University Research Funding: The United States is Behind and Falling

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While U.S. research universities are still a key strength, their future is uncertain given large cuts in state higher education budgets and slow growth in federal support for university research.

Research and development drives innovation and innovation drives long-run economic growth, creating jobs and improving living standards in the process. University-based research is of particular importance to innovation, as the early-stage research that is typically performed at universities serves to expand the knowledge pool from which the private sector draws ideas and innovation.[1] As such, it is troubling that in 2008 the United States ranked 22nd out of 30 countries in government-funded university research and 21st in business-funded university research. Moreover, we are falling even farther behind. From 2000 to 2008, the United States ranked 18th in the growth of government-funded university research, with countries like China, Korea and the United Kingdom significantly outperforming the United States. Worse still, the United States ranked 23rd in the growth of business-funded research, with it actually declining as a share of GDP. In contrast, collaboration between universities and business grew dramatically in nations like Austria, China, Israel and Taiwan.[2]

These statistics are unmistakable and troubling. As we fail to increase these investments in our future at anywhere near the rate of our economic competitors, our innovation system is faltering. National economies increasingly compete on the basis of innovation, and, in the race for global innovation advantage, the United States will continue to trail countries that have placed university research and industrial collaboration at the forefront of their economic policy.

While our public research universities used to be the envy of the world, 20 years of underfunding by state governments have meant that many public research universities have fallen in their capabilities relative to private research universities.[3] And while our research universities, public and private, are still a key strength, their future is uncertain given the large cuts in state higher education budgets and slow growth in federal support for university research.[4]

Of course, there is a remedy. Instead of across-the-board budget cutting at the state and national levels, policymakers can prioritize and target university research for increased funding, with the knowledge that the long-term payoffs to their state and to the nation as a whole will be substantial. Likewise, instead of "reforming" the tax code by "broadening the base" and lowering the rate, policymakers can take a page out of the playbooks of other nations and enact a collaborative R&D tax credit that provides companies with a generous tax credit for expenditures on research conducted at universities.

As U.S. companies have shifted their R&D activities upstream, universities have taken on a larger role in the innovation system.

THE IMPORTANCE OF UNIVERSITY RESEARCH

In developed, knowledge-based economies, innovation powers long-run economic growth. For example, two-thirds of UK private-sector productivity growth between 2000 and 2007 was a result of innovation.[5] Klenow and Rodríguez-Clare decomposed the cross-country differences in income per-worker into shares that could be attributed to physical capital, human capital, and total factor productivity, and they found that more than 90 percent of the variation in the growth of income per worker was a result of how effectively capital is used (that is, innovation), with differences in the actual amount of human and physical capital accounting for just 9 percent.[6]

Innovation is also positively correlated to job growth in the mid- to long-term.[7] Innovation leads to job growth in three fundamental ways. First, innovation gives a nation's firms a first-mover advantage in new products and services, expanding exports and creating expansionary employment effects in the short term. In fact, in the United States, growth in exports leads to twice as many jobs as an equivalent expansion of sales domestically.[8] Second, innovation's expansionary effects lead to a virtuous cycle of expanding employment. For example, in the early- to mid-1990s, the emergence of information technology as a general purpose technology drove broad-based economic growth, creating hundreds of thousands of new jobs, which, in turn, led to additional job growth in supporting industries. Finally, when innovation leads to higher productivity, it also leads to increased wages and lower prices, both of which expand domestic economic activity and create jobs.[9]

Research performed outside the private sector is essential to the U.S. innovation system. Even with robust corporate R&D investment, the private sector alone does not provide the level of innovative activity that society needs, because firms do not capture all of the benefits of innovation. A plethora of studies have found that the rate of return to society from corporate R&D and innovation activities is at least twice the estimated returns that a company itself receives.[10] For example, Tewksbury, Crandall and Crane examine the rate of return from twenty prominent innovations and find a median private rate of return of 27 percent but a median social rate of return of a whopping 99 percent, almost four times higher.[11] Nordhaus estimates that inventors capture just 4 percent of the total social gains from their innovations; the rest spill over to other companies and to society as a whole.[12] In other words, the private sector under-invests in innovation and thus, without public investment, the rates of economic growth, job creation and living standard improvement are all lower than their potential. The university system, therefore, plays a key role in filling in this gap in order to provide innovation at the social optimum.

Recently, universities have taken on an even greater role in the American innovation system. Over the last three decades, many large corporations have shut down or repurposed central research laboratories that used to conduct R&D. For example, since its founding in 1925, Bell Labs (until 1995, a subsidiary of AT&T) made seminal scientific discoveries, created powerful new technologies, and built the world's most advanced and reliable telecommunications networks. Because so much of these results spilled over to other firms (not just AT&T) and industries, the incentive to perform this kind of foundational, generic research was based on the fact that AT&T had significant market power and was a regulated monopoly. But with the introduction of competition to the telecommunications industry in the 1980s and 1990s, Bell Labs was restructured to focus more on incremental technology improvements with shorter-term payoffs. This is reflective of an overall shift in corporate R&D, with companies in the United States expanding their investments in later-stage applied research and development much more quickly than their investments in basic, early-stage research.[13] From 1991 to 2008, basic research as a share of total corporate R&D funding conducted in the United States fell by 3.2 percentage points, while applied research fell by 3.7 percentage points. In contrast, development's share increased by 6.9 percentage points.[14]

In terms of its impact on product and process development in U.S. firms, the social rate of return from investment in academic research is at least 40 percent.

This shift to shorter-term, less fundamental R&D risks a shrinking of the knowledge pool from which firms draw the ideas and information necessary to conduct later-stage R&D and to bring innovations to the market. As U.S. companies have shifted their R&D activities upstream, universities have taken on a larger role in the innovation system. Today, universities perform 56 percent of all basic research, compared to 38 percent in 1960.[15] Moreover, universities are increasingly passing on these results to the private sector: Between 1991 and 2009, the number of patent applications filed by universities increased from 14 per institution to 68 per institution; licensing income increased from $1.9 million per institution to $13 million per institution; and new start-ups formed as a result of university research increased from 212 in 1994 to 685 in 2009.[16]

Overall, university research has large impacts on U.S. economic growth. In terms of its impact on product and process development in U.S. firms, Mansfield finds the social rate of return from investment in academic research to be at least 40 percent.[17] And a study by the Science Coalition found that "companies spun out of research universities have a far greater success rate than other companies."[18] Indeed, university research gave the United States breakthrough companies such as Google, Medtronic and iRobot.[19]

U.S. PERFORMANCE IN GOVERNMENT-FUNDED UNIVERSITY RESEARCH

Due to their importance to the U.S. innovation system, the development and expansion of major U.S. research universities, including the public land grant universities and other state universities, has played a key role in driving U.S. global innovation leadership. Indeed, it has become almost a matter of faith in economic and innovation policy circles to point to U.S. research universities as the secret weapon in the U.S. economic competitiveness arsenal.

But this widely held view reflects the past rather than the present. In recent years, state fiscal support for university research has fallen.[20] (Table 1) Federal support for doctoral research fellowships has declined.[21] Overall, other nations have outpaced the United States in the growth of government funding for university research. From 2000 to 2008, government support for U.S. university research grew by 17 percent as a share of GDP, placing the United States 18th among the 30 nations studied. (Table A2) In contrast, the average growth of the 30 nations was almost fifty percent higher, at 24 percent. (Figure 1) Many foreign governments rightly see that, to win the race for global innovation advantage, they need to significantly boost support for research universities. China, for example, increased its research funding by 59 percent—an even more impressive feat when taking in account its extraordinary GDP growth. Ireland's research funding grew by 121 percent; Korea's by 105 percent; and the United Kingdom's grew by 32 percent, almost double the rate of the United States.[22]

STATE	PERCENTAGE CHANGE IN STATE FUNDING
Alaska	-49%
Utah	-24%
Wyoming	-23%
Idaho	-22%
Oklahoma	-20%
Iowa	-20%
Nevada	-18%
Louisiana	-15%
Vermont	-11%
Washington	-9%
50-State Average	-2%

Table 1: Top Ten States with the Largest Cuts in State Funding for University Research as a Share of GDP: 2003-2008[23]

The result is that the United States now lags far behind other nations. (Figure 2) In 2008, the average government among the 30 countries studied invested a 0.34 percent share of GDP in university research, while the United States invested just 0.24 percent—earning a rank of 22nd. (Table A1) Sweden, the top funder, invested more than two and half times as much, at 0.61 percent. The Netherlands and Australia have made the support of university research a key component of their strategies to create more innovation-based jobs, each investing more than double the U.S. levels.

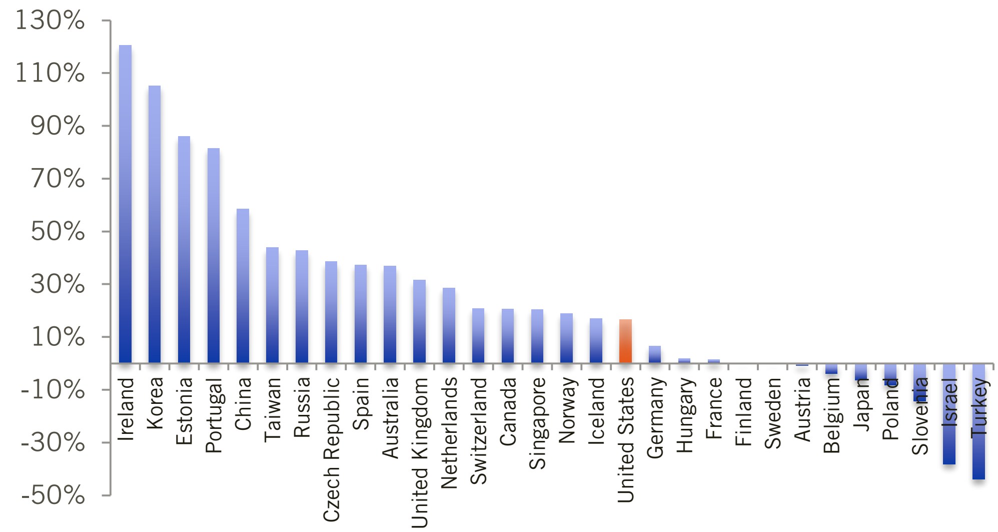

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Figure 1: Percentage Change in Government-Funded Research Performed in the Higher Education as a Share of GDP: 2000-2008[24]

It is worth comparing the United States to our neighbor to the north. Over these eight years, Canadian government funding of university research has increased by 21 percent (compared to 17 percent in the U.S.) to a 2008 GDP share of 0.39 percent (compared to the U.S. level of 0.24 percent). One reason is that successive governments from both conservative and liberal parties have made innovation-based competitiveness a national priority and have recognized the health of research universities as a valuable core asset. As a result, in only five years, the number of Canadian universities listed among the top 200 in the world has increased from seven to ten.[25]

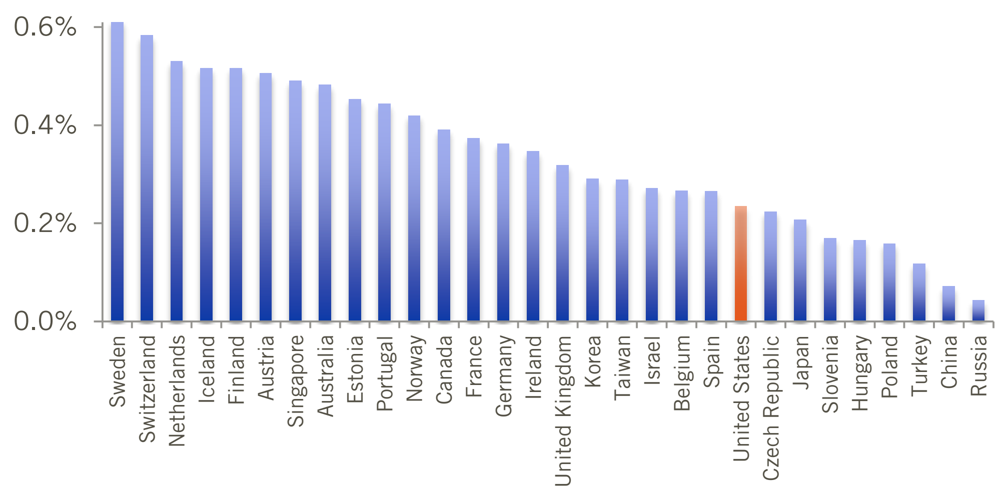

Figure 2: Government-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2008[26]

THE PERFORMANCE OF THE UNITED STATES IN BUSINESS-FUNDED UNIVERSITY RESEARCH

Some will argue that, while other, more "statist" nations must rely on government funding of university research, the more market-oriented United States relies on robust business-university partnerships. After all, they argue, we are the nation that passed the Bayh-Dole Act to spur commercialization of university research, and we have inherently more entrepreneurial faculty at our universities as well. But, there are two key problems with this as an excuse for our lagging government funding. First, even in the United States, government funding of university research exceeds business funding by an order of magnitude.[27] And, second, even with these "policy innovations," the United States is in fact trailing other nations when it comes to business support of university research.

In 2008, funding of U.S. university research by business was just 0.020 percent of GDP, less than two-thirds of the 30-country average of 0.032 percent of GDP. (Figure 3) The United States ranked 21st of 30 nations. (Table A4) In countries like Canada, China, Germany, Israel, Korea and the Netherlands, business invests more than twice as much in university research than does business in the United States.[28]

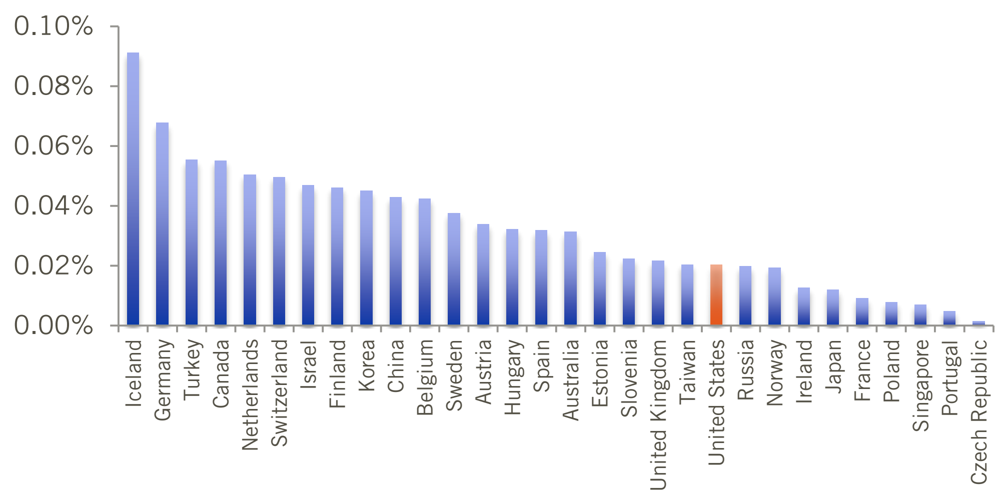

Figure 3: Business-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2008[29]

The trend is even more troubling. From 2000 to 2008, the United States ranked 23rd of 30 nations in the change in business-funded university research. (Table A5) Business funding for U.S. university research declined by 7 percent as a share of GDP. (Figure 4) Indeed, for the first time since the data were collected in 1953, the share of U.S. university research supported by industry declined over a six year period, from 1999 to 2005 (before experiencing a modest increase after 2006).[30] Contrast the United States' performance to nations like Hungary (211 percent growth); Israel (95 percent); Spain and China (72 percent each).

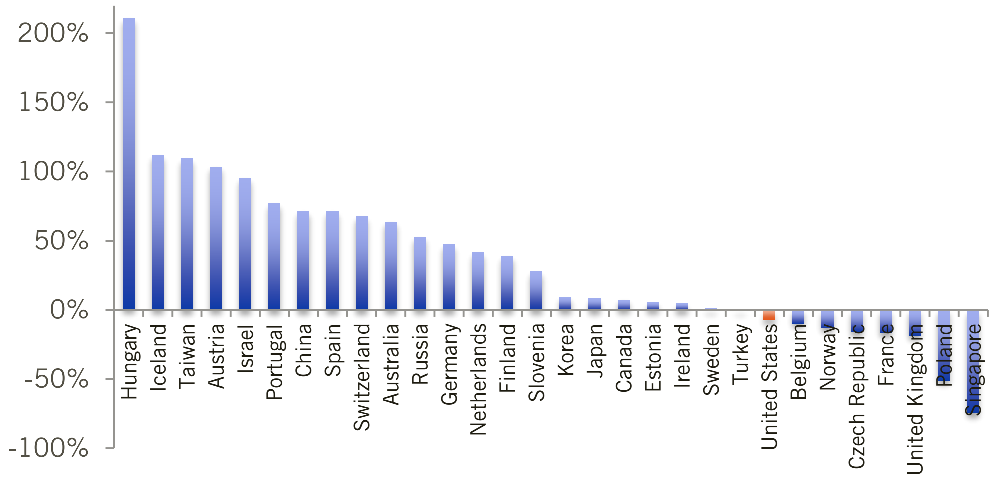

Figure 4: Percentage Change in Business-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2000-2008[31]

University researchers are not necessarily motivated to work on problems that are relevant to commercial needs. Business funding of university research encourages essential links between commerce and academia, orienting research toward topics and ideas that are more likely to create new businesses, products and jobs. This is why at least nine nations have established collaborative research tax credits that provide a more generous credit for business R&D funded at universities. Hungary, Spain, the Netherlands, Canada, Japan and, recently, Belgium have all established some form of a collaborative R&D tax credit.[32] For example, Hungary offers a 10 percent collaborative R&D tax credit for researcher wages, along with a 400 percent income tax allowance for collaborative R&D expenses with public research institutions. In the Canadian province of Quebec, businesses receive a refundable tax credit of 35 percent on 80 percent of all research expenditures at universities or public research centers, on top of a federal tax credit of up to 35 percent on all R&D expenditure.[33] In contrast, the U.S. R&D credit is actually *less generous* for research firms fund at universities.[34] To remedy this, Congress should allow firms to take a flat credit of 20 percent for all collaborative research conducted at universities (and at federal laboratories and research consortia).[35]

CONCLUSION

Given the importance of university research to the U.S. innovation system, and the primary role that innovation plays in economic growth, competitiveness, and job creation, the data presented here should serve as a wakeup call for U.S. policymakers. We can no longer rest on our laurels and assume that our universities will continue to lead the world, just because they once did. The reason they led was no accident. It had nothing to do with our weather, our geography, or our culture. Instead, it had everything to do with the fact that after World War II, we, before any other nation, dramatically increased federal (and state) support for higher education generally and higher education research specifically.

As ITIF found in our report, *The Atlantic Century*, which benchmarked the innovation-based competitiveness of 36 countries and four regions, the United States ranks 6th in overall competitiveness and dead last in the rate of change in competiveness over the last decade.[36] The takeaway here is that, in a globalized economy, relative decline *is* decline, and this report presents one more piece of evidence that the U.S. innovation system is faltering. It is up to policymakers to recognize the existence of the problem, and then to implement policies that target the specific areas of deficiency, such as the underfunding of university research. Then, and only then, will the United States be able to restore its position as the global innovation leader.

APPENDIX

Table A1: Government-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2008[37]

RANK	COUNTRY	EXPENDITURE SHARE OF GDP
1	Sweden	0.61%
2	Switzerland	0.58%
3	Netherlands	0.53%
4	Iceland	0.52%
5	Finland	0.52%
6	Austria	0.51%
7	Singapore	0.49%
8	Australia	0.48%
9	Estonia	0.45%
10	Portugal	0.44%
11	Norway	0.42%
12	Canada	0.39%
13	France	0.37%
14	Germany	0.36%
15	Ireland	0.35%
16	United Kingdom	0.32%
17	Korea	0.29%
18	Taiwan	0.29%
19	Israel	0.27%
20	Belgium	0.27%
21	Spain	0.27%
22	United States	0.24%
23	Czech Republic	0.22%
24	Japan	0.21%
25	Slovenia	0.17%
26	Hungary	0.17%
27	Poland	0.16%
28	Turkey	0.12%
29	China	0.07%
30	Russia	0.04%

Table A2: Percentage Change in Government-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2000-2008[38]

RANK	COUNTRY	PERCENTAGE CHANGE
1	Ireland	121%
2	Korea	105%
3	Estonia	86%
4	Portugal	81%
5	China	59%
6	Taiwan	44%
7	Russia	43%
8	Czech Republic	39%
9	Spain	37%
10	Australia	37%
11	United Kingdom	32%
12	Netherlands	28%
13	Switzerland	21%
14	Canada	21%
15	Singapore	20%
16	Norway	19%
17	Iceland	17%
18	United States	17%
19	Germany	7%
20	Hungary	2%
21	France	1%
22	Finland	0%
23	Sweden	0%
24	Austria	-1%
25	Belgium	-4%
26	Japan	-6%
27	Poland	-8%
28	Slovenia	-14%
29	Israel	-38%
30	Turkey	-44%

Table A3: Percentage Change in Government-Funded Research Performed in the Higher Education Sector, Constant PPP Dollars: 2000-2008[39]

RANK	COUNTRY	PERCENTAGE CHANGE
1	China	253%
2	Ireland	209%
3	Estonia	206%
4	Korea	189%
5	Russia	135%
6	Portugal	96%
7	Czech Republic	93%
8	Taiwan	92%
9	Singapore	79%
10	Australia	76%
11	Spain	75%
12	Iceland	67%
13	Norway	61%
14	United Kingdom	57%
15	Netherlands	50%
16	Canada	45%
17	Switzerland	41%
18	United States	37%
19	Hungary	30%
20	Poland	27%
21	Finland	26%
22	Sweden	23%
23	Austria	22%
24	Slovenia	20%
25	Germany	18%
26	France	16%
27	Belgium	14%
28	Japan	3%
29	Israel	-15%
30	Turkey	-21%

Table A4: Business-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2008[40]

RANK	COUNTRY	EXPENDITURE SHARE OF GDP
1	Iceland	0.091%
2	Germany	0.068%
3	Turkey	0.055%
4	Canada	0.055%
5	Netherlands	0.050%
6	Switzerland	0.050%
7	Israel	0.047%
8	Finland	0.046%
9	Korea	0.045%
10	China	0.043%
11	Belgium	0.042%
12	Sweden	0.038%
13	Austria	0.034%
14	Hungary	0.032%
15	Spain	0.032%
16	Australia	0.031%
17	Estonia	0.025%
18	Slovenia	0.022%
19	United Kingdom	0.022%
20	Taiwan	0.020%
21	United States	0.020%
22	Russia	0.020%
23	Norway	0.019%
24	Ireland	0.013%
25	Japan	0.012%
26	France	0.009%
27	Poland	0.008%
28	Singapore	0.007%
29	Portugal	0.005%
30	Czech Republic	0.002%

Table A5: Percentage Change in Business-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2000-2008[41]

RANK	COUNTRY	PERCENTAGE CHANGE
1	Hungary	211%
2	Iceland	112%
3	Taiwan	110%
4	Austria	103%
5	Israel	95%
6	Portugal	77%
7	China	72%
8	Spain	72%
9	Switzerland	68%
10	Australia	64%
11	Russia	53%
12	Germany	48%
13	Netherlands	42%
14	Finland	39%
15	Slovenia	28%
16	Korea	9%
17	Japan	8%
18	Canada	7%
19	Estonia	6%
20	Ireland	5%
21	Sweden	1%
22	Turkey	-1%
23	United States	-7%
24	Belgium	-10%
25	Norway	-13%
26	Czech Republic	-16%
27	France	-16%
28	United Kingdom	-18%
29	Poland	-51%
30	Singapore	-75%

Table A6: Percentage Change in Business-Funded Research Performed in the Higher Education Sector, Constant PPP Dollars: 2000-2008[42]

RANK	COUNTRY	PERCENTAGE CHANGE
1	Hungary	296%
2	China	283%
3	Iceland	210%
4	Taiwan	180%
5	Israel	157%
6	Austria	156%
7	Russia	151%
8	Spain	119%
9	Australia	110%
10	Switzerland	96%
11	Portugal	91%
12	Slovenia	80%
13	Finland	75%
14	Estonia	74%
15	Netherlands	70%
16	Germany	63%
17	Korea	54%
18	Ireland	47%
19	Turkey	39%
20	Canada	28%
21	Sweden	26%
22	Norway	24%
23	Japan	19%
24	Czech Republic	18%
25	United States	9%
26	Belgium	9%
27	United Kingdom	-3%
28	France	-5%
29	Poland	-32%
30	Singapore	-62%

ENDNOTES

1. For example, a study by the National Bureau of Economic Research finds that every dollar of U.S. public funding for medical research increases U.S. private investment by 32 cents. See Margaret E. Blume-Kohout, Krishna B. Kumar and Neeraj Sood, "Federal Life Sciences Funding and University R&D" (working paper, National Bureau of Economic Research, 2009).
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10. See Charles Jones and John Williams, "Measuring the Social Return to R&D," *Quarterly Journal of Economics* 113, no. 4 (1998): 1119-1135; Edwin Mansfield, "Social Returns from R&D: Findings, Methods, and Limitations," *Research Technology Management* 34, no. 6 (1991): 24-27; Eric Brynjolfsson, Lauren Hitt, and Shinkyu Yang, "Intangible Assets: How the Interaction of Information Technology and Organizational Structure Affects Stock Market Valuations," *Brookings Papers on Economic Activity* 33 (2000): 137-199.
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14. National Science Board, *Science and Engineering Indicators 2010*, appendix tables 4-7, 4-8, 4-9 and 4-10.
15. Ibid., appendix table 4-4.

16. Richard Kordal, Arjun Sanga and Reid Smith, eds., *AUTM Licensing Activity Survey: FY2009 Summary: A Survey Summary of Technology Licensing (and Related) Activity for U.S. Academic and Nonprofit Institutions and Technology Investment Firms* (Deerfield, IL: Association of University Technology Managers, 2011); Robert D. Atkinson and Scott M. Andes, *The 2008 State New Economy Index: Benchmarking Economic Transformation in the States* (Washington, DC: Information Technology and Innovation Foundation, 2008), 64, http://www.itif.org/publications/2008-state-new-economy-index.
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22. Trends adjusted for purchasing power parity (PPP), rather than GDP, tell a similar story: between 2000 and 2008, the United States ranked 18th in the percentage change in government-funded research performed in the higher education sector (constant PPP dollars), with a growth rate of 37 percent, compared to the 30-country average of 68 percent. See Table A3.
23. National Science Board, *Science and Engineering Indicators 2010*, table 8-40.
24. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds); OECD.Stat; Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Republic of China, *Statistical Abstract of National Income*; World Bank, World Development Indicators. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.
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27. National Science Board, *Science and Engineering Indicators 2010*, appendix table 4-7. In 2008, government funding for university research was more than 12 times greater than business funding for university research.
28. Trends adjusted for purchasing power parity (PPP), rather than GDP, paint an even worse picture: between 2000 and 2008, the United States ranked 25th in the percentage change in business-funded research performed in the higher education sector (constant PPP dollars), with a growth rate of just 9 percent, compared to the 30-country average of 79 percent. See Table A6.
29. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds); OECD.Stat; Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Republic of China, *Statistical Abstract of National Income*; World Bank, World Development Indicators. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.
30. National Science Board, *Science and Engineering Indicators 2010*, appendix table 4-3. This may stem from the fact that university contracts are often undertaken as discretionary activities and are the first to

be cut when revenues are down. See Barry Bozeman and Albert N. Link, "Tax Incentives for R&D: A Critical Evaluation," *Research Policy 13*, no. 1 (1984): 21-31.

31. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds); OECD.Stat; Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Republic of China, *Statistical Abstract of National Income*; World Bank, World Development Indicators. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

32. Matthew Stepp, "Crisis Management: Creating a Collaborative R&D Tax Credit" (technical report, Information Technology and Innovation Foundation, forthcoming).

33. Expert Group on Impacts of R&D Tax Incentives, *Design and Evaluation of Tax Incentives for Business Research and Development: Good Practice and Future Developments* (Brussels: European Commission, 2009), 82, http://ec.europa.eu/invest-in-research/pdf/download_en/tax_expert_group_final_report_2009.pdf. The Canadian province of Ontario also has a collaborative R&D tax credit.

34. Stepp, "Crisis Management."

35. For more details on this proposal, see Stepp, "Crisis Management."

36. Robert D. Atkinson and Scott M. Andes, *The Atlantic Century: Benchmarking EU and U.S. Innovation and Competitiveness* (Washington, DC: Information Technology and Innovation Foundation, 2009), http://www.itif.org/files/2009-atlantic-century.pdf.

37. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds); OECD.Stat; Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Republic of China, *Statistical Abstract of National Income*; World Bank, World Development Indicators. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

38. Ibid. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

39. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds; accessed April 25, 2011). Purchasing power parity (PPP) adjustments correct for exchange-rate biases in international data. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

40. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds); OECD.Stat; Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Republic of China, *Statistical Abstract of National Income*; World Bank, World Development Indicators. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

41. Ibid. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

42. OECD Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds). Purchasing power parity (PPP) adjustments correct for exchange-rate biases in international data. 2008 R&D data points were estimated using simple linear regression for the following countries: Austria, Belgium, Israel, the Netherlands, and Norway.

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