The Information Technology and Innovation Foundation

The Research and Experimentation Tax Credit: A Critical Policy Tool for Boosting Research and Enhancing U.S. Economic Competitiveness

Dr. Robert D. Atkinson

September 4, 2006

Not only does the R&D tax credit spur the retention and attraction of investment in R&D in the United States, new scholarly research shows convincingly that the credit is an effective tool for stimulating additional research, which in turn leads to faster economic growth.

The emergence of a "flat world" has meant that the U.S. economy faces new robust economic competitors, many that combine low costs and high tech. Indeed, as a growing number of nations have come to understand the link between technological innovation and increased prosperity, many not only encourage domestic firms to invest more in research, but also aggressively seek R&D investments by foreign, often American, technology companies. And key weapons in their economic arsenals are tax incentives for research.

As a result the United States faces a significantly different world than even 20 years ago. After President Reagan signed legislation creating the R&D tax credit in 1981 the United States had the distinction of providing the most generous tax treatment of R&D of all OECD nations.[1] But because the generosity of the credit has been whittled away over the years, and other nations have forged ahead, by 2004 we had dropped to 17th most generous.[2]

The Research and Experimentation Tax Credit (referred to here as the R&D tax credit) can play an important role in ensuring that the United States remains an attractive location for global companies to conduct research. Not only does the credit spur the retention and attraction of investment in R&D in the United States, new scholarly research shows convincingly that the credit is an effective tool for stimulating additional research which in turn leads to faster economic growth. As a result, legislation now before Congress to extend and expand (by adding the Alternative Simplified Credit) the credit is crucial to ensuring that the U.S. innovation economy continues to prosper and grow.

The R&D Credit Effectively Stimulates Research

One criticism often leveled against the R&D credit is that it simply rewards companies for what they would have done anyway.[3] And the fact that some very early studies of the credit found its effect to be modest reinforced that belief. However, many of these studies suffered from serious methodological limitations.[4] In contrast, almost all scholarly studies conducted since the early 1990s, including newer analyses conducted in the last five years, have found that the credit is an effective tool and that at minimum it produces at least one dollar of research for every tax dollar forgone. The former Congressional Office of Technology Assessment concluded that, "for every dollar lost in tax revenue, the R&D tax credit produces a dollar increase in reported R&D spending, on the margin."[5] Bloom, Griffith and Van Reenen found that in the long run the credit stimulates $1.10 of research for every dollar of lost tax revenue. Other studies have found even greater benefits, with the research investment to tax-cost ratio Between 1.3 and 2.9.[6] For example, Hall examined the credit from 1981 to 1991 (when it was more generous) and found that approximately two dollars in research were generated for every one dollar in tax expenditure.[7] Klassen, Pittman and Reed found that the R&D tax credit induces $2.96 of additional R&D investment for every dollar of taxes foregone. [8]

Until recently most studies have focused on the U.S. credit. However, a number of studies have examined the effect of other nations' tax incentives for R&D and found similar results. A study of the Australian R&D tax incentives found that it produced about one dollar of R&D for every dollar of tax expenditure.[9] A study of the French credit found an even larger impact, with the credit producing an increase in research of 3 to 4 times the budgetary cost.[10]

The Canadian tax credit – one of the most generous in the world – generates between 98 cents and $1.38 in additional R&D for every dollar of credit, according to three separate studies.[11] Another study found that not only did the credit stimulate R&D but also had a "positive impact" on sales and the number of product innovations. The authors examined Canadian innovations that were the first to emerge anywhere in the world – and found that the R&D credit was responsible for doubling the number of these innovations by Canadian companies, in turn making them more competitive.[12]

Box 1: How the R&D Tax Credit Works

Firms can take one of two types of credit for qualified research expenses made in the Untied States. The first is a credit on the incremental increases in research. A taxpayer's current-year "qualified research expenses" in excess of a specified base amount are eligible for a 20 percent tax credit. For firms in existence then, the base amount is a ratio of R&D expenses relative to sales for the years 1984 to 1988

Some firms do not qualify for the credit because their R&D to sales ratio is lower now than in the base period. This is the case for many firms that have merged with less R&D-intensive firms, grown rapidly in sales, faced defense spending cuts, or had either low sales or very high spikes in R&D spending during the base period. To support R&D investments at these kinds of firms, Congress created the Alternative Incremental Credit in 1996. Under the AIC, firms that cannot qualify for the regular credit can take a credit of between 1.65 percent and 2.75 percent of qualified research expenses in excess of 1% of a company's average annual gross receipts.

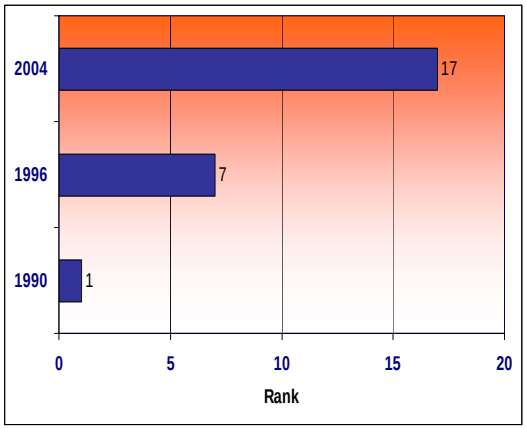
Several recent studies have looked at the effect of tax incentives for research across a number of nations. In examining R&D tax incentives in 17 OECD nations, Guellec and van Pottelsberghe found that incentives effectively stimulated business R&D.[13] Likewise, Falk concluded that R&D tax incentives "have a strong and significant positive impact on R&D intensity."[14] In particular, he found that every dollar of R&D tax expenditure stimulates at least 90 cents in additional business R&D.[15] Another cross-national study by Reinthaler and Wolff determined that R&D tax subsidies stimulate at least one dollar of R&D for every dollar of tax expenditure.[16] Likewise, in a study of nine OECD nations, Bloom, Griffith and Van Reenen found that every dollar of R&D tax expenditure stimulates approximately one dollar of business R&D. It is interesting to note that they also found that among the three countries to make significant changes in their credits (Australia, Canada and Spain), increases in the credit led to increases in private R&D while decreases had the opposite effect.

The R&D Credit Makes the U.S. Economy More Competitive For Innovation-Based Activities

Until recently most scholarly analysis of tax incentives for research measured their impact on the overall amount companies invested in research. On this point, as discussed above, the scholarly research is clear: the credit effectively stimulates business investments in research. Recently, however, scholars have begun to examine the effectiveness of the credit not just in stimulating more R&D but also in attracting and retaining potentially mobile research investments within the taxing jurisdiction.

Until recently corporate R&D was generally not very mobile, certainly not in comparison to manufacturing. But in a "flat world" companies can increasingly locate R&D

Figure 1: U.S. Rank in Tax Generosity of R&D Among OECD Nations



activities anywhere skilled researchers are located. A recent study of California high-tech firms found that research was the activity most likely to be offshored, with 60 percent of firms reporting that they had offshored R&D compared to just 22 percent that had offshored back office work.[18] While there were several motivations for firms to offshore R&D, for many firms cost reduction was the most important driver.

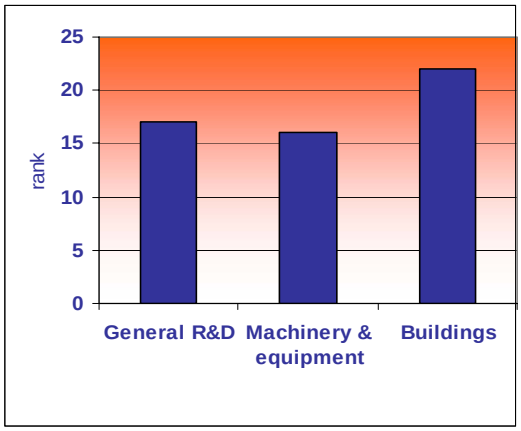
This is not just a California phenomenon. Booz Allen Hamilton found that in the last decade the share of U.S. company R&D sites in the United States declined from 59 percent to 52 percent, while the share in China and India increased from 8 to 18 percent.[19] They also found that when it comes to moving R&D to developing nations, access to a "low cost skills base" is a key driver for establishing new R&D sites. Internationally, UNCTAD reports that of 1,773 new R&D projects set up between 2002 and 2004, 953 were from companies in developed countries establishing projects in developing nations, with 70 percent of those in China and India.[20]

Not only may companies cut costs by investing R&D resources in nations with lower wage skilled researchers, they can also save money by investing R&D

resources in nations that provide more generous R&D financial incentives. In the past decade an increasing number of nations have discovered the advantages of a more technologically intensive economy and have put in place policies to grow and attract internationally mobile corporate R&D investment. Of 27 OECD nations examined, 70 percent had R&D tax incentives in place in 2005, up from 50 percent in 1996.[21]

Many nations are also providing significantly more generous tax incentives for research than the United States. In the late 1980s and early 1990s, the United States provided the most generous tax treatment of R&D in the world.[22] By 1996, we had fallen to seventh most generous, behind Spain, Australia, Canada, Denmark, the Netherlands, and France.[23] By 2003, we had fallen to 17th in generosity for general R&D; 16th for machinery and equipment used for research; and 22nd for buildings used for research.[24] (see Figs. 1 and 2) In fact, among nations with a tax incentive for R&D, the United States now provides one of the weakest incentives, below our neighbors Canada and Mexico, and behind many Asian and European nations. (see Figure 3) It's ironic that at a time of increased concern about America's growing competitiveness challenge, our credit is getting weaker, both in absolute terms and relative to other nations. The United States tumbled from 1st to 17th partly because changes made by Congress to the credit over the years have diminished its generosity.[25] This is one reason why changes to the credit being proposed by Congress, particularly the addition of the alternative simplified credit, are so important.

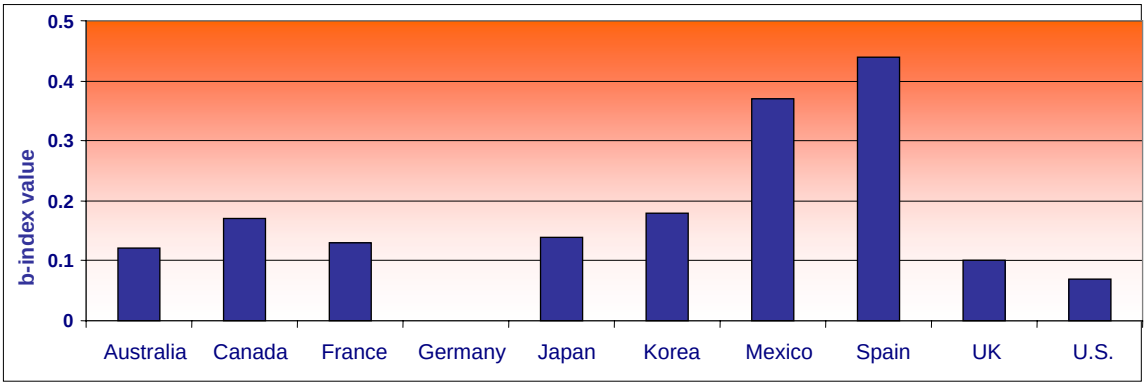
Figure 2: R&D Tax Generosity: U.S. Rank Among 27 OECD Nations



Moreover, in the last decade, all other nations with R&D tax incentives (with the exception of Canada) have boosted the generosity of their R&D tax incentives, particularly since 2000.[26] As a result, U.S. companies can receive significantly more generous tax incentives if they invest in R&D in these other nations.

One reason why the credit in the United States is so limited compared to many other nations is that the U.S. provides a relatively modest credit of 20 percent only on increases in R&D (as a share of sales). In contrast, many other countries provide either higher rates or credits on all increases, not just increases in R&D investments (or both). Companies conducting research in Spain, for example, receive a flat credit of 30 percent on all R&D conducted, plus an additional 30 percent for increases in R&D. France, which many pundits deride as a socialist basket case, has acted with resolve, adopting in 2004 a credit essentially equivalent to a 45 percent incremental R&D tax credit, plus a 5 percent credit on non-incremental expenditures. The UK and Australia provide the equivalent of a 7.5 percent flat credit on R&D, meaning that their effective credit is almost twice as generous as that of the United States. With a flat credit of at least 8 percent on all R&D investments, Japan's R&D tax incentives are more than twice as generous as ours.[27] Singapore allows a double deduction for R&D expenses.[28]

Figure 3: Tax Subsidy Generosity for R&D by Large Firms in Selected OECD Nations[29]



In explicit bids to attract U.S. multi-national R&D investments, our neighbors to the north and south have put in place extremely generous R&D tax incentives. Mexico offers a tax credit of 30 percent not only for all R&D expenses but also for equipment (which is not eligible for the credit in the United States). In Canada large companies are eligible for a flat 20 percent credit (with 35 percent on the first million dollars invested) while small firms can receive a 35 percent credit. A number of Canadian provinces provide equally generous credits on top of the federal credit. As a result, the tax treatment of R&D expenditures for small firms in Canada is more than $4^{1/2}$ times more generous than in the United States. A U.S. firm investing in R&D in Ontario receives a tax credit of 49 cents for every dollar of R&D it invests in, compared to around 6 cents in the United States.[30]

Among nations with a tax incentive for R&D, the U.S. now provides one of the weakest incentives, below our neighbors Canada and Mexico, and behind many European and Asian nations.

Even lower-wage nations are building on that advantage by providing R&D tax incentives. On top of salaries for R&D personnel that are as low as $1/6^{th}$ of the costs in the United States, China provides a 150 percent deduction on R&D expenses (provided that R&D spending increased 10 percent over the prior year). India provides a tax deduction of 125 percent of certain R&D expenses.[31]

Many foreign nations have boosted their tax support for R&D in order to be more attractive to multinational R&D investment. When the UK recently boosted its R&D tax incentive, the government argued that, "The R&D tax credit is an additional attraction for multinational investment. The credit encourages multinational corporations to get more of their R&D input from the UK, both by helping to retain and grow existing multinational R&D investment and by attracting new multinationals to the UK."[32]

Many nations aggressively market their R&D tax policies to attract global research investments. Australia touts its generous R&D tax incentives in order to persuade multinational companies to invest in Australia.[33] Ireland places ads in U.S. business magazines to market its attractiveness as a location for R&D facilities.[34] Canada markets its generous credit by comparing it to the United States, highlighting that their credit is significantly more generous and is permanent.[35] The Canadian government even offers firms the services of account executives, in order to "help make sure you get maximum benefits from the tax incentives available."[36]

While the scholarly evidence regarding the effect of the credit on the location (as opposed to amount) of R&D is limited, there

is some evidence that R&D tax incentives affect where companies perform R&D. A recent study of the California R&D tax credit found that it stimulated considerably more R&D than was usually thought, in part because it may have not only induced firms in California to perform more R&D, but because it also induced firms outside California to relocate R&D there.[37] San Francisco Federal Reserve Bank economist David Wilson found that state R&D tax credits stimulate a relocation of R&D from states with less generous credits to states with more generous ones.[38]

Internationally, Billings found that the growth rate of R&D of U.S. foreign affiliates was higher in countries with tax-based R&D incentives than without.[39] Given the relative generosity of our foreign competitors' tax treatment of R&D, it's perhaps not surprising that between 1998 and 2003 investment in R&D by U.S. majority-owned affiliates increased twice as fast overseas as it did at home (52 percent vs. 26 percent).[40] In contrast, corporate R&D spending in the United States as a share of GDP has fallen every year between 2000 and 2003, from 1.84 percent to 1.67 percent.[41] Moreover, as a share of GDP, corporate-funded R&D fell in the United States by 7 percent from 1999 to 2003, while in Europe it grew 3 percent and in Japan 9 percent.[42] While a number of factors have contributed to these differential R&D growth rates, the more generous R&D tax incentives in Europe and Japan are likely one factor.

Conclusion

Growth in today's knowledge-driven global economy is increasingly powered by innovation born of investments in research. Moreover, in a world where many other nations have woken up to the economic advantages gained by a more technology-intensive economy (e.g. higher wages, higher productivity, and better products and services), the competition for R&D has never been more intense. It is in this new environment that the R&D tax credit plays a key role and why it is so critical that Congress extends and expands it.

Endnotes

1. Bronwyn Hall and John van Reenen, "How Effective Are Fiscal Incentives for R&D? A Review of the Evidence," *Research Policy 29 (*2000): 449-469

2. Jacek Warda, "Tax Treatment of Investment in Intellectual Assets: An International Comparison," *OECD Science, Technology and Industry Working Papers 4* (Paris: OECD, 2006).

3. While not a causal relationship, it is indicative to note that in the 21 years before the credit (1960-1981) was put in place, industrial R&D expenditures in the United States as a share of GDP grew at a rate of 1.38 per year, but after the credit was in effect in 1982, the rate of growth almost doubled to 2.46 per year. (source: National Science Foundation, *Science and Engineering Indicators, 2006*).

4. Hall and van Reenen, op. cit. p. 462.

5. Bronwyn Hall, "The Effectiveness of Research and Experimental Tax Credits: Critical Literature Review and Research Design," (Washington, DC: U.S. Congress, Office of Technology Assessment, 1995).

6. Coopers and Lybrand, "Economic Benefits of the R&D Tax Credit," (1998). Bailey and Lawrence also found that one dollar of foregone tax revenue stimulated $2 in R&D. Martin N. Bailey and Robert Z.

Lawrence, "Tax Incentives for R&D: What Do the Data Tell Us?" (Washington, DC: Council on Research and Technology, 1992).

7. Bronwyn Hall, "R&D Tax Policy During the Eighties: Success or Failure?" *NBER Working Paper*, No. 4240, Cambridge, MA, 1992.

8. Kenneth Klassen, Jeffrey Pittman, and Margaret Reed, "A Cross-national Comparison of R&D Expenditure Decisions: Tax Incentives and Financial Constraints," Contemporary Accounting Research, Vol 21, no. 3 (Fall 2004): 639-80.

9. Australian Bureau of Industry Economics, cited in Hall and van Reenen, p. 466.

10. Benoit Mulkay and Jacques Mairesse, "The Effect of the R&D Tax Credit in France," *EEA-ESEM Conference*, Stockholm, Sweden, 2003, <www.eea.esem.com/eeaesem/2003/prog/viewpaper.asp?pid=2250>

11. Marcel Dagenais, Pierre Mohnen and Pierre Therrien, "Do Canadian Firms Respond to Fiscal Incentives to Research and Development?" *CIRANO Working Papers* 97s-34 (1997). Department of Finance Canada, "The Federal System of Income Tax Incentives for Scientific Research and Experimental Development," (Ottawa, Ontario: Department of Finance, 1997).

12. Dirk Czarnitzki, Petr Hanel and Julio Miguel Rosa, "Evaluating the Impact of R&D Tax Credits on Innovation: A Microeconomic Study of Canadian Firms," "Montreal, Quebec: CIRST, 2005): 21. Klassen, Pittman, and Reed (op. cit) found that the Canadian credit generated an additional $1.30 in R&D investment for every foregone dollar of tax revenue.

13. Dominique Guellec and Bruno van Pottelsberghe de la Potterie, "The Impact of Public R&D Expenditures on Business R&D," *Economics of Innovation and New Technology* 12-3 (2003): 225-243.

14. Martin Falk, "What Drives Business R&D Intensity Across OECD Nations?" paper presented at the DRUID 10th Anniversary Summer Conference 2005, (Copenhagen, Denmark): 15.

15. One reason that figure is lower than the estimates usually found in studies focusing on the U.S. R&D credit is that it looks at nations with both incremental and flat credits, and flat credits tend to have a less stimulative effect on R&D than incremental ones for each tax dollar invested.

16. Reinthaler Volker and Guntram B. Wolff, "The Effectiveness of Subsidies Revisited: Accounting for Wage and Employment Effects in Business R&D, *ZEI Working Paper Series* (2004).

17. Nick Bloom, Rachel Griffith, and John van Reenen, "Do R&D Tax Credits Work? Evidence from a Panel of Countries, 1979-1997," *Journal of Public Economics* 85 (2002): 1-31.

18. Ashok D. Bardhan and Dwight M. Jaffee, "Innovation, R&D and Offshoring," (Berkeley, CA: Fisher Center for Real Estate & Urban Economics, 2005), and personal communication from the author.

19. Booz Allen Hamilton and INSEAD, "Innovation: Is Global the Way Forward?" (2006): 3.

20. United Nations Conference on Trade and Development, *World Investment Report 2005: Transnational Corporations and the Internationalization or R&D* (New York: UNCTAD, 2006).

21. Jacek Warda, op. cit., p. 15.

22. Hall and van Reenen, op. cit.

23. Dominique Guellec and Bruno van Pottelsberghe de la Potterie, "Does Government Support Stimulate Private R&D?" *OECD Economic Studies* 29 (1997).

24. It would be one thing if our tax treatment of R&D became less generous but direct government support increased. In fact, government support declined significantly over this period and as a result, the United States was one of the few nations where the share of R&D to GDP ratio fell between 1991 and 2002.

25. In 1985 the rate was reduced from 25 to 20 percent, and other restrictions (such as the 50 percent rule and the recapture of benefits through reductions in expensing) were put in place in the late 1980s.

26. Martin Falk, "What Drives Business &D Intensity Across OECD Countries?" *Paper Presented at the DRUID 10th Anniversary Summer Conference, Copenhagen, Denmark, 27-29 June 2005.*

27. Jacek Warda, op. cit.

28. Anthony B. Billings, "Are U.S. Tax Incentives for Corporate R&D Likely to Motivate American Firms to Perform Research Abroad?" *Tax Executive*, 7/1/2003.

29. Jacek Warda, op. cit.

30. Dirk Czarnitzki, Petr Hanel and Julio Miguel Rosa, op. cit.

31. Billings, op. cit.

32. HM Treasury "Supporting Growth in Innovation: Enhancing the R&D Tax Credit," (London, England: HMSO:2005: 14, <www.hmrc.gov.uk/consult_new/rd-taxcredit.pdf>.

33. Australian Government Department of Foreign Affairs and Trade, "Australia Now: Investing in Australia," <www.dfat.gov.au/facts/investing_in_australia.html>.

34. *Business Week*, August 28, 2004.

35, Manitoba Industry, Economic Development and Mines, "Advantages of Canada's R&D Tax Incentives," <www.gov.mb.ca/iedm/invest/busfacts/r_d/adv_tax.html>.

36. Canada Revenue Agency, "SR&ED Program: Services We Offer," <www.cra-arc.gc.ca/taxcredit/sred/services-e.html>.

37. Lolita Paff, "State-Level R&D Tax Credits: A Firm-Level Analysis," *Topics in Economic Analysis and Policy* 5 (2005).

38. Daniel J. Wilson, "Beggar Thy Neighbor? The In-State, Out-of-State, and Aggregate Effects of R&D Tax Credits," *FRBSF Working Paper Series* (Federal Reserve Bank of San Francisco, April 2006).

39. Billings, op. cit.

40. Majority-owned foreign affiliates (MOFA), which are foreign business enterprises that are owned at least 50% by U.S. parent(s).

41. However, this is not unprecedented. Corporate R&D fell in the recession of the early 1990s and took five years to regain its peak. (Source: National Science Foundation. *Science and Engineering and Indicators* 2006.)

42. *OECD STI Scoreboard 2005* (Paris: OECD 2005.)

About the Author:

Dr. Robert D. Atkinson is President of the Information Technology and Innovation Foundation. As former director of the Progressive Policy Institute's Technology and New Economy Project, executive director of the Rhode Island Economic Policy Council and project director of the Congressional Office of Technology Assessment, he has conducted groundbreaking technology research, advised policy makers, and written and spoken extensively on tech issues. He is the author of *The Past and Future of America's Economy: Long Waves of Innovation that Power Cycles of Growth* (Edward Elgar: 2005).

About the Information Technology and Innovation Foundation

The Information Technology and Innovation Foundation (ITIF) is a nonprofit non-partisan public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington and in the states. Through its research, policies proposals, and commentary, ITIF is working to advance and support public policies that boost innovation, e-transformation and productivity.

For more information contact ITIF at 202-626-5732 or at mail@itif.org, or go online to www.innovationpolicy.org

ITIF • 1250 I St. N.W. • Suite 200 • Washington, DC 20005