Can a Research and Development Tax Credit Be Properly Designed for Economic Efficiency?

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ABSTRACT

Economic growth is driven by new ideas, innovation, and technology. Since 1981, the research and development (R&D) tax credit has attempted to lower the cost of these activities through subsidies in the tax code. Theory often predicts benefits from subsidies for R&D, but policymakers are not able to properly design and implement such a tax credit. Losses owing to rent-seeking and policy uncertainty undermine the predicted benefits of a well-structured incentive program. Policymakers' inability to correctly target incentives means that programs attempting to do so harm the economy by distorting the market process. The tax code should be simplified by removing the R&D tax credit and lowering the corporate tax rate with the resulting savings. A second best alternative would make the credit permanent, eliminate credit claims on amended returns, expand the definition of qualified R&D, and use a simpler version of the credit calculation.

JEL codes: E62, H21, H23, H25

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Economic growth is primarily driven by new ideas, innovation, and technology. The research and development (R&D) tax credit is intended to incentivize private companies to produce more ideas, innovation, and technology by lowering the cost of these activities. Despite the simple allure of such a policy, the R&D tax credit perversely distorts investment decisions and signals that the tax code is open for tailoring to special interests. Theory may predict benefits from the R&D tax credit, but in reality it is difficult to actually design a credit to induce investment that fosters innovation and economic growth.

Section I of this paper provides a brief overview of the four R&D component credits. Section II describes the current state of the R&D tax credit and the history of 16 separate expirations and extensions since the credit's enactment in 1981. Section III surveys the literature about how effective the R&D credit is at inducing private spending. Tax incentives for R&D have a small and uncertain ability to increase private research spending—essentially, a dollar in R&D tax incentives amounts to a dollar in increased R&D spending. But this extra spending is not shown to significantly increase measures of innovation, and may even reduce the quality of research. Section IV lays out the case for the credit, but section V demonstrates how poor incentives lead to inefficiencies that detract from the credit's perceived benefits.

Section VI discusses current and time series data from the Internal Revenue Service Statistics of Income Division (SOI), detailing which industries and firm sizes use the credit most.[1] The largest tenth of a percent of all firms (0.13 percent) claims 82 percent of all research tax credit dollars; the smallest 95 percent of firms claim less than 5 percent of credit dollars. Since 1990 there has been an 83 percent ($7.7 billion) increase in R&D credit

1. This paper presents data on the federal R&D tax credit. However, 30 states offer similar credits in addition to the federal credit. Scott Drenkard and Joseph Henchman, *2015 State Business Tax Climate Index*, Tax Foundation, October 2014, 56, http://taxfoundation.org/sites/taxfoundation.org/files/docs/TaxFoundation_2015_SBTCI.pdf.

expenditures, and in 2011 the manufacturing sector received more than 64 percent of total credit dollars.

Section VII concludes with two policy recommendations. The most economically sound proposal is to eliminate the credit entirely and lower the corporate statutory rate with the savings. A second-best alternative would be to carry out these improvements: make the credit permanent, eliminate credit claims on amended returns, expand the definition of qualified research and development, and use a simpler version of the credit calculation.

I. THE R&D CREDIT TODAY

Although the research and development tax credit is often discussed in singular terms, section 41 of the Internal Revenue Code (IRC) has four component credits: regular research, alternative simplified research, basic research, and energy research.[2] Taxpayers can potentially use three of the four section 41 credits—they must choose between the regular research credit and the alternative simplified credit (ASC) because of overlapping provisions. The R&D credit is a dollar-for-dollar credit against taxes paid or owed. For example, if a firm owes $1,000 in taxes before the credit, a $100 credit would reduce the firm's taxes owed to $900. This is in contrast to a deduction or exemption, which reduces income before taxes are calculated.[3]

In addition, section 41 interacts with IRC section 174, which provides a different type of research incentive by allowing current-period deduction of research expenses. Section 174 allows businesses to deduct the cost of research and experimentation in the year they are purchased, rather than depreciating the assets as is required for non-R&D capital expenses. This is known as expensing, and can offer a considerable tax advantage in certain circumstances. Section 174 defines research as any expense incurred by a business owner for research and experimentation in "connection with his trade or business." Section 174 does not apply to land, property, routine expenses, and exploration expenditures on ore or mineral deposits.[4] The justifications for and against the 174 provision more broadly fall into a discussion of capital depreciation policy;

2. The credit is officially titled the Credit for Increasing Research Activities; however it is also known as the research and experimentation (R&E) tax credit, the research tax credit, or the R&D tax credit. Credit for Increasing Research Activities, 26 U.S.C. § 41 (2004), http://www.law.cornell.edu/uscode/text/26/41.

3. The credit can be claimed by both traditional corporations and pass-through entities. In 2011, less than 2.5 percent of credit dollars were claimed by pass-through entities.

4. Research and Experimental Expenditures, 26 U.S.C. § 174 (2012), http://www.law.cornell.edu/uscode/text/26/174.

this paper will primarily focus on the tax credit as the main avenue for R&D incentives.[5]

The research credit significantly narrows the scope of qualified expenditures. The credit applies to "qualified research" as defined by a four-part test in section 41(d).[6] First, the expenditure must qualify under section 174 by being experimental in the laboratory sense and related to the business. Second, the research must be directed at discovering information that is technological in nature. Third, it must develop or improve a "product, process, computer software, technique, formula, or invention which is to be held for sale, lease, or license, or used."[7] And fourth, the process of experimentation must relate "to a new or improved function, performance, reliability or quality." The credit may not be claimed for research beginning after commercial production or relating to "style, taste, cosmetic, or seasonal design factors." The credit also does not apply to expenditures on research-related equipment, buildings, overhead costs (such as electricity, maintenance, rent, and insurance) and fringe benefits for personnel.[8]

In general, the expenses claimed under section 174 cannot be claimed under section 41, and vice versa. However, IRC section 280 C(c) allows taxpayers to reduce claimed expenses under section 174 by the dollar amount of the claimed research credit. In effect this adds the credit to taxable income and allows a business to both expense R&D spending under 174 and claim a reduced R&D credit on the same spending. As a close approximation of this procedure, firms can elect to use a 13 percent credit calculation under the regular research credit, or 65 percent of the ASC final credit, while leaving the 174 deduction in place. Section 280 C(c) essentially allows firms to gain tax advantage twice, once under section 174 and again under section 41.

The regular research credit is designed to approximate a base amount of research spending that would be normal without the credit. The credit then subsidizes as much as 20 percent of spending above the normal baseline. The normal spending base amount must be at least 50 percent of the total qualified research spending. Firms that had qualified research expenditures (QREs) in

5. For further information on capital depreciation policy and expensing in the tax code, see Jason J. Fichtner and Adam N. Michel, "Options for Corporate Capital Cost Recovery: Tax Rates and Depreciation" (Mercatus Research, Mercatus Center at George Mason University, Arlington, VA, January 2015).
6. 26 U.S.C. § 174.
7. Ibid.
8. Ibid.; Internal Revenue Service, *Audit Techniques Guide: Credit for Increasing Research Activities (i.e. Research Tax Credit) IRC § 41*—Qualified Research Activities*, June 2005, http://www.irs.gov/pub/irs-utl/rc2005atg2irsgovrepublished1_2008.pdf.

three of the years between 1984 and 1988 are categorized as "established firms." Firms established after 1983 or those that have fewer than three tax years between 1984 and 1988 are defined as "start-up firms."[9]

The base amount is calculated by multiplying the average annual gross receipts in the previous four years by the fixed-base percentage. "An established firm's fixed-base percentage is the ratio of its total QREs to total gross receipts in 1984 to 1988, capped at 16%."[10] A start-up firm's fixed-base percentage is 3 percent of total gross receipts for five years, and then it incrementally adjusts so that year 11 resembles the firm's actual experience, where the base percentage is the ratio of qualified research expenses to total receipts.

The ASC can be claimed instead of the regular research credit. Taxpayers with relatively large base amounts, recent large growth in total receipts, or complicated or incomplete records for base period calculations can benefit from the ASC. The Congressional Research Service (CRS) writes, "The ASC is equal to 14% of a taxpayer's QREs in the current tax year above 50% of its average QREs during the three previous tax years. If a taxpayer has no QREs in any of those years, then the credit is equal to 6% of its QREs in the current tax year."[11]

The regular research credit was originally designed with a fixed base as a way to create a marginal tax incentive.

"The constant 'temporary' nature of the credit creates a level of uncertainty in the business community. Businesses must guess whether the tax credit will be continued and in what form."

9. For the purposes of the credit, "start-up firm" just means that a firm does not have a fixed-base percentage that is tied to a 1984–1988 calculation period. The date in the definition of start-up companies has changed since enactment: "A start-up company is generally defined as a company that did not have both gross receipts and QREs in at least three of the base period years, or the first taxable year in which there were both QREs and gross receipts began after December 31, 1983." (I.R.C. § 41(c)(3)(B), *Audit Techniques Guide: Credit for Increasing Research Activities*, 2005). I.R.C. § 41(c)(3)(B)(ii) stipulates that the start-up company's incremental adjustment formula begins after December 31, 1993. See also Gary Guenther, "Research Tax Credit: Current Law and Policy Issues for the 113th Congress" (CRS Report RL31181, Congressional Research Service, 2013), 5n12.
10. Guenther, "Research Tax Credit," 10.
11. Ibid., 13.

If the incentive can closely target research above the normal level of private R&D spending (the marginal investment), the forgone tax revenue will have a stronger effect than a simple flat percentage credit. However, the Government Accountability Office (GAO) notes that "over time, the historically fixed base of the regular credit becomes a very poor measure of the research spending that taxpayers would have done anyway. As a result, the benefits and incentives provided by the credit become allocated arbitrarily and inequitably across taxpayers, likely causing inefficiencies in resource allocation."[12] The perceived inequity of credit availability was one reason the ASC was introduced, that is, to allow more firms access to the incentive.

The basic research credit is intended for "any original investigation for the advancement of scientific knowledge not having a specific commercial objective."[13] The credit is available to qualified organizations, usually universities and other tax-exempt research institutions. The basic credit is 20 percent of payments above a base amount, which strives to approximate a normal, precredit spending level. The energy research credit applies to 20 percent of the full amount paid to organizations that operate "primarily to conduct energy research in the public interest."[14] The energy research credit is unique among the four credits because it generously applies to all "qualified research" spending without setting a base amount. Expenses applied to the basic and energy research credits cannot be applied to the regular or alternative simplified research credit.

II. LEGISLATIVE HISTORY

The research and development tax credit's legislative history is quite repetitive. Since 1981, when the credit was first voted into law, it has expired and been extended 16 times. Without a permanent R&D tax credit, the constant "temporary" nature of the credit creates a level of uncertainty in the business community. Businesses must guess whether the tax credit will be continued and in what form. This uncertainty may lead to reduced or delayed investment, limiting the effectiveness and efficiency of the R&D tax credit overall.

The 97th Congress passed the Economic Recovery Tax Act of 1981, which, among other things, created the first research and development tax credit. Congress was concerned that the United States's lead in research

12. Government Accountability Office, *The Research Tax Credit's Design and Administration Can Be Improved*, GAO-10-136, November 6, 2009, 16, http://www.gao.gov/products/GAO-10-136.
13. 26 U.S.C. § 41(e)(7)(A).
14. Guenther, "Research Tax Credit," 15.

and development was in decline and that this decline could be detrimental to "technological advances that are essential to increased productivity and competitiveness."[15] The 1981 law used an average of the three previous years' QREs as the base amount and credited 25 percent above the base amount. Table 1 describes the full legislative history of the R&D tax credit and its evolution since the temporary 1981 act required an extension. The most recent law expired on December 31, 2014, and has not yet been renewed.[16]

III. HOW EFFECTIVE ARE R&D INCENTIVES?

The literature on R&D tax credits is extensive; by some accounts, the credit is one of the most carefully studied tax incentives.[17] There is tenuous agreement among researchers that the R&D tax credit generally stimulates one dollar of additional R&D spending for each dollar of tax credit.[18] Despite the relative agreement and extensive research, the literature is still in a state of uncertainty, owing to several major problems in estimating the effect of the credit.

The tenuous consensus around unity incentive effects of the R&D tax credit is complicated by incomplete data, flawed definitions, and price deflators.[19] First, the data are most likely incomplete because the firm-level data all suffer from what is commonly known as a relabeling problem. Once preferential tax treatment is given to a certain type of spending, companies will attempt to label as much of their spending under that heading as possible.

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15. Joint Committee on Taxation, *General Explanation of the Economic Recovery Tax Act of 1981, H.R. 4242, 97th Congress, Public Law 97-34*, December 31, 1981, https://www.jct.gov/publications.html?func=startdown&id=2397.
16. On December 16, 2014, the latest tax extender bill was signed into law, renewing about 55 tax provisions, including the R&D tax credit. The bill retroactively extended the bundle of credits for the 2014 tax year, allowing them to expire again 15 days after enactment. The House of Representatives voted in May 2015 to permanently extend the R&D tax credit. As of July 2015 the Senate has not yet taken action. Tax Increase Prevention Act of 2014, Pub. L. No. 113-295, 128 Stat. 4014 (2014).
17. Laura Tyson and Greg Linden, "The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness," Center for American Progress, January 6, 2012, 41, http://www.americanprogress.org/issues/tax-reform/report/2012/01/06/10975/the-corporate-rd-tax-credit-and-u-s-innovation-and-competitiveness/.
18. For example, economists Bronwyn Hall and John Van Reenen survey the econometric evidence in a literature review from 2000. Bronwyn Hall and John Van Reenen, "How Effective Are Fiscal Incentives for R&D? A Review of the Evidence," *Research Policy* 29, no. 4–5 (April 2000): 449–69, doi:10.1016/S0048-7333(99)00085-2.
19. There is also a more sophisticated debate around complex econometric modeling issues that will not be discussed in this paper. For more discussion of different modeling techniques, see ibid.; Bronwyn H. Hall, Jacques Mairesse, and Pierre Mohnen, "Measuring the Returns to R&D" (NBER Working Paper No. 15622, National Bureau of Economic Research, Cambridge, MA, December 2009), http://www.nber.org/papers/w15622.

TABLE 1. LEGISLATIVE HISTORY OF THE RESEARCH AND DEVELOPMENT TAX CREDIT

Legislation title	Date of enactment	Effective date	Duration	Changes to legislation
Economic Recovery Tax Act of 1981	Aug. 1981	July 1981	4.5 years	Average of 3 previous years for base amount, limited to section 174 definition.
Tax Reform Act of 1986	Oct. 1986	Jan. 1986	3 years	Reduced rate to 20%. Narrowed definitions; enacted basic credit.
Technical and Miscellaneous Revenue Act of 1988	Nov. 1988	Jan. 1989	1 year	Reduced section 174 claims by half of R&D credit. Set minimum base amount to 50%.
Omnibus Budget Reconciliation Act of 1989	Dec. 1989	Jan. 1990	1 year	Reduced section 174 claims by 100% of R&D credit. Created 1984–1988 base period, and start-up criteria.
Omnibus Budget Reconciliation Act of 1990	Nov. 1990	Jan. 1991	1 year	
Tax Extension Act of 1991	Dec. 1991	Jan. 1992	6 months	
Omnibus Budget Reconciliation Act of 1993	Aug. 1993	July 1992	3 years	Changed start-up firm's base calculation.
Credit allowed to expire July 1995 through June 1996				
Small Business Job Protection Act of 1996	Aug. 1996	July 1996	11 months	Introduced Alternative Incremental Research Credit (AIRC).
Taxpayer Relief Act of 1997	Aug. 1997	June 1997	13 Months	
Tax and Trade Relief Extension Act of 1998	Oct. 1998	July 1998	1 year	
Ticket to Work and Work Incentives Improvement Act of 1999	Dec. 1999	July 1999	5 years	Increased credit rates under AIRC. Includes US territories.
Working Families Tax Relief Act of 2004	Oct. 2004	July 2004	18 Months	Added energy research credit through the Energy Policy Act of 2005.
Tax Relief and Health Care Act of 2005	Dec. 2006	Jan. 2006	2 years	Introduced ASC.
Emergency Economic Stabilization Act of 2008	Oct. 2008	Jan. 2008	2 years	Increased ASC rate to 14% in 2009. AIRC expired 2008.
Tax Relief, Unemployment Compensation, and Job Creation Act of 2010	Dec. 2010	Jan. 2010	1 year	
American Taxpayer Relief Act of 2012	Jan. 2013	Jan. 2012	2 years	
Tax Increase Prevention Act of 2014	Dec. 2014	Jan. 2013	1 year	Expired December 31, 2014.

Sources: Laura Tyson and Greg Linden, "The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness" (Center for American Progress, January 2012), and Martin Sullivan, "Research Credit Hits New Heights, No End in Sight," *Tax Notes* 94, no. 7 (2002): 801. See also Gary Guenther, "Research Tax Credit: Current Law and Policy Issues for the 113th Congress" (CRS Report RL31181, Congressional Research Service, 2013), 16–18.

This is evidenced by a precipitous increase in qualified R&D expenditures when the credit was first enacted in 1981, part of which has been attributed to relabeling.[20] The Government Accountability Office reports that in 2007 the IRS designated "research credit claims" as a Tier I compliance issue. This designation came after a rise in contingency fee–based amended returns, which are now prohibited. The GAO noted that most interviewed tax practitioners admitted to "aggressive and sometimes sloppy research credit claims." In many cases when the IRS challenges a claim, taxpayers immediately settle for as little as 50 cents on the dollar, further suggesting aggressive credit claims.[21]

Second, and further compounding the issue of relabeling, is the difficulty in defining qualified research. The IRS flagged research credit claims as a compliance issue because it is nearly impossible to define research while maintaining the spirit of the law. The credit's definitions of qualified research have continuously evolved over the years, with significant reinterpretation of the law taking place as recently as January 2015.[22] In a 2010 article, Martin Sullivan, chief economist at Tax Analysts, chronicled some of the significant litigation concerning the definition of qualified research. He concludes that the current definition is vague and uncertain, finding that "attempts to apply [the definition of qualified research] to real-world circumstances require in-depth fact-finding, and examination of complex technologies, and evolving techniques for developing those technologies."[23] Fungible definitions for qualified research allow easier relabeling, resulting in an even larger distortion of the data and the resulting estimates of induced spending.

The third major issue is the selection of a price deflator when constructing production or cost functions for returns to R&D spending. The price deflator is an attempt to correct two problems in the data. First, the prices of the inputs and the innovative outputs themselves do not account for quality improvements—a computer today has many improvements compared to a

20. Hall and Van Reenen, "How Effective Are Fiscal Incentives for R&D?," 463.
21. From 2006 to 2012, the IRS used a three-tier system to classify compliance issues. A Tier 1 classification meant that the issue was the highest priority. In the case of the R&D credit, a special tax issue management team was assigned to develop an appropriate compliance strategy. GAO, *The Research Tax Credit's Design and Administration Can Be Improved*; Heather Maloy, IRS, "Tiered Issues," memorandum to all LB&I employees, August 17, 2012, http://www.irs.gov/Businesses/Corporations/Tiered-Issues.
22. Credit for Increasing Research Activities, 80 Fed. Reg. 2624 (proposed January 16, 2015) (to be codified at 26 C.F.R. pt. 1).
23. Martin Sullivan, "Time to Scrap the Research Credit," *Tax Notes* (Tax Analysts), February 22, 2010, 891.

computer from 20 years ago, and it is sold at a lower price.[24] Second and more importantly, the price deflator is necessary as a price variable because there is little variation in tax treatment across time. Because most deflators are heavily correlated with time, the resulting estimates are often dependent on other time-related variables in the model.[25] Although the deflator is a technical point, a review of the literature called it "a very thin reed on which to rest the estimation of the price elasticity."[26]

Even with issues concerning flawed definitions, relabeling, incomplete data, and poor price deflators, the estimated dollar for dollar incentive of forgone tax revenue is often used to justify the credit program. The estimates are valuable only in deciding whether the credit or a direct subsidy is the most efficient way to spend tax dollars. The implicit assumption of an incentive discussion is that the optimal size of the subsidy has already been decided.[27] In a legislative history, CRS economist Gary Guenther said there is little evidence that either the original 25 percent rate of subsidization or the adjustments that followed were carried out with any "rigorous assessment of the gap between the private and social returns to R&D investment."[28] This is to say that the level of R&D subsidization has been a political choice—Congress decided it wanted more R&D and picked a number.

Understanding how much extra spending the tax credit induces is not as important as the effect of that extra spending. Unfortunately, there have been relatively few

"Fungible definitions for qualified research allow easier relabeling, resulting in an even larger distortion of the data and the resulting estimates of induced spending."

24. Bronwyn Hall, "The Private and Social Returns to Research and Development," in *Technology, R&D, and the Economy*, Bruce L. R. Smith and Claude E. Barfield, eds., 1st ed. (Washington, DC: Brookings Institution Press, 1996), 141–45, http://eml.berkeley.edu/~bhhall/papers/BHH96%20R&Dreturns.pdf.
25. Hall and Van Reenen, "How Effective Are Fiscal Incentives for R&D?," 459.
26. Elasticity is a measure of how a change in one variable will change another. In the case of R&D, a price elasticity of –1 means that lowering the cost of R&D (through a tax credit) by $1 will increase spending on R&D by $1. Hall and Van Reenen, "How Effective Are Fiscal Incentives for R&D?"
27. Ibid., 457.
28. Guenther, "Research Tax Credit," 16.

studies looking at the impact of R&D tax incentives on innovation and productivity. Many studies link R&D incentives to increases in innovation, measured by the number of patent applications. A 2011 study of European countries by economists Christof Ernst and Christoph Spengel finds that R&D tax incentives have a positive effect on patenting. The same study also finds a negative relationship between the statutory corporate tax rate and patenting.[29] Said another way, patent applications can be increased through either increased R&D incentives or a lower statutory corporate tax rate. A more recent study challenges the emerging narrative that tax incentives benefit innovation. In fact, that study finds that tax credits and tax allowances hurt patent quality.[30] One summary of the literature concluded that the findings may indicate that R&D incentives increase incremental innovations while not fostering an environment for radical innovations.[31]

The totality of the literature above suggests that a dollar's worth of R&D tax incentives will allow a private company to spend one more dollar on R&D. The extra private R&D spending does seem to increase patent applications, but it may reduce their quality. A further body of research suggests that R&D spending can only explain a small portion of patent variance across industries and across time.[32] This means that a one-dollar investment in R&D may only induce a small increase in patent activity. This small and uncertain increase may not even increase the type of radical innovations that stimulate economic growth.

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29. Christof Ernst and Christoph Spengel, "Taxation, R&D Tax Incentives and Patent Application in Europe" (ZEW Discussion Paper No. 11-024, Center for European Economic Research, 2011).
30. The authors focused on European countries and did find a positive impact on the quality of patents from patent boxes, a different type of incentive structure. Christof Ernst, Katharina Richter, and Nadine Riedel, "Corporate Taxation and the Quality of Research and Development" (FZID Discussion Papers, University of Hohenheim, Center for Research on Innovation and Services, 2013).
31. Bas Straathof et al., "A Study on R&D Tax Incentives" (Working Paper No. 52-2014, Netherlands Bureau for Economic Policy Analysis, November 2014).
32. Zvi Griliches finds that "Time-series estimates, which presumably measure returns to movements primarily along already established trajectories, all tend to come out with relatively low elasticities of patents received with respect to R&D invested, on the order of 0.2 to 0.45. On the other hand, cross-sectional studies, which presumably better represent the optimal migration of R&D resources across fields and the finding of new niches, yield elasticity estimates much closer to unity." Zvi Griliches, "Patent Statistics as Economic Indicators: A Survey," in *R&D and Productivity: The Econometric Evidence*, Zvi Griliches, ed. (University of Chicago Press, 1998), 287–343, http://www.nber.org/chapters/c8351.pdf. A more recent survey of the literature found that "R&D and the various fixed effects (country, industry and time dummies) explain about 20 percent of the variance in the growth rate of patents." Jérôme Danguy, Gaétan de Rassenfosse, and Bruno van Pottelsberghe de la Potterie, "The R&D-Patent Relationship: An Industry Perspective," *European Investment Bank* 14, no. 1 (2009): 170–95.

IV. THE CASE FOR THE R&D CREDIT

Many economists believe that private markets do not provide the socially optimal amount of research.[33] Firms engage in research to maintain their place in the market by innovating better than their competitors. They choose to invest in research when they think they can recoup their investment plus some profit. Economists generally think that this profit motive leaves some socially beneficial research undone because it may be difficult to internalize the benefit of the new innovation. Patents are a parallel government program that attempts to overcome this same challenge. When an inventor is granted exclusive rights to a new idea, it becomes easier for the inventor to make a profit on the idea. Theory suggests that the inventor would be reluctant to spend 10 years developing a new vaccine if a competitor could use the inventor's idea without spending the 10 years of research, time, and money.

The research and development tax credit is intended to lower the cost of research that has large spillover benefits that are hard for the innovating company to internalize through profits. Through a tax credit, the government attempts to increase research that has significant positive external benefits to society at large. In theory this increases total social welfare because individuals and businesses alike benefit from the new ideas that otherwise would have never seen investment.

The positive spillovers from innovation are one key part of economic growth. New products and services can revolutionize the economy. The Internet, which has redefined commerce, information, and even social relationships, is a striking example of the massive spillovers an innovation can have that are not necessarily captured in one firm's profits. The positive impact of research externalities are often estimated by process of elimination—the growth that cannot be explained through traditional inputs, such as labor and capital, must be from technology, productivity, or innovation. The leftover growth is often called total factor productivity, multifactor productivity, or the Solow Residual.[34]

Having identified a significant aspect of growth, the logical next step is to ask what the best way is to get more of it. Many policymakers have settled on the R&D tax credit as one of many ways to increase positive spillovers and induce faster economic growth.[35] As discussed above, econometric

33. Charles I. Jones and John C. Williams, "Measuring the Social Return to R & D," *Quarterly Journal of Economics* 113, no. 4 (November 1, 1998): 1119–35.
34. Ana M. Aizcorbe, Carol E. Moylan, and Carol A. Robbins, "Toward Better Measurement of Innovation and Intangibles," *Survey of Current Business*, BEA Briefing 89, no. 1 (January 2009): 12–13.
35. Guenther, "Research Tax Credit," 16.

estimates generally show that a dollar of forgone tax revenue induces a dollar of extra private R&D spending, while at the high end of the range, some have estimated more than two dollars of increased R&D for every one dollar of tax expenditure.[36]

In their book *The Technology Pork Barrel*, economists Linda Cohen and Roger Noll discuss how information uncertainty and policymakers' inability to gather useful information can make it difficult for governments to choose optimal research investments. This government failure is further exacerbated by the predisposition of the state to reward lobbyists and bureaucracies over productive investments.[37] If government funds are to be spent to encourage R&D, then it is more efficient to let private firms decide where to invest, and the research credit fulfills this criteria.

The inefficiencies of direct government investment in research lend strong support to a tax credit. The credit theoretically allows businesses to choose how to most efficiently allocate their research spending, overcoming the government's knowledge and incentive problems, while maximizing social returns. But, as the next section shows, some of these benefits begin to look more like costs upon a closer examination of how the R&D tax credit works.

V. THE CASE AGAINST THE R&D CREDIT

Accepting for a moment that the market does fail to provide the socially optimal amount of research and innovation, there are two reasons to be skeptical about the projected benefits of the R&D tax credit. First, the costs of lobbyists, lawyers, and IRS compliance agents directly cut into the projected benefits. Second and more importantly, the credit inefficiently distorts the types of investments companies carry out.

Unaccounted-For Costs

The research and development tax credit has expired and been retroactively extended 16 times since enactment in 1981—on average, every two years. From the group of about 50 commonly discussed "tax extenders," 39 have been

36. Sanjay Gupta, Yuhchang Hwang, and Andrew P. Schmidt, "Structural Change in the Research and Experimentation Tax Credit: Success or Failure?," *National Tax Journal* 64, no. 2 (June 2011): 285–322.
37. Linda R. Cohen and Roger G. Noll, *The Technology Pork Barrel* (Washington, DC: Brookings Institution Press, 1991).

around since 2008, and have been extended only three or four times.[38] The R&D credit has been around since before the 1986 tax reform; it is one of the oldest temporary tax provisions. The R&D tax credit creates tax uncertainty because of poor definitions of qualified research and development. Furthermore, temporary tax policies induce economically unproductive activity through various forms of rent-seeking.

Economists use the term rent-seeking to describe lobbying the government for special privileges.[39] The potential expiration of the tax credit every several years induces private spending on lobbyists and lawyers to extend and alter the tax benefit. These private expenditures contribute nothing to economic growth and thus work against the intent of the R&D credit. In theory, spending on rent-seeking by individual firms can be either higher or lower than the benefit gained, but it is always costly for the broader economy.[40]

A growing body of literature has linked tax code uncertainty to increased rent-seeking and a misallocation of resources. Economists Seth Giertz and Jacob Feldman show that future policy uncertainty can slow economic growth, force private firms to allocate resources away from economically productive activity, and paralyze private investment.[41] Corroborating these findings, several studies have found that lobbying expenditures correlate with lower effective corporate tax rates. One estimate finds that one additional dollar spent on lobbying results in $6 to $20 of

"A growing body of literature has linked tax code uncertainty to increased rent seeking and a misallocation of resources."

38. Lindsey McPherson, "Things to Know about the Tax Extenders' History," *Featured News*, Tax Analysts website, July 10, 2014.
39. Matthew Mitchell, *The Pathology of Privilege: The Economic Consequences of Government Favoritism*, Mercatus Center at George Mason University, July 8, 2012, 17, http://mercatus.org/sites/default/files/Mitchell-Pathology-March-2014.pdf.
40. Ibid.
41. Seth Giertz and Jacob Feldman, "The Costs of Tax Policy Uncertainty and the Need for Tax Reform," *Tax Notes* Special Report (Tax Analysts), February 25, 2013.

tax benefits to the average company.[42] The almost yearly uncertainty around the extension of the R&D credit does seem to induce economically unproductive lobbying and may also contribute to investment paralysis and slower economic growth.

Most of the evidence that the R&D credit induces above-normal expenditures on lobbying is anecdotal, but it is supported by economic theory. An Americans for Tax Fairness report, *Corporate Lobbying on Tax Extenders*, estimates that between January 2011 and September 2013 at least 1,359 unique lobbyists contacted members of Congress about tax extenders. The R&D credit was the largest tax extender in the tax package during that time frame. The report estimates that almost $2.9 billion dollars were spent lobbying Congress over the almost three-year period.[43] Although these estimates encompass all lobbying expenditures (not just those on R&D), experienced tax experts agree that businesses spend large amounts of time and money to ensure that the credit is renewed and tailored to suit their needs.[44]

Beyond the cost of lobbying and uncertainty, an inability to properly define qualified research opens the credit up to further inefficiencies. In 2009 the GAO wrote that disputes around the definition of research "raise the cost of the credit to both taxpayers and IRS and diminish the credit's incentive effect by making the ultimate benefit to taxpayers less certain."[45] This broad statement speaks to several costs of the R&D credit, most notably, the cost associated with the tax consultants and lawyers who are necessary to navigate what Martin Sullivan calls one of the most complex areas in tax law.[46] Complexity means more resources must be spent on administrative support and on interpreting and following the law.

As discussed in section III, the difficulty in defining research for the purposes of the credit has resulted in a long list of legal disputes and statutory

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42. A similar estimate from a working paper out of the Federal Reserve Bank of San Francisco found that $1 of business campaign contributions lowered a firm's state corporate taxes by approximately $6.65. Robert S. Chirinko and Daniel J. Wilson, "Can Lower Tax Rates Be Bought? Business Rent-Seeking and Tax Competition among U.S. States" (Working Paper No. 2009-29, Federal Reserve Bank of San Francisco, June 2010), http://www.frbsf.org/economic-research/files/wp09-29bk.pdf. See also Brian Kelleher Richter, Krislert Samphantharak, and Jeffrey F. Timmons, "Lobbying and Taxes," *American Journal of Political Science* 53, no. 4 (October 1, 2009): 893–909.
43. *Corporate Lobbying on Tax Extenders and the "GE Loophole"* (Americans for Tax Fairness, March 2014), http://www.americansfortaxfairness.org/files/Corporate-Lobbying-on-Tax-Extenders-and-the-GE-Loophole.pdf.
44. Martin Sullivan, "Research Credit Hits New Heights."
45. GAO, *The Research Tax Credit's Design and Administration Can Be Improved*, 26.
46. Martin Sullivan, "Putting the Research Tax Credit to the Test," *Tax Notes* (Tax Analysts), March 17, 2014.

reinterpretations to better target the definition of qualified research. The IRS's interpretation of qualified research through regulation has been just as uncertain as the credit's reauthorization. After the first regulatory interpretation in 1998, the IRS had to withdraw several different versions of its definition following harsh criticism from both taxpayers and Congress.[47] The most recent proposed regulation interpreting section 41 (January 2015) comes following a settlement between Federal Express and the IRS over internal software development. The case shows the difficulty of writing legal standards for emerging and truly innovative technology research. Beginning in 2008, the five-year legal battle demonstrates the time and resources that can be expended on definitional interpretations.[48] The inability to precisely define qualified research has resulted in untold resources spent by both private firms and the IRS. Resources spent interpreting, litigating, and following the law decrease the predicted positive incentive effects of the credit and the resulting economic growth.

The R&D tax credit is designed so that firms can take advantage of the tax benefit years after the research has been completed. The tax credit is intended to change the benefit-cost analysis of firms when they are deciding where to invest their money. However, the IRS allows taxpayers to amend tax returns years after the initial filing for the stated purpose of correcting unintended oversights. Reclassifying expenditures as qualified research after the investment has been made is by definition not incentivizing research above the normal amount. The practice of amending returns is illustrative of the relabeling problem discussed in section III. The tax industry offers services to comb through a company's books to find costs that can be reclassified as qualified research.[49] Martin Sullivan explains how amended returns pervert the credit's intended incentive:

> From an economic perspective, there is something intrinsically damning about filing a late claim. For an incentive to have a positive impact on research to which it applies, the taxpayer must know about the credit before or during the time that research is conducted. If there is a cost benefit analysis, the credit must be part of that analysis. Taxpayers who file claims years after the fact, after being informed by outside consultants that they

47. David Click, "Zeal and Activity in the Arena of the Research Tax Credit," *Tax Notes* (Tax Analysts), December 15, 2008.
48. Matthew R. Madara, "Government Abandons Appeal in FedEx over Internal Use Software and Discovery Tests," Tax Analysts, September 3, 2013.
49. Sullivan, "Putting the Research Tax Credit to the Test," 1225.

might be eligible for the credit, are not provided an incentive. They are receiving a windfall.[50]

The "intrinsically damning" filing of late claims can be described in the framework of economist William Baumol's unproductive entrepreneurship. He asserts that when the "rules of the game" are structured poorly, people and firms will divert their resources toward innovating new rent-seeking methods rather than new products and services.[51] Section 41 of the IRC signals to firms that it is open for tampering by litigation, congressional lobbying, and amended returns. Individual firms may benefit, but rent-seeking undermines the economic growth that R&D promises and may even be destructive to the economy at large.

Allocative Inefficiency

The R&D tax credit is intended to distort investment decisions by lowering the cost of beneficial research with high spillovers and social value. Imperfect definitions of qualified research make it increasingly difficult to successfully target the credit, and more fundamentally, regulators don't possess the necessary information to target the credit even if definitional issues could be overcome.

The motivation for the R&D tax credit is founded in a belief that policymakers can improve the natural allocation of resources. The allocation of scarce resources to competing ends is informed by the market process, as buyers and sellers exchange products and services. To improve on the market process, policymakers must presuppose that they have a superior mechanism for discovering the proper information so as to better allocate scarce resources. The popular claim that private markets fail to reach the most efficient level of R&D investment owing to the presence of externalities presupposes that policymakers can better direct private investment decisions.

Policymakers' task to use superior information in order to allocate scare resources—better than private markets could—is a difficult task in light of Nobel laureate F. A. Hayek's observation that knowledge is dispersed in the economy, held by billions of economic actors around the world. This knowledge is often not the scientific kind that can be held and interpreted by experts, but tacit knowledge that is not easily communicated.[52] Setting aside the inability to

50. Sullivan, "Time to Scrap the Research Credit," 896.
51. William J. Baumol, "Entrepreneurship: Productive, Unproductive, and Destructive," *Journal of Political Economy* 98, no. 5 (October 1, 1990): 909.
52. F. A. Hayek, "The Use of Knowledge in Society," *American Economic Review* 35, no. 4 (September 1, 1945): 519–30.

define qualified research in regulatory legalese, policymakers will struggle on a fundamental level as they seek to improve the natural allocation of resources, resulting in unintended distortions.

One example of the inability to properly target the credit is that relatively few small firms claim the credit. Small and start-up firms are often considered to have the most socially beneficial research—yet the credit is of limited or no use to them.[53] The credit rarely helps small and start-up firms because it requires a positive tax liability and past expenditures in the calculation. CRS economist William Cox finds that "some of the most research-intensive firms could claim either no credit, or they could claim credits with a marginal effective rate half as large as the rate of the credit that could be claimed by firms with much lower [research] intensities."[54] These findings are also corroborated by our data in the next section.

The credit can also distort investment between established firms. The distortion of research is inherent in the credit's design—poor definitions of research can lead to unintended incentives. For example, firm A is able to use the credit to lower the cost of research and firm B is not able to use the credit. Firm A will expand research using the credit and firm B will continue its business as normal. This can result in two problems. First, if the credit's definition is incomplete or insufficient, the expanded research may not have any positive spillovers—maybe there was a firm C that was left out. Second, firm A's increase in spending has changed the mix of goods in the economy, thus changing consumption patterns, which in turn creates inefficiencies in the market.[55] Given poor definitions of qualified research since the tax credit's enactment, it is highly likely that investments have been inefficiently distorted.

Even if the private market does not achieve the most efficient level of investment owing to uncompensated positive externalities, government policymakers are unlikely to do better. It may be possible for other firms to build on research in ways that don't compensate the original firm doing R&D, so that the market ends up with less R&D spending than is optimal. The current positive externality justification for maximizing social welfare requires legislators and regulators to design a policy to subsidize a specific

53. Sullivan, "Putting the Research Tax Credit to the Test," 1224; Zoltan J. Acs, David B. Audretsch, and Erik E. Lehmann, "The Knowledge Spillover Theory of Entrepreneurship," *Small Business Economics* 41, no. 4 (December 1, 2013): 757–74, doi:10.1007/s11187-013-9505-9.
54. William A. Cox, "Research and Experimentation Tax Credits: Who Got How Much? Evaluating Possible Changes" (CRS Report 96-505, Congressional Research Service, 1996), 5–10, cited in Guenther, "Research Tax Credit," 25.
55. Stylized example adapted from Martin Sullivan. Sullivan, "Time to Scrap the Research Credit"; Sullivan, "Putting the Research Tax Credit to the Test."

type of private investment. This task seems very difficult. Any market model of optimal research and development would require the government to have knowledge of the effects of R&D in each industry and to further understand how changes to any given set of industries changes the incentives and the long-run mix of goods in the economy. Even working under the assumption that definitions of qualified research could be perfectly tailored, government actors don't have access to the relevant information. The fluid nature of economic calculation makes choosing the type, location, and method of research an impossible task for government policy.

VI. THE DISPARATE ALLOCATION OF R&D CREDITS

The IRS collects data on R&D credits claimed by active corporations reported through the Statistics of Income Division.[56] The SOI data help illustrate some of the distributional disparities of credits and credit dollars between different industries and different firm sizes. In 2011, 14,672 corporations claimed R&D credits totaling $9.2 billion dollars.[57]

Figure 1 and table 2 show the spread of R&D credits claimed by the size of business receipts. This breakdown shows that both small and large firms are able to claim the credit. However, the largest firms are just 0.13 percent of all firms and yet claim 14 percent of the credits, while the smallest firms (24.88 percent of all firms) claim 15 percent. Firms with more than 5 million dollars in receipts comprise less than 5 percent of all firms but claim 59 percent of the total credits.

Figure 2 shows an even more striking disparity among firm sizes for total credit dollars distributed. The largest firms (just 0.13 percent of all firms) claim 82 percent of all research tax credit dollars, while the smallest firm categories (receipts less than 5 million and 95 percent of all firms) claim just 5 percent. Returning to table 2, 28 percent of the largest firms (i.e., those firms with business receipts over $250 million) receive a credit—compared to 0.149 percent of the smallest firms.

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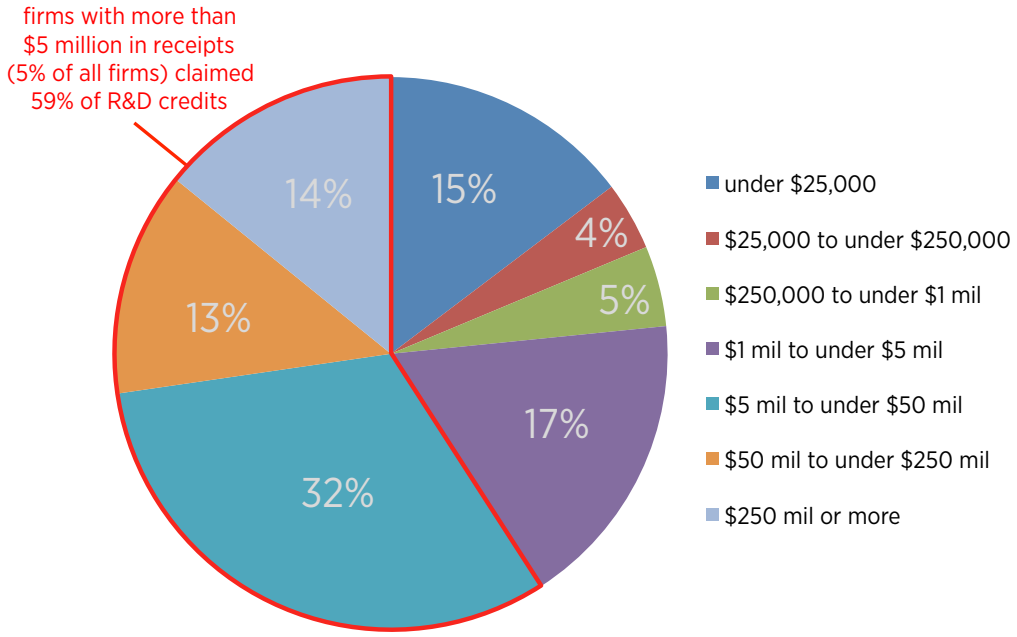
56. Data include returns of active corporations, other than Forms 1120S, 1120-REIT, and 1120-RIC. All figures are estimates based on samples. SOI Tax Stats, Table 1, Corporation Research Credit (IRS), accessed October 21, 2014, http://www.irs.gov/uac/SOI-Tax-Stats-Corporation-Research-Credit; SOI Tax Stats, Table 5, Returns of Active Corporations (IRS), accessed October 21, 2014, http://www.irs.gov/uac/SOI-Tax-Stats-Table-5-Returns-of-Active-Corporations.

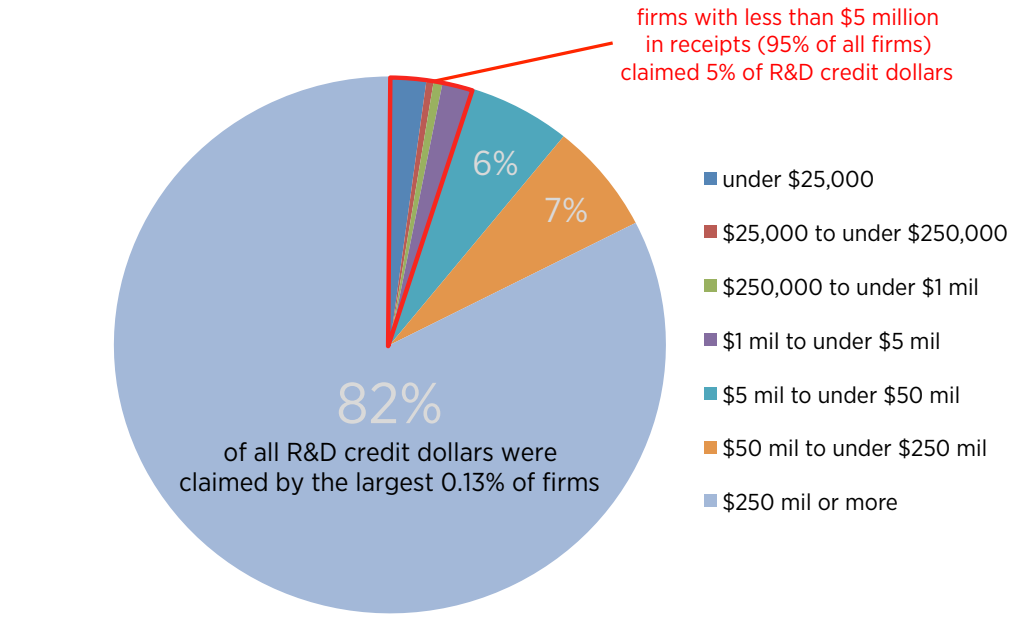
57. 2011 is the most current IRS, SOI data available. All figures and tables in this section are updates or adaptations of a 2008 Ernst and Young report. *Supporting Innovation and Economic Growth: The Broad Impact of the R&D Credit in 2005*, Ernst & Young, April 2008, http://investinamericasfuture.org/PDFs/R&DTaxCreditStudy2008final.pdf.

FIGURE 1. PERCENTAGE OF TOTAL RESEARCH AND DEVELOPMENT CREDITS CLAIMED IN 2011, BY FIRM SIZE



Source: Internal Revenue Service Statistics of Income Division Tax Stats, Table 1, Corporation Research Credit (2014).

FIGURE 2. PERCENTAGE OF TOTAL RESEARCH AND DEVELOPMENT CREDIT DOLLARS CLAIMED IN 2011, BY FIRM SIZE



Source: Internal Revenue Service Statistics of Income Division Tax Stats, Table 1, Corporation Research Credit (2014).

TABLE 2. RESEARCH AND DEVELOPMENT CREDITS CLAIMED IN 2011, BY FIRM SIZE

Firm size (by business receipts)	Credit amounts (thousands of dollars)	Number of credit claimants	Average dollars per claimant (thousands of dollars)	Total returns of active corporations	Percentage of firms claiming credit	Firms in size category as percentage of total firms
Under $25,000	196,712	2,155	91	1,448,673	0.149	24.88
$25,000 to under $100,000	15,267	258	59	961,421	0.027	16.51
$100,000 to under $250,000	23,727	331	72	994,284	0.033	17.07
$250,000 to under $500,000	21,268	330	64	748,422	0.044	12.85
$500,000 to under $1 mil	27,155	360	75	623,733	0.058	10.71
$1 mil to under $2.5 mil	81,612	1,198	68	535,265	0.224	9.19
$2.5 mil to under $5 mil	90,790	1,368	66	232,392	0.589	3.99
$5 mil to under $10 mil	134,062	1,412	95	123,513	1.143	2.12
$10 mil to under $50 mil	410,896	3,255	126	121,595	2.677	2.09
$50 mil to under $100 mil	184,601	927	199	16,797	5.519	0.29
$100 mil to under $250 mil	429,949	1,002	429	9,649	10.384	0.17
$250 mil or more	7,624,412	2,077	3,671	7,381	28.140	0.13
TOTAL	9,420,452	14,672	642	5,823,126	0.252	100.00

Source: Internal Revenue Service Statistics of Income Division Tax Stats, Table 1, Corporation Research Credit (2014); Internal Revenue Service Statistics of Income Division Tax Stats, Table 5, Returns of Active Corporations (2014).

Table 3 shows R&D credits claimed by industry in 2011. Four types of firms make up a majority of claimants and receive the lion's share of total dollars: manufacturing; information; professional, scientific, and technical services; and wholesale and retail trade. The manufacturing sector takes the largest share (about 64 percent) of credit dollars, followed by information (12.7 percent). Industries receiving the highest dollar amount per claimant are mining ($989 million), manufacturing ($962 million), and information ($956 million). The mining sector only files 0.3 percent of total claims and receives 0.5 percent of total R&D credit dollars. Between 2006 and 2010, three sectors increased their claimed credit dollars more than 150 percent: mining; real estate, rental, and leasing; and administrative and support and waste management.

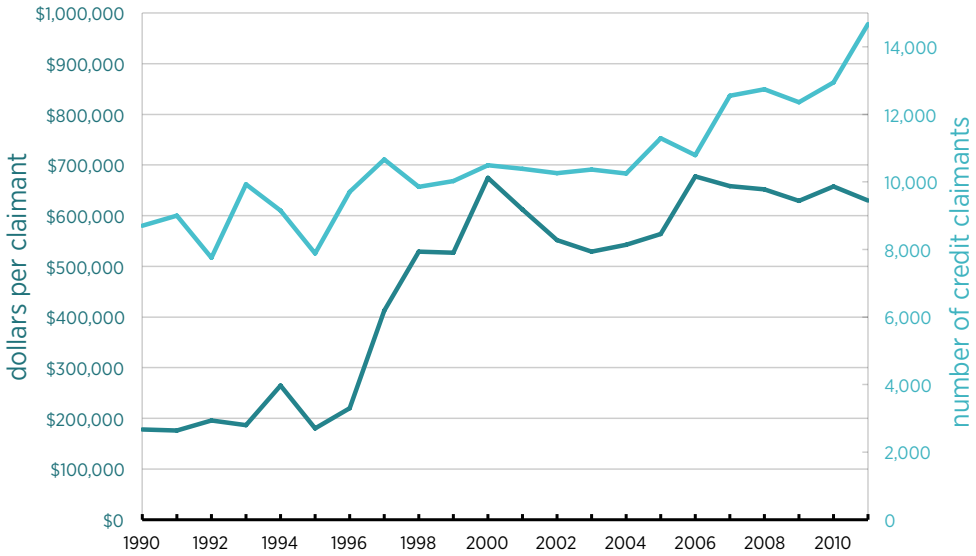
TABLE 3. RESEARCH AND DEVELOPMENT CREDITS CLAIMED IN 2011, BY INDUSTRY

Sector	Number of returns	Percentage of returns	Amount claimed (millions of dollars)	Percentage of total dollars	Amount per credit (millions of dollars)
Manufacturing	6,165	42.0	5,932,503	64.2	962
Information	1,229	8.4	1,174,650	12.7	956
Professional, scientific, and technical services	4,429	30.2	883,569	9.6	199
Wholesale and retail trade	1,287	8.8	705,475	7.6	548
Finance and insurance	303	2.1	182,006	2.0	601
Management of companies (holding companies)	366	2.5	115,558	1.3	316
Utilities	89	0.6	55,251	0.6	621
Mining	50	0.3	49,429	0.5	989
Administrative, support and waste management	226	1.5	37,427	0.4	166
Various services	172	1.2	33,092	0.4	192
Real estate, rental, and leasing	60	0.4	27,423	0.3	457
Construction	174	1.2	18,567	0.2	107
Transportation and warehousing	81	0.6	18,175	0.2	224
Agriculture, forestry, fishing, and hunting	39	0.3	7,327	0.1	188
ALL SECTORS	14,672	100	9,240,452	100	630

Source: Internal Revenue Service Statistics of Income Division Tax Stats, Table 1, Corporation Research Credit (2014).

Figure 3 and table 4 show trends in R&D credits between 1990 and 2011.[58] The total number of firms claiming the credit has increased by almost 6,000 since 1990, a 40.7 percent increase. There has been a more dramatic rise in the size of dollar claims over the same period, increasing $7.7 billion or 83 percent. The dramatic increase in claimed credit dollars, beginning in 1996, was partly owing to the introduction of the alternative incremental research credit. Available from 1996 to 2008, the credit offered a different mechanism for calculating a base amount and subsidized 20 percent above the base.[59]

FIGURE 3. FIRMS CLAIMING RESEARCH AND DEVELOPMENT CREDITS, 1990–2011



Source: Internal Revenue Service Statistics of Income Division Tax Stats, Table 1, Corporation Research Credit, 1990–2011 (2014).

VII. CONCLUDING POLICY RECOMMENDATIONS

Tax reform is often used to improve economic efficiency. However, lowering tax rates is often one of the best ways to improve economic efficiency, not expanding tax credits and deductions. Under the policy constraint of revenue neutrality, the tax base should be broadened by removing tax privileges that benefit some groups over others. With respect to the R&D tax credit, the most

58. 1990 to 2011 is the full time spread available through the IRS online SOI tables.
59. Guenther, "Research Tax Credit."

TABLE 4. RESEARCH AND DEVELOPMENT CREDITS CLAIMED, 1990–2011

Year	Number of claimants	Percentage change in number of claimants	Amount claimed (millions of dollars)	Percentage change in amount claimed	Average amount per claimant (dollars)
1990	8,699	*no data*	1,547	*no data*	177,869
1991	9,001	3.5	1,585	2.4	176,046
1992	7,750	−13.9	1,515	−4.4	195,537
1993	9,933	28.2	1,857	22.5	186,902
1994	9,150	−7.9	2,423	30.5	264,774
1995	7,877	−13.9	1,422	−41.3	180,564
1996	9,709	23.3	2,134	50.1	219,822
1997	10,668	9.9	4,398	106.1	412,244
1998	9,849	−7.7	5,208	18.4	528,805
1999	10,020	1.7	5,281	1.4	527,028
2000	10,495	4.7	7,079	34.0	674,467
2001	10,389	−1.0	6,356	−10.2	611,801
2002	10,254	−1.3	5,656	−11.0	551,590
2003	10,369	1.1	5,488	−3.0	529,270
2004	10,244	−1.2	5,554	1.2	542,171
2005	11,290	10.2	6,363	14.6	563,596
2006	10,788	−4.4	7,311	14.9	677,697
2007	12,548	16.3	8,260	13.0	658,272
2008	12,736	1.5	8,303	0.5	651,932
2009	12,359	−3.0	7,774	−6.4	629,015
2010	12,941	4.7	8,511	9.5	657,677
2011	14,672	13.4	9,240	8.6	629,771

Source: Internal Revenue Service Statistics of Income Division Tax Stats, Table 1, Corporation Research Credit, 1990–2011 (2014).

economically sound proposal is to eliminate the R&D tax credit entirely and lower the corporate statutory tax rate with the savings. This proposal would benefit the whole economy as lower corporate tax rates have been shown to encourage research and development.[60]

The institutional challenges of removing a tax privilege such as the R&D tax credit, however, could prove politically infeasible. A second-best alternative would be to make the credit permanent, eliminate credit claims on amended returns, expand the definition of qualified research and development (using the section 174 definition), and use the alterative simplified credit over the regular research credit.

60. Ernst and Spengel, "Taxation, R&D Tax Incentives and Patent Application in Europe."

The evidence presented above has called into question the ability of legislators and regulators to properly implement an appropriate R&D incentive. The credit likely induces private R&D spending; however the increased spending only partially translates into increased innovation. Empirical evidence shows a decline in patent quality when tax incentives are increased. This supports our claim that policymakers are unable to gather the type of information necessary to tailor a policy that exploits gains from increased R&D. The inability to correctly target incentives may even hurt the economy by distorting the market's allocation of resources. Losses to rent-seeking and policy uncertainty also undermine the predicted benefits of a well-structured incentive program.

In a world with both imperfect markets and an imperfect political system, the best policy option is to simplify the tax code by removing the R&D tax credit and lowering the corporate tax rate with the savings. R&D tax credit research from Europe indicates that lowering the statutory corporate income tax rate can induce research spending and increase patent applications in a similar manner to the tax credit.[61] Although not the topic of this paper, there are many other benefits to lowering the corporate income tax rate.[62]

The first and most fundamental reform to the R&D credit is permanence. Businesses need tax certainty in order to plan future investments. Businesses invest less when returns on investment (which depend on taxes) are uncertain. The uncertainty of the biennial authorization of the R&D tax credits is bad for business and growth.[63] Furthermore, the temporary nature of the R&D credit induces more rent-seeking and wasted resources when industry must lobby Congress every two years for reenactment. Section 41 of the IRC has been a part of the tax code for more than three decades and policymakers seem to favor keeping the provision. If a research credit is going to persist, future innovation and growth would be well served if it was a permanent part of the tax code.

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61. Some of this incentive may be lost on noncorporate entities who claim the credit. However, in 2011 less than 2.5 percent of credit dollars went to pass-through corporations, so this effect should be very limited. Ernst and Spengel, "Taxation, R&D Tax Incentives and Patent Application in Europe"; SOI Tax Stats, Table 1, Corporation Research Credit.

62. Jason J. Fichtner and Nick Tuszynski, "Why the United States Needs to Restructure the Corporate Income Tax" (Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, November 2011); Jason J. Fichtner, *Increasing America's Competitiveness by Lowering the Corporate Tax Rate and Simplifying the Tax Code*, Testimony before the US Senate Committee on Finance, January 31, 2012, http://mercatus.org/publication/increasing-america-s-competitiveness-lowering-corporate-tax-rate-and-simplifying-tax.

63. Jim Shanahan and Kendall Fox, "Why US Business Needs a Reliable Research Incentive," PricewaterhouseCoopers Publications (Financial Executive Online), accessed October 21, 2014, http://www.pwc.com/us/en/tax-products-delivery-group/publications/us-business-reliable-research-initiiatives.jhtml.

Second, any permanent R&D tax credit should disallow credit claims on amended returns. The practice of amending a return to take advantage of the research credit violates the underlying principle of the legislation.[64] The credit is intended to induce research that would not have otherwise been pursued. It is entirely impossible to induce research through a retroactive tax break. This may bar some firms from claiming R&D spending that was accidentally left out of the tax calculus. However, the calculation for the current period will increase the effects of the credit's incentive by ensuring that firms calculate the decreased cost in their investment decisions each year. The credit should be exclusively for current tax filers and should not be granted on amended returns.

Third, the definition of qualified research should be expanded and simplified. The definition used in IRC Section 174 for expensing research costs is a step in this direction. The 174 definition is conveniently already in place and one definition is simpler than two. The broad applicability of this definition will decrease the administrative costs of strict compliance standards and allow firms more control over the labeling of research activities. Section 174 is one of three IRC sections that distinguish between assets that are deductible as business expenses (section 162), capital assets to be depreciated (section 263), and research expenditures that a taxpayer can elect to expense or capitalize. Section 41 adds unnecessary complication and restriction. The section 174 definition may dilute some of the theoretical benefits of a narrowly tailored rule (benefits of targeting the most socially optimal research). We have shown the current rule is also not properly targeted and policymakers are furthermore unable to beneficially target the credit.[65] The constraints of policymakers brand any discussion of retooling a narrower or better targeted definition of qualified research a losing proposition. A broad, simple definition of qualified research will streamline administration and decrease the ability of special interests to manipulate the rule to favor their industry.

Finally, a permanent R&D tax credit should remove the regular research credit in favor of the alternative simplified credit.[66] The ASC would eliminate the tax administration burden of using tax record from the 1980s, while making the credit easier to calculate and audit. The incremental nature of the regular

64. Sullivan, "Time to Scrap the Research Credit," 896.
65. David L. Click, "Baby, Bathwater, and Research Credit: A Response to Sullivan," *Tax Notes* (Tax Analysts), March 8, 2010.
66. The ASC is similar to a simple flat percentage credit, which would have all the same benefits of the ASC—it may even be simpler. We argue here for the ASC because taxpayers and the IRS are already familiar with the current scheme and because the benefit of a flat credit over the ASC seems small.

research credit is increasingly problematic, as each passing year the credit creates uneven and arbitrary levels of R&D subsidy. Even more remarkably, the distortions are based on tax records from three decades ago. A fixed-base credit may offer a stronger incentive, but this is only beneficial if the correct investments are targeted. The benefits of the incremental credit should be strongly questioned owing to an inability to tailor research definitions and arbitrarily set base years. Choosing one version of the tax credit, one that subsidizes R&D more equally, will treat all taxpayers similarly, rather than allowing different rules for different firms.[67]

So, can an R&D tax credit be properly designed for economic efficiency? The answer seems to be no, given the imperfect political process and the lack of relevant market knowledge. The best way to grow the economy and increase business investment is by simplifying the entire tax code and lowering the corporate tax rate to competitive international levels.

67. Click, "Baby, Bathwater, and Research Credit."

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