

The Information Technology and Innovation Foundation

Expanding the R&D Tax Credit to Drive Innovation, Competitiveness and Prosperity

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“If the United States is to remain the world’s preeminent location for technological innovation (and the high paying jobs that result), Congress will need to significantly expand the Research and Experimentation Tax Credit.”

The U.S. economy faces a new and formidable competitiveness challenge. Not only has the emergence of a global economy led to the creation of robust new economic competitors, but within the last decade many nations, including most of Southeast Asia and Europe, have made innovation-led economic development a centerpiece of their national economic strategies. Their aggressive use of research and development (R&D) tax incentives is just one indicator of that commitment. Unfortunately, the United States has not kept pace. While we provided the most generous tax treatment of R&D in the late 1980s among OECD nations, by 2004 we had fallen to 17th.¹

Addressing this new competitiveness challenge will require policy makers to take a host of steps, including improving education and significantly increasing funding for research.² Yet while these steps are necessary, they are not sufficient to win the competitiveness challenge. Policy needs to do more than boost the supply of innovation resources (e.g., a better trained workforce and increased basic research discoveries); it must also spur demand by companies to locate more of their innovation-based production in the United States. If the United States is to remain the world’s preeminent location for technological innovation (and the high paying jobs that result), Congress will need to significantly expand the Research and Experimentation Tax Credit.³ To do that Congress should:

- **Make the R&D tax credit permanent,**
- **Double the rate of the regular credit from 20 percent to 40 percent,**
- **Expand the Alternative Simplified Credit,**
- **Create a flat credit for collaborative R&D,**
- **Allow firms to expense in the first year expenditures on research equipment, and**
- **Exempt the credit from the corporate Alternative Minimum Tax.**

Expanding the credit would not only spur more R&D investments here at home, leading to faster economic growth and more quality-of-life enhancing innovations, it would also make the U.S. a much more competitive location for internationally-mobile R&D. In fact, if Congress enacts the reforms proposed here the United States would jump from having the 16th most generous tax treatment of R&D to approximately 6th.⁴

Expanding the R&D Credit

The R&D credit, codified in Section 41 of the Internal Revenue Service Code, is an important tool for boosting innovation and competitiveness and creating higher wage jobs. Under the regular credit a taxpayer's current-year "qualified research expenses," in excess of a specified base amount, are eligible for a 20 percent tax credit, although in practice the *effective rate* is 13 percent because the expensing of research costs is reduced by the amount of the credit taken. Under the Alternative Incremental Research Credit (AIRC) firms can instead take a much smaller credit on total amounts of research above certain base levels. Additionally, under the new Alternative Simplified Credit (ASC) companies can take a credit of 12 percent of the amount of qualified expenses that exceed 50 percent of the average qualified research expenses for the preceding 3 years.

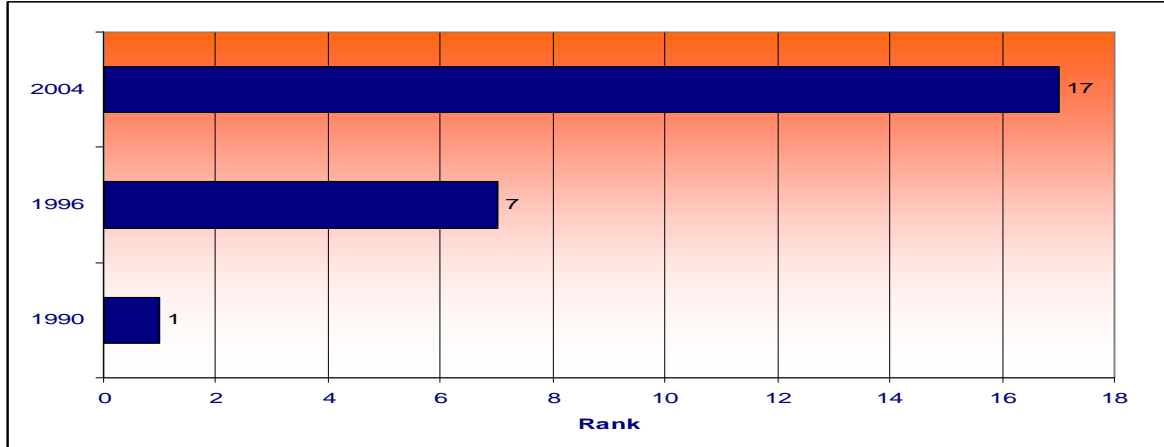
As ITIF has documented, almost all scholarly research conducted on the credit since the early 1990s has found that it is a cost-effective tool that spurs at least one dollar of private sector research investment for every tax dollar forgone.⁵ The debate over whether R&D tax incentives, including the U.S. R&D credit, are effective is largely over: they spur companies to invest in more research.

However, the credit not only spurs companies to increase R&D, it also influences the location of that 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 appears to have not only induced firms in California to perform more R&D, but also to have induced firms

outside California to relocate R&D there.⁶ Likewise the Federal Reserve Bank 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.⁷ At the international level, Bloom and Griffith found that R&D in one country responds to a change in its price in another "competitor" country.⁸ Likewise, 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.⁹

Because companies can receive the credit only for research investments made in the United States, the credit makes the United States more attractive for globally-mobile R&D investments. However, the competition is not sitting still. Many nations now provide significantly more generous tax incentives for research than does the United States. In the late 1980s the United States provided the most generous tax treatment of R&D in the world.¹⁰ By 1996, we had fallen to seventh most generous among OECD nations, behind Spain, Australia, Canada, Denmark, the Netherlands, and France.¹¹ By 2004, 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 research¹² (see Figure 1). 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 2). It's ironic that at a time of increased concern about America's growing competitiveness challenge, our credit, until just last year, had been getting weaker, both in absolute terms and relative to other nations in part because of changes made by Congress over the years that have diminished its generosity.¹³ In fact, until the passage in 2006 of the Alternative Simplified Credit the credit was about half as generous as it was in the early 1980s.¹⁴ 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 2000.¹⁵ As a result, companies can receive significantly more generous tax incentives if they invest in R&D in these other nations.

Figure 1: U.S. Rank in Tax Generosity of R&D Among OECD Nations, 2004¹⁶



For example, the UK and Australia provide the equivalent to a 7.5 percent flat credit on R&D, meaning that their effective credit is almost twice that of the United States. Japan's credit is almost three times as generous as the United States' and for small companies it's four times as generous. On top of salaries for R&D personnel that are as low as 1/6th 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). In an explicit effort to attract U.S. corporate R&D, our neighbor to the north is even more generous. In Canada large companies are eligible for a flat 20 percent credit while small firms can receive a 35 percent credit. In many provinces equally generous credits can be taken on top of the federal credit. Even France, who many pundits deride as a socialist basket case, has acted with resolve, adopting in 2004 a credit essentially equivalent to a 40 percent incremental R&D tax credit.

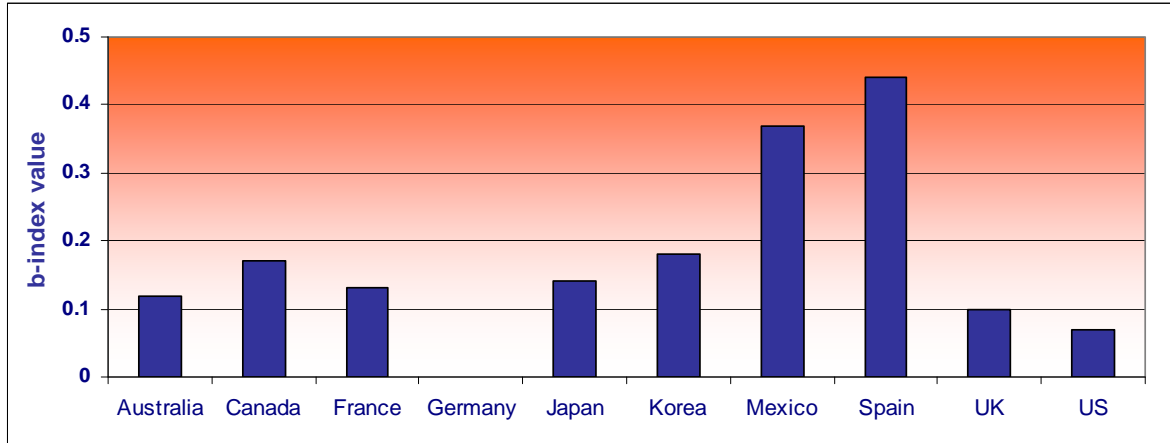
Given the relative generosity of our foreign competitors' tax treatment of R&D, it's perhaps not surprising that between 1998 and 2003 investment in R&D by U.S. majority-owned affiliates increased twice as fast overseas as it did at home (52 percent vs. 26 percent).¹⁷ In contrast, corporate R&D spending in the United States as a share of GDP fell every year between 2000 and 2003, from 1.84 percent to 1.67 percent.¹⁸ 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.¹⁹ While a number of factors have contributed to this differential in R&D growth rates, the more generous R&D tax incentives in Europe and Japan are likely one factor.

Finally, increased R&D investments don't just spur more innovation, they boost exports, in turn creating more high-paying production jobs.²⁰ This is important because increasing U.S. competitiveness and turning around the large trade deficit will require that U.S. exporting firms become more competitive.

As a result, there is a new urgency to expand the R&D tax credit. To the credit of Congress and the administration, they both have been active in that task. In 2006 Congress extended the R&D credit and added a new Alternative Simplified Credit (ASC). While this was clearly a step in the right direction, it is important to note that the addition of the ASC will only increase our rank from 17th to 15th in tax generosity for R&D (assuming that other nations did not increase their R&D incentives last year).²¹ As a result, to meet the new global competition for innovation-based activities, Congress needs to keep going and expand the credit. There are a number of different ways, however, to accomplish that, each with its own advantages and disadvantages.

Figure 2: Tax Subsidy Generosity for R&D by Large Firms in Selected OECD Nations, 2004.²²



Issues in the Optimal Design of R&D Tax Incentives

Perhaps the most important issue in the design of an R&D tax credit is whether it should be a volume credit, an incremental credit, or some mix of the two. An incremental credit defines some base level of R&D with incremental R&D defined as R&D above this base level. Most economists favor an incremental credit because it rewards only increases in research investments. However, an incremental credit has two main disadvantages. First, as discussed below, determining the appropriate base level can be difficult. That is even more difficult now that it is so easy for firms to locate R&D in a wide number of nations. In this case, all of a firm's R&D may be incremental in the sense that a firm may choose to perform the research in the United States or outside of it. Second, the compliance costs for industry and government from incremental credits can be higher. Finally, because of the complexity and lack of transparency, incremental credits can send an uncertain signal to business managers who decide on R&D levels.

If an incremental credit is used, it can be on either absolute increases in R&D investments or on increases in the ratio of R&D to some other measure, usually sales. The regular credit is based on a ratio of R&D to sales. One advantage to this approach is that it is intended to provide a credit only for increases in R&D intensity and not on increased R&D resulting from a firm simply

getting bigger. While elegant in theory, the use of a sales denominator can make the credit quite complex and in some cases, is an inaccurate measure of R&D intensity. Since many factors influence the R&D to sales ratio that may have little to do with R&D investments this approach can inaccurately target incremental increases. Firms that have grown rapidly in sales, have merged with firms that are less R&D-intensive, or for a particular reason had either low sales during the base period or very high spikes in R&D spending may find that a sales denominated qualified research base period provides an inaccurate metric to gauge incremental research increases.

Finally, if a base period is used, it's not clear if it should be fixed or rolling. A fixed base period assigns one or more years as the base and any R&D investments going forward above R&D levels in the base period are eligible for a credit. In contrast, a rolling base period is updated every year. One advantage of a fixed base period is that increases in research by a company in one year don't lead to a reduced credit the next year. For example, with a purely incremental credit, if a company's average R&D in the fixed base period was \$10 million per year and the company invests \$13 million the next year, it will receive a credit on \$3 million ($\$13 - \10). With a rolling base period, however, increases in R&D raise the base level of R&D the next year making it harder to take a credit in the future. For example, if a company invested \$13 million in R&D its base

amount would increase to \$11 million $((\$10 + \$10 + \$13)/3)$ the next year, reducing the amount of credit it would receive by one third. With a rolling base period and an incremental credit the incentive is realized at a declining rate due to base creep. And since companies cannot infinitely expand their R&D (especially as a share of sales), eventually incremental credits with a rolling base period provide limited benefits to firms. Finally, shorter rolling base periods generally provide companies with a smaller credit than longer periods, are more volatile than longer base periods since sharp increases (or decreases) can more significantly affect the average R&D, and have higher rates of base creep. Ultimately, there is a tradeoff between a rapid resetting of the base (or a shorter rolling base period) to keep the base close to current R&D expenditures and a slow re-setting of the base (or a longer rolling base period) to reduce the disincentives to raising R&D expenditures.

There are several other factors in the design of R&D tax incentives. One is whether incentives should differentiate between types of research, with more generous incentives for basic and earlier stage research. The advantage of this is that economists generally agree that earlier stage research is not only riskier but benefits of it are harder to be fully captured by the company, as they spill over into other uses. One disadvantage is that it can be very difficult to distinguish for tax purposes what intramural research is basic and what is applied. However, it is easy to distinguish between intramural and extramural research, and much extramural research, particularly at universities, is earlier stage and more risky.

Finally, there is an issue of the kind of research expenditures to which tax incentives should apply. Currently, the R&D tax credit applies to research labor and supplies, but not to research equipment. One view is that because research equipment is a capital expenditure with a value after its first year, that investments in it should not receive a credit. However, by limiting the credit to labor and supplies the current credit biases investment toward labor and against new equipment.

These factors suggest that the optimal credit is a combination of volume and incremental; on

amounts of R&D investments (rather than as a share of sales); over a moderately long rolling base period; with some incentives for research equipment as well as labor; and with more generous incentives for earlier stage collaborative research. With these in mind, this report proposes six recommendations for improving the credit.

Policy Recommendations

1) Make the Credit Permanent: R&D tax incentives in virtually all nations except the United States are permanent features of the tax code. Since its enactment in 1981, the R&D tax credit has been extended 11 times and expired twice, including in 2006.²³ The uncertainty over the credit's existence adds risk to the already risky research investments made by companies and it reduces its effectiveness. One OECD study found that the less stability and more uncertainty of the credit, the less likely it is to have a positive effect on stimulating R&D.²⁴ One reason Congress has not made the credit permanent is because the expenditures must be scored for five years, raising the budgeted cost. Yet, extending the credit each year does not lower its actual cost significantly, but it does allow the costs to be passed on to next year's budget.²⁵ As a result, **Congress should make the credit permanent.**

2) Double the regular credit's rate to 40 percent: Given that many international competitors provide significantly more generous tax treatment of research investments, it is time for Congress to increase the credit. One step is to double the rate for the regular credit from 20 percent to 40 percent. The National Academy of Sciences' *Rising Above the Gathering Storm* report made a similar recommendation which was introduced into legislation by Senators Alexander (R-TN) and Bingaman (D-NM).²⁶ **Doubling the credit would make an important statement that the United States is serious about keeping and growing research-based economic activities.**

3) Expand the Alternative Simplified Credit: Under the regular credit firms can only get an incentive if their research expenses (as a share of sales) increase each year (or are higher than they were in the base period). However, many firms do not qualify for the credit because their current

R&D-to-sales ratio is lower than their base period ratio. To provide these firms with an R&D incentive, Congress created the Alternative Incremental Research Credit (AIRC) in 1996 and expanded it in 2006 to between 3 percent and 5 percent, depending on the share of R&D to sales. While the AIRC helps firms that don't qualify for the regular credit, its minimal rate provides a small incentive at best for firms to increase research investments in the United States.²⁷

Because of these limitations, in 2006 Congress created a new Alternative Simplified Credit (ASC) that let companies receive a credit of 12 percent of the amount of qualified expenses that exceed 50 percent of the average qualified research expenses for the preceding 3 years. One advantage of limiting the credit to expenditures greater than 50 percent (instead of to all expenditures) is that it allows the credit to be larger with the same fiscal impact. However, firms must choose either the ASC or regular credit. Firms taking the ASC have less incentive to expand research (12 percent vs. 20 percent) than firms taking the regular credit, but the regular credit is relatively modest compared to many other nations' R&D tax incentives.

One solution is to combine the best features of both credits. Some nations do this, providing incentives for maintenance of effort (as the ASC does) but more generous incentives for increases in research investments (as the regular credit does). Australia allows 125 percent of expenditures to be deducted with a 175 percent deduction for expenditures that exceed the average R&D expenditures over the prior three years. Portugal and Spain offer credits of 20 and 30 percent of R&D respectively, with increases in R&D qualifying for a 50 percent credit. Hungary and Austria also provide mixed incentives.

The advantage of mixed incentives is that they reward firms for maintaining R&D effort, but also provide a larger incentive to spur firms to expand their R&D investments. To implement this model Congress should change the ASC in two ways. First, **Congress should expand the ASC by enacting a three-tier credit.** Firms would continue to receive a credit of 12 percent of the amount of qualified expenses greater than 50

percent and below or equal to 75 percent of the average qualified research expenses. For qualified expenses greater than 75 percent and below or equal to 100 percent firms would receive a credit of 20 percent and for qualified research exceeding 100 percent of the base the credit would increase to 40 percent. Second, **Congress should lengthen the ASC base period from 3 years to 5 years.** Compared to the 3 year base period, a 5 year rolling average reduces the negative feedback incentive from firms increasing R&D only to see their new base period be significantly higher.

4) Create a 40 percent flat credit for collaborative R&D: Increasingly, firms are collaborating with other firms or institutions in order to lower the costs of research and increase its effectiveness by maximizing idea flow and creativity. Indeed, a growing share of research is now conducted not only on the basis of strategic alliances and partnerships but also through ongoing networks of learning and innovation.²⁸ Moreover, participation in research consortia has a positive impact on firms' own R&D expenditures and research productivity.²⁹

Yet, most collaborative research, whether in partnership with a university, national laboratory, or industry consortium, is more basic and exploratory than research typically conducted by a single company. Moreover, the research results are often shared, often through scientific publications. As a result, firms are less able to capture the benefits of collaborative research, leading them to underinvest in such research relative to socially optimal levels.³⁰ This risk of underinvestment is particularly true as the economy has become more competitive, and a reflection of this is the fact that for the first time since the data were collected in 1953 the percentage of U.S. academic R&D supported by industry has declined in each of the last five years.³¹ 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.³²

Other countries, including Norway, Spain and the UK, provide firms more generous tax incentives for collaborative R&D. Denmark and Hungary

provide more generous tax deductions for collaborative R&D with public research institutions.³³ Japan's R&D incentive is almost twice as generous for research expenditures companies make with universities and other research institutes.³⁴

The U.S. tax code allows firms a basic research credit of 20 percent of expenses above a base period amount.³⁵ But the credit is not significantly more generous than the regular credit. Moreover, its applicability is limited because rules require that such research not have any "specific commercial objective." At minimum, Congress should delete such language from current law and allow any research expenditures at universities to qualify for the basic research credit.

But Congress should go further and provide a more generous incentive for collaborative research. As part of the Energy Policy Act of 2005, Congress created an energy research credit that allowed companies to claim a credit equal to 20 percent of the payments to qualified research consortia (of five or more firms); universities, and federal laboratories for energy research. In 2006, several bills were proposed allowing payments to all research consortia, not just energy-related ones, to be eligible for a 20 percent flat credit.³⁶ **Congress should go further and allow firms to take a flat credit of 40 percent for collaborative research conducted at universities, federal laboratories, and research consortia.**

5) Allow firms to expense in the first year expenditures on research equipment: Firms can take a credit only on the wages and salaries of employees and their direct supervisors engaged in qualified research and on the costs of materials and supplies. But investments in equipment (e.g., scientific instruments) must be depreciated (usually over five years).³⁷ Treating research equipment less generously than wages and salaries not only provides a disincentive for firms to use equipment to improve the productivity of their R&D activities, it reduces the overall generosity of the credit, making R&D more likely to be conducted offshore. Other nations provide more generous tax treatment of equipment and buildings. At least five nations allow accelerated depreciation while another five (Canada,

Denmark, Ireland, Spain and the UK) allow companies to depreciate equipment used to conduct research in the first year.³⁸ For example, Ireland provides a flat 20 percent tax credit on buildings used to house R&D facilities. Korea allows firms to depreciate buildings used for R&D in just 5 years, compared to 39 years in the United States. **As a result, Congress should allow firms to deduct in the first year their investments in R&D equipment as they can with investments in research personnel costs.**

6) Exempt the R&D credit from the Alternative Minimum Tax: Even if the credit is expanded, some firms will be unable to use it in current tax years because they face alternative minimum tax (AMT) requirements. The presence of the corporate AMT can limit the effectiveness of the R&D credit, not only because it means that some companies facing the AMT do not receive an incentive from the credit, but also because the AMT raises uncertainty about whether firms will be able to take a credit.³⁹ In 1988, 11,874 companies, representing an estimated 10 percent of corporate assets had the use of credits (including the R&D tax credit) curtailed because of the AMT.⁴⁰ While the corporate AMT may serve an overall useful goal, it is at odds with the national goal of boosting investment in research. As such, **Congress should allow firms to take the R&D tax credit even if it means that they will fall below AMT obligations.**

Common Arguments Against Expanding the R&D Tax Credit

While there are compelling reasons for expanding the R&D tax credit, some policy makers and policy analysts make a number of different arguments against doing so. These include:

1) We can't afford it: Some fiscal hawks argue that we would be better off reducing the budget deficit rather than increasing the R&D credit. But relative to the increased productivity, innovation and overall growth that a more generous R&D tax credit would bring, the benefits of modestly lower interest rates that a smaller budget deficit might bring would be minimal. This is because as the new growth economics research shows, the major driver of economic growth is innovation. Indeed,

a one percent increase in research increases productivity 0.23 percent per year.⁴¹ This is why if the U.S. economy invested the same amount on R&D as a share of GDP today as it did in 1950, productivity would be 17 to 32 percent lower.⁴² Moreover, to the extent the credit boosts innovation, productivity, and growth, it will lead to increased compensating tax revenues. Coopers and Lybrand found that the increased revenues from the credit offset 175 percent of the credit's "static" revenue loss.⁴³

2) It's corporate welfare: Some skeptics argue that the credit simply rewards firms for R&D that they do anyway. But this view is contradicted by a large amount of scholarly research that shows that R&D tax incentives effectively stimulate additional R&D.⁴⁴

3) It's big corporate welfare: Not only do some skeptics argue that the credit rewards companies for what they would already do, some claim that it mostly rewards big companies. Leaving aside the fact that effective economic policy should be neutral with regard to the issue of firm size (it's what firms do, not their size that should matter), this argument is no longer valid. It's true that in the old economy most R&D was performed by large corporations that were more able to translate that research into marketable products and services. But the rise of computers and the Internet has made it much easier for small firms to enter markets previously dominated by large firms.⁴⁵ In response, small and mid-sized firms have dramatically increased their R&D investments. In fact, virtually all of the near-doubling of the corporate R&D-to-GDP ratio between 1980 and 2000 was due to firms with fewer than 5,000 employees increasing their R&D investments.⁴⁶ Indeed, in many industries, small and mid-sized firms now invest more in R&D than larger firms.

4) R&D tax credits don't influence where companies do research: Some argue that tax incentives in particular, and cost differentials more generally, have little influence over where companies conduct R&D. Rather, they assert that companies are attracted by R&D talent pools.⁴⁷ But careful studies suggest that corporate decisions about where to invest in R&D are in fact

influenced, in some cases significantly, by cost. A recent survey of corporate R&D managers found that the two most important factors in determining why companies offshore R&D relate to cost (lower cost scientific and engineering talent and lower cost facilities and materials).⁴⁸ Financial incentives (including R&D tax credits) were also important.⁴⁹ In a global economy where scientific and engineering talent is available in many nations, companies' decisions as to where to conduct R&D will be influenced by cost factors, including R&D tax incentives. Because the R&D tax credit lowers the cost of doing research, expanding it would play an important role in making the United States a more globally desirable location for investing in R&D.

5) It's better to spend money directly on federally-funded research. Some advocates who support more R&D argue that it's better to increase funding for federal research, such as the National Science Foundation. They argue that firms will invest in research with the highest private payoff, which may not have the highest social payoff. Only direct federal funding, they argue, can target this kind of research. But this should not be a debate about whether corporate R&D or government R&D is superior. Both are important and both have advantages and disadvantages. The credit has several advantages. The choice of projects is left up to firms. Compliance costs are relatively low.⁵⁰ And the credit is the principal tool government has for influencing the overall level of corporate R&D. Federally-supported research programs also have advantages and should be expanded. These programs can help shape the kind of R&D that is done, particularly in supporting more early stage, higher risk research.⁵¹ Both federally-funded research and federal incentives to spur private sector research are valuable and needed.

6) It's picking winners and losers. Some critics argue that the ideal tax code should be neutral with respect to favoring one industry or another. Ideally, they contend, the best tax is one with few deductions and a low rate. But while it's true that some tax provisions exist solely to serve special interests and have no economic rationale, this cannot be said of the R&D tax credit. Economists have long argued that because of spillovers and

other market failures, the market will invest less in research than is societally optimal. The credit corrects this market failure, making the economy more innovative, productive and efficient. A tax code that is neutral with respect to R&D would be one that is less effective at driving growth than one with an R&D tax credit.

Conclusion

Growth in the 21st century is driven in large part by innovation, much of it born of

investments in research. By encouraging greater public and private investments in research, government policy can play an important role in spurring economic growth and enhancing U.S. competitiveness. The R&D tax credit is an important tool in achieving this goal. But the time has come – 25 years after its introduction – for a significant expansion of the credit to help the United States meet the new global competition.

Endnotes

1. Jacek Warda, “Tax Treatment of Investment in Intellectual Assets: An International Comparison,” *OECD Science, Technology and Industry Working Papers* 4 (Paris: OECD, 2006).
2. Robert D. Atkinson, “Deep Competitiveness,” *Issues in Science and Technology* (Winter 2007): 69-75; <www.itif.org/files/Deep-Competitiveness.pdf>.
3. Referred to in this report as the R&D tax credit.
4. The United States would still be behind Canada, Hungary, Mexico, Portugal, Singapore, and Spain. This was calculated by estimating the cost of these changes compared to the costs of the current credits. Doubling the regular credit, adding a new collaborative credit and expanding the ASC would likely lead to the tax generosity of the credit increasing by approximately 130 percent. The current U.S. R&D tax subsidy rate as calculated by Warda (op. cit) was then multiplied by 2.3 to calculate the new expected tax generosity.
5. Robert D. Atkinson, “The Research and Experimentation Tax Credit: A Critical Policy Tool for Boosting Research and Enhancing U.S. Economic Competitiveness,” (Washington, D.C.: The Information Technology & Innovation Foundation, 2006): <www.itif.org/files/R&DTaxCredit.pdf>.
6. Lolita Paff, “State-Level R&D Tax Credits: A Firm-Level Analysis,” *Topics in Economic Analysis and Policy* 5 (2005).
7. Daniel J. Wilson, “Beggars 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, Apr. 2006).
8. Nick Bloom and Rachel Griffith, “The Internationalization of R&D,” *Fiscal Studies* 22:3 (2001): 337-355.
9. Anthony B. Billings, “Are U.S. Tax Incentives for Corporate R&D Likely to Motivate American Firms to Perform Research Abroad?” *Tax Executive* (Jul. 2003).
10. 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.
11. Dominique Guellec and Bruno van Pottelsberghe de la Potterie, “Does Government Support Stimulate Private R&D?” *OECD Economic Studies* 29 (1997).

12. 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.
13. 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.
14. K.C. Whang, *A Guide to the Research Tax Credit: Why We Have It, How It Works, and How It Can Be Improved* (Washington, D.C.: U.S. Congress, Working Paper Series, Offered to the Joint Economic Committee Minority, Dec. 1998).
15. Martin Falk, "What Drives Business R&D Intensity Across OECD Countries?" Paper Presented at the DRUID 10th Anniversary Summer Conference, Copenhagen, Denmark (27-29 Jun. 2005).
16. OECD data including Jacek Warda (op. cit.).
17. Majority-owned foreign affiliates (MOFA), which are foreign business enterprises that are owned at least 50% by U.S. parent(s).
18. However, this is not unprecedented. Corporate R&D fell in the recession of the early 1990s and took five years to regain its peak. National Science Foundation, *Science and Engineering Indicators*, 2006.
19. Organisation for Economic Co-operation and Development (OECD), *OECD STI Scoreboard 2005* (Paris: OECD 2005).
20. Miguel León-Ledesma, "R&D Spillovers and Export Performance: Evidence from the OECD Countries," *Studies in Economics* 14 (University of Kent, Dec. 2000): <www.kent.ac.uk/economics/papers/papers-pdf/2000/0014.pdf>.
21. Measuring the exact impact of the ASC is difficult. Using a rough estimate that the cost of the regular credit is \$7 billion and that the ASC costs \$2.5 billion (\$3 billion a year minus \$500 million from a less used Alternative Incremental Research Credit), this suggests that the ASC expanded U.S. research tax generosity by approximately 36 percent. Using Warda's calculations of R&D generosity, the U.S. tax subsidy (1 – B-index) would increase from .07 to 0.95. With this, the United States would only move up past Austria in R&D tax generosity (Warda, op. cit.). The reason why the United States does not move up more is because the tax generosity of higher ranked nations is significantly greater than the United States.
22. Warda, op. cit.
23. Since its enactment in 1981, the credit has been extended 12 times.
24. Guellec and van Pottelsberghe de la Potterie, 109.
25. If the uncertainty of the credit leads firms to invest less in R&D, it would mean that firms use the credit less and therefore the costs to the budget would be slightly less.
26. Committee on Prospering in the Global Economy of the 21st Century, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, D.C.: The National Academy of Sciences, The National Academy of Engineering, and the Institute of Medicine, 2006); *PACE – Finance Act*, S. 2199

27. The most recent legislative revision to the R&D credit, signed by President Bush at the end of 2006, raised the alternative incremental rates from 2.65, 3.2 and 3.75 percent to 3, 4 and 5 percent, respectively.
28. Jane E. Fountain and Robert D. Atkinson, *Innovation, Social Capital, and the New Economy: New Federal Policies to Support Collaborative Research* (Washington, DC: Progressive Policy Institute, Jul. 1998).
29. L. Branstetter and M. Sakakibara, "Japanese Research Consortia: A Microeconomic Analysis of Industrial Policy," *Journal of Industrial Economics* 46 (1998): 207–233.
30. For example, spillovers from company-funded basic research are very high – over 150 percent according to one study: Albert N. Link, "Basic Research and Productivity Increase in Manufacturing: Additional Evidence," *The American Economic Review* 71.5 (Dec. 1981): 1111-1112.
31. According to NSF, industrial R&D support to U.S. universities and colleges in current dollars reached its peak in 2001 and has declined every year since then (to 2004). The share of academic R&D provided by industry peaked in 1999 and has declined every year since. See Alan I. Rapoport, "Where Has the Money Gone? Declining Industrial Support of Academic R&D," (National Science Foundation, Division of Science Resources Statistics, Sep. 2006): <www.nsf.gov/statistics/infbrief/nsf06328/>.
32. Barry Bozeman and Albert N. Link, "Tax Incentives for R&D: A Critical Evaluation," *Research Policy* 13.1 (1984): 21-31.
33. Denmark looks to promote public and private co-operation in R&D by having a 150% deduction of investments co-financed by a public university or research institute and the industry.
34. Warda, op. cit., Appendix 1.1.
35. Currently the expenditures firms make to outside organizations are treated two ways. Qualified expenses cover just 65 percent of payments for contract research, unless the payments are to a qualified non-profit research consortium at which point the company can count 75 percent of the payments as qualified expenses. However, firms contracting with certain nonprofit organizations (e.g. universities) to perform basic research may claim a credit of 20 percent.
36. The 109th Senate considered versions of HR.4297 (Thomas, (R-CA)), S.14 (Stabenow (D-MI)), S.2199 (Domenici (R-NM)), and S.2357 (Kennedy (D-MA)). S.2357 would institute a flat credit for payments to qualified research consortia.
37. Commercial real property can be depreciated over a period of 39 years. In the case of equipment, depreciation is permitted on a straight-line or accelerated basis that depends on the type of property. The depreciation period is normally 3, 5, or 7 years, and the maximum rate of depreciation allowed is 200% of the declining basis of the property.
38. Organisation for Economic Co-operation and Development (OECD), *Tax Incentives for Research and Development: Trends and Issues* (Paris, 2003).
39. However, firms can carry forward unused credits for 20 years.
40. United States Department of the Treasury, "Corporate Alternative Minimum Tax Data," (2006): <treas.gov/press/releases/docs/Chart762.pdf>
41. D.T. Coe and E. Helpman, "International R&D Spillovers," *European Economic Review* 39 (1995): 859-887.

42. Charles I. Jones, "Sources of U.S. Economic Growth in a World of Ideas," *American Economic Review* 92.1 (2002): 220-239.

43. Their model assumed a relatively conservative 3 percent discount rate and a 31 percent annual rate of the return from R&D. Coopers and Lybrand, "Economic Benefits of the R&D Tax Credit," (Jan. 1998).

44. In examining R&D tax incentives in 17 OECD nations, Guellec and van Pottelsberghe (op. cit.) found that incentives effectively stimulated business R&D. Likewise, Falk (op. cit.) concluded that R&D tax incentives "have a strong and significant positive impact on R&D intensity."

45. Robert M. Hunt and Leonard I. Nakamura, "The Democratization of U.S. Research and Development after 1980," *Meeting Papers* 121 (Society for Economic Dynamics, 2006).

46. Hunt and Nakamura, op. cit., 1.

47. The principal proponents of this view are Jerry and Marie Thursby, who recently published a report "Here or There: A Survey on the Factors in Multinational R&D Location and IP Protection." They argue that costs are not all that important and instead that access to growing markets or skilled researchers are the main drivers. However, there are three problems with this conclusion. First, when it comes to deciding whether or not to invest in developing nations, cost is actually the third most important factor of 13. Second, no firm is going to locate an R&D facility in a nation that doesn't have skilled researchers. Skilled researchers are to R&D what water is to a soft-drink beverage maker. A more important and revealing question is, given the presence of R&D talent in a variety of nations, what factors determine your location there. In this case, cost, as the Battelle study (see fn. 48) found, is the most important factor. Finally, the survey did not ask firms to rank the overall importance of costs, but rather separated out the cost factor into two questions: overall costs and tax incentives. As a result, their importance separately was less than it would have been together. Jerry Thursby and Marie Thursby, *Here or There? A Survey of Factors in Multinational R&D Location* (Washington, D.C.: The National Academies Press, 2006): <www.kauffman.org/pdf/thursby_final_1206.pdf>.

48. Battelle and R&D Magazine, "2007 Global R&D Report," (Sep. 2006): G16; <www.rdmag.com/pdf/RD_GR2006.pdf>.

49. Respondents ranked "local incentives" as 2.62 (with 5 as very important and 1 as unimportant). This was more important than "required to do business locally," "continuing support of infrastructure" and "support host country's industry."

50. A study of the Canadian R&D credit found that compliance costs are just 0.7 percent of the costs of credits claimed. Sally Gunz, Alan Macnaughton and Karen Wensley, "Measuring the Compliance Cost of Tax Expenditures: The Case of Research and Development Incentives," *Canadian Tax Journal* 43.6 (1995): 2008-2034. The working paper is available at: <strategis.ic.gc.ca/pics/ra/wp6e.pdf>.

51. Gregory Tasse, *The Technology Imperative* (London: Edward Elgar (forthcoming), 2007).

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