

March 9, 2014

*Innovation Economics and*  
**The State of Innovation in the States**

*Entrepreneurship and Innovation in Silicon Valley: Best Practices and Emerging Trends Conference*

*Stephen Ezell, Senior Analyst*

*Information Technology and Innovation Foundation*

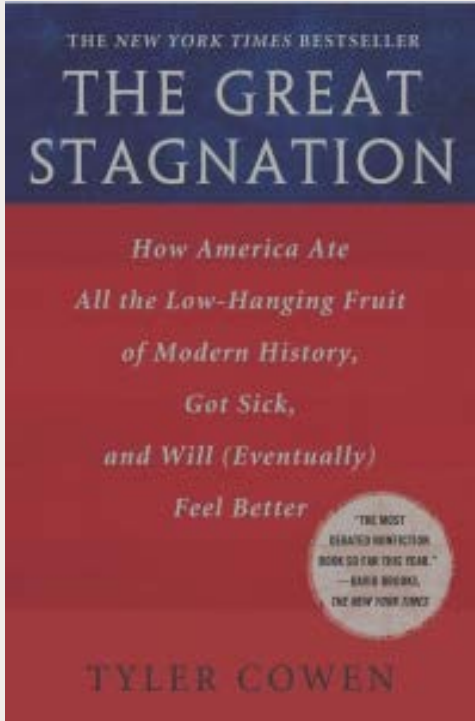
**ITIF is an economic and technology policy think tank committed to articulating and advancing an unabashedly pro-productivity and pro-innovation policy agenda internationally, in Washington, and in the states.**

**ITIF focuses on:**

- Innovation and competitiveness
- Science/technology policy
- Digital transformation (E-commerce, e-government, e-health, etc.)
- ICT and economic productivity
- Broadband/Internet tech policies
- Energy innovation/Climate change policy



# ■ The Great Stagnation?



the NATIONAL BUREAU of ECONOMIC RESEARCH

## The Demise of U.S. Economic Growth: Restatement, Rebuttal, and Reflections

Robert J. Gordon

NBER Working Paper No. 19895  
 Issued in February 2014  
 NBER Program(s): DAE EFG PR

The United States achieved a 2.0 percent average annual growth rate of real GDP per capita between 1891 and 2007. This paper predicts that growth in the 25 to 40 years after 2007 will be much slower, particularly for the great majority of the population. Future growth will be 1.3 percent per annum for labor productivity in the total economy, 0.9 percent for output per capita, 0.4 percent for real income per capita of the bottom 99 percent of the income distribution, and 0.2 percent for the real disposable income of that group.

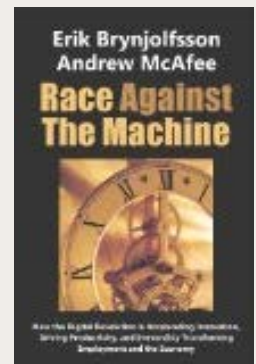
The primary cause of this growth slowdown is a set of four headwinds, all of them widely recognized and uncontroversial. Demographic shifts will reduce hours worked per capita, due not just to the retirement of the baby boom generation but also as a result of an exit from the labor force both of youth and prime-age adults. Educational attainment, a central driver of growth over the past century, stagnates at a plateau as the U.S. sinks lower in the world league tables of high school and college completion rates. Inequality continues to increase, resulting in real income growth for the bottom 99 percent of the income distribution that is fully half a point per year below the average growth of all incomes. A projected long-term increase in the ratio of debt to GDP at all levels of government will inevitably lead to more rapid growth in tax revenues and/or slower growth in transfer payments at some point within the next several decades.

There is no need to forecast any slowdown in the pace of future innovation for this gloomy forecast to come true, because that slowdown already occurred four decades ago. In the eight decades before 1972 labor productivity grew at an average rate 0.8 percent per year faster than in the four decades since 1972. While no forecast of a future slowdown of innovation is needed, skepticism is offered here, particularly about the techno-optimists who currently believe that we are at a point of inflection leading to faster technological change. The paper offers several historical examples showing that the future of technology can be forecast 50 or even 100 years in advance and assesses widely discussed innovations anticipated to occur over the next few decades, including medical research, small robots, 3-D printing, big data, driverless vehicles, and oil-gas fracking.



## ■ Is the Great Age of Innovation Over?

1. We're experiencing “long-term technological stasis;” “low-hanging” innovation fruit is gone.
2. There were only a few truly fundamental innovations, and we've mostly made them.
3. We really haven't innovated anything all-that-impressive since the 1970s/1980s.
4. Technology is not creating, but destroying, jobs.



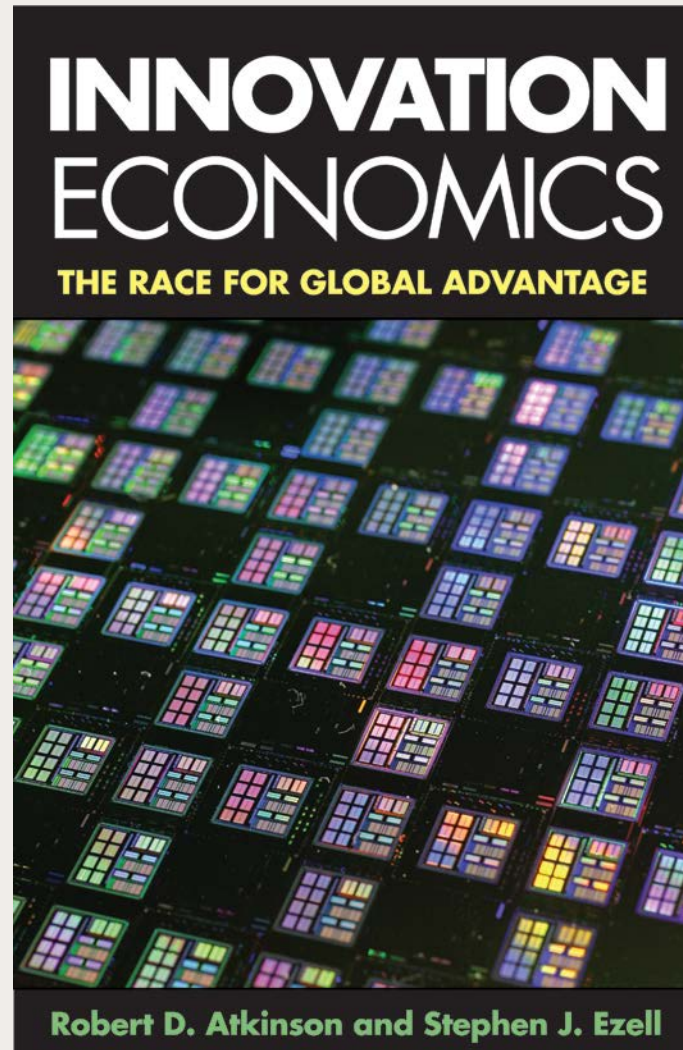


Charles H. Duell

*“Everything that can be  
invented already has been.”*

- Commissioner U.S. Patent & Trademark Office, 1900

## ■ Innovation Economics



**Rob Atkinson**



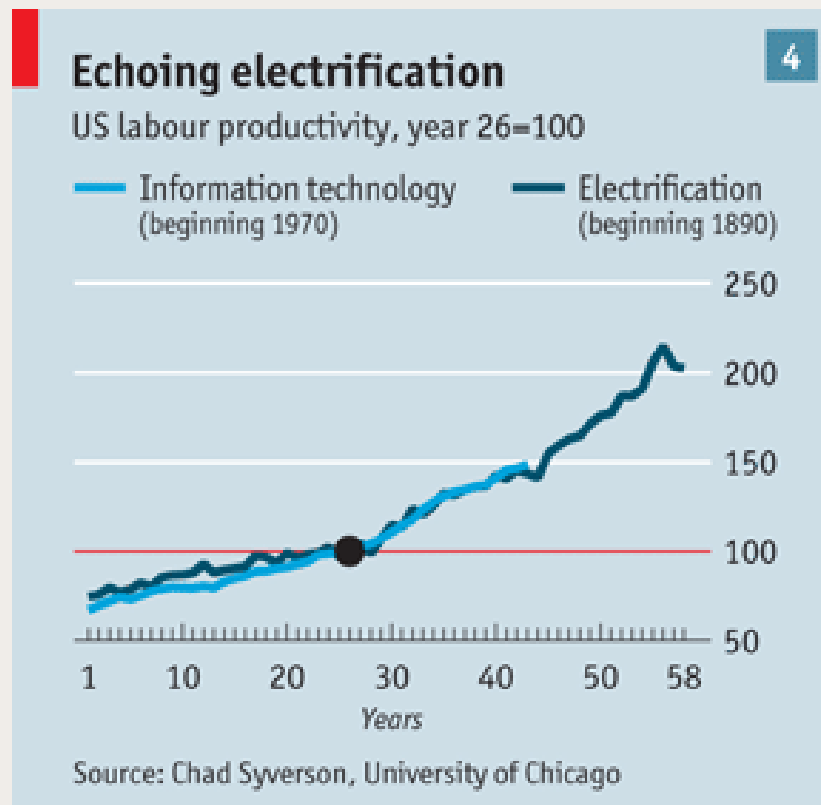
**Stephen Ezell**

**Yale University Press  
September 2012**



## ■ Benefits of ICT Innovation Far From Over

- The lag between investments in ICT and improvements in productivity is between 5-15 years.





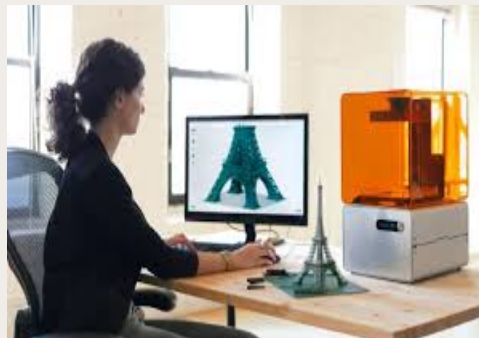


## ■ Innovation Is Far From Over

- On the cusp of breakthroughs in many sectors:

We only mapped the human genome a decade ago; biologics/drugs take 12-14 years to develop.

- 92% of all scientists and engineers in world history live today.



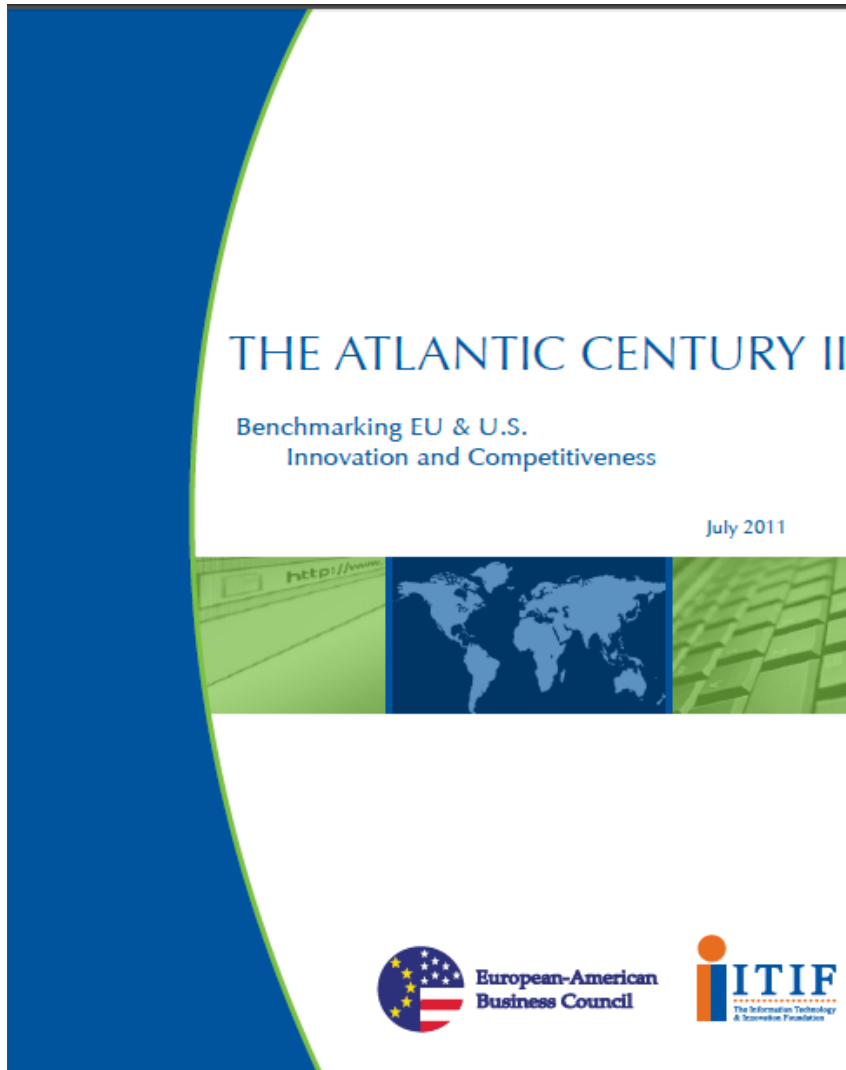
## ■ Innovation Is Far From Over



Joseph Schumpeter

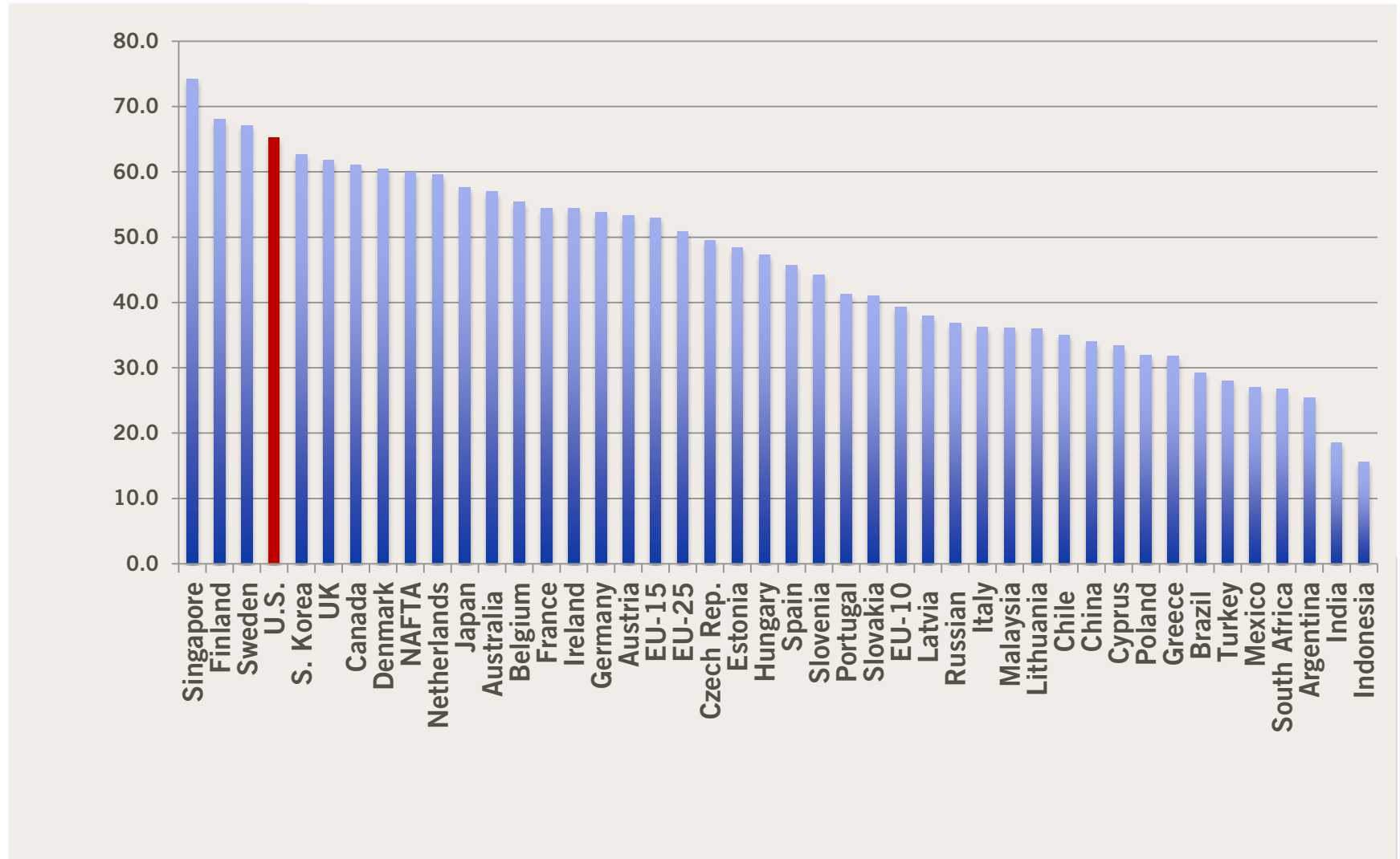
*“There is no reason to expect the slackening of output through the exhaustion of technological possibilities.”*

## ■ The Atlantic Century II



- **The Study:** Compares innovation-based competitiveness of 44 nations and regions.
- **16 indicators:** Including corporate and government R&D, scientists and engineers, new firms, corp. tax, productivity growth and others.

## Overall Score for Global Competitiveness and Innovation





## ■ A Tale of Two Americas:

### **1. A Very Robust Silicon Valley/High-Tech Sector**

- Strong in ICTs; Apps; Aerospace; Biotechnology
- Still the Best Business Environment for Innovation

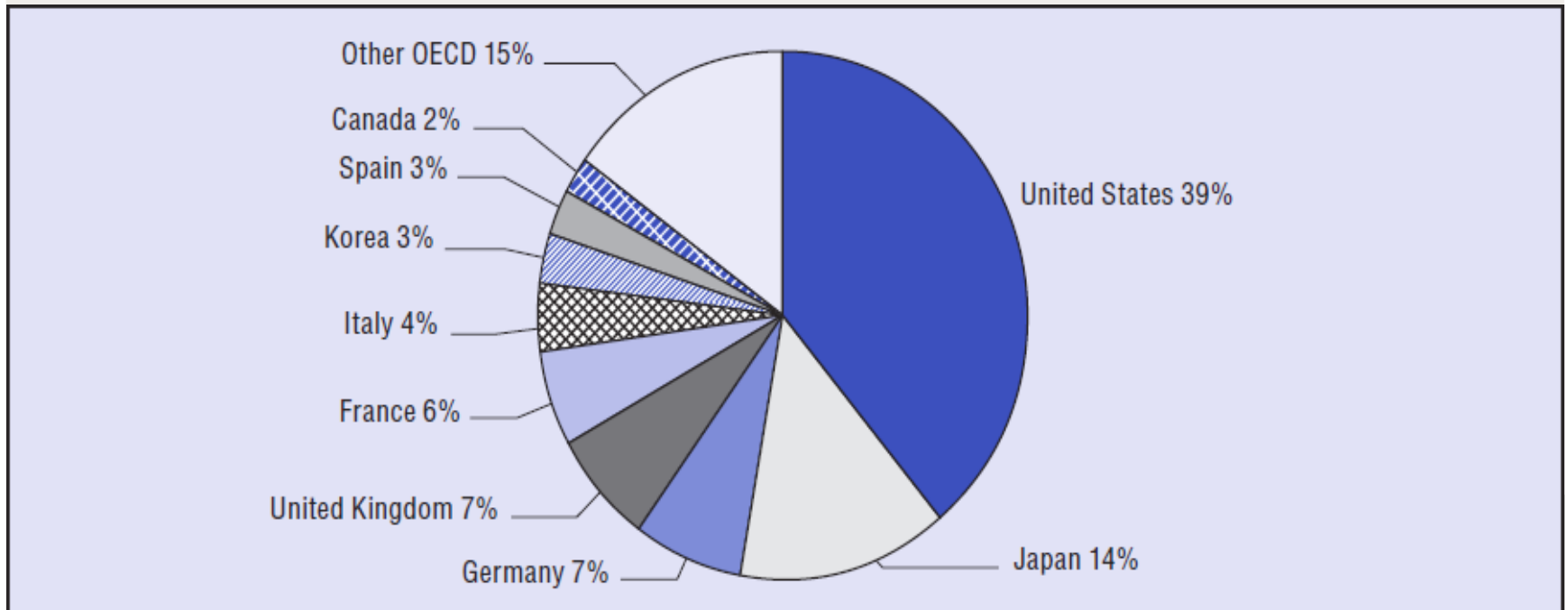
### **2. A Faltering Innovation Policy Environment**

- Faltering Innovation Infrastructure
- Lacking Political Consensus to Support Innovation

■ U.S. Hotbed for ICT Innovation



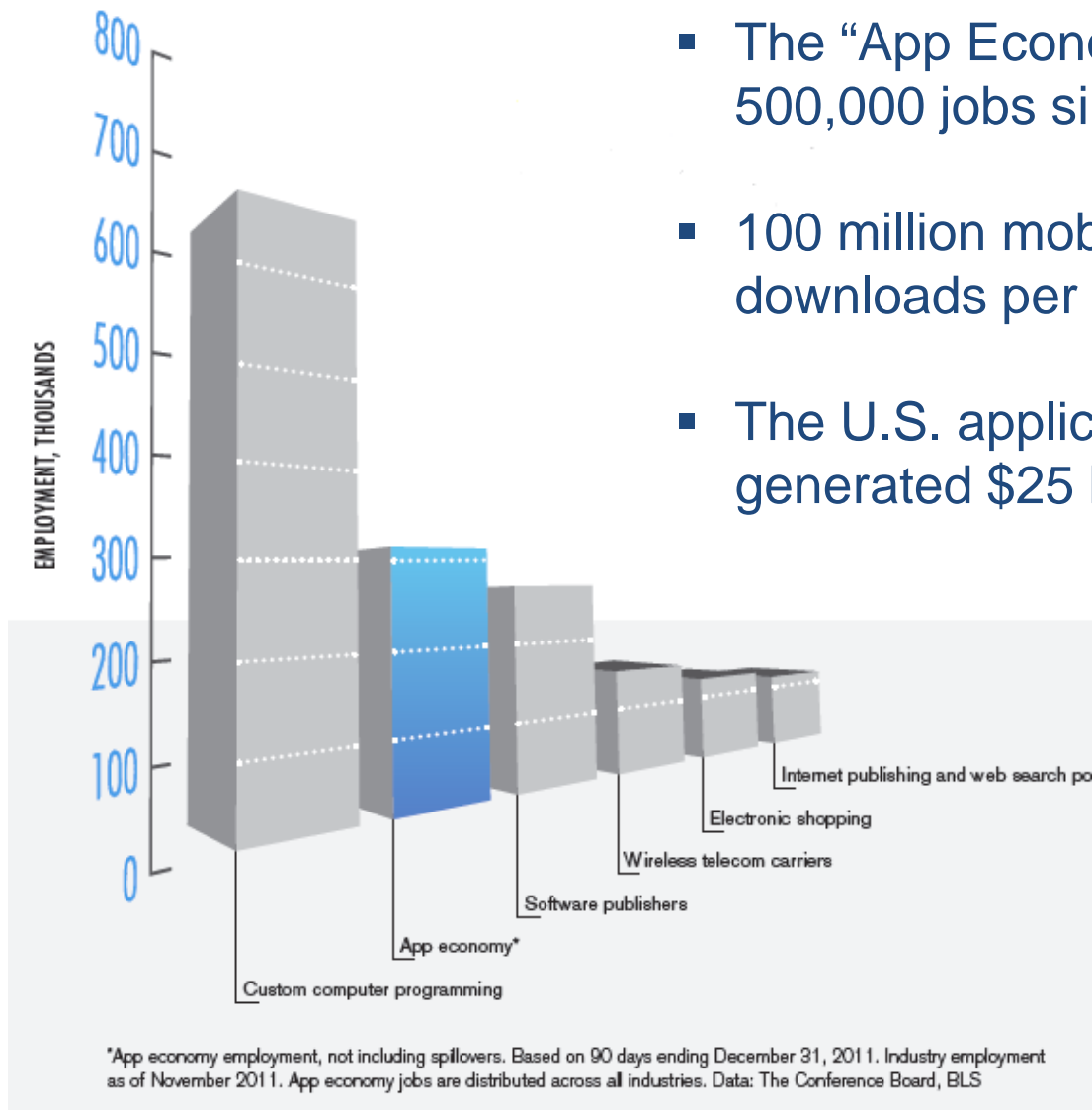
## ■ Share of OECD ICT Sector Value-Added by Country



Source: OECD Information Technology Outlook, 2011

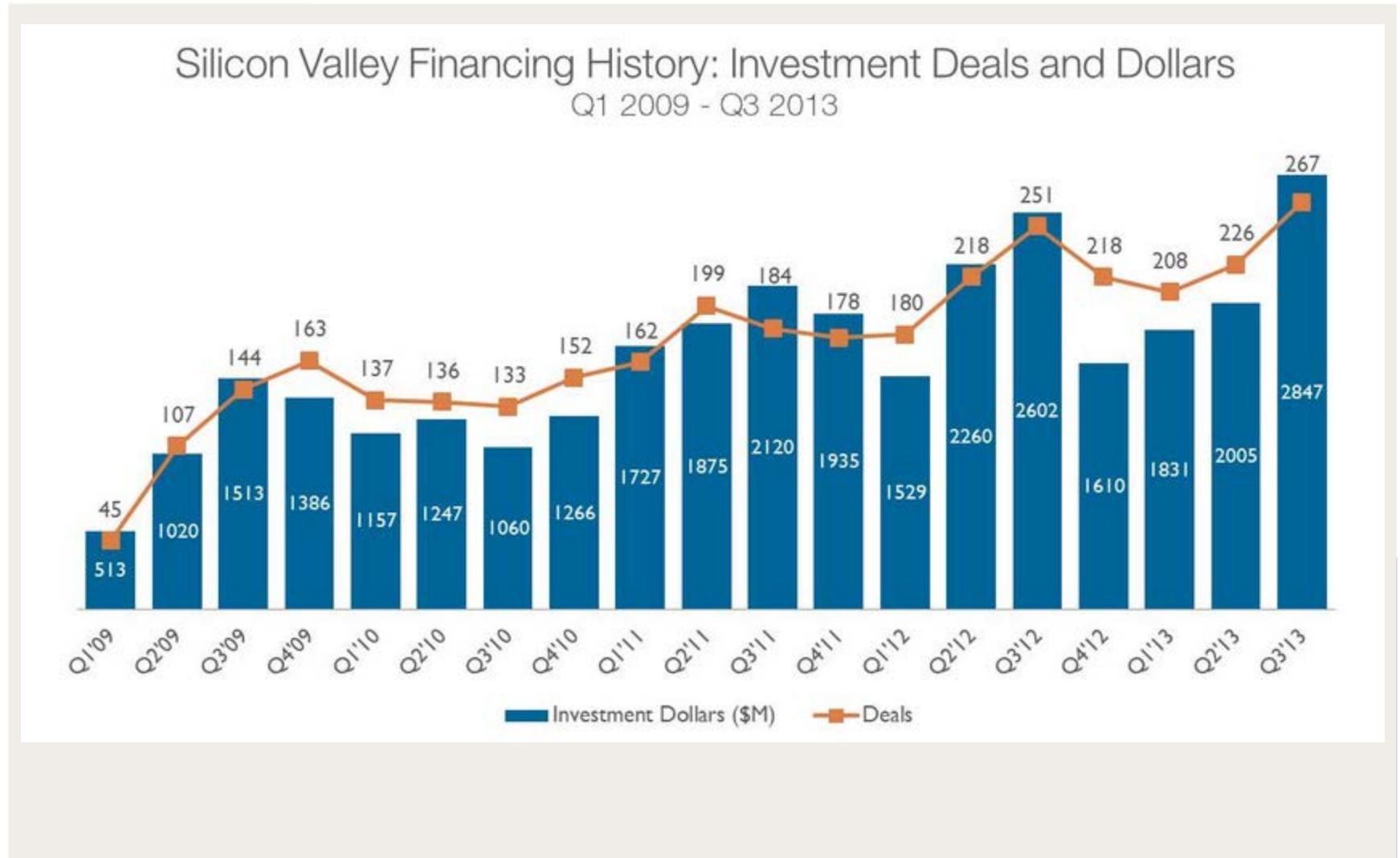
## ■ The “App Economy” Now Driving Innovation

- The “App Economy” has created over 500,000 jobs since 2007.
- 100 million mobile applications downloads per day globally; 36B/year.
- The U.S. applications development generated \$25 billion in revenue in 2013.

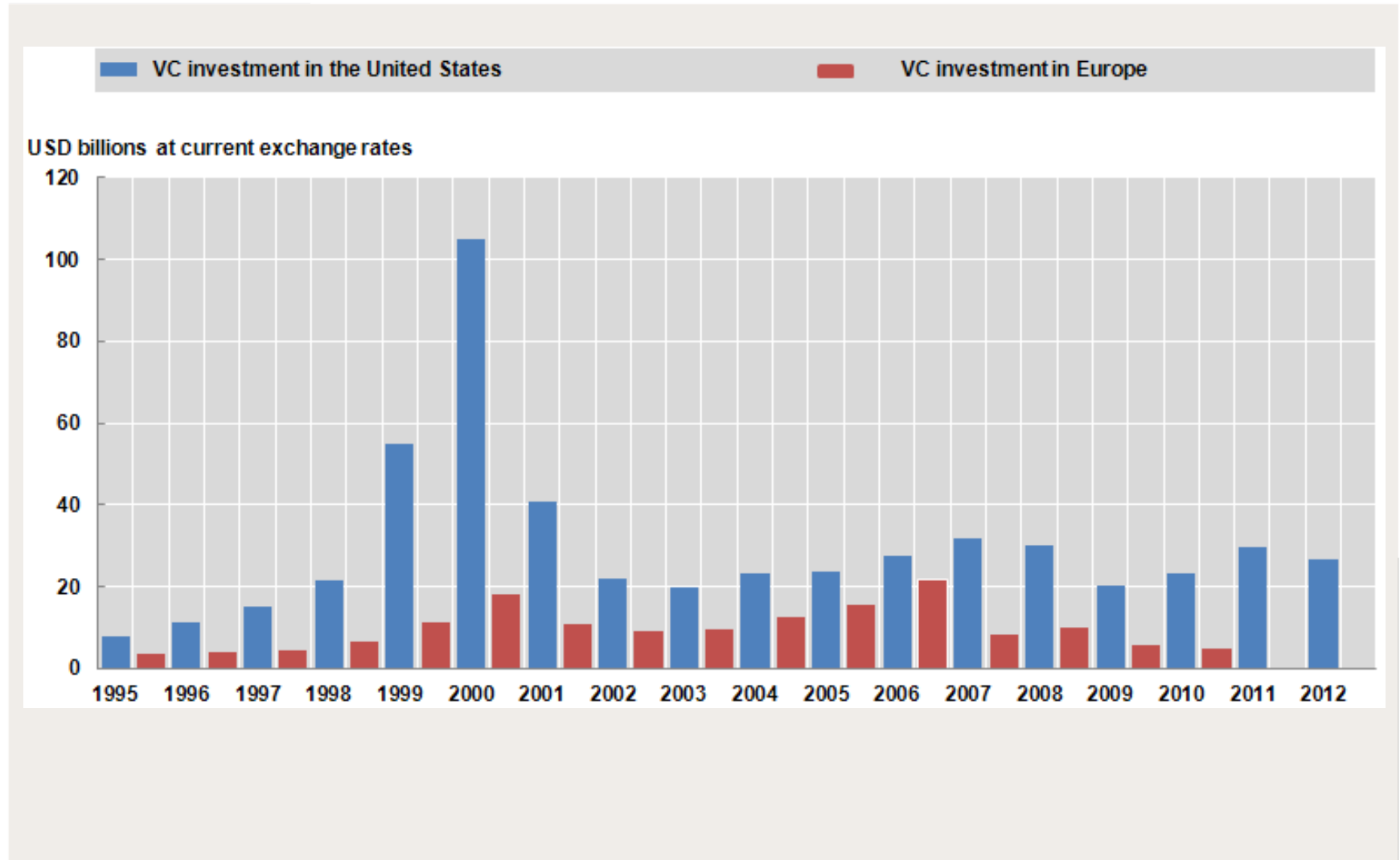




## ■ Silicon Valley Bouncing Back After Great Recession



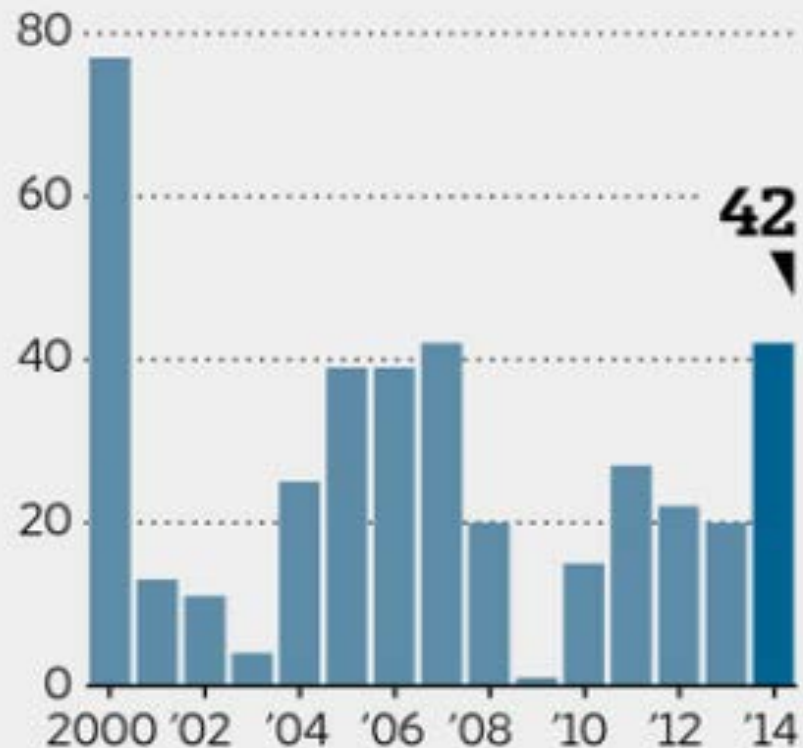
## ■ U.S. Remains Global Leader in Venture Capital Investment



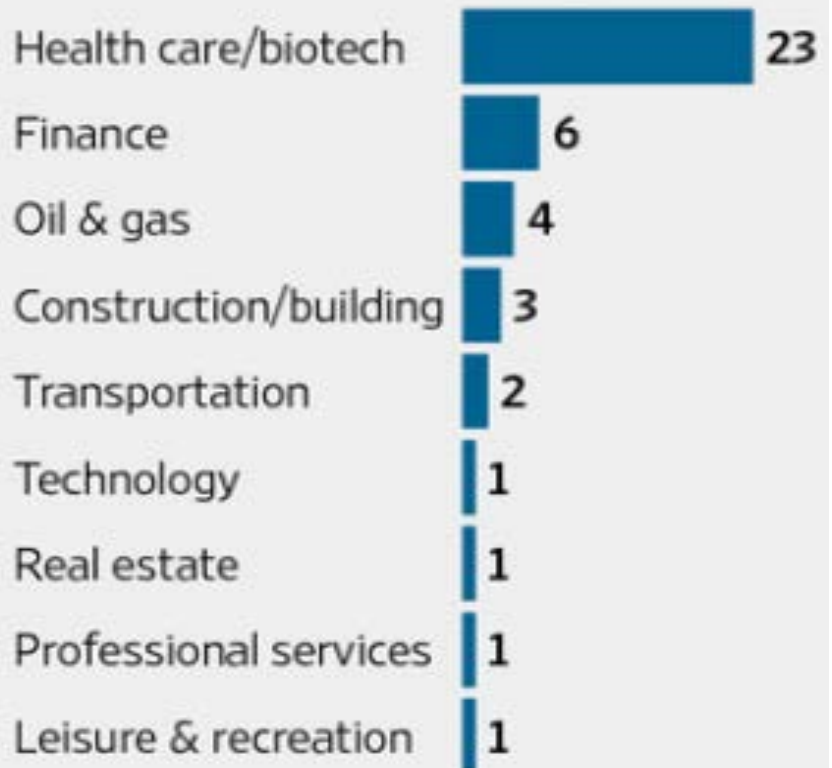
## ■ IPO Market Starting to Bounce Back

### Off to Market

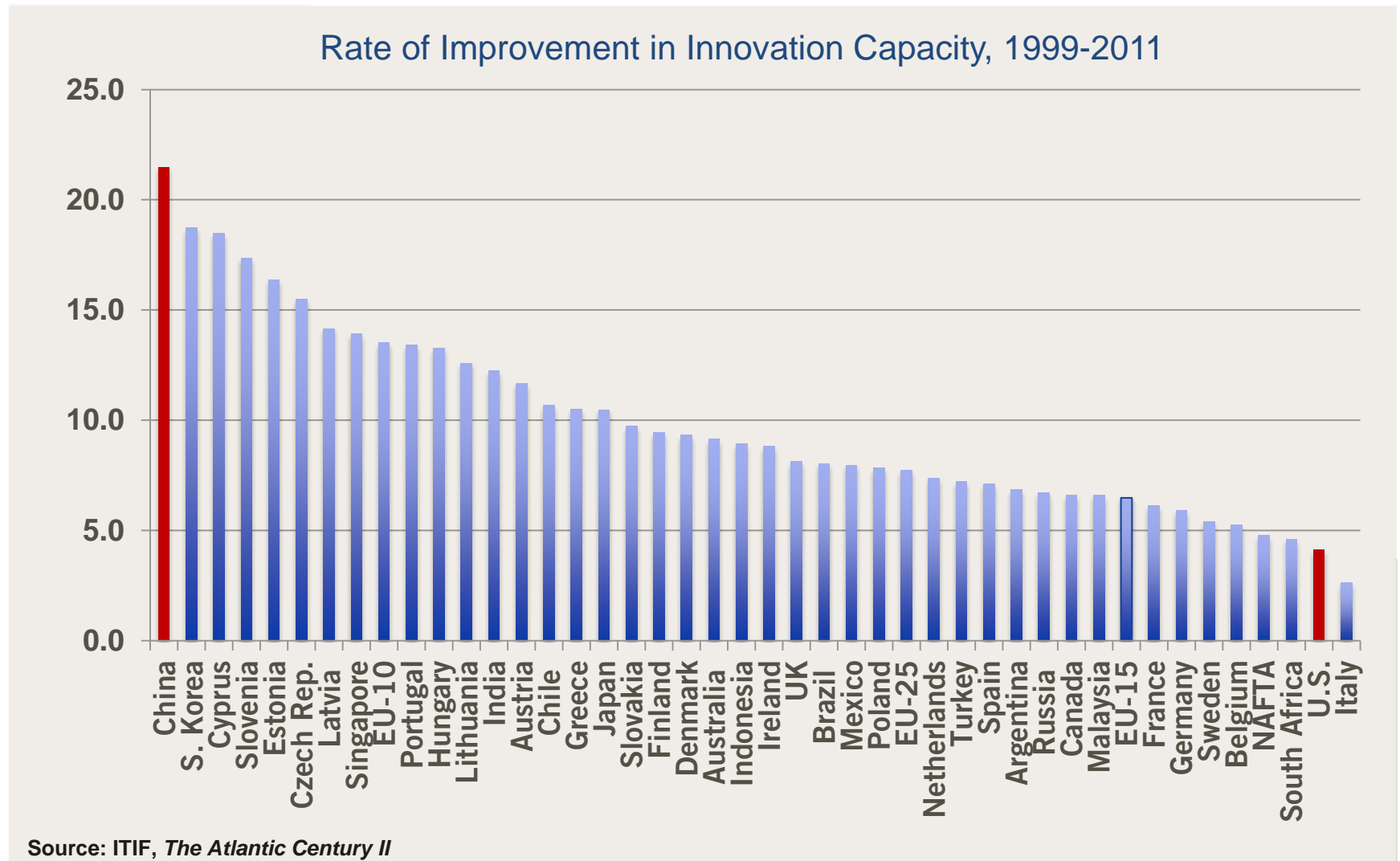
Number of IPOs through February of each year



Sector breakdown of IPOs through February of this year



# ■ But All is Not Well With the U.S. Innovation Economy





## ■ But All is Not Well With the U.S. Innovation Economy

Innovation Environment {

- Lagging R&D Investment
- VC Investment Still Down Over Past Decade
- Bad Policy Killing Innovative U.S. Industries

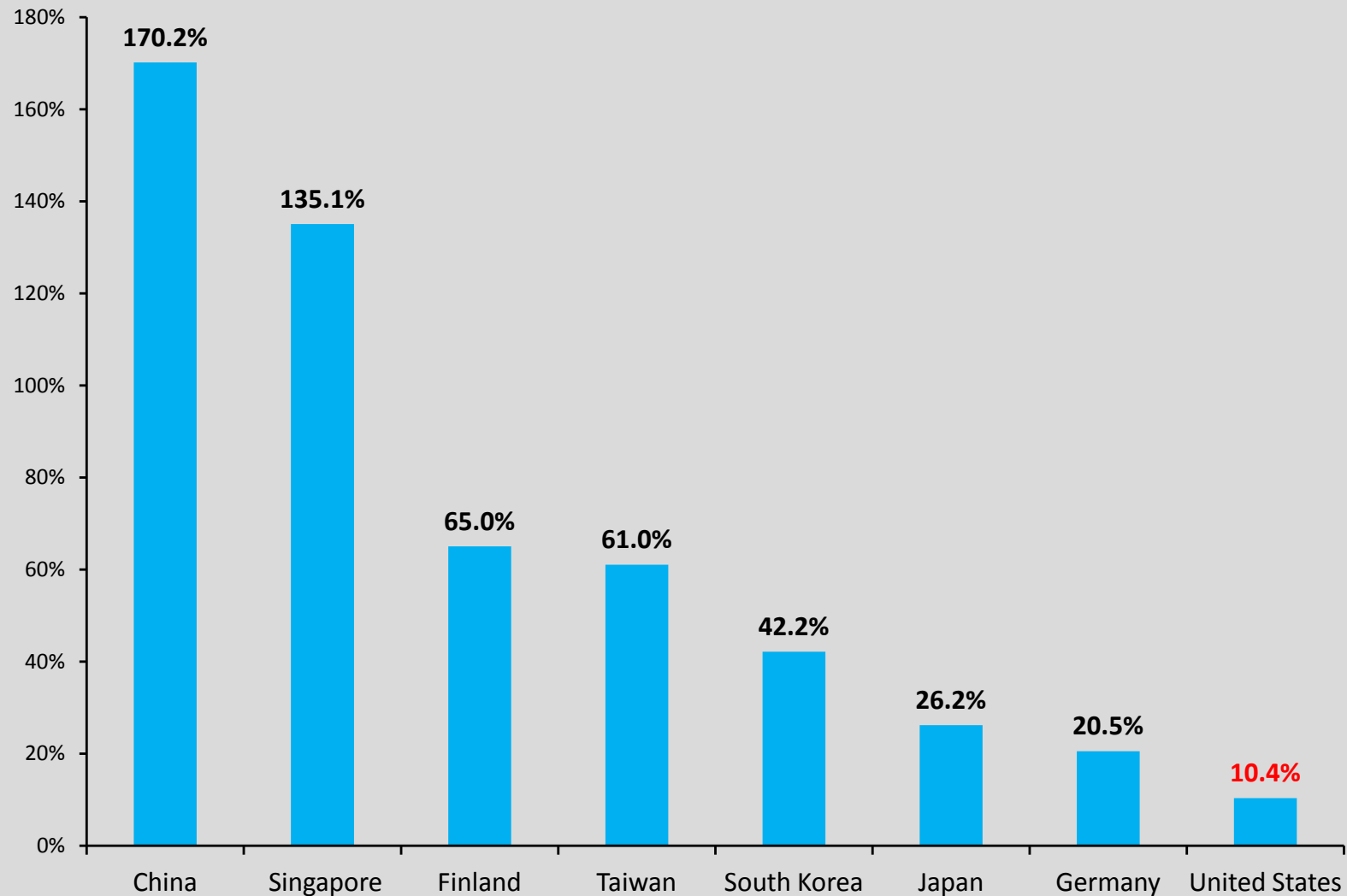
Economic Environment {

- Trade Deficit Enormous
- Manufacturing Decimated

Framework Environment {

- Poor Tax Environment
- Education and Infrastructure Faltering
- Self-destructive Immigration Policies

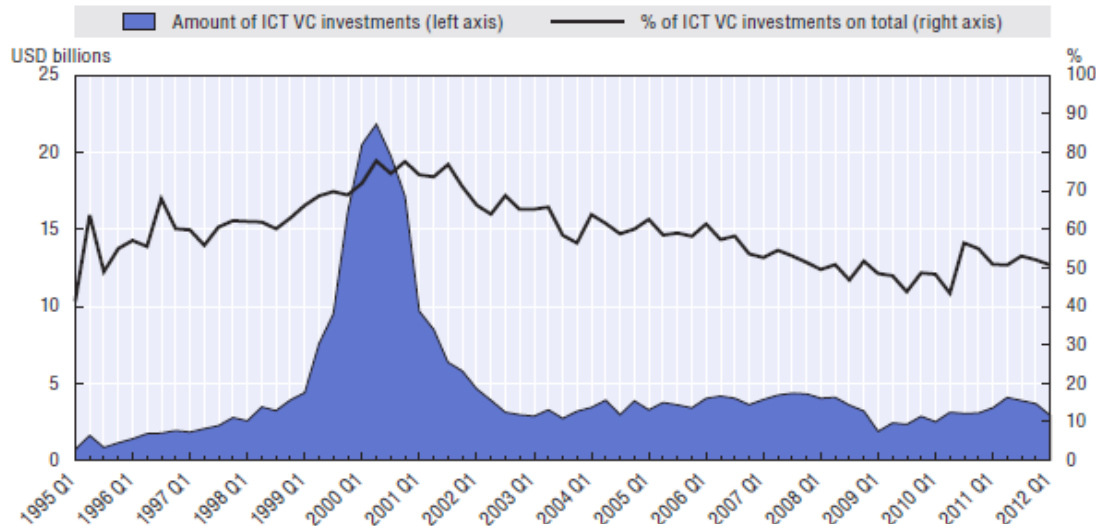
## ■ Change in National R&D Intensity, 1995-2008



Source: Gregory Tasse, "Beyond the Business Cycle: The Need for a Technology-Based Growth Strategy," forthcoming. Data from OECD, *Main Science and Technology Indicators*, 2010/1.

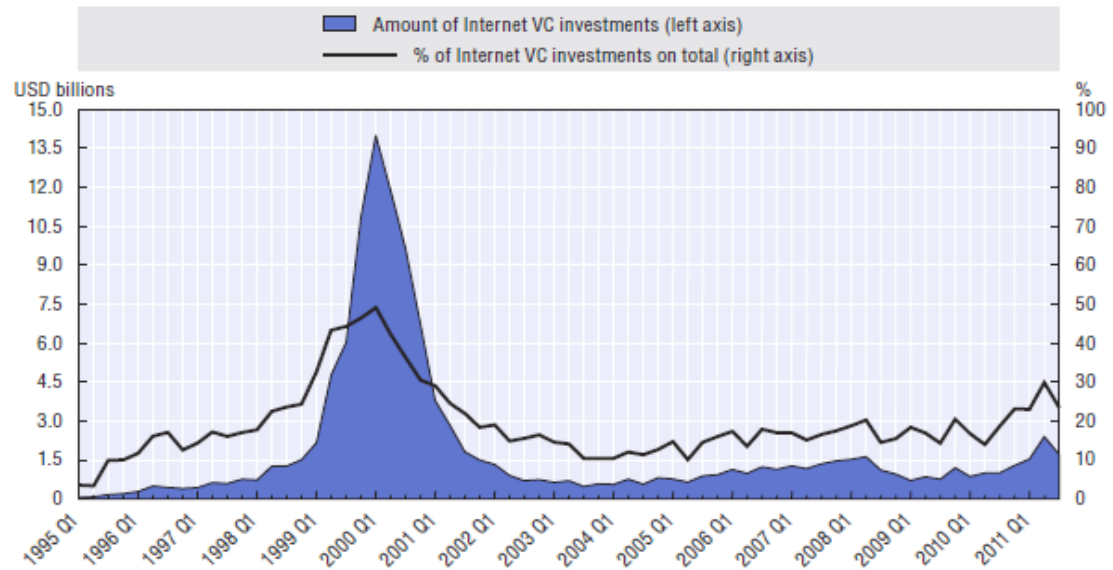
# 80% Declines in VC Investments, 1999-2011

Quarterly venture capital investments in the ICT sector in the United States, Q1 1995-Q1 2012

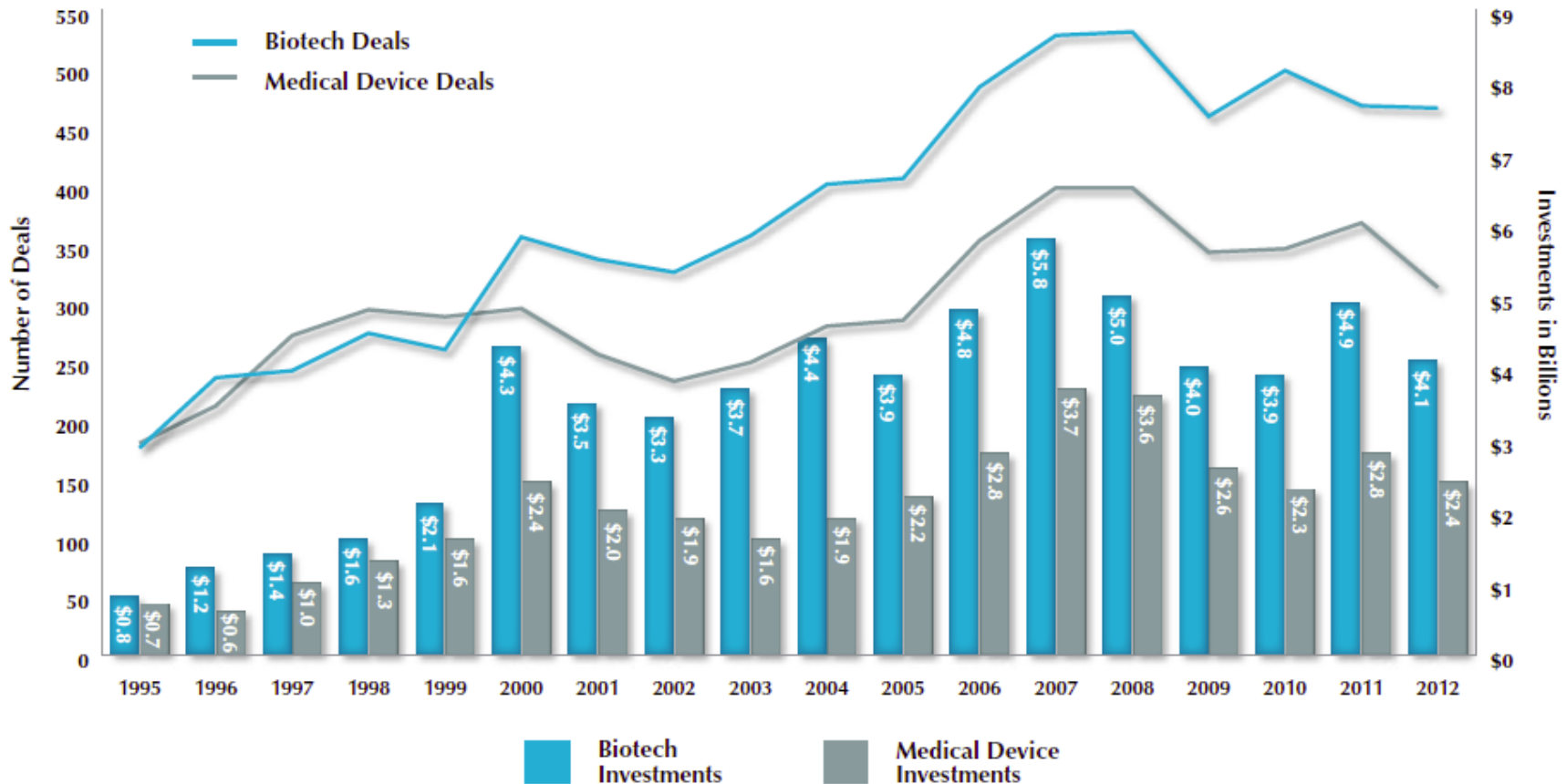


From 2000-2011, U.S. VC investment fell by 78%.

Quarterly venture capital investments in the Internet sector in the United States, Q1 1995-Q1 2012



# VC Investment in Medical Devices Devastated



Source: *Patient Capital 3.0*, National Venture Capital Association

## ■ Compromising Our Cloud Computing Companies

- NSA spying program may result in U.S. cloud providers losing up to 20% of foreign markets to overseas competitors.
- \$35-\$45 billion in U.S. cloud computing industry losses over just the next three years.



## ■ But All is Not Well With the U.S. Innovation Economy

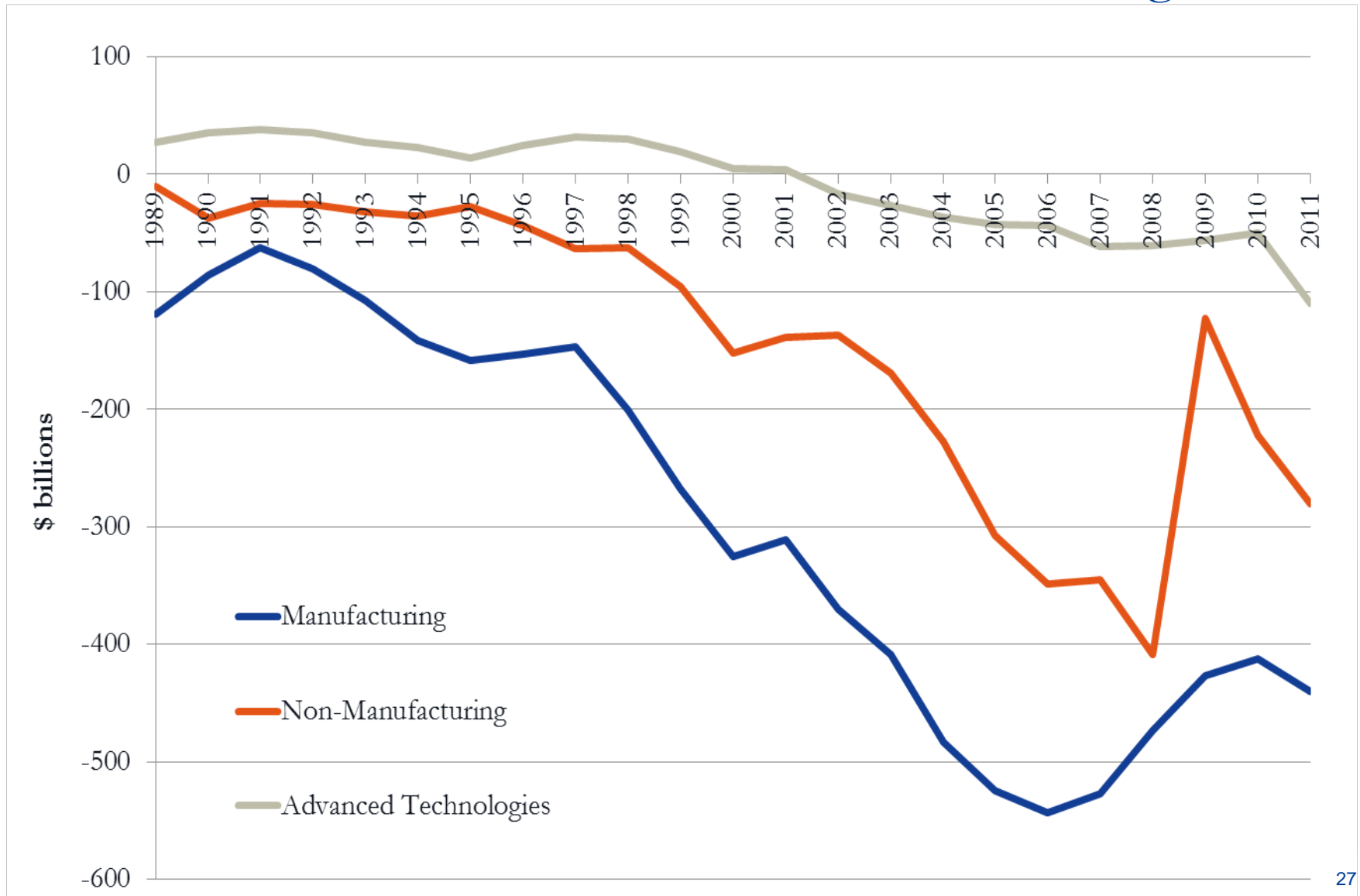
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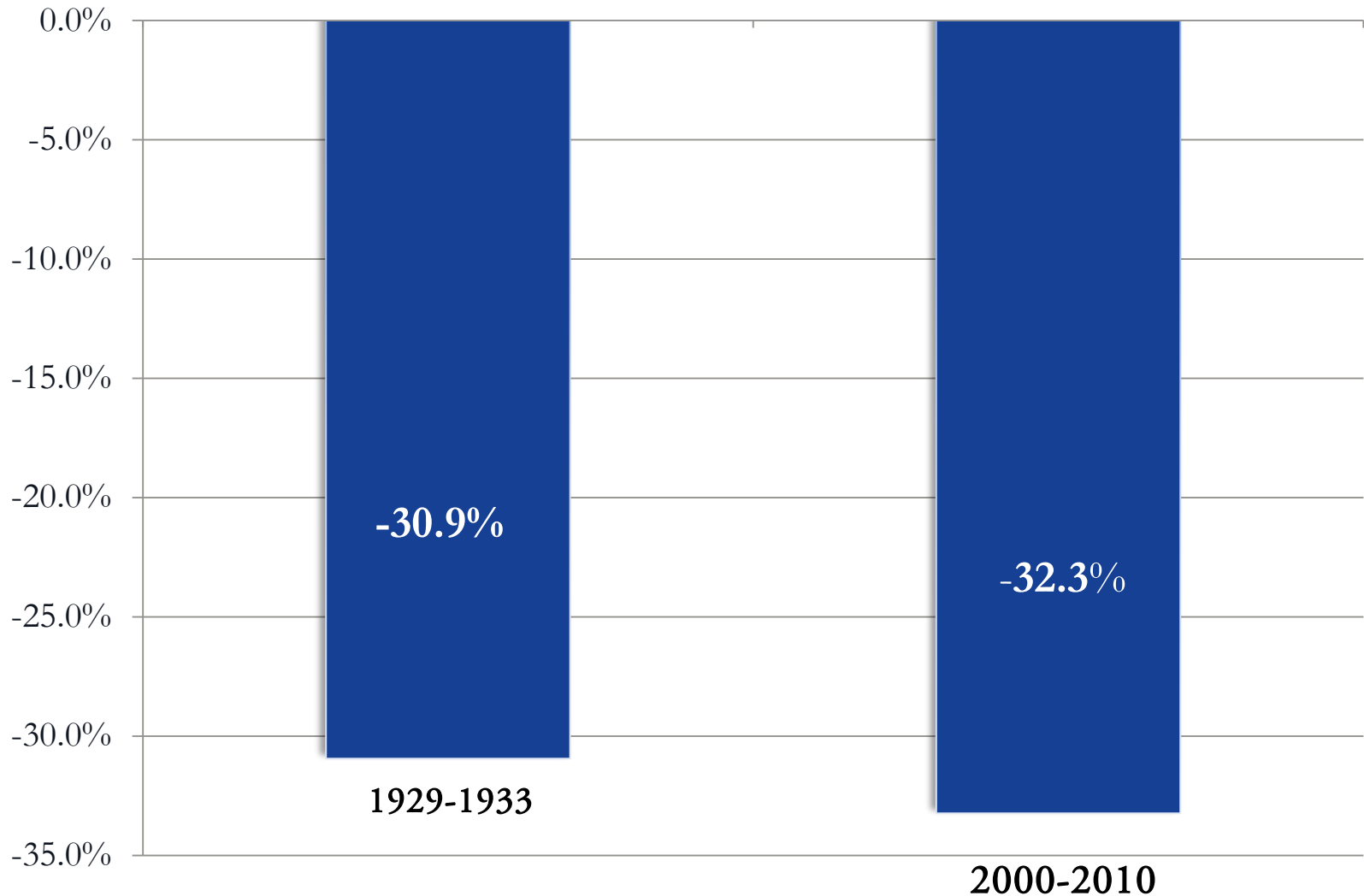
- Framework Environment
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# ■ U.S. Trade Deficits Have Reached Astounding Levels



## ■ Worse Manufacturing Job Loss than the Great Depression



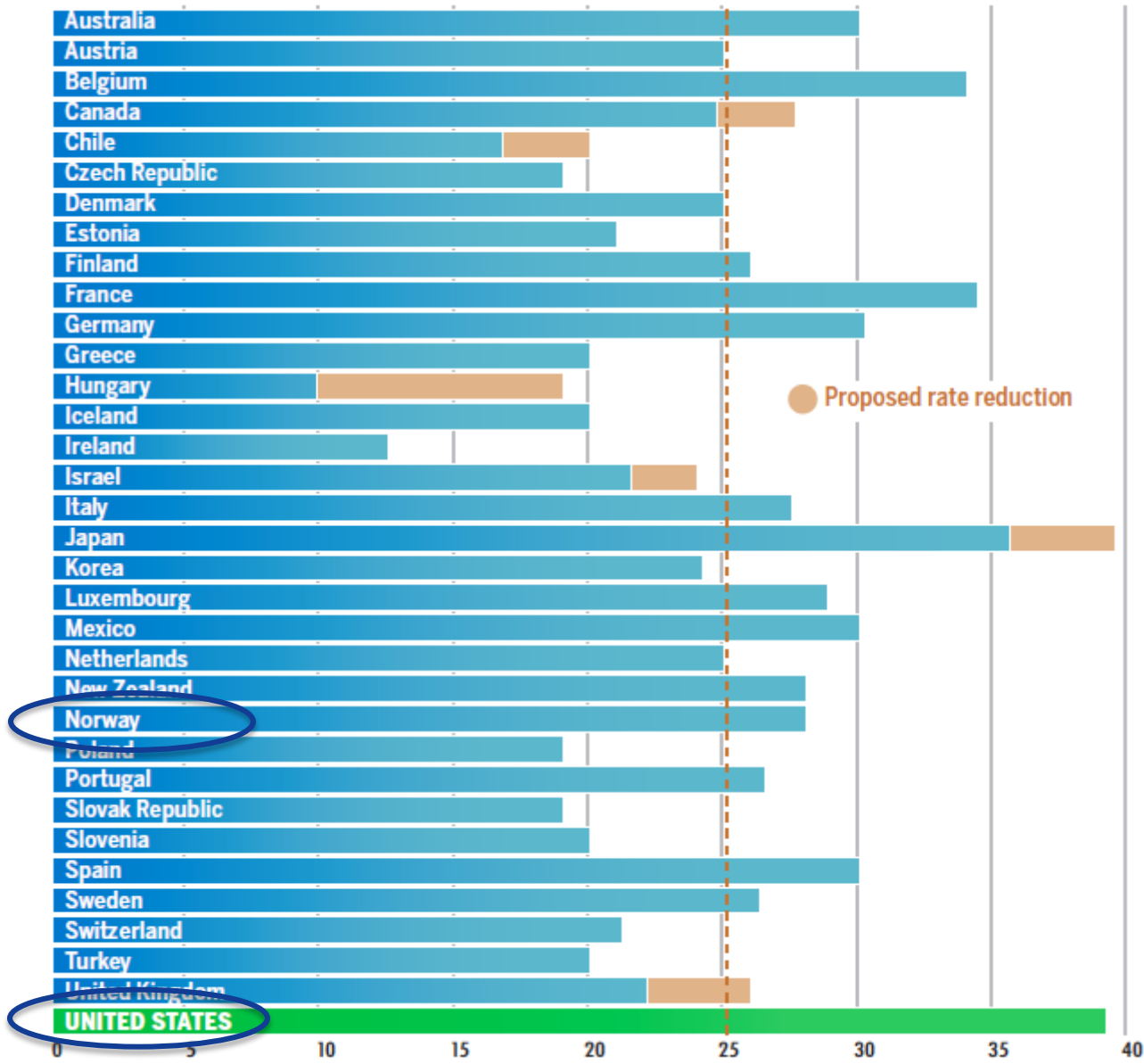
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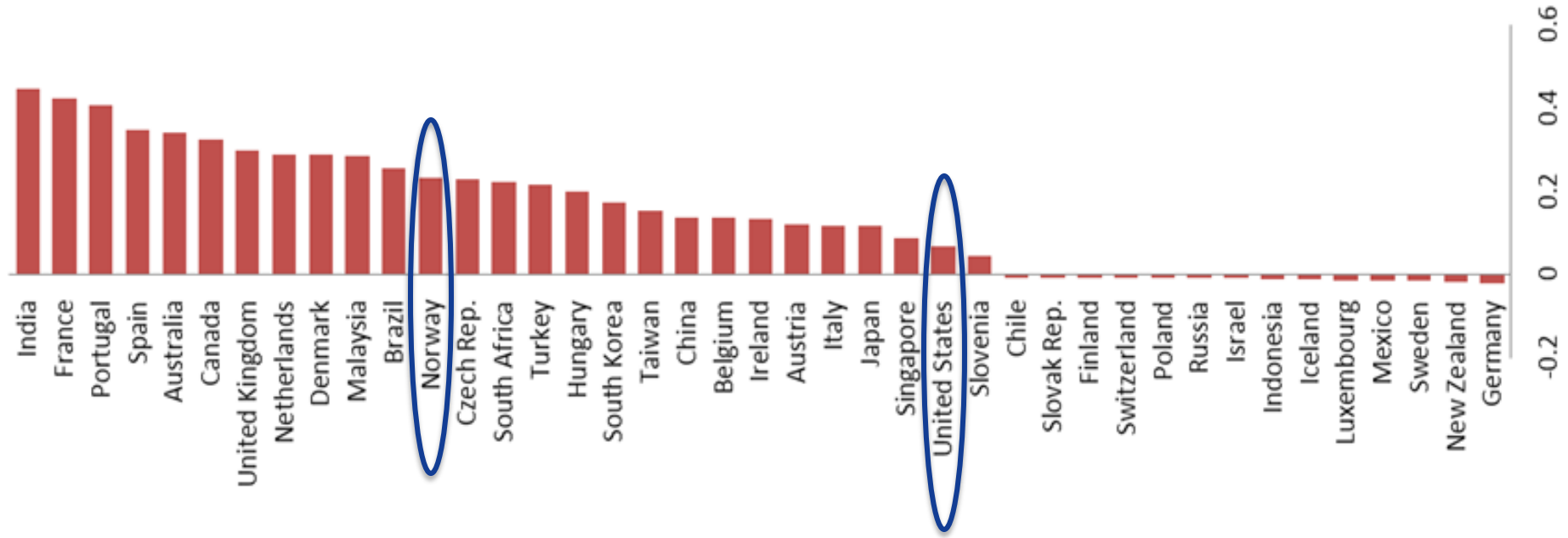
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# ■ U.S. Has OECD's Highest Corporate Tax Rate

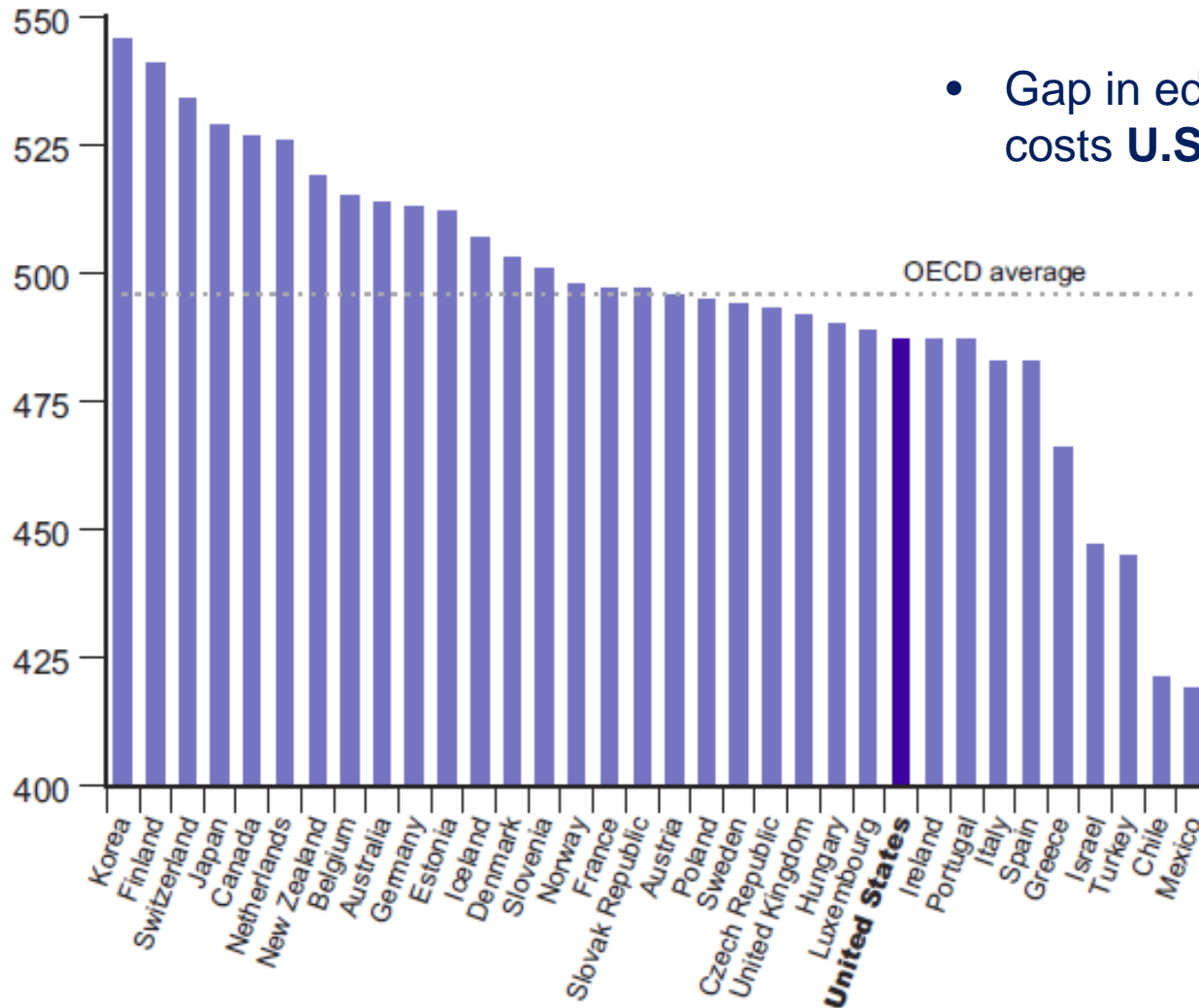


# ■ U.S. Is 26<sup>th</sup> in R&D Tax Credit Generosity



# ■ U.S. Education System Faltering

8<sup>th</sup> Grade PISA Math Scores

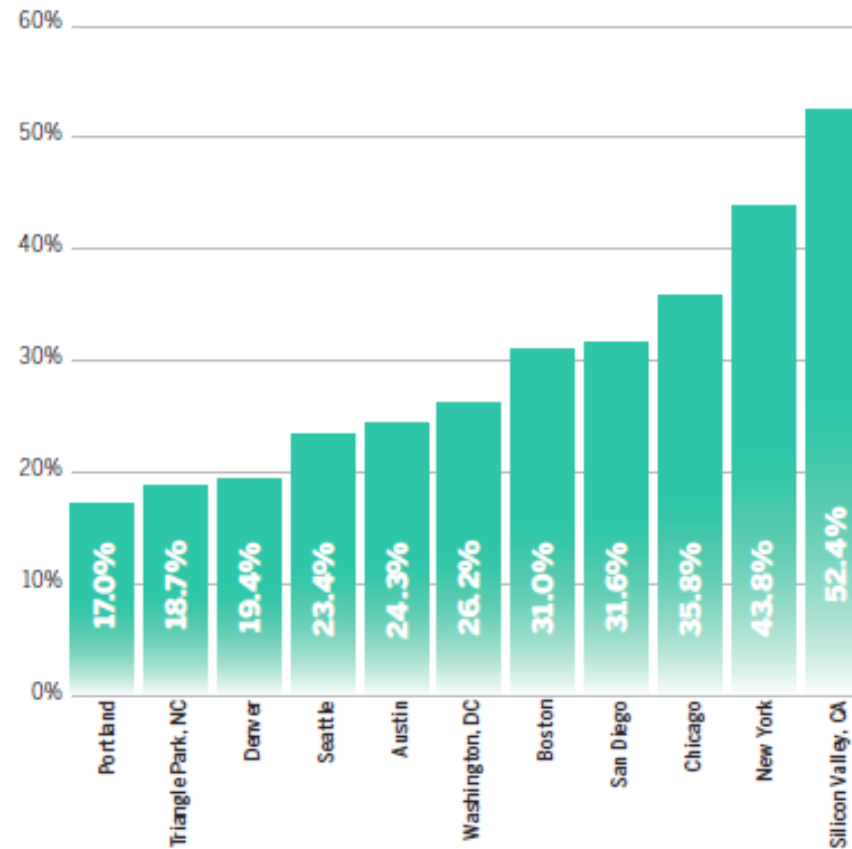


- U.S. 48th in quality of mathematics and science education.
- Gap in education achievement costs **U.S. \$2.3 trillion** annually.



## ■ U.S. Not as Welcoming to High-Skill Immigrants

**IMMIGRANT-FOUNDED START-UPS AS  
A PERCENT OF TOTAL START-UPS IN TECH CENTERS**



Source: Wadhwa, V. (2008). *Foreign-Born Entrepreneurs: An Underestimated American Resource*. Ewing Marion Kauffman Foundation.

## ■ The Message:

- Companies have moved from being price makers to price takers in global markets.
- The U.S. has simply become a less attractive investment environment for globally mobile capital.

## ■ So What Does America (Or Any Country) Need to Do?

1. Embrace “Innovation Economics”
2. Get the “Innovation Triangle” Right
3. Promote an Innovation-Maximizing Global Economic System
4. Recognize that an Innovator’s Job is Never Done

## ■ Embrace Innovation Economics



Paul Krugman

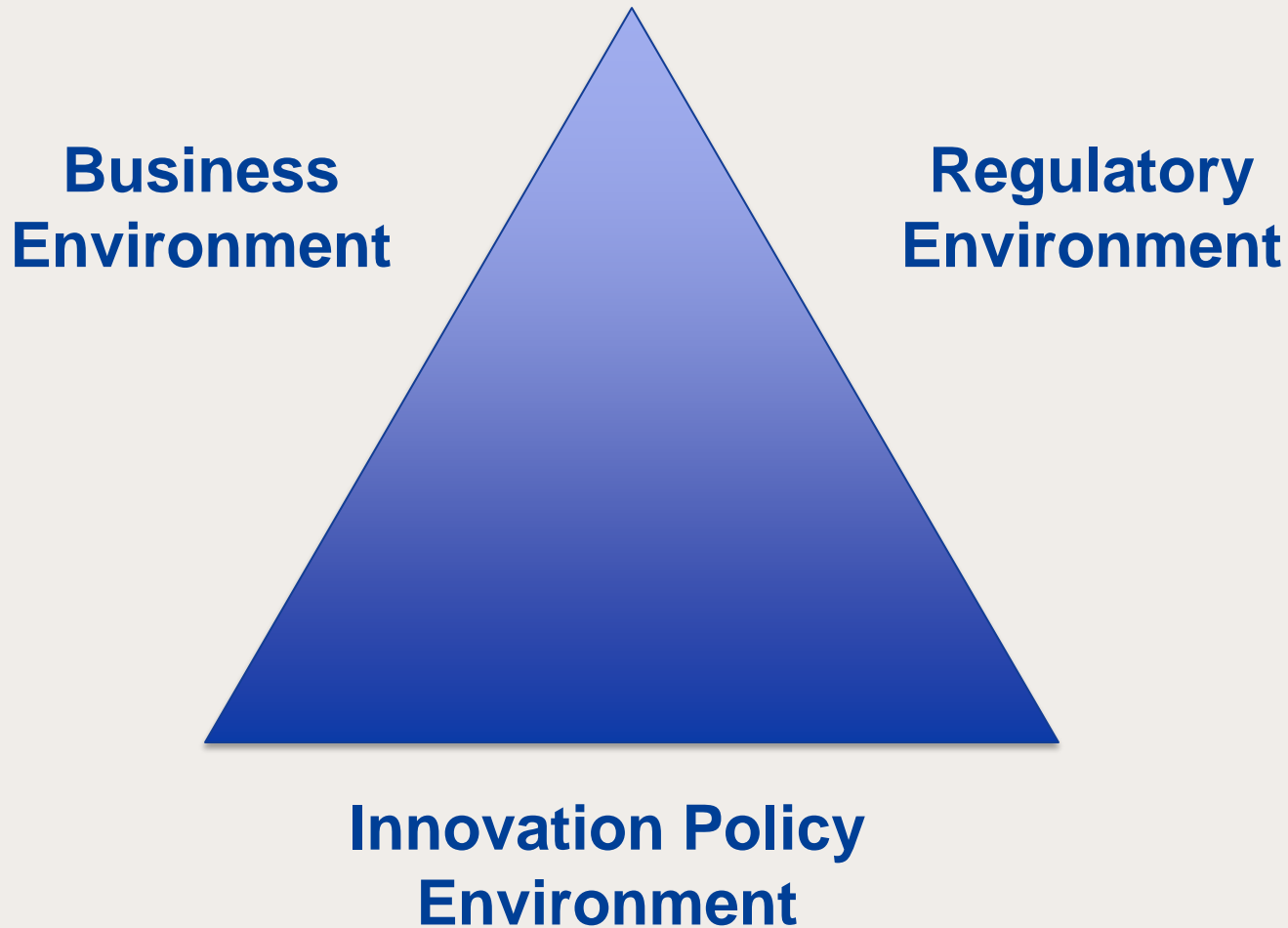
“Productivity growth is the single most important factor our economic well-being. *But it is not a policy issue, because we are not going to do anything about it.*”



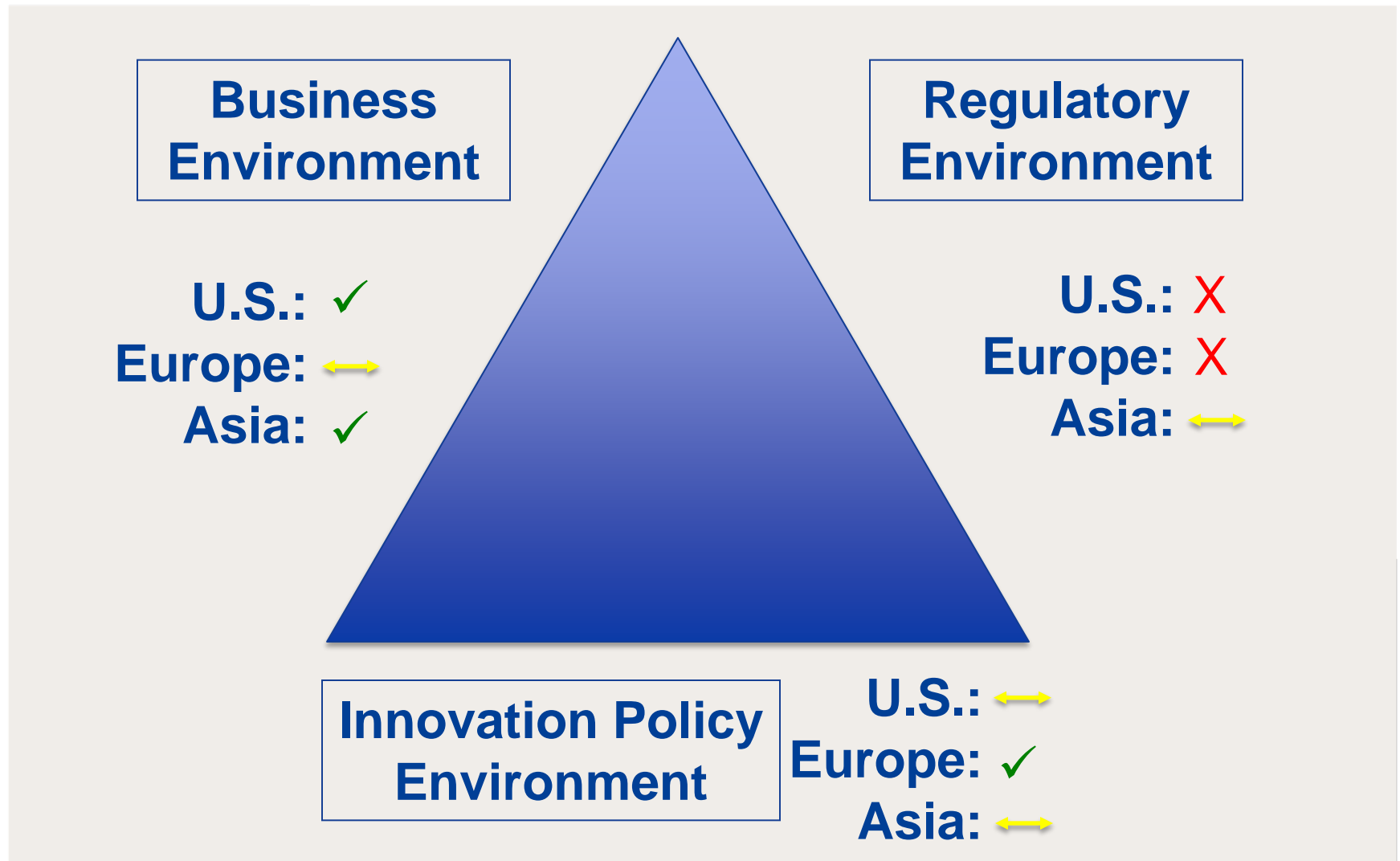
Joseph Schumpeter

1. The central goal of economic policy should be to spur higher productivity and greater innovation.
2. Markets relying on price signals alone will not always be as effective as smart public-private partnerships in spurring higher productivity and greater innovation.

- Maximizing Innovation: Get the Innovation Triangle Right



# ■ Maximizing Innovation: Get the Innovation Triangle Right





# ■ Architect an Innovation-Maximizing Global Economy

		<b>World</b>	
		<b>Wins</b>	<b>Loses</b>
<b>Country</b>	<b>Wins</b>	<b>“Good”</b> (e.g. R&D Support)	<b>“Ugly”</b> (e.g. IP Theft; Currency or Standards Manipulation)
	<b>Loses</b>	<b>“Self-destructive”</b> (e.g. Limiting High-Skill Immigration)	<b>“Bad”</b> (e.g. Import Substitution Industrialization)

## ■ Beware the Innovation Paradox

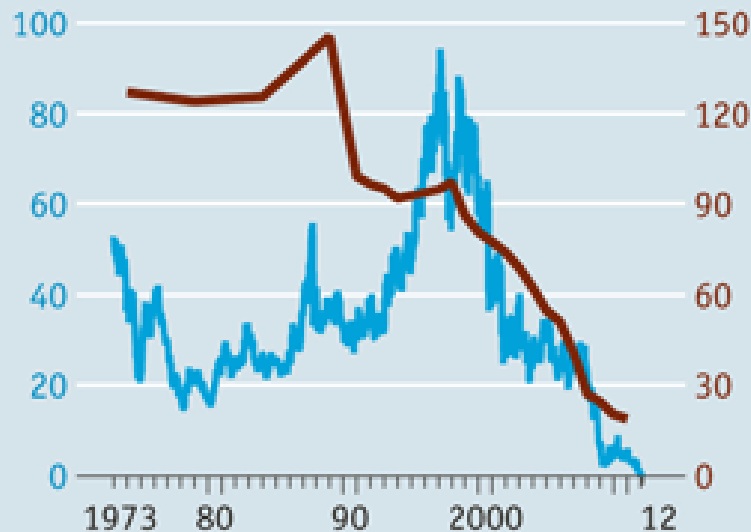
### The Fall of Kodak

#### An ugly picture

Kodak's:

share price, \$

employees, '000



Sources: Company reports; Thomson Reuters

*When you don't recognize the need to innovate until it's too late!*

**Kodak:**  
**1999 Revenues: \$16B**  
**2012 = Bankrupt**

Source: *The Economist*, "The Last Kodak Moment"

## ■ Beware the Innovation Paradox

“Only the paranoid survive.”  
– Andy Grove, Intel



“There is no way around innovation.”  
– Babis Papadopoulos, Secretary for Economic &  
Commercial Affairs, Embassy of Greece, Washington, DC



## ■ Weaknesses of U.S. Innovation System

1. Believe we'll always be #1 without having to do anything about it.
2. We lack a political consensus that technology and innovation drive economic growth.
  - Any kind of innovation strategy is demeaned as industrial policy.
3. We have become a risk averse society that views innovation and progress with fear and loathing.
4. We don't do a good enough job commercializing and producing our technological innovations.
5. Running out of money for R&D investment.

## ■ Strengths of U.S. Innovation System

1. Strong embrace of innovation/use of ICT by our private sector.
2. Majority of the world's best universities.
3. Fair amount of residual bench strength. (E.g. National Labs/DARPA).
4. Can still place a lot of bets across many emerging technology areas.
5. Entrepreneurs and innovators still want to come/be here.

So: Is Churchill still right?



# Tusen Takk!

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