University Research Funding: The United States is Behind and Falling

May 7, 2014

Dr. Robert D. Atkinson, President
The 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 innovation will create new opportunities to boost economic growth and improve quality of life. ITIF focuses on:

- Innovation “verticals”: energy, life sciences, telecom, manufacturing, and Internet and IT transformation

- Innovation “horizontals”: trade, tax, talent, and tech policy

- “Innovation economics” as an alternative to mainstream economics
Headlines

- Federally-funded university-based research plays an increasingly vital role in the U.S. innovation system.

- But, as a share of GDP, both growth in and actual government funding—and business funding—for university research falls notably below the OECD country average.
Today’s Presentation

1. Why Does S&T-Based Innovation Matter?
2. Trends in R&D Funding for Universities
3. Effects of Future R&D Cuts
The societal rates of return to R&D are at least twice private returns.

The private return to R&D is 7% while the societal RoR is 30% suggesting that the optimal level of R&D investment in the US economy is between two to four times larger than the total current level of private investment. (Jones and Williams, 2000)

Every 1% increase in investment in research increased productivity by 0.23%. (Coe and Helpman, 1995)

At least two-thirds of increase in per-capita GDP is attributable to innovation.
Corporations Shifting to Later-Stage Development

- Development: Up 54.1%
- Applied Research: down 0.9%
- Basic Research: up 8.5%

Source: National Science Foundation
Corporations Shifting to Later-Stage Development

Percentage Point Change in Business R&D Funding by Type: 1991-2008

- Basic Research: -3.2%
- Applied Research: -3.7%
- Development: 6.9%

Source: National Science Foundation
As a Result, University Research has Become More Important to the U.S. Innovation System

U.S. Basic Research Expenditures by Performing Sector: 2008

- Universities and Colleges: 59%
- Federal: 14%
- Industry: 21%
- Other Nonprofit: 7%

Source: National Science Foundation
University Research Generates Substantial Societal Returns

- The social rate of return from investment in academic research is at least 40 percent.

- Scores of companies directly trace their origin to federally-funded university-based research.

http://www.sciencecoalition.org/successstories
Today’s Presentation

1. Why Does S&T-Based Innovation Matter?

2. Trends in R&D Funding for Universities

3. Effects of Future R&D Cuts
Government Funding for University R&D as a Share of GDP, 2011

- Denmark: 0.74%
- Sweden: 0.68%
- Finland: 0.61%
- Australia: 0.58%
- Norway: 0.47%
- France: 0.43%
- Germany: 0.42%
- EU-15: 0.41%
- Canada: 0.39%
- Ireland: 0.39%
- Korea: 0.34%
- New Zealand: 0.33%
- United Kingdom: 0.32%
- Taiwan: 0.31%
- Czech Republic: 0.28%
- United States: 0.28%
- Japan: 0.23%
- China: 0.09%
Percentage Point Change in Government Funding for University R&D as a Share of GDP, 2000–2011
Annual Percentage Change in Government Funding for University R&D in Constant PPP Dollars, 2000–2011

- China: 17.2%
- Korea: 12.7%
- Ireland: 12.0%
- Czech Republic: 9.5%
- Taiwan: 8.0%
- Australia: 7.2%
- New Zealand: 6.7%
- Denmark: 6.6%
- Norway: 6.1%
- United States: 4.9%
- United Kingdom: 4.5%
- Canada: 4.2%
- Finland: 3.5%
- Sweden: 3.3%
- Germany: 3.2%
- France: 2.6%
- Japan: 1.2%
Percentage Point Change in Business Funding for University R&D as a Share of GDP, 2000–2011

- Germany: 0.026%
- China: 0.026%
- Denmark: 0.020%
- Canada: 0.016%
- New Zealand: 0.014%
- Ireland: 0.009%
- Finland: 0.008%
- Korea: 0.007%
- Sweden: 0.005%
- Czech Republic: 0.002%
- EU-15: 0.000%
- Japan: -0.001%
- Australia: -0.002%
- Taiwan: -0.002%
- France: -0.004%
- Norway: -0.005%
- United Kingdom: -0.008%
- United States: -0.016%
Business Funding for University R&D as a Share of GDP, 2011
Average Annual Percentage Change in Business Funding for University R&D in Constant PPP Dollars, 2000–2011

China: 18.3%
Czech Republic: 17.9%
Denmark: 16.6%
Taiwan: 13.9%
New Zealand: 11.1%
Ireland: 10.2%
Australia: 5.7%
Korea: 5.6%
Germany: 5.4%
Finland: 4.2%
Canada: 1.7%
France: 1.5%
United States: 1.3%
Norway: 0.8%
Sweden: 0.5%
Japan: 0.4%
United Kingdom: 0.1%
State Appropriations for Higher Education per Full-Time Equivalent Student, 2000–2012

Academic year

2011 dollars

$0 $2,000 $4,000 $6,000 $8,000 $10,000 $12,000

Today’s Presentation

1. Why Does S&T-Based Innovation Matter?

2. Trends in R&D Funding for Universities

3. Effects of Future R&D Cuts
U.S. Federal R&D Expenditure Paths

- Keep pace with China's R&D/GDP
- R&D/GDP constant
- CBO Baseline: Hold R&D expenditures at 2011 levels
- Sequestration
## R&D Expenditure Shortfalls ($2012 Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sequestration vs. R&amp;D at 2011 Level</th>
<th>Sequestration vs. Stable R&amp;D Share of GDP</th>
<th>Sequestration vs. Expanding R&amp;D Share of GDP at China’s Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>-$12,484</td>
<td>-$15,326</td>
<td>-$20,646</td>
</tr>
<tr>
<td>Cumulative: 2013-2021</td>
<td>-$94,976</td>
<td>-$329,856</td>
<td>-$510,930</td>
</tr>
</tbody>
</table>
R&D Cuts Reduce GDP

R&D Funding Shortfalls and the Related Losses in Real GDP 2013-2021 Cumulative Effect, Sources: NSF, OMB, CBO, BEA, ITIF

- $1,000
- $750
- $500
- $250
- $0
- $203
- $565
- $860

Impact on GDP

Sequester Versus Expenditures at Constant 2011 Rates

Sequestration versus Constant R&D share of GDP

Sequestration versus the R&D Share of GDP at China's Pace
## R&D Cuts Reduce New Knowledge

<table>
<thead>
<tr>
<th></th>
<th>Journal Publications</th>
<th>Patents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>-9.2%</td>
<td>-3.3%</td>
</tr>
<tr>
<td>2013-2021</td>
<td>-7.8%</td>
<td>-2.8%</td>
</tr>
</tbody>
</table>

(Sequestration Compared to CBO Baseline)
## R&D Cuts Reduce Jobs

<table>
<thead>
<tr>
<th>Year</th>
<th>&quot;Keynesian&quot; Effect</th>
<th>&quot;Schumpeterian&quot; Effect</th>
<th>Net Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Losses: (2013-2016)</td>
<td>-117,771</td>
<td>-81,453</td>
<td>-199,224</td>
</tr>
</tbody>
</table>

(Sequestration Compared to CBO Baseline)
Thank You

Robert D. Atkinson  ratkinson@itif.org

Follow ITIF

www.itif.org

@RobAtkinsonITIF

www.innovationfiles.org

facebook.com/innovationpolicy

www.youtube.com/techpolicy