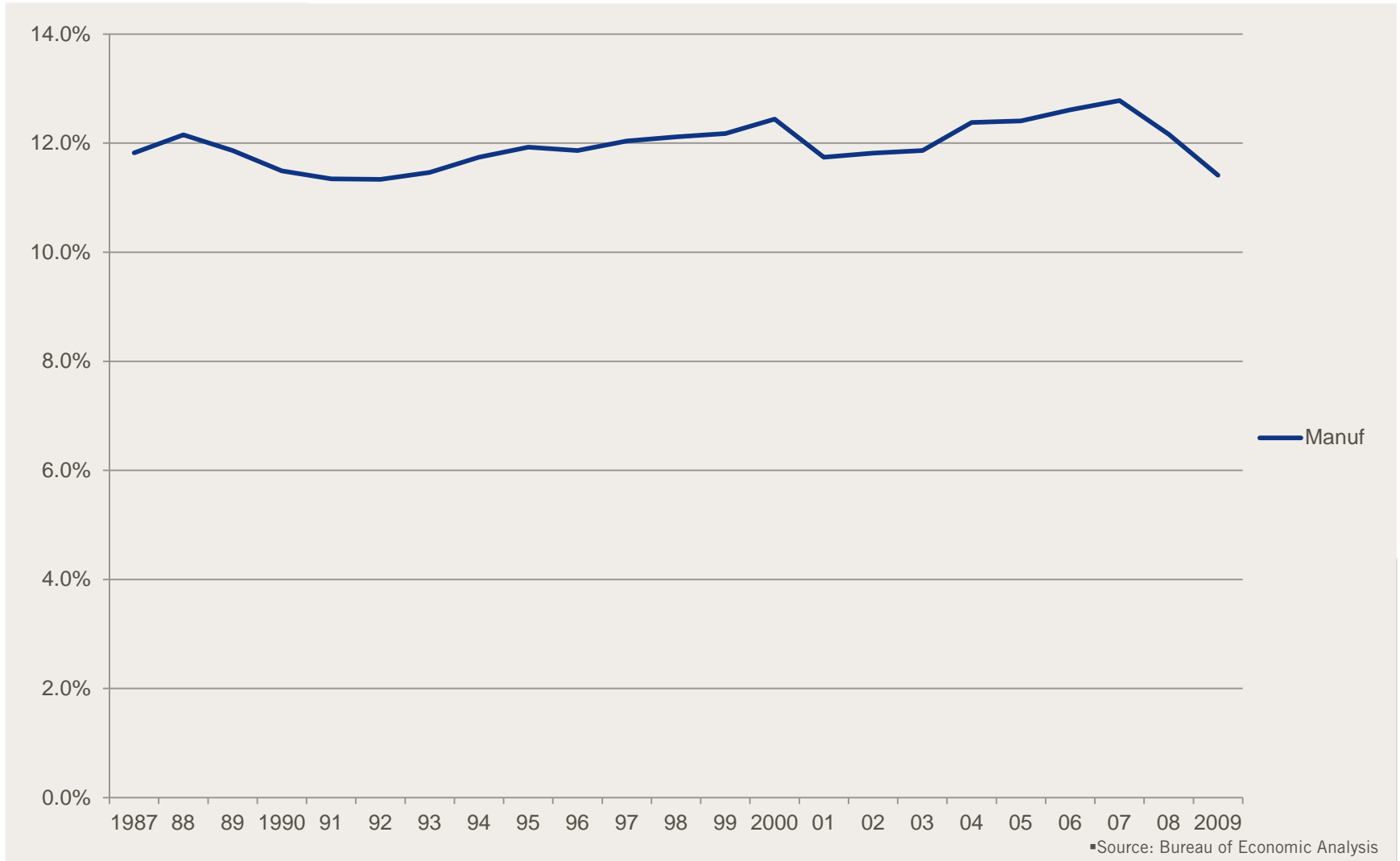
■ U.S. Manufacturing Jobs Fell Precipitously in the Last Decade



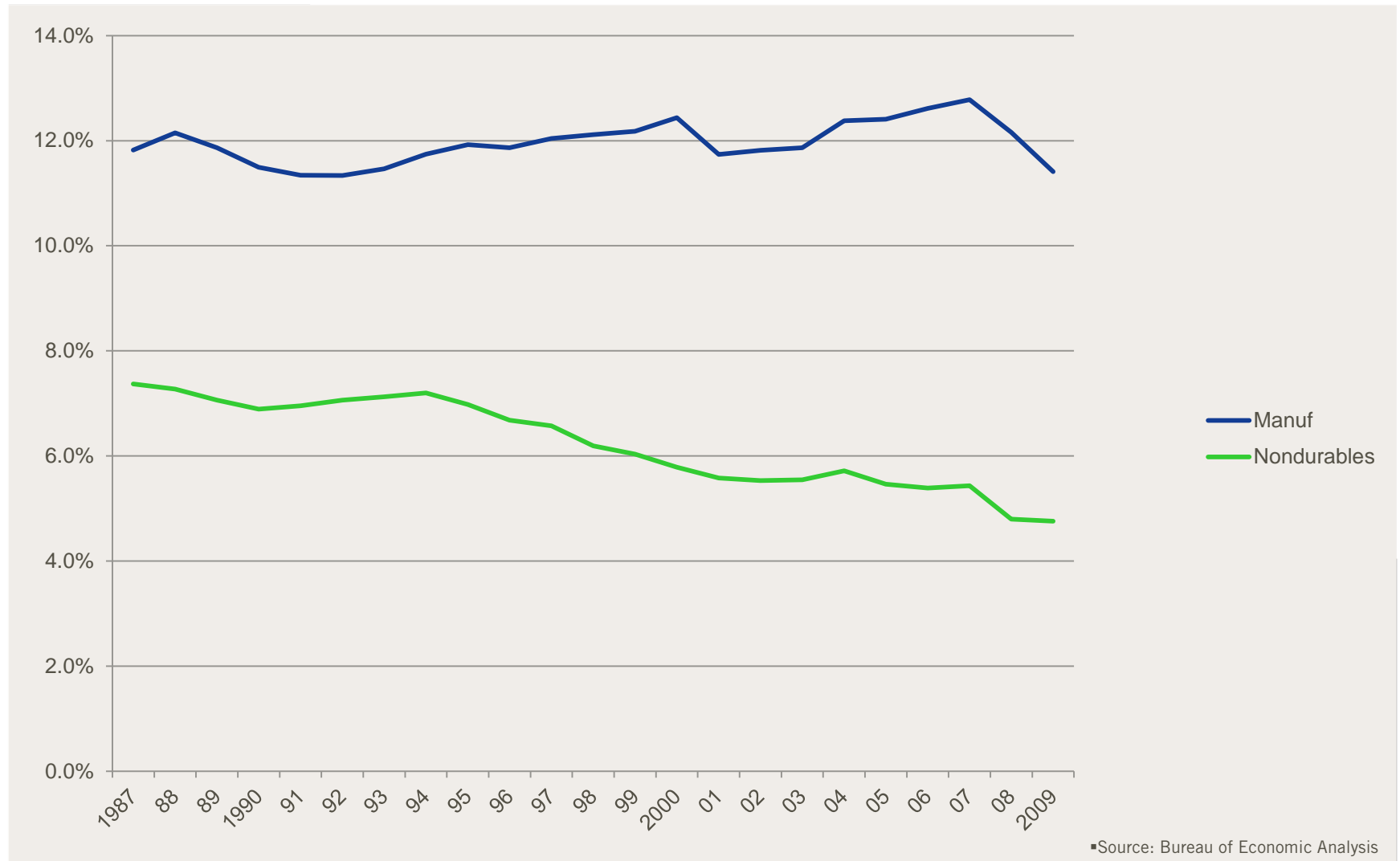
■ But *Not* Principally Because of Productivity



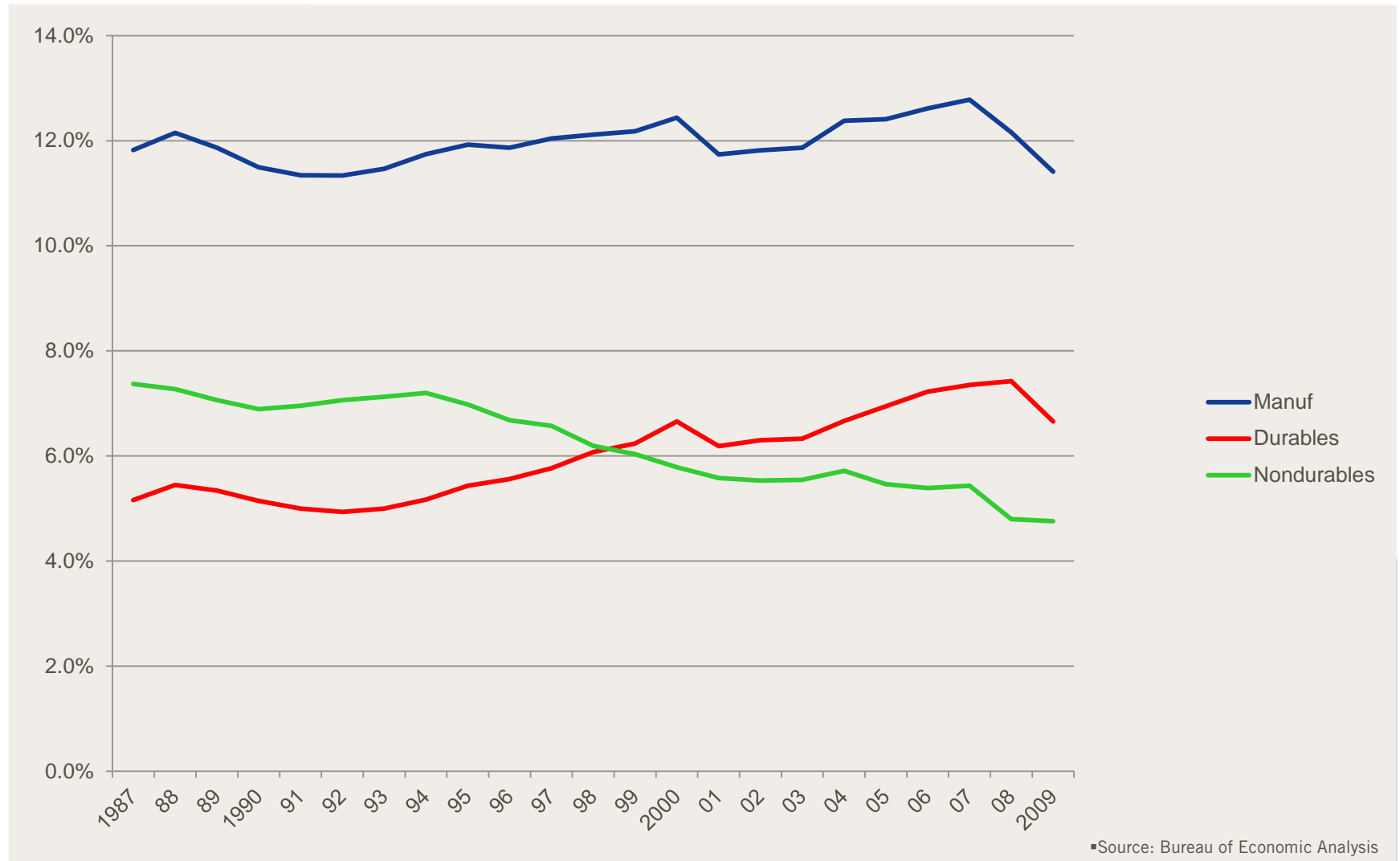
■ Real Manufacturing Value-Added As Share of GDP



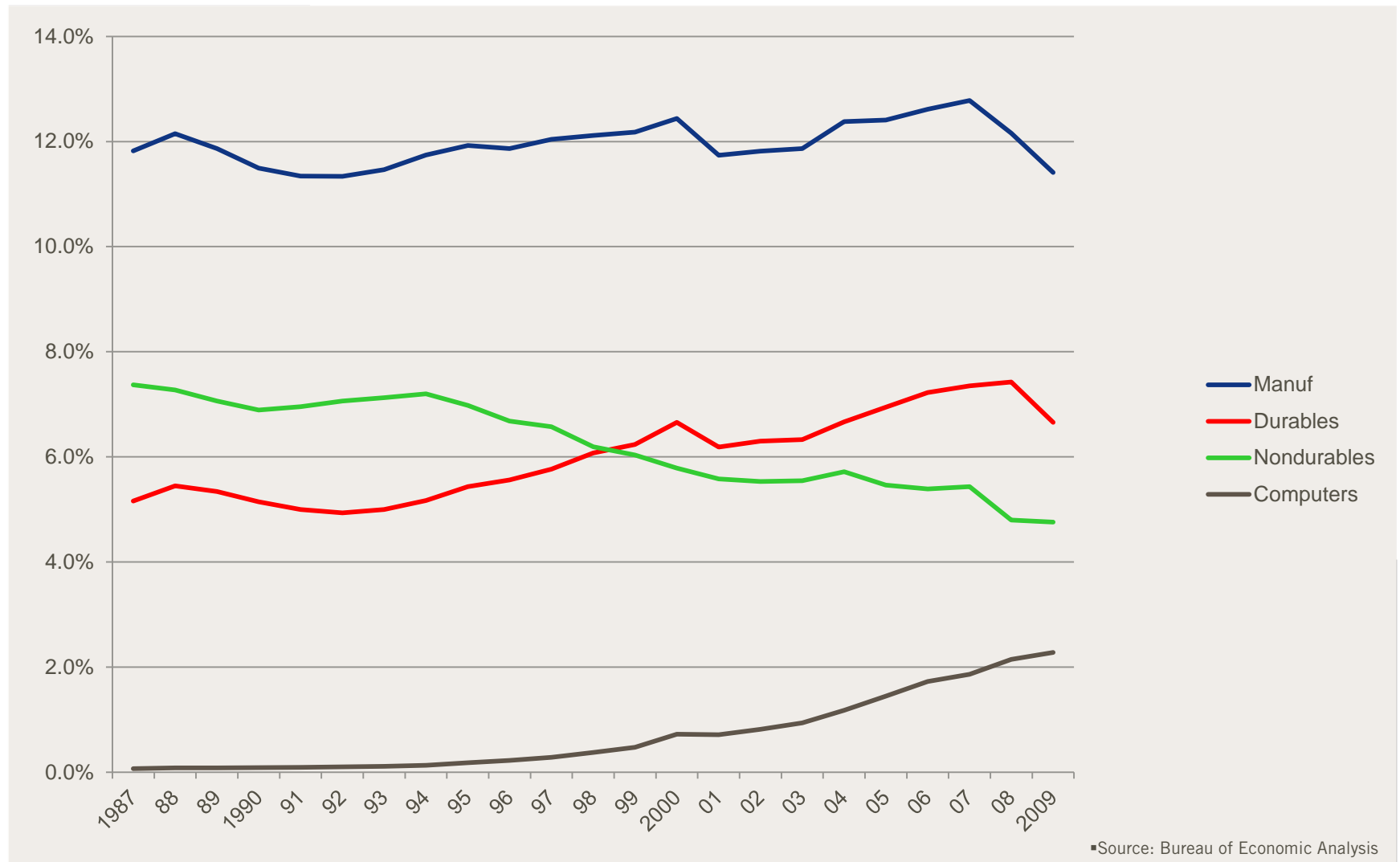
■ Real Manufacturing Value-Added As Share of GDP



■ Real Manufacturing Value-Added As Share of GDP

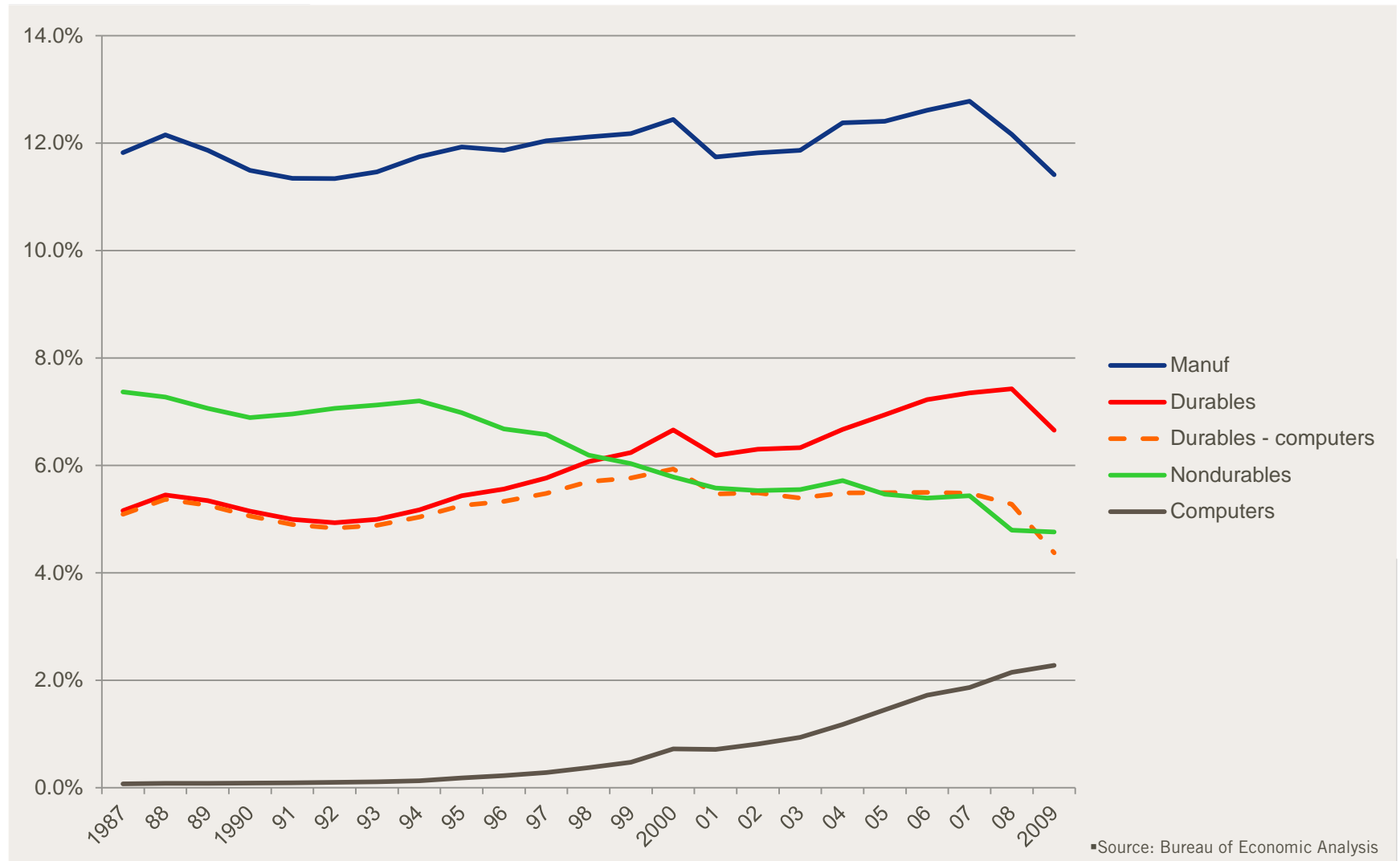


■ Real Manufacturing Value-Added As Share of GDP



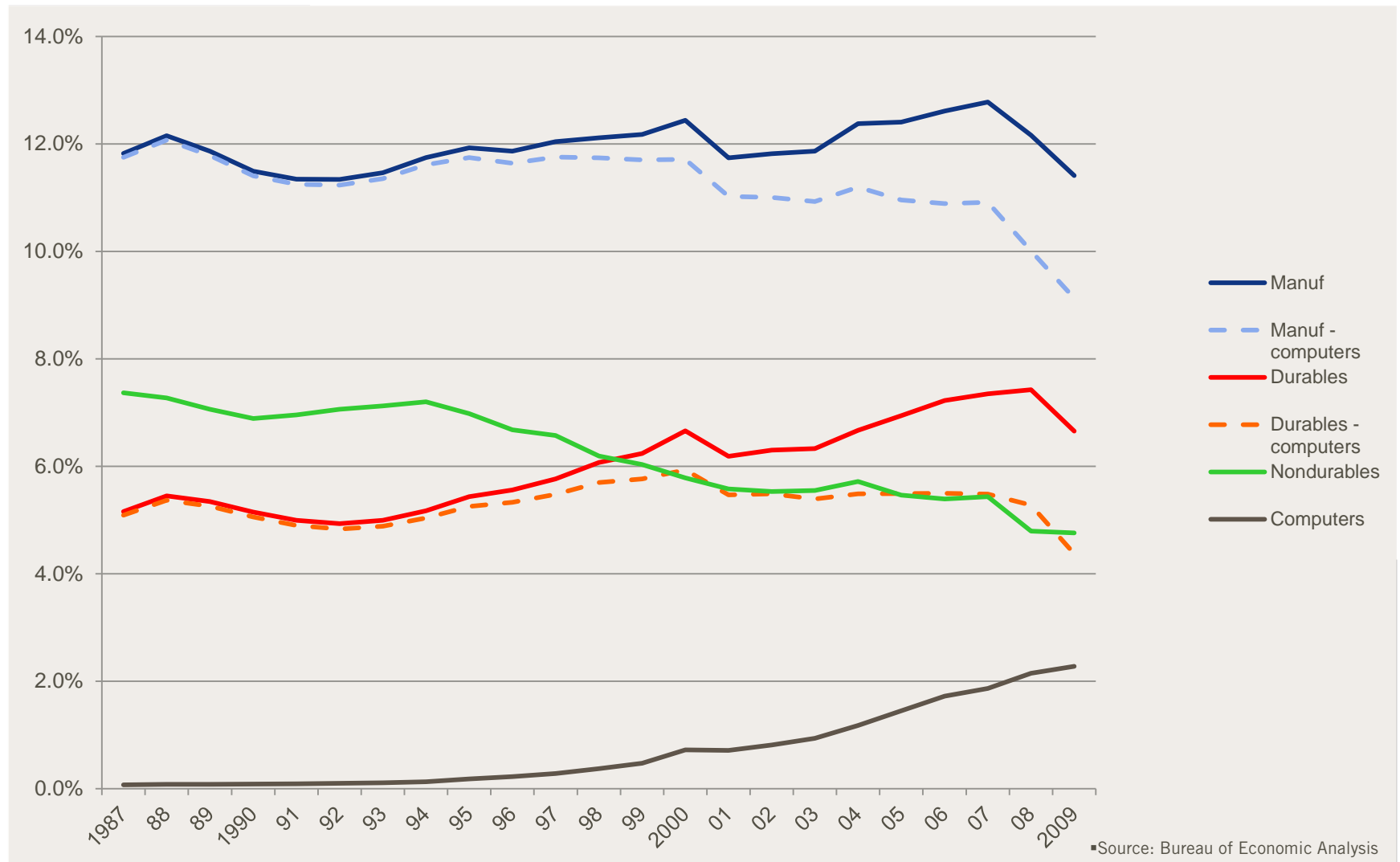
Source: Bureau of Economic Analysis

■ Real Manufacturing Value-Added As Share of GDP



Source: Bureau of Economic Analysis

■ Real Manufacturing Value-Added As Share of GDP



■ Today's Presentation

1

Where Are We in U.S. Manufacturing?

2

Why Innovation is Key to Manufacturing Renewal

3

Why is IT Driving Manufacturing Innovation

4

Key Trends in IT Evolution and Intersection with Manufacturing

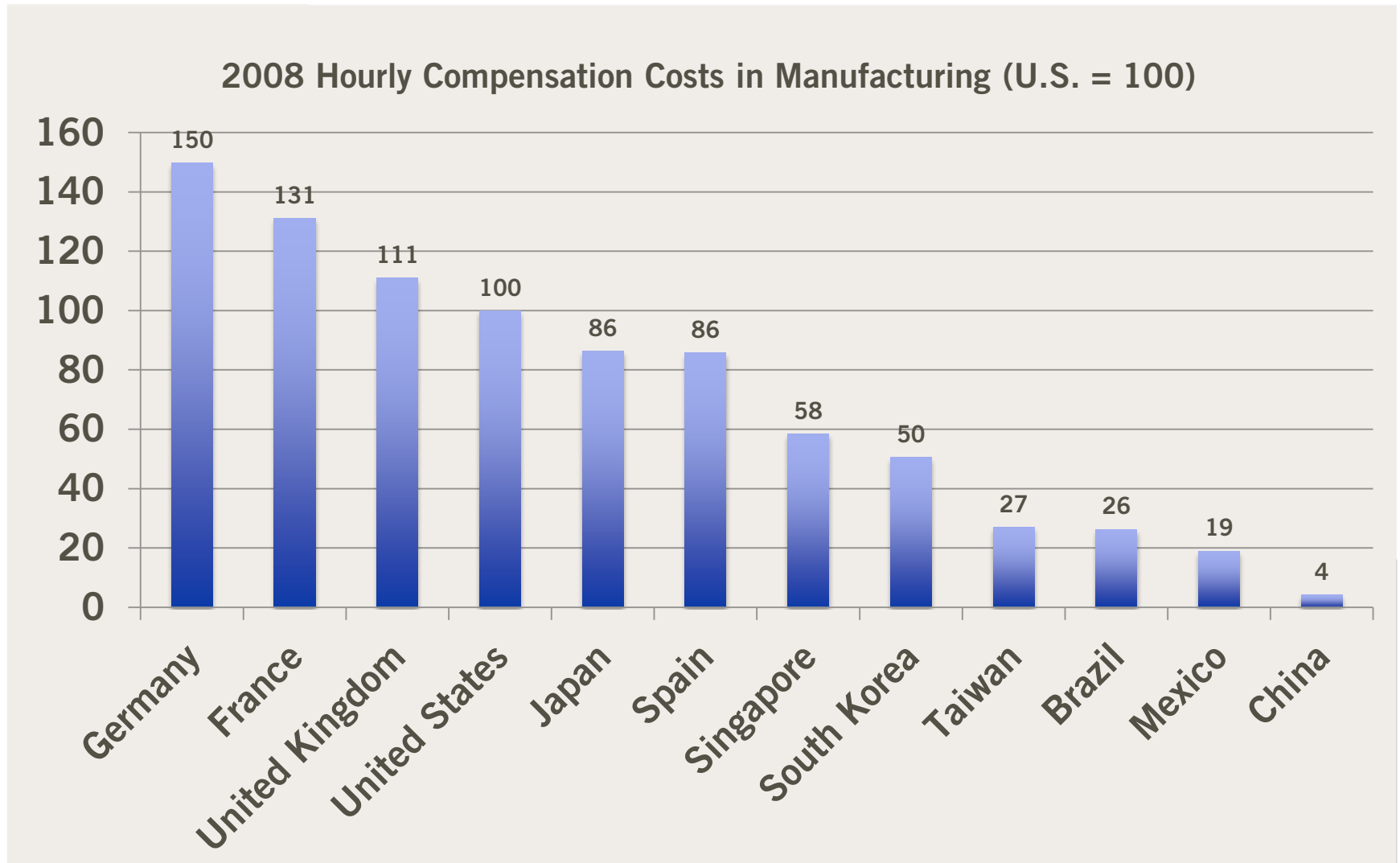
5

What Should Washington Do?

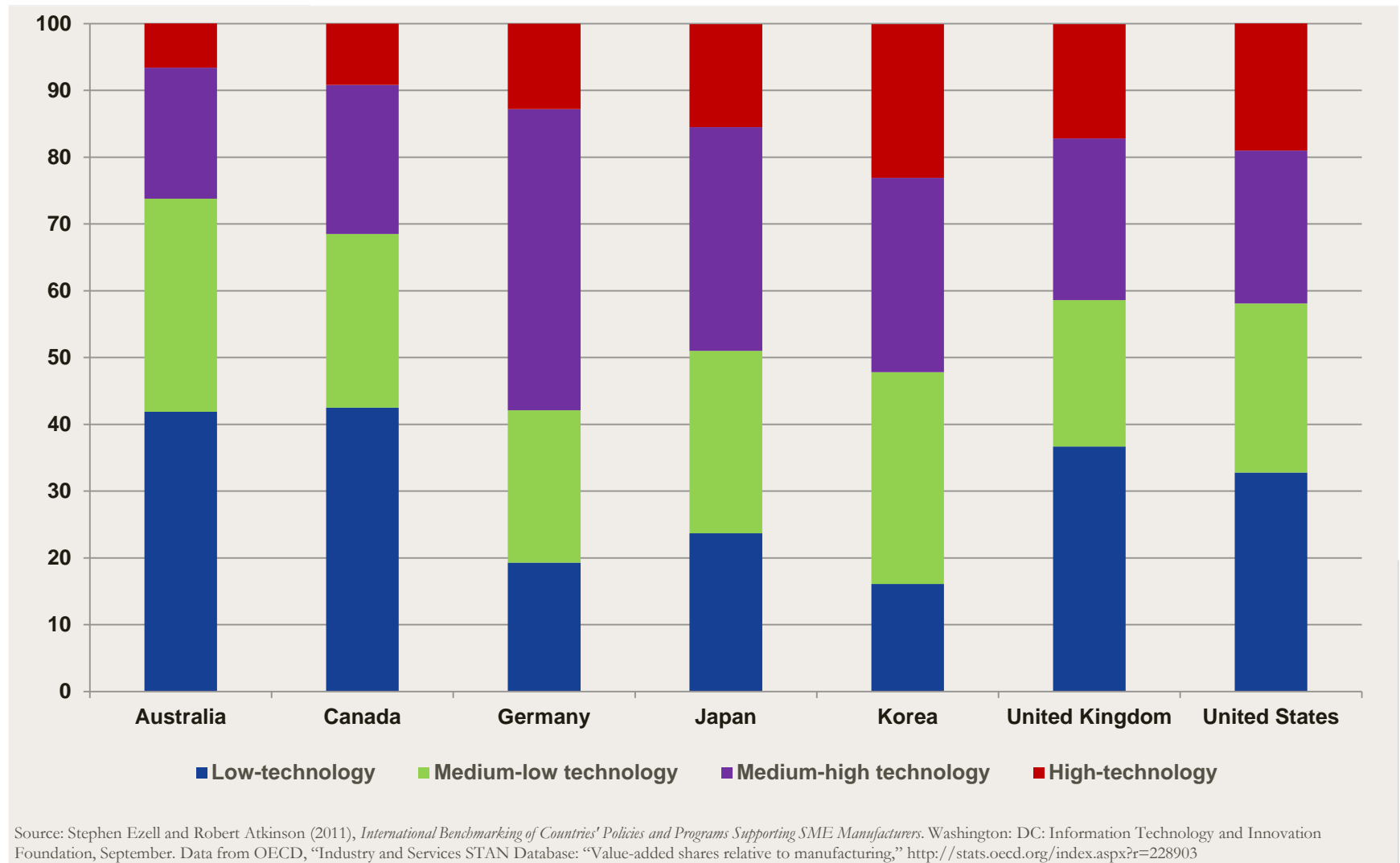
6

Why Hasn't Washington Done More?

■ We Are Competing With Developing Nations for Cost-Based Manufacturing



■ Easier to Compete in High-Tech Manufacturing



Source: Stephen Ezell and Robert Atkinson (2011), *International Benchmarking of Countries' Policies and Programs Supporting SME Manufacturers*. Washington: DC: Information Technology and Innovation Foundation, September. Data from OECD, "Industry and Services STAN Database: "Value-added shares relative to manufacturing," <http://stats.oecd.org/index.aspx?r=228903>

■ Today's Presentation

1

Where Are We in U.S. Manufacturing?

2

Why Innovation is Key to Manufacturing Renewal

3

Why is IT Driving Manufacturing Innovation?

4

Key Trends in IT Evolution and Intersection with Manufacturing

5

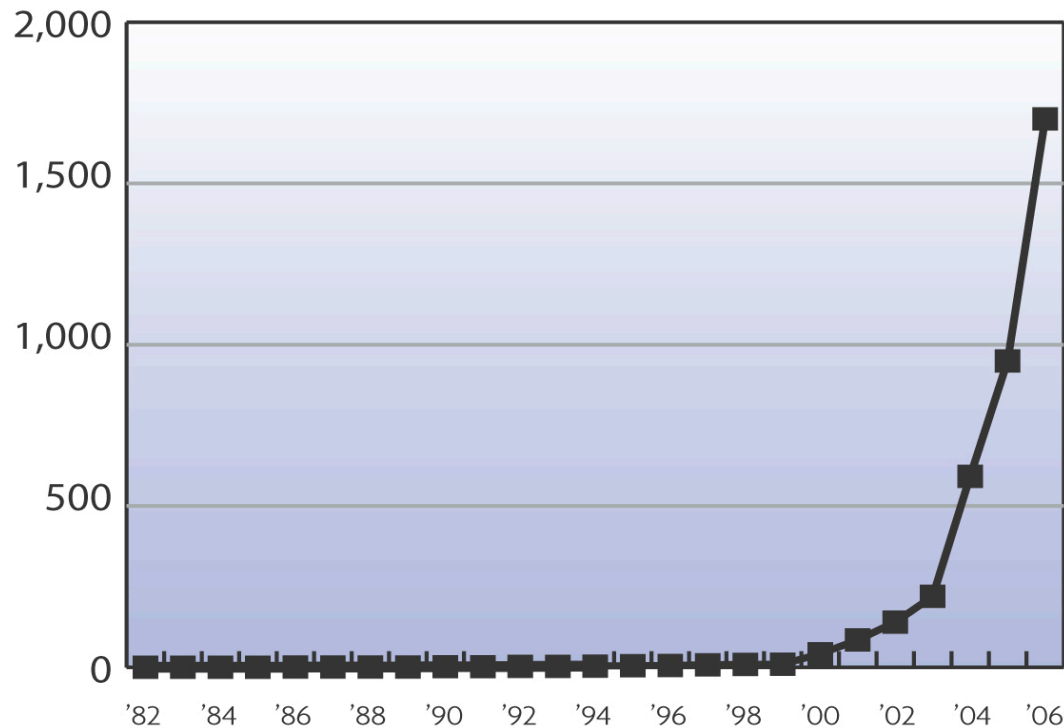
What Should Washington Do?

6

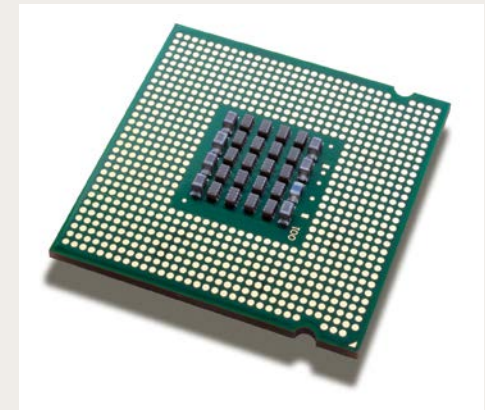
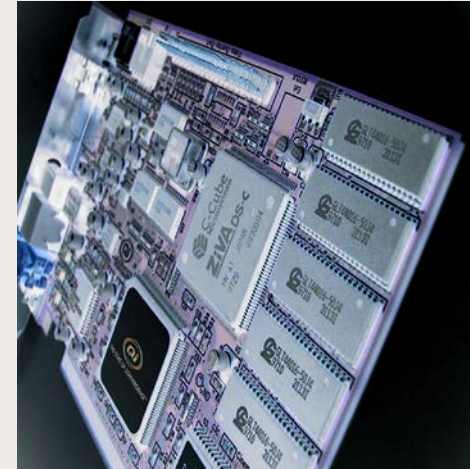
Why Hasn't Washington Done More?

■ Because Moore's Law Has Not Slowed Down

millions of transistors



Transistor Growth in Intel Computer Processor Chips



■ How much would 5 GBs of storage have cost using 1995 technology?

- 1) \$5.50
- 2) \$55
- 3) \$550
- 4) \$5,500



■ How much would 5 GBs of storage have cost using 1995 technology?

- 1) \$5.50
- 2) \$55
- 3) \$550
- 4) **\$5,500**



■ **5 GBs cost \$1.5 billion in 1960.**

■ ICT Doubling (or Halving) Times

- Total bits shipped 1.1 years
- Microprocessor Cost per Transistor Cycle 1.1 years
- Magnetic Data Storage 1.3 years
- Dynamic Random Access Memory (RAM) 1.5 years
- Average Transistor Price 1.6 years
- Processor Performance in MIPS 1.8 years
- Modem Speeds 1.9 years
- Transistors in Intel Microprocessors 2.0 years
- Microprocessor Clock Speed 2.7 years

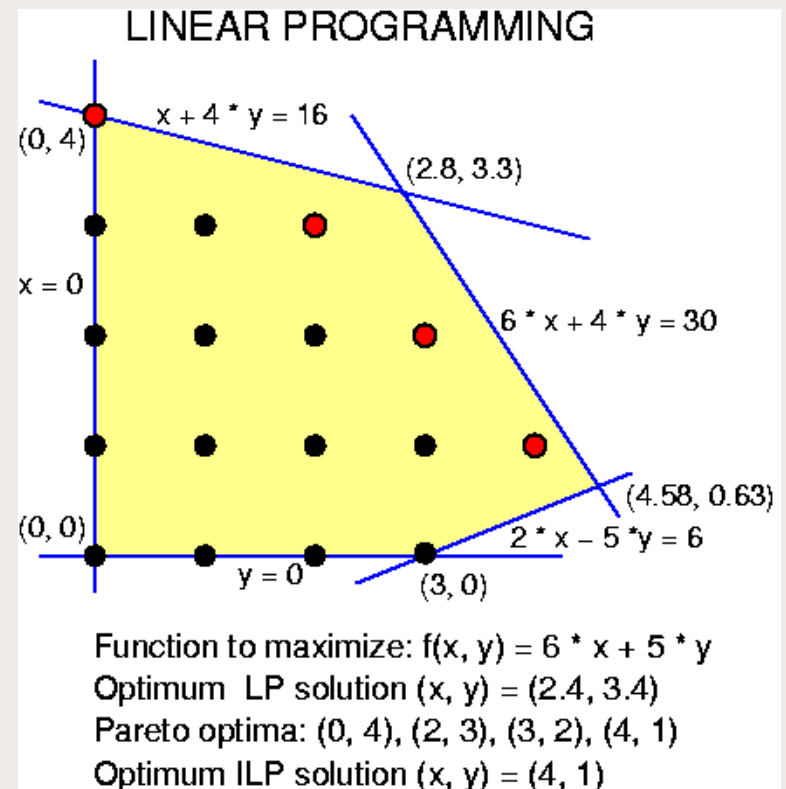
■ Rapid Growth in Bandwidth Capacity

- The capacity of the network backbone has increased by 18 million % in the past decade.
- By 2020, average network speeds are likely to be 3 million times greater than they were in 1990.



■ But Not All Due to Computing

- Solving a complex linear programming model:
 - 1988: 82 years
 - 2003: 1 minute
- An increase in efficiency of 43 million. Of this, a factor of roughly 1,000 was due to increased processor speed, whereas a factor of roughly 43,000 was due to improvements in algorithms.



- Source: Ed Lazowski, University of Washington, Computer Science Dept.

■ Today's Presentation

1

Where Are We in U.S. Manufacturing?

2

Why Innovation is Key to Manufacturing Renewal

3

Why is IT Driving Manufacturing Innovation?

4

Key Trends in IT Evolution and Intersection with Manufacturing

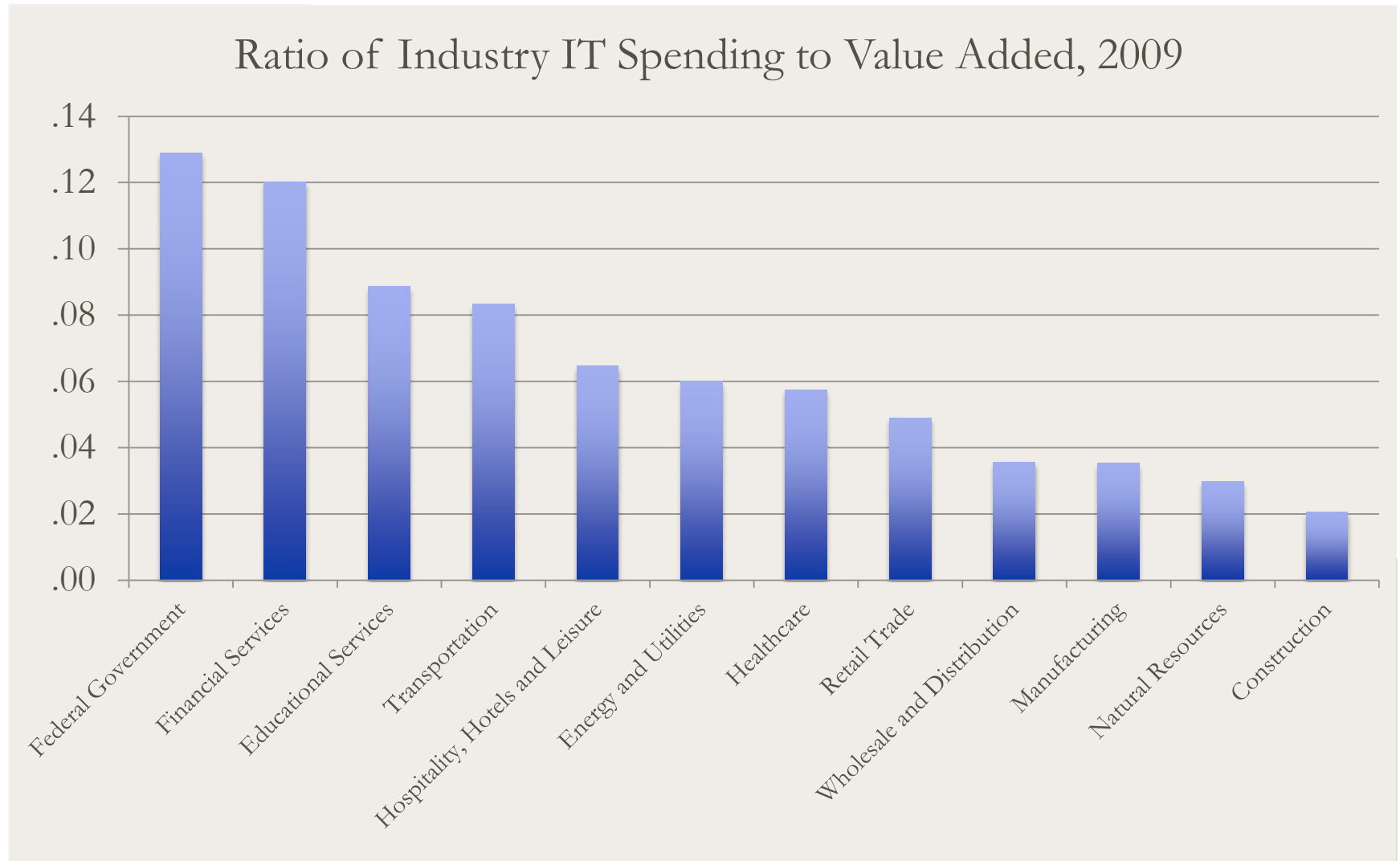
5

What Should Washington Do?

6

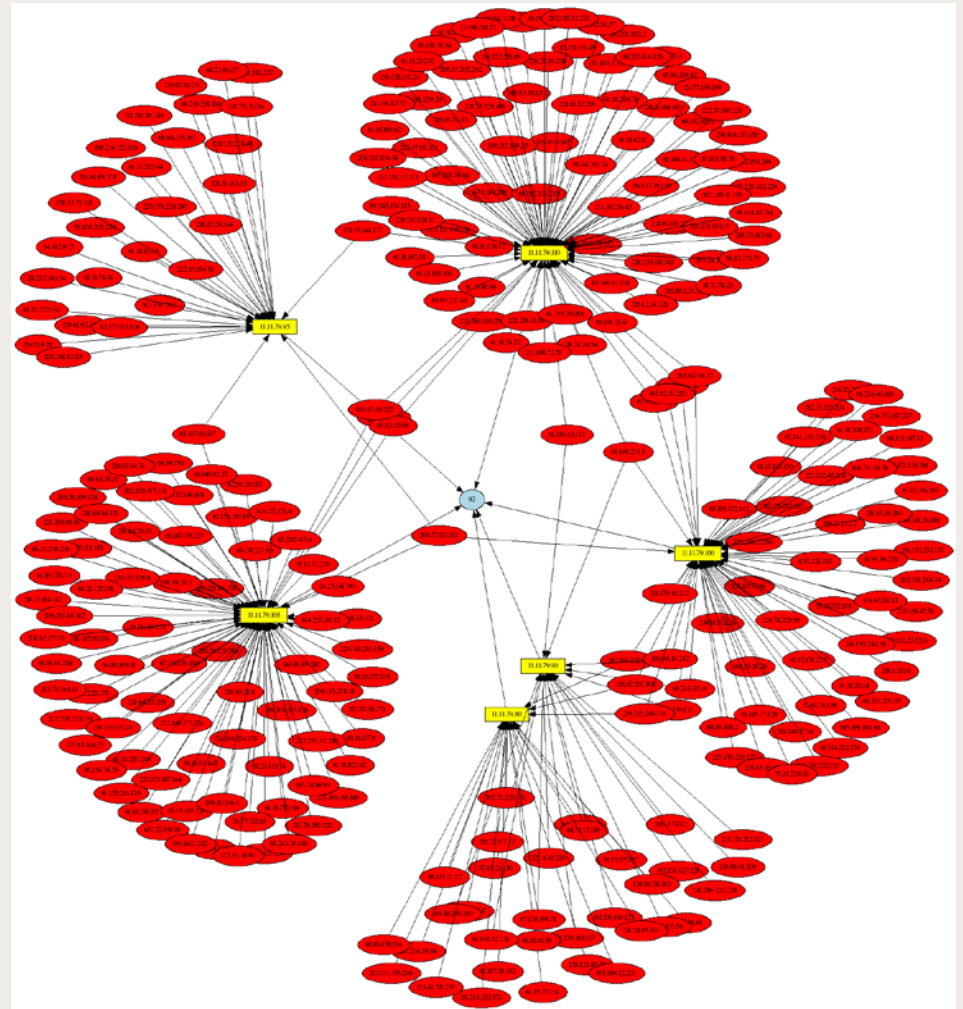
Why Hasn't Washington Done More?

■ U.S. Manufacturing Has Lagged Behind in Using IT



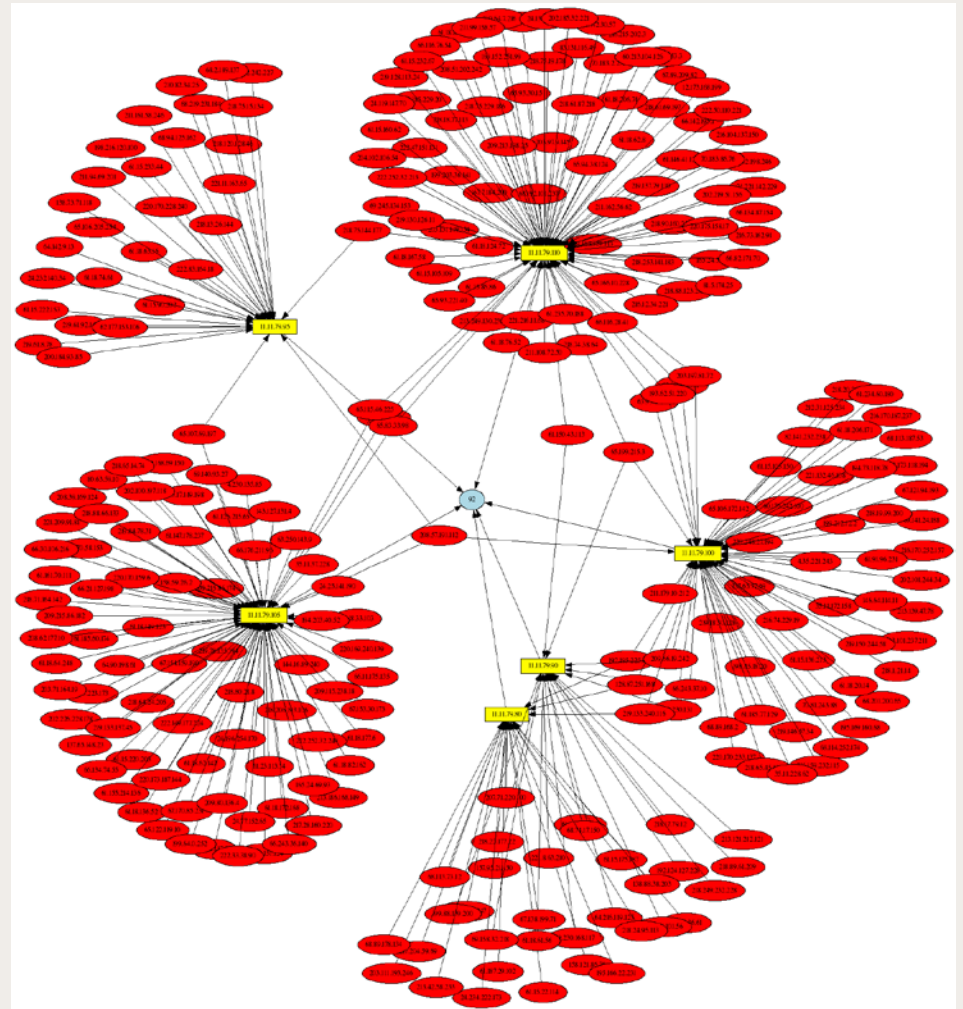
■ But Manufacturing is About Atoms *and* Bits

- A part is *information*.
- What its characteristics are is *information*.
- Where it is *information*.
- What its condition is *information*.



■ New IT Capabilities are Enabling Smart Manufacturing

- Smart sensing and instrumentation
- Faster, more reliable networks
- IT-enabled micro-controllers
- Design and visualization software
- High performance modeling and simulation programs
- Machine vision

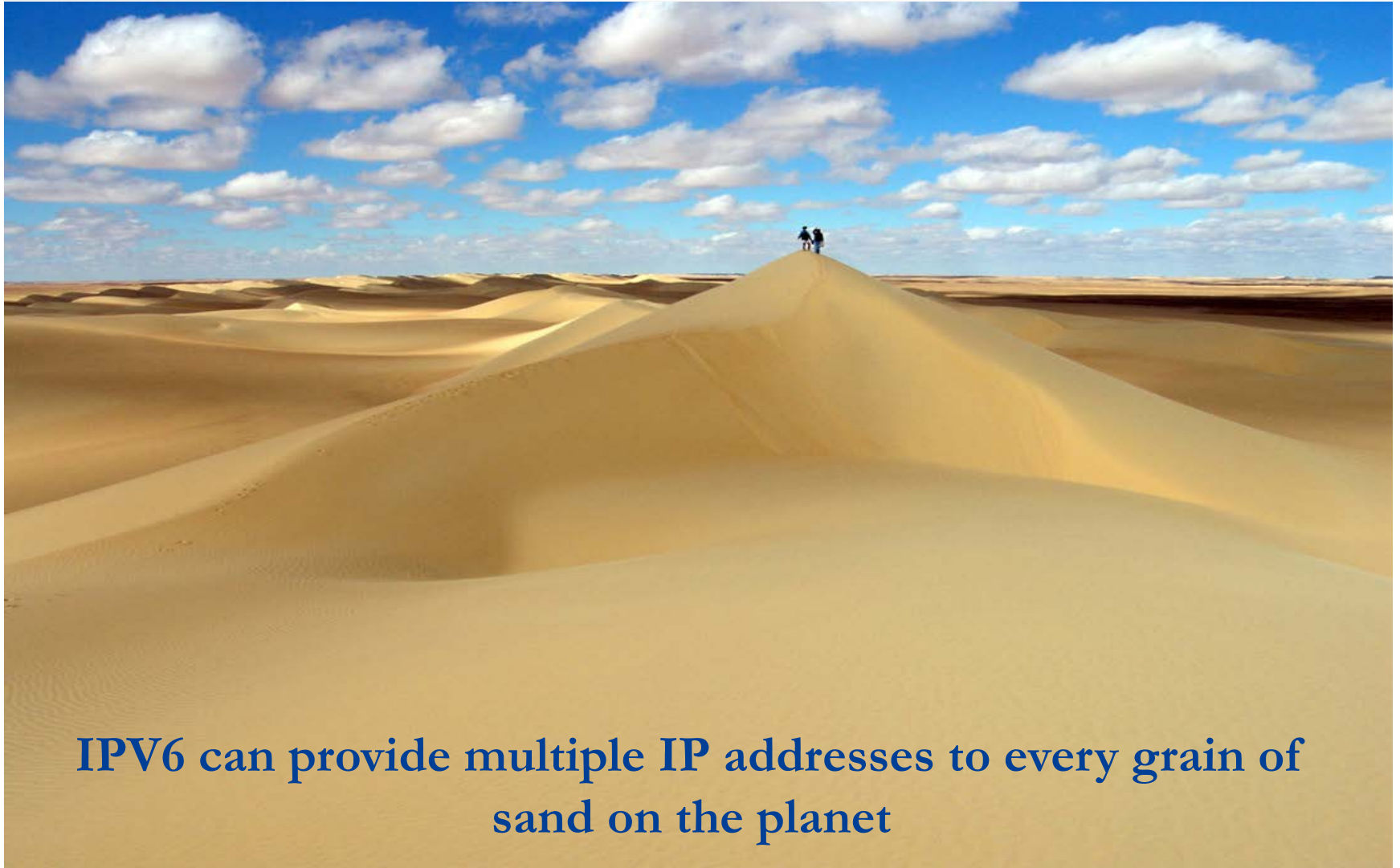


■ A Shift to the Cloud

- In 2011 44% of manufacturing companies were either implementing or evaluating cloud deployments; and 22% already have implemented. (Source: IDC)



■ Near Infinite Internet Addresses



IPV6 can provide multiple IP addresses to every grain of sand on the planet

■ Today's Presentation

1

Where Are We in U.S. Manufacturing?

2

Why Innovation is Key to Manufacturing Renewal

3

Why is IT Driving Manufacturing Innovation

4

Key Trends in IT Evolution and Intersection with Manufacturing

5

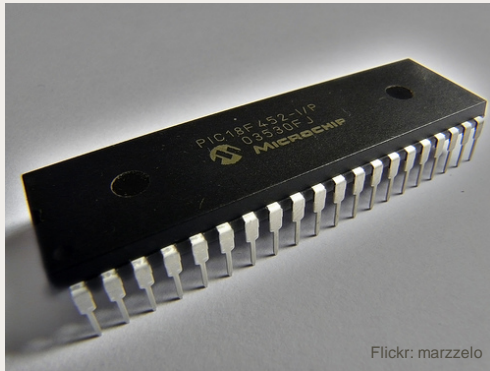
What Should Washington Do?

6

Why Hasn't Washington Done More?

- Get the 4 T's Right

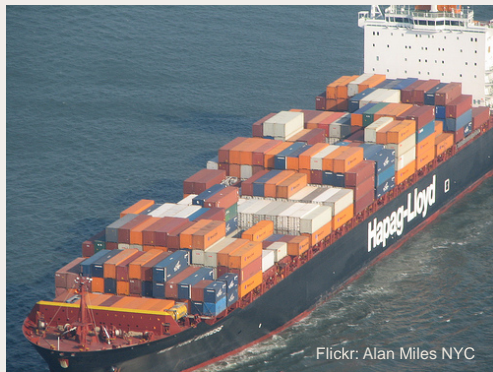
Tech



Talent



Trade



Tax



■ Today's Presentation

1

Where Are We in U.S. Manufacturing?

2

Why Innovation is Key to Manufacturing Renewal

3

Why is IT Driving Manufacturing Innovation

4

Key Trends in IT Evolution and Intersection with Manufacturing

5

What Should Washington Do?

6

Why Hasn't Washington Done More?

- Economists Don't "Get Manufacturing"

- "America's role is to feed a global economy that's increasingly based on knowledge and services rather than on making stuff." (Larry Summers)



- Economists Don't "Get Manufacturing"

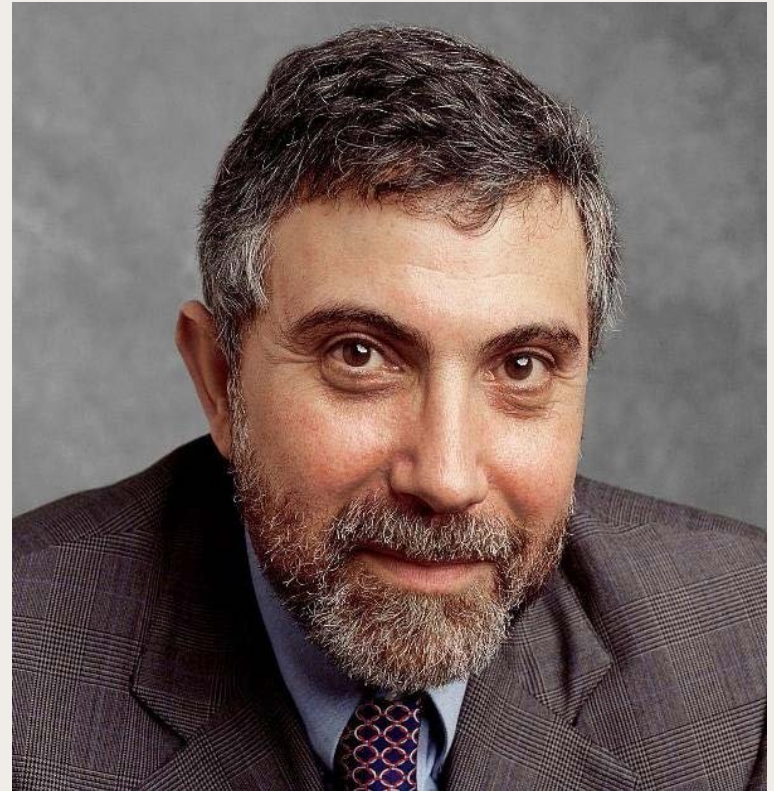
- "Any economist can tell you that this decline (in manufacturing) is not necessarily a cause for concern... We have become an ideas economy."

(Kevin Hassett, American Enterprise Institute)



■ Nor Competitiveness

■ “The notion that nations compete is incorrect... countries are not to any important degree in competition with each other.” (Paul Krugman)



■ Nor Competitiveness

■ “Potato chips, computer chips, what’s the difference.” (Bush I economic advisor, Michael Boskin)



Thank You

Robert Atkinson

ratkinson@itif.org

Follow ITIF:



Facebook: facebook.com/innovationpolicy



Blog: www.innovationpolicy.org



YouTube: www.youtube.com/user/techpolicy



Website: www.itif.org



Twitter: @robatkinsonitif

