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Create Jobs by Expanding the R&D Tax Credit

BY ROBERT D. ATKINSON | JANUARY 26, 2010

With the unemployment rate around 10 percent, job creation tops the policy agenda in Washington. One of the best ways to spur job creation is to expand the federal R&D tax credit to encourage more research and development.[1] ITIF estimates that expanding the Alternative Simplified Credit (ASC) from 14 percent to 20 percent would spur the creation of 162,000 jobs in the short run and an additional, but unspecified, number of jobs in the longer run. The advantage of including an increase in the credit in any jobs package passed by Congress is that it would not only give a quick shot in the arm to job creation, but it would also boost innovation and U.S. economic competiveness, thus laying the groundwork for longer-term prosperity. ITIF estimates that this expansion of the credit would lead to an increase in annual GDP by $66 billion, an increase in the number of patents issued to American inventors by 3,850, and by year 15 produces net revenue gains for the Federal treasury. Other nations have taken similar steps during the current downturn. For example, the Dutch government increased its R&D tax credit by 33 percent for fiscal years 2009 and 2010. It is time for the United States to do the same.

THE UNITED STATES LAGS OTHER NATIONS IN R&D TAX INCENTIVES

The United States was one of the first countries to realize the importance of spurring R&D through the tax code, putting in place the R&D credit in 1981. As a result, throughout the 1980s the United States had the most generous R&D tax incentive in the world, and there is a broad consensus among academic economists that the credit was and is an effective tool to spur more private sector research.[2] However, other nations soon learned from the United States' success with the credit and began to not just copy us, but go beyond us. As a result, by 1996 the United States had fallen to seventh in R&D tax generosity among the 30 OECD nations, behind Spain, Australia, Canada, Denmark, the Netherlands, and France. And the slide has continued. By 2004 we had fallen ten more spots to 17th. Even the recent expansion of the credit by Congress with the creation of the ASC merely allowed the United States to hold its position–in 2008 the United States continued to be ranked 17th overall (and 19th for R&D tax generosity towards small businesses) amongst OECD nations.[3] (see Figure 1)

One reason why the United States has fallen behind is that in the last decade every country that has an R&D tax incentive has increased the generosity of those incentives. For example, France recently put in place an extremely generous credit in an attempt to attract more global R&D investment. Using the ASC as the base (the ASC provides a 14 percent credit on R&D expenditures in excess of 50 percent of base period expenditures), the United States would have to increase the ASC to 20 percent to move to 10th place, 31 percent to move to 5th place, and 47 percent to be the most generous of the OECD nations.[4] The bottom-line concern is that as the other nations have strengthened fiscal and other incentives for their domestic industries to invest in R&D, the R&D intensity of the United States—once the highest—has been steadily slipping to it's current 8th position.

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.

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TABLE 1: Economic Estimated Effects of Increasing the Alternative Simplified Tax Credit From 14% to 20%

Employment	162,000 additional direct, indirect and induced jobs created or retained
Patents	3,850 U.S. utility patents filed
Productivity	0.64 percent increase in annual productivity
GDP	$66 billion increase in annual economic output
Federal Tax Revenues	Tax revenues exceed costs after 15 years

SPURRING PRIVATE SECTOR RESEARCH WILL CREATE NEEDED JOBS

Recessions negatively impact corporate R&D and research employment. During the last two decades economic downturns have impacted public and private organizations conducting research. After the last two downturns (1990-91 and 2001) total investment in R&D fell by over 2 percent, with industry funding declining even more. And the current recession will likely see even more significant declines. Not surprisingly these declines in research funding lead to job losses for researchers and others employed in related fields. In the 1991-92 recession, unemployment of scientists and engineers went up significantly. For example, the unemployment rate for electrical engineers tripled, while the rate for computer scientists more than doubled. In the recession of 2001-02 the unemployment rate for electrical engineers increased to more than 5 times its rate of the late 1990s, while the unemployment rate for computer scientists increased by 3 times.[5] And while normally the increased unemployment rate for researchers in a recession is still lower than the overall unemployment rate, in the last recession this was not true for electrical engineers. This suggests that efforts to increase research spending, even on a temporary basis, can reduce the number of researchers who become unemployed, and even spur hiring of additional researchers and research-related employees (e.g., technicians), leading to faster overall national recovery.

METHODOLOGY FOR ESTIMATING JOB CREATION

The first step in estimating job creation from an increase in the R&D credit is to estimate expected impact on private sector R&D investment. To do that it is first necessary to estimate how much the increase in the credit would cost the federal government. It is not clear exactly how much an increase in the Alternative Simplified Credit from 14 percent to 20 percent would cost in forgone tax revenues. However, the likely ceiling would be around $8 billion dollars annually. This is based on an estimate of corporate R&D investments of around $270 billion. The ASC credit would apply to half of this (50 percent of the base) which is $135 billion. However, not all firms eligible for the credit take the ASC (some still take the regular incremental credit).[6] Moreover, not all firms can take all or part of the credit because of lack of taxable income or restrictions because of the AMT. As a result, we estimate that the credit would provide $6 billion in tax credits to companies for research performed in the United States. (It is important to note that the credit only applies on research performed in the United States.)

The next step is to estimate how much private sector research is likely to be spurred by this amount of credit. There have been a wide range of economic studies by independent academic economists on the effect of R&D tax incentives on private sector research. The estimates, while all above 1, vary considerably. Bloom, Griffith and Van Reenen found that the credit stimulates $1.10 of research for every dollar of lost tax revenue.[7] Other studies have found even greater benefits, estimating the research investment to tax-cost ratio to be between 1.3 and 2.9. For example, Hall examined the credit from 1981 to 1991 and found that approximately two dollars in research were generated for every one dollar in tax expenditure. 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. Because of the variation in the range of estimates, for the purpose of this analysis, we chose a relatively low estimate, that a dollar of taxes foregone through the R&D credit, spurs an additional $1.25 in research expenditures. This suggests that increasing the ASC from 14 percent to 20 percent would spur an additional $7.5 billion in private sector research in the United States.

The next step is to estimate the number of jobs created (or retained) by an additional $7.5 billion in private sector research. To do this, the analysis measures the creation of direct, indirect, and induced jobs. Direct jobs are those created specifically by new spending, such as hiring new researchers or buying research materials. Indirect jobs are those created to supply the materials and other inputs to production, such as the manufacturers of components to scientific equipment. Induced jobs are those created by newly employed (or retained) workers spending their paychecks, thus creating jobs in establishments such as restaurants and retail stores.

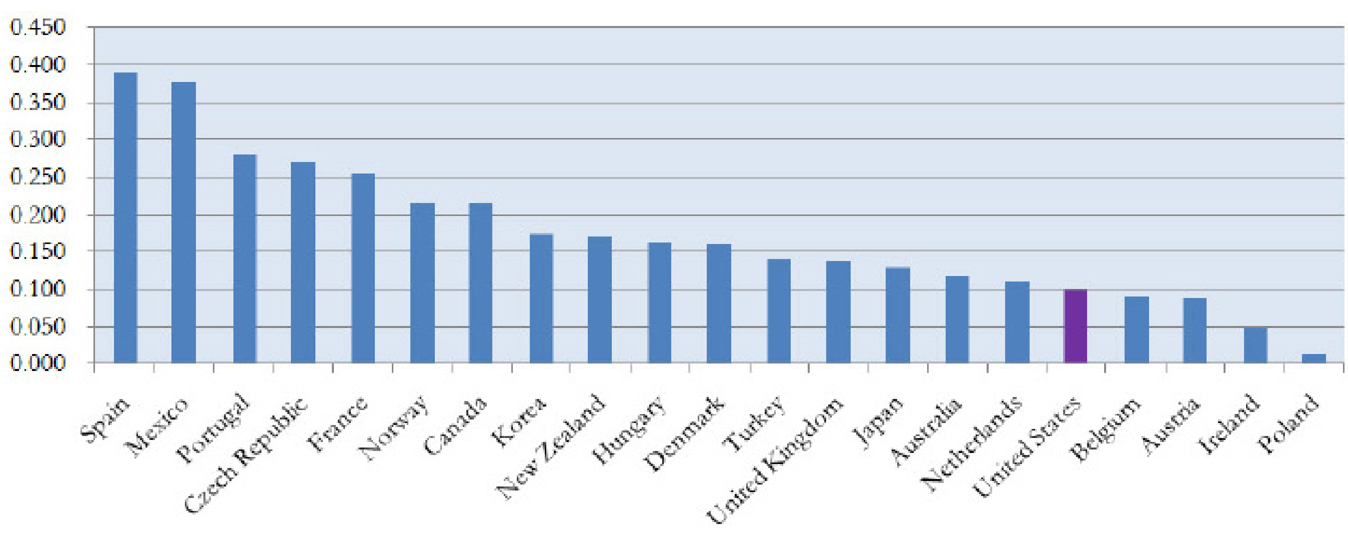
ITIF calculates the projected employment numbers based on RIMS II final-demand employment multipliers provided by the U.S. Department of Commerce's Bureau of Economic Analysis. The employment multipliers provide an estimate of the national impact on jobs of increasing final-demand in various industries. Because there is no explicit multiplier just for research services, we use aggregate industry RIMS II Type I (exogenous) final-demand multipliers for scientific research and development services and computer and electronic product manufacturing. We assume no significant direct loss to imports for spending on research since workers are hired in the United States. Based on these multipliers, we estimate that the expanded ASC would lead to an additional 73,000 direct and indirect jobs being created or retained and 89,000 induced jobs being created or retained, for a total of 162,000 jobs being created or retained.

Many of the direct and indirect jobs would be created in scientific fields that employ high-skilled high-wage workers. The mean annual salary of life, physical and social science occupations is $62,020, with researchers working in the physical sciences earning significantly more, such as physicists ($99,000) and biochemists and biophysicists (85,290).[8] Research jobs are not limited, however, to only those with advanced degrees: science technicians (in the physical sciences) earn on average $53,000 annually. These workers operate and maintain much of the laboratory equipment and conduct much of the research. These jobs typically only require a bachelor's degree, an associate degree or completion of a two-year training program.[9] Jobs in the industries providing research equipment range from production jobs involved in making and assembling the equipment to back office jobs such as accounting, marketing and sales.

METHODOLOGY FOR ESTIMATING OTHER ECONOMIC EFFECTS

Besides being an effective tool to create jobs in the short run, increasing the R&D tax credit will also increase jobs in the moderate run. However, because we are not aware of any economic models measuring the impact of R&D on jobs outside the R&D enterprise itself, we do not estimate the additional job creation. However, to the extent additional R&D spurs the development of new products that are in turn produced in the United States, additional jobs will be created. And despite what some skeptics claim about the link between R&D and domestic production being weak, clearly with the United States producing $1.64 trillion in manufacturing output annually, increased R&D will lead to additional goods and services output in the United States, and the jobs associated with that output.[10]

Figure 1: R&D Tax Generosity in OECD Nations



Increased R&D will also lead in the moderate term to more innovation, productivity, GDP growth and federal tax revenues. Estimates of the impact of research on productivity vary. R&D boosts innovation, leading to a new products and services. Cincer estimates that a 10 percent increase in corporate R&D leads to a 6 percent increase in patents.[11] This suggests that increasing the ASC to 20 percent would lead to an additional 3,850 U.S. utility patents being filed.[12]

R&D also boosts productivity. Both Grilliches and Kortum estimate that a 1 percent increase in the stock of research will boost productivity 0.3 percent.[13] Coe and Helpman estimate that for every 1 percent increase in the stock of research that productivity increases 0.23 percent.[14] In this analysis we use the lower number of 0.23 percent. As discussed above, increasing the ASC from 14 percent to 20 percent will spur an estimated $7.5 billion in additional R&D investment. This is equivalent to a 0.23 percent increase in the stock of U.S. corporate R&D.[15] We estimate this will lead to a 0.054 percent increase in annual productivity.[16] With annual GDP at approximately $14.4 trillion, this equates to a $6.9 billion increase in economic output in the second year, but because of compound growth in GDP, by year 15 the impact is $66 billion per year.[17] Moreover, the cumulative additional tax revenues increase slowly from $1.2 billion per year in year 2 to $91 billion in year 15.[18] This increase is expected to break even in year 15 in terms of R&D tax expenditures losses to the Treasury and tax gains from increased GDP. In other words, after 15 years, in real net present value terms the credit breaks even for the federal government in year 15 and produces net revenue gains each year after that. As such, increasing the R&D tax credit not only spurs economic growth, but ultimately creates more revenues for the federal government than it costs. One of the reasons why R&D generates larger economic returns than it costs is because, as numerous studies have shown, the social rate of return for R&D is much higher than the private rate of return.[19] Most important, because various market imperfections cause the expected private rate of return from in R&D to be below the corporate hurdle rate, underinvestment is a systematic problem requiring an effective public policy response.

One issue to consider is that of timeliness of effects. There are no studies that we are aware of estimating the time impacts of these effects. However, it is possible to roughly estimate when these benefits will occur. One major benefit of an increase to the R&D credit, especially in comparison to direct government spending, is that the effect is felt much sooner. Essentially, once an increase in the credit is enacted into law, companies should fairly quickly (within a matter of weeks) adjust their investment behavior to respond, and begin to hire additional staff (or cancel planned layoffs). This is in part because most companies that currently take the credit have a fairly large backlog of research projects they are working on and challenges they are seeking to solve. The limiting factor for most companies is a financial one – which an expanded credit helps reduce – in terms of either being able to allocate the financial resources or justifying them on an ROI basis. While the R&D and jobs impacts of a change in the credit could be expected to occur fairly quickly, most of the productivity, innovation, and GDP impacts (and by extension, the tax revenue impacts) will take longer to be realized. This is in part because research efforts take some time before they show results in the form of new products (or processes). However, the fact that the overall process from research to commercialization has generally gotten shorter over the last two decades, suggests that these macroeconomic impacts would begin to be felt in a matter of a few years.

One final question is if expanding the R&D credit leads to even more federal revenues, wouldn't it make sense to expand the credit even more. The short answer is yes. Because as numerous academic studies have shown that companies under-invest in research relative to what is societally optimal, more research funding would in fact be a good societal investment of scarce resources. However, this does not mean that there is no limit to this bounty. Clearly at some point diminishing marginal returns set in and more money on research would not produce a positive rate of return to society. But it is fairly clear that we are long way from that point, and that considerable increases in the R&D credit would continue to produce very positive societal returns.

CONCLUSION

The research and experimentation tax credit has been shown to be effective at spurring research, and research has been shown to be a key to boosting economic growth. Increasing the R&D tax credit will spur companies to perform more R&D in the United

States, reducing layoffs of scientific and technical personnel, and in many cases enabling companies to expand research employment. In addition, by maintaining or expanding research investments, companies will be better positioned to innovate and compete successfully in international markets.

ENDNOTES

1. The official name of the credit is the Research and Experimentation Tax Credit, but because many people refer to it as the R&D tax credit, that name is used here.

2. Robert D. Atkinson, "The Research and Experimentation Tax Credit: A Critical Policy Tool for Boosting Research and Enhancing U.S. Economic Competitiveness," Information Technology and Innovation Foundation, Washington, D.C., September 2006, http://www.itif.org/files/R&DTaxCredit.pdf.

3. Robert D. Atkinson and Scott M. Andes, "U.S. Continues to Tread Water in Global R&D Tax Incentive," Information Technology and Innovation Foundation, Washington, D.C., August 2009, http://www.itif.org/files/WM-2009-03-rd.pdf.

4. Ibid.

5. Ron Hira, "Offshore Outsourcing & Off-shoring of Technology Jobs: Impacts & Policy Dialogue," Presentation to AAAS S&T Policy Forum, April 23, 2004, http://www.aaas.org/spp/rd/hira404.pdf.

6. The GAO found that if firms had access to the regular credit before it was introduced in 2006 that around 56 percent to 60 percent of the revenue cost of firms would go to the ASC. United States Government Accountability Office. *Tax Policy: The Research Tax Credit's Design and Administration Can Be Improved*. Report to the Committee on Finance, U.S. Senate, Washington, D.C., November 2009, http://www.gao.gov/new.items/d10136.pdf.

7. Atkinson, "The Research and Experimentation Tax Credit."

8. U.S. Bureau of Labor Statistics. *May 2007 National Occupational Employment and Wage Estimates*, September 23, 2008, http://www.bls.gov/oes/current/oes_nat.htm.

9. U.S. Bureau of Labor Statistics. *Science Technicians*, December 18, 2007, http://www.bls.gov/oco/ocos115.htm.

10. Bureau of Economic Analysis, *Gross Domestic Product by Industry Data*, U.S. Department of Commerce, 2008, http://www.bea.gov/industry/gdpbyind_data.htm.

11. Michele Cincer, "Patents, R&D, and Technological Spillovers at the Firm Level: Some Evidence from Econometric Count Models for Panel Data," *Journal of Applied Econometrics*, 12, no. 3 (1997): 265-280.

12. There were 232,000 patent applications by inventors in the United States in 2008. National Science Board. *Science and Engineering Indicators 2010*. Arlington, VA, 2010, 6-47, http://www.nsf.gov/statistics/seind10/pdf/c06.pdf. Since R&D is expected to increase 2.78 percent, patents are expected to increases 1.67 percent.

13. Samuel S. Kortum, "Research, Patenting, and Technological Change," *Econometrica*, 65, no. 6 (1997): 1389-1419, http://www.jstor.org/pss/2171741; see also Zvi Griliches, "The Search for R&D spillovers," *Scandinavian Journal of Economics*, 1992, v. 94, 29-47.

14. David T. Coe and Elhanan Helpman, "International R&D Spillovers," *European Economic Review*, 39, no. 5: 859-87.

15. The R&D stock was calculated by assuming the same ratio of GDP to R&D stock today as Coe Helpman measured (4.39), yielding an R&D stock of $3.28 trillion..

16. This is calculated by multiplying 0.23 percent (the multiplier) by 0.23 percent (the increase in R&D stock).

17. This is calculated by depreciating the productivity growth impact by 0.03 percent per year, the amount Coe and Helpman assumes R&D capital stock depreciates each year, and applying a 2 percent discount rate at increased GDP in net present value terms.

18. This is based on Federal revenues amounting to 18.6 percent of GDP.

19. Kortum estimates the social rate of return from research to be 3 times higher than the private rate: Kortum, "Research, Patenting, and Technological Change," 1407. See also Jeffrey I. Bernstein and M. Ishaq Nadiri, "Product Demand, Cost of Production, Spillovers, and the Social Rate of Return to R&D," (NBER Working Paper No. 3625, 1993).

This report was revised in August 2010 to reflect the fact that the estimated increase in economic output possible by raising the R&D credit to 20 percent was lower than originally calculated. Net tax revenues to the federal government would be roughly even after 15 years, rather than in the initial few years after boosting the credit. In addition, GDP growth would be lower, but still significant ($66 billion after 15 years).