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Research Tax Credit: Current Law and Policy Issues for the 114th Congress

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Summary

Technological innovation is a primary engine of long-term economic growth, and research and development (R&D) serves as the lifeblood of innovation. The federal government encourages private investment in R&D in several ways, including a tax credit for increases in spending on qualified research above a base amount.

This report describes the current status of the credit, summarizes its legislative history, and discusses policy issues it raises.

The research tax credit (also known as the research and experimentation (or R&E) tax credit) was permanently extended in 2015. Since its enactment in mid-1981, the credit was temporarily extended 16 times and significantly modified 5 times.

While the credit is often thought of as a single credit, it actually consists of four discrete credits: (1) a regular credit, (2) an alternative simplified credit (ASC), (3) a university basic research credit, and (4) an energy research credit. A taxpayer may claim one of the first two and each of the other two, provided it meets the requirements for each.

In essence, the research credit endeavors to boost business investment in basic and applied research by reducing the after-tax cost of undertaking qualified research above a base amount, which approximates the amount a company would invest in R&D in the absence of the credit. As a result, the credit's effectiveness hinges, in part, on the sensitivity of the demand for this research to decreases in its cost. It is unclear from existing studies exactly how sensitive that demand is.

While most analysts endorse the use of tax incentives to generate ever-higher levels of business R&D investment, some have some reservations about the design of the current credit. Critics contend that it is not as effective as it could or should be, given the economic benefits of technological innovation. The limits on the credit's effectiveness, in their view, include uneven and inadequate incentive effects, a lack of refundability, and an ambiguous definition of qualified research that fosters disputes between the Internal Revenue Service and companies over the legitimacy of claims for the credit.

The 114th Congress permanently extended the research tax credit by passing the Protecting Americans from Tax Hikes Act of 2015 (PATH Act, P.L. 114-113). The act also allowed certain small firms to apply up to $250,000 of any credit they may claim against their payroll taxes in a tax year.

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Introduction

Economists have gained notoriety for their differences of opinion on a variety of policy issues. Notable examples include the long-term economic effects of large, permanent tax cuts; the impact of illegal immigration on domestic wages; and the best ways to lessen income inequality. But on two issues there is little, if any, disagreement: (1) the impact of technological innovation on economic growth in the long run and (2) the proper role of government in the development and commercial uses of new technologies.

Among economists, it is widely believed that technological innovation has accounted for a major share of long-term growth in real per-capita income in the United States and certain other developed countries.[1] Economists who study the forces driving economic growth see innovation as a convoluted and uncertain process that encompasses the acquisition of new scientific and technical knowledge and its application to the development of new goods and services or methods of production through a process of research and experimentation. Learning-by-doing and learning-by-using play critical roles in this process.

In market economies, technological innovation is driven by the efforts of competing firms to gain, sustain, or reinforce competitive advantages by being the first to introduce or use new or improved products or services; more efficient production processes; or more effective strategies for management, marketing and promotion, and customer service and support.

Most economists also recognize that private R&D investment is likely to be less than the amounts that are warranted by its overall economic benefits. The reason for this shortfall lies in the nature of these benefits. It seems probable that the average company investing in R&D cannot capture all the returns to their R&D investments, even in the presence of patents, trademarks, and other forms of intellectual property protection. There are several channels through which the returns from innovation may elude full capture by innovating firms and spill over to society at large. The most common ones are reverse engineering by other firms, migration of research scientists and engineers from one firm to another, and the availability of new or improved goods and services at prices below what most consumers and companies would be willing to pay.[2]

Economists refer to an excess of total (or social) returns to R&D investments over private returns as the spillover effects or external benefits of R&D. Numerous studies have found that the average social returns to private R&D investments greatly exceeded the average private returns.[3] The ratio of the former to the latter from available estimates averages two to one.[4] This finding held true regardless of whether a firm invested in research projects narrowly focused on its existing lines of business, or in research projects aimed at extending the boundaries of knowledge in particular scientific disciplines in ways that had no obvious or immediate commercial applications.

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[1] Linda R. Cohen and Roger G. Noll, "Privatizing Public Research," *Scientific American*, September 1994, p. 72.

[2] For a brief discussion of these channels, see Bronwyn H. 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. (Washington: Brookings Institution and American Enterprise Institute, 1996), pp. 140-141.

[3] See, for example, Edwin Mansfield, "Microeconomics of Technological Innovation," in *The Positive Sum Strategy*, Ralph Landau and Nathan Rosenberg, eds. (Washington: National Academy Press, 1986), pp. 307-325; and John C. Williams and Charles I. Jones, "Measuring the Social Return to R&D," *Quarterly Journal of Economics*, vol. 113, no. 4, November 1998, pp. 1119-1135.

[4] Laura Tyson and Greg Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, Center for American Progress, January 2012, pp. 7-8.

When seen through the lens of standard economic theory, the external benefits from technological innovation resemble a market failure. They signal that too few resources are being allocated to the activities leading to the discovery and commercialization of new technical knowledge and know-how. As a remedy for this failure, most economists recommend the adoption of public policies aimed at boosting or supplementing private investment in R&D.

The U.S. government supports R&D in a variety of ways. Direct support comes mainly in the form of research performed by federal agencies and federal grants for basic and applied research and development intended to support specific policy goals, such as protecting the natural environment, exploring outer space, advancing the treatment of deadly diseases, and strengthening the national defense. Indirect support is more diffuse. The chief sources are federal funding of higher education in engineering and the natural sciences, legal protection of intellectual property rights, special allowances under antitrust law for joint research ventures, and tax incentives for business R&D investment.

Federal tax law offers two such incentives: (1) an expensing allowance for qualified research expenditures (QREs) under Section 174 of the Internal Revenue Code (IRC), and (2) a non-refundable tax credit for QREs above a base amount under IRC Section 41—also known as the research and experimentation (R&E) tax credit, the research tax credit, the R&D tax credit, or the credit for increasing research activities. The expensing allowance has been a permanent IRC provision since it was first enacted in 1954. Its main advantages are that the allowance simplifies tax accounting for R&D expenditures, reduces the likelihood of IRS challenges of the expensing of QREs, and encourages business R&D investment by taxing the returns to such investment at a marginal effective rate of zero and increasing cash flow among companies claiming the allowance.

A similar policy objective lies behind the research tax credit, which was a temporary provision of the IRC from July 1981 until 2015, when the Protecting Americans from American Tax Hikes (PATH) Act of 2015 (P.L. 114-113) permanently extended the credit. The credit is intended to stimulate more business R&D investment than otherwise would take place by lowering the after-tax cost of engaging in qualified research.[5] But unlike the deduction, it complicates tax compliance for firms investing in qualified R&D.

In FY2016, the combined revenue cost of the expensing option and the credit could total an estimated $13.5 billion.[6]

This report examines the current status of the R&E tax credit, describes its legislative history, and discusses some of the key policy issues raised by the current credit.

Design of the R&E Tax Credit

Many think of the research tax credit as a single unified credit. But it actually has four discrete components: a regular research credit, an alternative simplified credit (ASC), a basic research credit, and a credit for energy research.[7] Each is non-refundable. In any tax year, taxpayers may

[5] For more information on the Section 174 expensing allowance, see U.S. Congress, Senate Committee on the Budget, *Tax Expenditures*, committee print, 107th Cong., 2nd sess. (Washington: GPO, 2002), pp. 55-58.

[6] Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2015-2019*, JCX-141R-15 (Washington: December 7, 2015), p. 29; and Joint Committee on Taxation, *Estimated Budget Effects of Division Q of Amendment #2 to the Senate Amendment to H.R. 2029, the "Protecting Americans from Tax Hikes Act of 2015*, JCX-143-15 (Washington: December 16, 2015), p. 2.

[7] Firms investing in qualified research that could not claim the regular credit had the option of taking what was known

claim no more than the basic and energy research credits, plus either the regular credit or the ASC. To prevent taxpayers from benefiting twice from the same expenditures, any research tax credit claimed must be subtracted from deductible research expenses. The four components of the research tax credit were extended permanently in December 2015 by the

Qualified Research Expenditures

Ultimately, claims for the regular credit and the ASC hinge on the definition of qualified research expenditures (QREs). There are two aspects to this definition: (1) the nature of qualified research and (2) the expenses that qualify for the credit. Each is examined below.

Nature of Qualified Research

One aspect of what constitutes a QRE concerns the nature of qualified research. Under Section 41(d) of the federal tax code, research must satisfy the following four criteria in order to qualify for the regular credit or the ASC:

- The research must involve activities that qualify for the deduction under Section 174, which means that the activities must be "experimental" in the laboratory sense and aimed at the development of a new or improved product or process.
- The research must seek to discover information that is "technological in nature."
- The research should be intended to gain new technical knowledge that is useful in the development of a new or improved "business component," which is defined as a product, process, computer software technique, formula, or invention to be sold, leased, licensed, or used by the firm performing the research.
- The research must entail a process of experimentation aimed at the development of a product or process with "a new or improved function, performance or reliability or quality."

Businesses, the courts, and the IRS have clashed repeatedly over the interpretation of the four criteria. Although the IRS issued final regulations clarifying the definition of qualified research in December 2003 (T.D. 9104), numerous businesses and the IRS have continued to disagree over what activities qualify for the credit.[8]

Section 41(d) (4) identifies the activities for which the credit may not be claimed. Specifically, the credit does not apply to

- research conducted after the start of commercial production of a "business component";
- research done to adapt an existing business component to a specific customer's needs or requirements;
- research intended to modify a business component according to "style, taste, (and) cosmetic or seasonal design factors";
- research related to the duplication of an existing business component;

as an alternative incremental R&E tax credit (or AIRC), under IRC Section 41(c)(4), for tax years from 1996 to 2008. The Emergency Economic Stabilization Act of 2008 (P.L. 110-343) repealed the AIRC for the 2009 tax year, and Congress has not reinstated it. See page 14 for more details on the AIRC.

[8] See the discussion of concerns raised by the current definition of qualified research in the "Ambiguity and Uncertainty in the Definition of Qualified Research and QREs" section of this report.

- surveys and studies related to data collection, market research, production efficiency, quality control, and managerial techniques;
- research to develop computer software for a firm's internal use (except as allowed in any regulations issued by the IRS);
- research conducted outside the United States, Puerto Rico, or any other U.S. possession;
- research in the social sciences, arts, or humanities; or
- research funded by another entity.

Expenses Eligible for the Credit

The second aspect of the definition of QREs is the expenses to which the credit applies. Under Section 41(b) (1), qualified expenses relate to both in-house research and contract research. In the case of in-house research, the regular credit and ASC apply to the wages and salaries of employees and supervisors engaged in qualified research, as well as the cost of materials, supplies, and leased computer time used in this research. In the case of contract research, the credits apply to the full amount paid for qualified research conducted by certain small firms, colleges and universities, and federal laboratories; 75% of payments for qualified research performed by certain research consortia; and 65% of payments for qualified research performed by certain other nonprofit entities dedicated to scientific research.

As a result, the credits do not cover all the expenses a company incurs in conducting qualified research. Specifically, outlays for depreciable durable assets used in qualified research (such as buildings and equipment), overhead expenses (e.g., heating, electricity, rents, leasing fees, insurance, and property taxes), and the fringe benefits of research personnel are excluded. The exclusion of these expenses dilutes the incentive effect of the credit (more on this later). According to some estimates, excluded expenses account for 27% to 50% of business R&D spending.[9]

Regular Research Credit

The regular research tax credit was extended 16 times before the PATH Act permanently extended it. Congress has also significantly modified the credit six times, including the changes made by that act. Under IRC Section 41(a) (1), the regular credit is equal to 20% of a firm's QREs beyond a base amount. Such an incremental design serves a dual purpose. First, it encourages firms to spend more on R&D than they otherwise would by lowering the after-tax cost to business taxpayers of investing in qualified research above some normal or expected amount by as much as 20%.[10] There is evidence that business R&D investment is responsive to reductions in its after-tax cost.[11] Second, the incremental design of the regular credit is intended to minimize the revenue cost of boosting R&D investment.

[9] U.S. Office of Technology Assessment, *The Effectiveness of Research and Experimentation Tax Credits* (Washington: 1995), p. 29.

[10] For a variety of reasons, which will be discussed in a later section of the report, the actual or effective rate of the credit is much lower than 20%.

[11] Available studies indicate that the price elasticity of demand for R&D ranges from 0.2 to 2.0, which means that a 1% reduction in the cost of R&D would raise R&D spending between 0.2% and 2%.

The base amount for the regular credit is supposed to approximate how much a firm would spend on qualified research in the absence of the credit. As such, the base amount can be viewed as a firm's normal or expected level of R&D investment. Two rules govern the calculation of the base amount under IRC Section 41(c). First, it cannot be less than 50% of a firm's QREs in the current tax year—a rule that some call the 50-percent rule.[12] Second, the calculation of the base amount varies depending on whether a company qualifies as an established firm or a start-up firm. Established firms are defined as firms with gross receipts and QREs in at least three of the tax years from 1984 through 1988. Start-up firms, by contrast, are defined as firms whose first tax year with both gross receipts and QREs occurred after 1988, or firms that had fewer than three tax years from 1984 to 1988 with both gross receipts and QREs.[13] The base amount for all firms, established or start-up, is the product of a fixed-base percentage and average annual gross receipts in the previous four tax years. 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%. A start-up firm's fixed-base percentage is set at 3% for the firm's first five tax years with QREs and gross receipts. Thereafter, the percentage gradually adjusts to reflect a firm's actual experience, so that by its 11th tax year, the percentage equals the firm's total QREs relative to its total receipts in its 5th through 10th tax years.

A company's odds of being able to claim the regular credit hinge on its fixed-base percentage. More specifically, as a company's fixed-base percentage decreases, its chances of claiming the regular credit increase, all other things being equal. Furthermore, a firm can expect to benefit from the regular credit if its ratio of QREs in the current tax year to its average annual gross receipts in the previous four tax years is greater than its fixed-base percentage.

(See **Table 1** for a calculation of the regular credit for a hypothetical established firm and **Table 2** for a calculation of the regular credit for a hypothetical start-up firm.)

Table 1. Sample Calculations of the Regular and Alternative Simplified Research Tax Credits in 2016 for an Established Firm

($ millions)

Year	Gross Receipts	Qualified Research Expenses
1984	100	5
1985	150	8
1986	250	12
1987	400	15
1988	450	16
1989	400	18
1990	450	18
2009	835	45
2010	915	50
2011	1,005	53
2012	1,215	60

[12] In other words, the expenses against which the regular research credit may be claimed can equal no more than 50% of total QREs in a given tax year.

[13] The definition of a start-up firm has changed a few times since the research credit was enacted. Presently, it denotes a firm that recorded gross receipts and QREs in a tax year for the first time after 1993.

Year	Gross Receipts	Qualified Research Expenses
2013	1,465	70
2014	1,650	85
2015	1,825	95
2016	1,900	100

Source: Congressional Research Service.

Calculation: Regular Research Tax Credit

Compute the fixed-base percentage:

1. Sum the qualified research expenses for 1984 to 1988: $56 million.

2. Sum the gross receipts for 1984 to 1988: $1,350 million.

3. Divide the total qualified research expenses by the total gross receipts to determine the fixed-base percentage: 4.0%.

Compute the base amount for 2016:

1. Calculate the average annual gross receipts for the four previous years (2012-2015): $1,539 million.

2. Multiply this average by the fixed-base percentage to determine the base amount: $62 million.

Compute the regular tax credit for 2016:

1. Reduce the $100 million in qualified research expenses for 2016 by the greater of the base amount ($62 million) or 50% of the qualified research expenses for 2016 ($50 million): $38 million.

2. Multiply this amount by 20% to determine the regular R&E tax credit for 2016: **$7.60 million**.

Calculation: Alternative Simplified Research Credit

1. Calculate the average qualified research expenditures in the three previous years (2013-2015): $83 million.

2. Divide this amount by 2: $41.5 million.

3. Subtract this amount from qualified research expenditures in 2016: $58.5 million.

4. Multiply this amount by 0.14 to determine the alternative simplified research credit for 2016: **$8.2 million**.

Table 2. Sample Calculations of the Regular and Alternative Simplified Research Tax Credits in 2016 for a Start-up Firm

($ millions)

Year	Gross Receipts	Qualified Research Expenses
2008	30	35
2009	42	40

Year	Gross Receipts	Qualified Research Expenses
2010	55	45
2011	60	55
2012	210	65
2013	305	73
2014	400	82
2015	475	90
2014	600	105

Source: Congressional Research Service.

Calculation: Regular Research Tax Credit

Compute the fixed-base percentage:

1. According to current law, a start-up firm's fixed-base percentage is fixed at 3% for each of the first five years after 1988 when it has both gross receipts and qualified research expenses; it then adjusts according to a formula over the next six years to reflect the firm's actual research intensity. Thus, the fixed-base percentages are 3% for 2008 through 2012, 7.4% in 2013, 8.9% in 2014, 12.0% in 2015, and 14.9% in 2016.

Compute the base amount for 2016:

1. Calculate the average annual receipts for the four previous years (2012-2015): $347.5 million.

2. Multiply this amount by the fixed-base percentage (14.9%) to determine the base amount: $52 million.

Compute the regular tax credit:

1. Reduce qualified research expenses for 2016 ($105 million) by the greater of the base amount ($52 million) or 50% of the qualified research expenses for 2016 ($52.5 million): $52.5 million.

2. Multiply this amount by 20% to determine the regular R&E tax credit for 2016: **$10.5 million**.

Calculation: Alternative Simplified Research Credit

1. Calculate the average qualified research expenditures for the three previous years (2013-2015): $82 million.

2. Divide that amount by 2: $41 million.

3. Subtract that amount from qualified research expenditures in 2016: $64 million.

4. Multiply this amount by 0.14 to determine the alternative simplified research credit for 2016: **$9.0 million**.

Alternative Simplified Credit

The most recent addition to the research tax credits provided by Section 41 is the alternative simplified credit (ASC). It was established by the Health Care and Tax Relief Act of 2006 (P.L.

109-432). Under Section 41(c) (5), a business taxpayer may claim the ASC in lieu of the regular credit. 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. No 50-percent rule applies to the computation of the ASC. A decision to elect the ASC remains in effect until a company gains the consent of the IRS to switch to the regular research credit.

(See **Table 1** for a hypothetical calculation of the ASC for an established firm and **Table 2** for a similar calculation of the ASC for a startup firm.)

Owing to differences in the designs for the regular credit and the ASC, a company is unlikely to benefit equally from both. If one or more of the following conditions is present, a company probably would benefit more from the ASC than the regular credit:

- a relatively large base amount under the regular credit;
- incomplete records for determining its base period as a start-up firm;
- substantial growth in gross receipts in recent years; and
- a history of mergers, re-organizations, acquisitions, and dispositions.

Alternative Incremental Research Credit

Firms investing in qualified research that could not claim the regular credit once had another option: the alternative incremental R&E tax credit (or AIRC), under IRC Section 41(c) (4), which was available for tax years from 1996 to 2008. The Emergency Economic Stabilization Act of 2008 (P.L. 110-343) repealed the AIRC for the 2009 tax year, and Congress has not reinstated it. When a firm elected the AIRC for a particular tax year, it had to continue to do so, unless the firm received permission from the IRS to claim the regular research credit. Some were concerned that such a rule deterred some firms from claiming the AIRC, even though they might have been better off doing so.

The definition of QREs for the AIRC was the same as the definition of QREs for the regular credit and the ASC. But that was where any similarity between the two credits ended. While the regular credit is equal to 20% of QREs in excess of a base amount, the AIRC, in the final year it could be taken, was equal to 3% of a firm's QREs above 1% but less than 1.5% of its average annual gross receipts in the previous four tax years, plus 4% of its QREs above 1.5% but less than 2.0% of its average annual gross receipts in the previous four tax years, plus 5% of its QREs greater than 2.0% of its average annual gross receipts in the previous four tax years.

In general, firms were better off claiming the AIRC if their QREs in the current tax year exceeded 1% of their average annual gross receipts during the past four tax years. In addition, the AIRC was generally of greater benefit than the regular credit to companies that had relatively high fixed-base percentages, or whose research spending was declining, or whose sales were growing much faster than their research spending.

(See **Table 1** for a calculation of the AIRC for a hypothetical established firm and **Table 2** for a calculation of the AIRC for a hypothetical start-up firm.)

University Basic Research Credit

Firms that enter into contracts with certain nonprofit organizations to perform basic research may be able to claim a separate non-refundable incremental research credit for some of their expenditures for this purpose under IRC Section 41(e). The credit is intended to foster

collaborative research involving U.S. firms and colleges and universities. It is equal to 20% of total payments for qualified basic research above a base amount, which is called the "qualified organization base period amount." The determination of this amount has little in common with the base amount for the regular R&E tax credit, although both amounts are supposed to approximate the amount firms would spend on qualified research in the absence of the credits.[14]

For the purpose of the Section 41(e) credit, basic research is defined as "any original investigation for the advancement of scientific knowledge not having a specific commercial objective."

Like the regular credit and the ASC, the credit does not apply to qualified basic research done outside the United States, or to basic research in the social sciences, arts, or the humanities.

In addition, the basic research credit applies only to payments for qualified research performed under a written contract by the following organizations: educational institutions, nonprofit scientific research organizations (excluding private foundations), and certain grant-giving organizations.

Firms conducting their own basic research may not claim the credit for their expenditures for this purpose, but the spending may be included in their QREs for the regular credit or ASC. In addition, basic research payments eligible for the credit that fall below the base amount are treated as contract research expenses and may be included in the QREs for those credits as well.

Energy Research Credit

Under IRC Section 41(a) (3), taxpayers may also claim a tax credit equal to 20% of a portion (usually 65%) of payments to certain entities for energy research. To qualify for the credit, the payments must satisfy several requirements. First, they have to go to a nonprofit organization exempt from taxation under IRC Section 501(a) and "organized and operated primarily to conduct energy research in the public interest." In addition, the organization conducting energy research must have a minimum of five contributing members, and none of them may account for more than half of the total payments for qualified research received by the organization in a calendar year.

But the credit applies to 100% of payments to colleges and universities, federal laboratories, and certain small firms for contract energy research. In the case of eligible small firms, a business may claim the credit for the full amount of payments with two limitations. First, the taxpayer cannot own 50% or more of the stock of the small firm performing the research (if the firm is a corporation), or hold 50% or more of the small firm's capital and profits (if the firm is a non-corporate entity such as a partnership). Second, the firm performing the research must have an average of 500 or fewer employees in one of the two previous calendar years.

Because the credit is flat rather than incremental, it is more generous than the other three components of the Section 41 tax credit.

[14] Calculating a firm's base amount for the basic research credit is more complicated than calculating its base amount for the regular credit. For the basic research credit, a firm's base period is the three tax years preceding the first year in which it had gross receipts after 1983. The base amount is equal to the sum of a firm's minimum basic research amount and its maintenance-of-effort amount in the base period. The former is the greater of 1% of the firm's average annual in-house and contract research expenses during the base period, or 1% of its total contract research expenses during the base period. For a firm claiming the basic research credit, its minimum basic research amount cannot be less than 50% of the firm's basic research payments in the current tax year. The latter is the difference between a firm's donations to qualified organizations in the current tax year for purposes other than basic research and its average annual donations to the same organizations for the same purposes during the base period, multiplied by a cost-of-living adjustment for the current tax year.

Option to Claim an Accelerated Refundable Research Tax Credit in Lieu of Bonus Depreciation in 2008 and 2009

As a result of the Economic Stimulus Act of 2008 (P.L. 110-185), corporate and non-corporate firms could claim an additional first-year depreciation deduction equal to 50% of the cost of qualified property placed in service between March 31, 2008, and December 31, 2008. The deduction was known as the 50% bonus depreciation allowance. A provision of the Housing and Economic Recovery Act of 2008 (P.L. 110-289) gave corporations only the option of claiming a limited refundable tax credit for unused research and alternative minimum tax (AMT) credits stemming from tax years before 2006, in lieu of any bonus depreciation allowance they could claim for qualified property acquired after March 31, 2008. The credit was capped at $30 million for a single corporation and was set to expire at the end of 2008.

The American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5) extended both the first-year 50-percent bonus depreciation allowance and the option to claim a refundable research and AMT credit through 2009.

Under the Tax Relief, Unemployment Compensation Reauthorization, and Job Creation Act of 2010 (P.L. 111-312), the option to monetize unused AMT credits from tax years before 2006 in lieu of claiming a bonus depreciation allowance was extended so that it applied to qualified property acquired after March 31, 2008, and before January 1, 2013. The extension did not apply to unused research credits from the same tax years. With the passage of the American Taxpayer Relief Act of 2012 (P.L. 112-240), the option was extended through 2013 for qualified property acquired and placed in service that year. The

Option to Apply the Section 41 Credit Against a Qualified Small Company's Payroll or Alternative Minimum Tax Liability

Beginning in 2016, eligible small companies may apply any research tax credit they may claim against any alternative minimum tax (AMT) they owe. To qualify for this treatment, a company cannot be a publicly traded corporation, and its average annual gross receipts in the three previous tax years must be less than $50 million. The PATH Act added the Section 41 credit to the list of "specified" credits that may be used to offset the AMT.

Also beginning in 2016, under Section 41(h), eligible small companies may elect to apply any research tax credit they may claim to offset a limited amount of the employer share of the Social Security trust fund tax. To qualify for this treatment, a company cannot have had gross receipts in any tax year before the previous five tax years, and its gross receipts in the current tax year must be less than $5 million. The payroll tax credit a company may take in a tax year is limited to the least of the following options: (1) $250,000, (2) the research credit calculated for the current year, or (3) in the case of an eligible C corporation, the Section 38 general business tax credit carried forward under Section 39 from previous tax years. In addition, the payroll tax credit cannot exceed a company's Social Security tax liability during a calendar quarter on the wages paid to all employees; any excess may be used as a credit against the company's payroll tax liability in the following quarter. No qualified taxpayer may apply its research tax credit against its payroll tax liability in more than five tax years.

One issue that the IRS may need to clarify through the issuance of regulations is the definition of gross receipts for both limitations. In the view of some tax practitioners, the need for clarification is especially acute in the case of the size limitation for start-up companies eligible to use the research tax credit against a portion of their employment tax liability. Two examples illustrate this

point: Would a company be eligible for this treatment if it has no sales in a year before the start of the five-year period but does receive interest income from bank accounts? Would the same company be able to apply the credit against its employment tax liability if it received income from the sublease of an office or private or public research grants in the same year?[15]

Legislative History of the Research Tax Credit

The research tax credit entered the tax code as a temporary provision through the Economic Recovery Tax Act of 1981 (P.L. 97-34). In adopting the credit, the 97th Congress was seeking, in part, to stem a decline in business R&D spending as a share of U.S. gross domestic product that commenced in the late 1960s. Around the time the credit was enacted, more than a few analysts thought the decline was a primary cause of both the slowdown in U.S. productivity growth and the loss of competitiveness by a variety of U.S. industries in the 1970s. A majority in Congress concluded that a "substantial tax credit for incremental research and experimental expenditures was needed to overcome the reluctance of many ongoing companies to bear the significant costs of staffing and supplies, and certain equipment expenses such as computer charges, which must be incurred to initiate or expand research programs in a trade or business."[16]

The initial credit was equal to 25% of a company's QREs above a base amount, which was equal to its average QREs in the three previous tax years, or 50% of current-year spending, whichever was greater. It is not clear why Congress chose a statutory rate of 25%. There is no evidence that the rate was chosen on the basis of a rigorous assessment of the gap between the private and social returns to R&D investment, or the sensitivity of R&D expenditures to declines in their after-tax cost. Any taxpayer that claimed the credit and could not apply the entire amount against its current-year federal income tax liability was allowed to carry the unused portion back as many as three tax years, or forward as many as 15 tax years. The credit was to remain in effect from July 1, 1981, to December 31, 1985.

Congress made the first significant changes in the original research tax credit with the passage of the Tax Reform Act of 1986 (TRA86, P.L. 99-514). Among the many significant changes it made to the federal tax code, the act extended the credit through December 31, 1988, and folded it into the general business credit under IRC Section 38, thereby subjecting it to a yearly cap. In addition, the act lowered the credit's statutory rate to 20%, modified the definition of QREs so that the credit applied to research intended to produce new technical knowledge deemed useful in the commercial development of new products and processes, and created a separate 20% incremental tax credit for payments to universities and certain other nonprofit organizations for the conduct of basic research according to a written contract. The reduction in the credit's rate was not based on an analysis of the credit's effectiveness in the first five years. Rather, it seemed to reflect the overriding goals of TRA86, which were to lower income tax rates across the board, broaden the income tax base, and shrink the differences in tax burdens on the return to investment among the major categories of depreciable business assets, including intangible assets.

The regular and university basic research credits were extended through 1989 by the Technical and Miscellaneous Revenue Act of 1988 (P.L. 100-647). In addition, the act curtailed the overall tax preference for business R&D investment by requiring companies to reduce any deduction

[15] Nathan J. Richman, "Gross Receipts Definition Tops Research Credit Guidance Needs," *Tax Notes Today*, March 10, 2016.

[16] U.S. Congress, Joint Committee on Taxation, *General Explanation of the Economic Recovery Tax Act of 1981*, joint committee print, 97th Cong., 1st sess. (Washington: GPO, 1981), p. 120.

they claimed for QREs under IRC Section 174 by half of the sum of any regular and basic research credits they claimed. This new rule decreased the maximum effective rate of the regular research tax credit by a factor equal to 0.5 times a taxpayer's marginal income tax rate.[17]

Growing dissatisfaction with the design of the original credit among interested parties led to the enactment of several additional changes in the regular credit under the Omnibus Budget Reconciliation Act of 1989 (OBRA89, P.L. 101-239). Much of the dissatisfaction concerned the formula for determining the base amount of the credit. Critics rightly pointed out that under the formula, which was based on a three-year moving average of a firm's QREs, an increase in a company's research spending in one year would boost its base amount in each of the following three years by one-third of that increase, perhaps making it more difficult to claim the credit in those years. Some argued that such a design would be less cost-effective in raising business R&D investment than a design that made a firm's base amount completely independent of its current-year QREs.[18]

To response to this concern, OBRA89 changed the formula for the base amount so that it was equal to the larger of two options: (1) 50% of a firm's current-year QREs or (2) the product of the firm's average annual gross receipts in the previous four tax years and a "fixed-base percentage." The act set this percentage equal to the ratio of a firm's total QREs to total gross receipts in four of the tax years from 1984 to 1988, capped at 16%. OBRA89 also made the credit available on more favorable terms to start-up firms, which it defined as firms without gross receipts and QREs in three of the four years from 1984 to 1988; these firms were assigned a fixed-base percentage of 3%. In addition, the act effectively extended the credits to December 31, 1990 (by requiring companies to prorate QREs incurred before January 1, 1991), made it clear that firms could apply the regular credit to QREs related to current lines of business and possible future lines of business, and required firms claiming the regular and university basic research credits to reduce any deduction they claim under IRC Section 174 by the entire amount of the credits.

In 1990 and 1991, Congress passed two bills that, among other things, temporarily extended the credits. The Omnibus Budget Reconciliation Act of 1990 (P.L. 101-508) extended the credits through December 31, 1991 and repealed the requirement that companies prorate QREs incurred before January 1, 1991. The Tax Extension Act of 1991 (P.L. 102-227) moved the expiration date for the credits to June 30, 1992. A major obstacle to longer extensions of the credits at the time lay in a congressional budget rule that required the revenue cost of lengthy or permanent extensions be scored over 10 fiscal years and offset with tax increases or cuts in non-defense discretionary spending.

Although Congress passed two bills in 1992 that would have extended the credits beyond June 30 of that year, President George H. W. Bush vetoed both for reasons that had nothing to do with the desirability of the credits. As a result, the credits expired and remained unavailable from July 1, 1992 until the enactment of the Omnibus Budget Reconciliation Act of 1993 (OBRA93, P.L. 103-66) in August 1993. That act retroactively extended the credits from July 1, 1992 through June 30, 1995. It also modified the fixed-base percentage for start-up firms. A company that had no gross receipts in three of the tax years from 1984 to 1988 was assigned a percentage of 3% for the first five tax years after 1993 in which it reported QREs. Starting in the sixth year, the percentage gradually adjusted so that, by the 11th year, the percentage would reflect the company's actual ratio of total QREs to total gross receipts in five of the previous six tax years.

[17] For a business taxpayer in the 30% tax bracket, the rule reduced the maximum effective rate of the regular research credit from 20% to 17.5%: .20 x [1 - (.5 x .30)].

[18] See U.S. Congress, Joint Economic Committee, *The R&D Tax Credit: An Evaluation of Evidence on Its Effectiveness*, joint committee print, 99th Cong., 1st sess. (Washington: GPO, 1985), pp. 17-22.

Congress allowed the credits to expire again on June 30, 1995. They remained in abeyance until the enactment of the Small Business Job Protection Act of 1996 (P.L. 104-188) in August 1996. That act reinstated the credits from July 1, 1996 to May 31, 1997, leaving a one-year gap in the credit's coverage since its inception in mid-1981. The act also expanded the definition of a start-up firm to include any firm whose first tax year with both gross receipts and QREs was 1984 or later, added a three-tiered alternative incremental research credit (AIRC) with rates of 1.65%, 2.2%, and 2.75%, and allowed companies to include 75% of their payments for qualified research performed under contract by nonprofit organizations "operated primarily to conduct scientific research" in the QREs eligible for the regular credit and the AIRC.

The credits expired yet again in 1997, but they were extended retroactively from June 1, 1997 to June 30, 1998 by the Taxpayer Relief Act of 1997 (P.L. 105-34). A further extension of the credits, to June 30, 1999, was included in the revenue portion of the Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1998 (P.L. 105-277).

Under circumstances reminiscent of 1997, the credits expired in 1999. But the revenue portion of the Ticket to Work and Work Incentives Improvement Act of 1999 (P.L. 106-170) extended them from July 1, 1999 to June 30, 2004. It also increased the three rates of the AIRC to 2.65%, 3.2%, and 3.75% and expanded the definition of qualified research to include qualified research performed in Puerto Rico and the other U.S. territorial possessions.

On October 4, 2004, President George W. Bush signed into law the Working Families Tax Relief Act of 2004 (P.L. 108-311), which extended the research tax credit through December 31, 2005.

The Energy Policy Act of 2005 (P.L. 109-58) added a fourth component to the research tax credit by establishing a credit equal to 20% of payments for energy research performed under contract by qualified research consortia, colleges and universities, federal laboratories, and eligible small firms.

Under the Tax Relief and Health Care Act of 2006 (P.L. 109-432), the research tax credit was extended retroactively through the end of 2007. The act also raised the three rates for the AIRC to 3%, 4%, and 5%, and established yet another research tax credit: the alternative simplified credit (ASC). This fifth component of the credit was equal to 12% of QREs in excess of 50% of average QREs in the past three tax years; but for businesses with no QREs in any of the three preceding tax years, the credit was equal to 6% of QREs in the current tax year.

The Emergency Economic Stabilization Act of 2008 (P.L. 110-343) retroactively extended the research credit through 2009. It also raised the rate of the ASIC from 12% to 14% and repealed the AIRC.

Under the Housing and Economic Recovery Act of 2008 (P.L. 110-289), corporations gained the option for the 2008 tax year only of claiming a limited, accelerated, refundable credit for unused research and AMT credits from tax years before 2006, in lieu of taking any bonus depreciation allowance they could claim for qualified assets placed in service between March 31, 2008, and December 31, 2008.

The American Recovery and Reinvestment Act of 2009 (P.L. 111-5) extended that option through 2009.

As a result of the Tax Relief, Unemployment Compensation Reauthorization, and Job Creation Act of 2010, (P.L. 111-312), the research credit remained available through 2011.

After a one-year lapse, Congress retroactively extended the credit through 2013 and made some minor changes in the rules governing the allocation of research credits among members of

controlled groups of companies and the use of the credit by the parties to business acquisitions by passing the American Taxpayer Relief Act of 2012 (P.L. 112-240).

The Tax Increase Prevention Act of 2014 (P.L. 113-295) extended all four components of the credit through 2014.

After years of being a temporary provision, the 114th Congress permanently extended the credits, starting with the 2015 tax year, through the Protecting Americans from Tax Hikes Act of 2015 (PATH Act, P.L. 114-113). The act also addressed two other concerns raised by the credit by allowing qualified small businesses to apply the research tax credits against any alternative minimum tax they may owe and against the employer share of the Social Security tax owed for each employee. The latter option is capped at $250,000 for a qualified employer in a tax year.

Effectiveness of the U.S. Research Tax Credit

A key question raised by the research tax credit concerns how effective it has been in encouraging businesses to invest more in R&D than they otherwise would have.

Among economists, the preferred approach to assessing the effectiveness of a research tax credit is to compare the social benefits from the added R&D induced by the credit with the social costs of the credit. The social benefit of the added R&D spending encompasses any additional profits received by the company investing in R&D from the use of the new technologies developed through the investment, the profits earned by other companies from adopting and adapting those technologies, and the welfare gains to consumers from any price declines or quality improvements arising from the new products, processes, and services derived from those technologies. The social cost of an additional unit of R&D is the loss of tax revenue because of the credit, the opportunity cost of the forgone revenue, and the public and private costs of administering the credit. Such an assessment of the credit's effectiveness has not been undertaken because of several intractable problems associated with measuring the social returns to R&D investments.[19]

As a result, analysts have relied on two other measures of effectiveness: (1) the amount of business R&D investment in a given year that can be attributed to the research credit and (2) the added R&D induced by one dollar of the credit. Each measure focuses on the direct benefits (added R&D investment) and the direct costs (revenue loss) of the credit; no secondary effects are considered. The results of the studies that have been done using each measure are discussed below.

Benefit-to-Cost Ratio of the Research Tax Credit

What do available studies say about the amount of additional qualified research induced by one dollar of the research tax credit? This measure looks at the ratio of the total R&D spending attributable to the credit's total revenue cost. As such, it measures the credit's cost-effectiveness. A ratio of 1.0 would indicate that one dollar of the credit leads a company to spend one additional dollar on R&D, all other things being equal.

[19] The principal barriers to measuring the social returns to R&D are developing adequate price indices for the cost elements of R&D for specific industries, specifying the time period in which to assess the productivity gains from R&D, and determining the depreciation rate for a society's stock of R&D assets. For a detailed discussion of these issues, see Bronwyn H. Hall, "The Private and Social Returns to Research and Development," in *Technology, R&D, and the Economy*, Bruce L. Smith and Claude E. Barfield, eds. (Washington: Brookings Institution, 1996), pp. 141-145.

This method of assessing the effectiveness of the research tax credit is built on an equation that predicts the level of R&D investment as a function of past R&D spending, previous output, expected demand, and other variables such as cash flow and the price of qualified R&D. A dummy variable is added to the equation, and it is equal to one when the credit is available and to zero when it is not. The size of the estimated coefficient for the dummy variable indicates the amount of R&D spending induced by the credit.

Several studies have estimated the gain in research expenditures from one dollar of the credit.

A 1999 review of studies of the effectiveness of the federal research tax credit by Bronwyn Hall and John van Reenen yielded two interesting findings.[20] First, Hall and van Reenen found that the studies based on the use of the credit between 1981 and 1983 generated lower estimates of the added research associated with one dollar of the credit than did the studies based on the use of the credit in periods starting with 1984. Second, using company R&D data reported in public sources only, Hall and van Reenen concluded that the one dollar of the research tax credit generated "roughly" a one dollar increase in reported R&D spending. But they had serious doubts about this estimate's accuracy. It was based on the response of QREs to a reduction in the estimated tax price of qualified research as a result of the credit. Hall and van Reenen pointed out that this method could produce inflated estimates since the credit gave companies an incentive to re-classify non-research expenditures so they qualified for the credit.[21]

In a 2012 study released by the Center for American Progress, Laura Tyson and Greg Linden examined the findings of 11 studies of the credit's effectiveness that had been published in peer-reviewed journals.[22] The studies were done using different analytical methods, time periods, and data sets. Tyson and Linden also found that the estimated benefit-to-cost ratio of the credit was significantly below 1.0 for the studies covering the period from 1981 to 1985. They also noted that the estimated benefit-to-cost ratios for periods between 1985 and 1997 were much higher: 0.95 to 2.96. The differences among the 11 studies in time period, industry data on R&D spending, and method of estimation rendered a comparison of their results problematic. Nonetheless, Tyson and Linden concluded, as had Hall and Van Reenen, that the credit was effective "in the sense that each dollar of foregone tax revenue or tax expenditure for the credit causes businesses to invest at least one additional dollar in R&D.[23]"

The Congressional Budget Office came to a similar conclusion in a 2007 report on federal support for R&D. According to the report's authors, many of the studies of the effectiveness of the research tax credit "have clustered around the finding that a dollar claimed under an R&D tax credit leads firms to spend an additional dollar on R&D.[24]

Business R&D Spending Induced by the Credit

What do available studies reveal about the total amount of business R&D investment that could be due to the credit?

[20] See Bronwyn H. Hall and John van Reenen, *How Effective Are Fiscal Incentives for R&D? A Review of the Evidence*, working paper 7098 (Cambridge, MA: National Bureau of Economic Research, April 1999).

[21] Ibid., p. 18.

[22] Laura Tyson and Greg Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, Center for American Progress, January 2012, https://cdn.americanprogress.org/wp-content/uploads/issues/2012/01/pdf/corporate_r_and_d.pdf.

[23] Ibid., p. 44.

[24] Congressional Budget Office, *Federal Support for Research and Development* (Washington: June 2007), p. 24.

This measure of the credit's effectiveness rests on the tax price elasticity of demand for R&D and the average effective rate (AER) of the credit across industries. Multiplying the former by the latter shows the percentage of total industry R&D spending in a year that might be due to the credit. A tax price elasticity of 1.0 means that 1.0% decline in the marginal cost of qualified research (measured as an R&D price deflator for a weighted average of R&D inputs) would lead a company investing in qualified research to increase its spending for that purpose by the same percentage, all other things being equal. The AER for the research tax credit gauges the extent to which it reduces the after-tax cost of qualified R&D investments in a year, taking into account the rules governing its use.

For example, if the credit's AER were 1.0%, then the after-tax marginal cost of another unit of R&D would be 1.0% less than the pre-tax cost, which is to say that the credit lowers the tax price of the project by 1.0%. So if the average tax price elasticity of demand for all industries were 1.0 and the AER for the credit were 10%, then it would be reasonable to conclude that the credit may have accounted for 10% of aggregate business R&D investment in a particular year.

This method of assessing the credit's effectiveness is also built around an equation that takes into account the non-tax determinants of R&D investment, such as previous levels of this investment and output. But the price variable in the equation represents the marginal cost of R&D projects. It is used to construct a measure of the sensitivity of R&D spending to changes in the price of R&D projects. The credit lowers the tax price of those projects. So if the price variable contains the implicit tax subsidy for qualified R&D investments, then it should indicate how R&D spending responds to the credit's marginal effective rate.

A majority of the same 11 academic studies reviewed by Tyson and Linden also estimated the tax price elasticity of demand for R&D in the short or long run (and in two cases both). The findings of the six studies that covered time periods ending in 1985 presented a mixed picture with limited usefulness. Only two of the studies generated elasticity estimates: a short-run elasticity of demand of 0.35 in one case and a long-run elasticity of 1.0 to 1.5 in the other case. The studies that covered later time periods yielded results that suggested the long-run tax price elasticity of demand fell in the range of 0.75 to 2.0. A consensus appears to have formed around a tax price elasticity of demand of 1.0.[25]

A measure of the reduction in the cost of qualified research due to the credit is its average effective rate. Ideally, the rate would be derived by dividing the total amount of the research credit received in a tax year by some measure of total business spending on qualified research in the same year. But the IRS does not make available through public sources of information the amount of the credit awarded in a year, but it does release figures on the amount of claims for the credit. So claims are used to determine the credit's AER. For the research tax credit, there are two indicators of total business spending on R&D: QREs as reported by the IRS and business spending on domestic basic and applied research and development as reported by the National Science Foundation (NSF). The research tax credit's AER can be computed using both QREs and business investment in domestic R&D.

As **Table 3** shows, the average effective rate of the credit from 2007 to 2012 was 3.6% for business investment in domestic R&D and 5.4% for QREs. This implies that the credit lowered

[25] Tyson and Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness,* p. 44. A 2002 study by Nick Bloom, Rachel Griffith, and John Van Reenen of the effectiveness of research tax credits in nine countries (including the United States) provides some backing for this consensus. The authors estimated a short-run tax price elasticity of demand for R&D in the period from 1979 to 1997 of 0.1 and a long-run elasticity of 1.0. (See Nick Bloom, Rachel Griffith, and John Van Reenen, "Do R&D Tax Credits Work? Evidence from a Panel of Countries 1979-1997," *Journal of Public Economics,* vol. 85, issue 1, pp. 1-31.

the average after-tax cost of that investment by 3.6% and of qualified research by 5.4% during that period. By contrast, the statutory rate from 2007 to 2012 was 20% for the regular credit and 14% for the ASC. While the regular credit and the ASC accounted for nearly equal shares of total QREs in 2007, 72% of total QREs were associated with claims for the ASC in 2012.

The gap between the AERs for QREs and business investment in domestic R&D reflects differences in scope of each measure of business R&D investment. Aggregate QREs amounted to 67% of aggregate domestic business R&D spending from 2007 to 2012. The NSF estimate covers domestic R&D funded by firms. It is based on annual surveys of business R&D and takes into account the wages, salaries, and fringe benefits of research personnel; the cost of materials and supplies, overhead expenses; and depreciation for equipment and buildings related to research activities. Excluded from the estimate are expenditures on the buildings and equipment used in research, quality control, routine product testing, and prototype production.[26] By contrast, QREs represent eligible spending on qualified research, as reported to the IRS on Form 6765. Qualified expenses consist of the wages and salaries of research personnel, materials, supplies, leased computer time used in qualified research, and 65% to 75% of contract research funded by the firms claiming the credit. The NSF figures cover a larger share of the total costs of business R&D investment than do QREs.

The figures in **Table 3** suggest that the credit delivered a modest stimulus to domestic business R&D investment from 2007 to 2012. Assuming the long-run tax price elasticity of demand for qualified research was 1.0, and the credit lowered the after-tax cost of business spending on qualified research by 5.4%, one can argue the credit may have boosted that spending by 5.4%, compared to the investment that might have taken place without the credit.[27]

Available evidence about the effect of the credit on business R&D investment points to several conclusions. First, the credit seems to have induced companies to spend more on domestic R&D than they otherwise would have. Second, the extent of that stimulus is uncertain, especially in the period since the late 1990s. The results of the studies that have estimated the credit's cost – effectiveness and the responsiveness of business R&D investment to changes in its tax price are not comparable because they cover different periods using different data sets and methodologies. Finally, the credit's incentive effect may grow over time, as more and more firms come to understand its design and requirements.

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[26] National Science Foundation, Division of Science Resource Statistics, *The Methodology Underlying the Measurement of R&D Expenditures: 2000 (data update)* (Arlington, VA: December 10, 2001), p. 2.

[27] This estimate assumes that all the credits claimed in each year of that decade were used immediately and were not subject to reduction because of IRS audits. Delays in the use of any credit shrink its present value, and thus its marginal effective rate. For instance, if a taxpayer claims a research credit of $1 million, has a discount rate of 5%, and cannot use the credit for three years, then the present value of the credit drops to about $864,000. Because the top marginal effective rate for the credit is 13%, owing to the rule that any deduction of research expenditures under Section 174 must be reduced by the amount of the credit, the delay in using the credit lowers the marginal effective rate to 11.2% (13% x 0.864). Delays can occur for two reasons: IRS audits or insufficient or no tax liability against which to apply credit in the current tax year.

A 2009 report on the design of the research tax credit by the Government Accountability Office (GAO) casts doubt on the plausibility of the assumptions underlying the estimated stimulus effect of the credit from 1998 to 2008. The report found that 44% of the "total net credits earned" in 2005 could not be used immediately and thus could be carried back one tax year or forward up to 20 tax years. It also noted that IRS data on examinations of claims for the credit by corporations with annual business receipts of $1 billion or more from 2000 to 2003 indicated that the examiners recommended changes that would have lowered the aggregate amount of credits claimed by 16.5% in 2000, 19.3% in 2001, 27.1% in 2002, and 24.5% in 2003. See U.S. Congress, Government Accountability Office, *Tax Policy: The Research Tax Credit's Design and Administration Can Be Improved*, GAO-10-136 (Washington: November 2009), pp. 14-15.

Table 3. Business and Federal Spending on Domestic Research and Development, and Claims for the Federal Research Tax Credit, 2007 to 2012

($ billions)

	2007	2008	2009	2010	2011	2012
Business Spending on Domestic R&D (BSDRD)[a]	$243	$254	$243	$245	$239	$247
Qualified Research Expenditures (QREs)[b]	$158	$151	$143	$160	$172	$196
Federal R&D Spending (FRS)[c]	$127	$127	$133	$147	$143	$141
Current-Year Research Tax Credit[d]	$8.3	$8.3	$7.9	$8.5	$9.2	$10.8
Ratio of Credit to BSDRD (%)	3.4%	3.3%	3.2%	3.5%	3.8%	4.4%
Ratio of Credit to QREs (%)	5.2%	5.5%	5.5%	5.3%	5.3%	5.5%
Ratio of Credit to FRS	6.5%	6.5%	5.9%	5.8%	6.4%	7.7%

Source: National Science Foundation, Division of Science Resources Statistics, *Science and Engineering Indicators 2014*, appendix table 4-3; National Science Foundation, Division of Science Resources Statistics, *Federal Funds for Research and Development: Fiscal Years 2010-12*, table 1; Internal Revenue Service, available at http://www.irs.gov/uac/SOI-Tax-Stats-Corporation-Research-Credit.

a. Total spending on domestic basic and applied research, as well as development, by companies only.

b. Spending on research that qualifies for the regular, alternative incremental, and university basic research tax credits, as reported by corporations claiming the credit on their federal income tax returns.

c. Budget authority for defense and non-defense R&D spending by fiscal year.

d. Total value of claims for the regular, incremental and basic research tax credits reported in federal corporate income tax returns. Because of limitations on the use of the general business credit, of which the research credit is a component, and audits of corporate claims for the credit by the Internal Revenue Service, the total amount of the research credit actually used in a particular year may differ from the total amount claimed.

Policy Issues Raised by the U.S. Research Tax Credit

Most economists and lawmakers endorse the use of tax incentives to stimulate greater domestic business R&D investment. Nonetheless, the research tax credit has been the target of considerable criticism since it was established in 1981. A primary concern of critics has been that the credit is not as effective as it could or should be. They attribute this outcome to certain problems with the

credit's design. More specifically, they argue that the credit would be likely to generate its intended benefits only if the following four problems are remedied:

- The regular credit and the ASC have weak and uneven incentive effects.
- Neither credit is refundable, though for eligible small companies, the credit may be used to lower their employment tax liabilities.
- The definition of qualified research remains a major source of legal disputes between the IRS and numerous companies investing in R&D.
- The credit is not targeted at R&D investments that are likely to generate economic benefits far in excess of their social cost.

Each potential difficulty is discussed in some depth below, along with possible remedies.

Uneven and Inadequate Incentive Effects

A tax subsidy's incentive effect refers to the magnitude of the benefit it offers eligible taxpayers. The greater the benefit, the greater the likelihood the subsidy will influence their behavior in the intended ways.

In the view of some critics, the research credit's incentive effect varies among firms conducting qualified research in ways that are not supported by economic theory and that might defeat the credit's purpose. They also contend that the maximum incentive effect of the regular credit and the ASC is too small to offset the predisposition of firms in general to invest less in research than its potential spillover benefits would warrant.

Is there any evidence to support these claims?

Uneven Incentive Effect

The regular credit's incentive effect appears to vary widely among firms investing in qualified research, including those that gradually but steadily increase their investment over an extended period. Evidence for such variation can be found in a number of sources, including a 1996 study by economist William Cox that identified the corporations from a large group of domestic corporations with sizable research budgets in 1994 that should have been able to claim the regular credit. (The ASC did not exist at that time.)[28]

The study was based on a sample of 900 publicly traded U.S.-based companies with the largest R&D budgets, culled from a database maintained by Compustat, Inc. Under the reasonable assumption that QREs for these firms were equal to 70% of their reported R&D spending for 1994, Cox determined that 62.5% of the firms could be considered established firms for the purpose of claiming the regular credit, as they had both business revenue and QREs in three of the years from 1984 to 1988; the remainder were treated as start-up firms. Cox found that 78% of the 900 firms in the sample (44.4% were established firms and 33.5% start-up firms) could have claimed the credit in 1994, while 22% could have claimed no credit (18% of established firms and 4% of start-up firms). He also found that 34% of all firms (32.3% were established firms and 1.7% start-up firms) had QREs greater than their base amounts but less than twice those amounts, allowing them to claim credits with a marginal effective rate of 13%, and that 43.8% of all firms

[28] CRS Report 96-505, *Research and Experimentation Tax Credits: Who Got How Much? Evaluating Possible Changes*, by William A. Cox, pp. 5-10. (This report is out of print but available to congressional clients from Gary Guenther upon request.) (Hereinafter cited as Cox, *Research and Experimentation Tax Credits*.)

had QREs greater than double their base amounts, allowing them to claim credits with a marginal effective rate of 6.5%.[29] These rates measure the reduction in the after-tax cost of an additional dollar of qualified research as a result of taking the regular credit. In addition, Cox found that some of the most research-intensive firms (as measured by their spending on R&D as a share of revenue) could claim either no credit or credits with a marginal effective rate half as large as the rate for the credits that could be claimed by firms with much lower propensities to invest in R&D.

The results showed that the regular credit was most beneficial to firms whose research intensities had risen since their base periods, and least beneficial to firms whose research intensities had changed little or not at all, or had shrunk, since their base periods. Most of the firms whose research intensities had declined found themselves in that position for two reasons: (1) their R&D spending was lower in 1994 than it was in their base period, or (2) their sales revenue had grown faster than their R&D expenditures over the same period.

Critics of the design of the regular credit argue that the pattern of R&D subsidization found in the Cox study seems unfair and arbitrary, has no justification in standard economic theory, and undercuts the intended purpose of the credit, which is to encourage all research-intensive firms to spend more on R&D than they otherwise would. According to Cox, the wide variation in the marginal effective rates of the credit among the firms in his analysis suggested "that society places a higher value on adding R&D at certain firms than at others and on adding R&D of certain types than others, when little or no basis for such different valuations exists."[30]

Two rules governing the use of the regular credit are responsible for most of the variation in its incentive effect. One is the requirement that the base amount for the regular credit cannot be less than 50% of QREs. The other rule is the requirement that older firms use gross receipts and QREs from 1984 to 1988 to calculate their fixed-base percentages.

In combination, the rules can produce dissimilar outcomes in the use of the regular credit among firms that spend substantial amounts on qualified research. Of particular concern to critics are firms whose research-intensity has shrunk over time. The structure of the U.S. economy can and does change markedly in a period of 20 or so years. So it is likely that economic and competitive conditions in research-intensive industries today bear little resemblance to the conditions that prevailed in the 1980s or 1990s. Most of the firms that have remained in business as independent entities and invested considerable amounts in R&D relative to revenues since then now face different climates for R&D investment. In some cases, the change in circumstances has led established firms to invest less in R&D as a share of revenues. Firms in this position may not be able to claim the regular credit, even if they spend relatively large sums on R&D.[31]

Inadequate Incentive Effect

In claiming that the regular credit's incentive effect is inadequate, critics have in mind two different measures of the effect. One deals with the credit rate deemed essential to inducing companies to increase their R&D investments, perhaps to socially optimal levels; the other

[29] Their effective credit rate was lower because each firm was subject to the 50-percent rule, which reduced the marginal effective rate of the credit on R&D spending above the base amount by 50%.

[30] Cox, *Research and Experimentation Tax Credits*, p. 10.

[31] Two examples are aerospace and semiconductor chip manufacturers. See McGee Grisby and John Westmoreland, "The Research Tax Credit: A Temporary and Incremental Dinosaur," *Tax Notes*, vol. 93, no. 12, December 17, 2001, p. 1633.

measure concerns differences between the regular credit's statutory rate and its average marginal effective rate. Both measures are examined here.

Research Credit Rate and Socially Optimal Levels of R&D Investment

Critics maintain that the average effective rate of the regular credit is too low to support levels of business investment in research commensurate with its economic benefits. To substantiate this claim, they point to another study by Cox, one that focused on the efficacy of the research tax credit.[32]

Cox built the analysis around the premise that tax incentives can overcome the private sector's predilection for investing suboptimal amounts in the creation of new technical knowledge and know-how. For tax incentives to have this effect, they must be designed so they subsidize R&D spending above and beyond what firms would undertake on their own, and they must be large enough to "raise private after-tax returns on R&D investments to the levels that would result from applying the same rate of taxation to the social rate of return from R&D."[33] A variety of studies from the past 50 years or so have concluded that the median private rate of return on R&D investment is roughly 50% of the median social rate of return.[34] Thus, assuming that the average social pre-tax rate of return is two times the average private pre-tax rate of return, the optimal R&D tax subsidy would double the private after-tax rate of return to R&D investment. For example, given a corporate tax rate of 35%, after-tax returns would equal 65% of pre-tax returns for corporations in the presence of no tax subsidies or preferences. In this case, the optimal R&D tax subsidy would double the private after-tax returns to R&D investment by increasing them to 130% of pre-tax returns: [2 x (1-0.35)].

Cox's analysis implied that the optimal average effective rate for an R&D tax subsidy, or a combination of such subsidies (e.g., a research tax credit combined with the expensing of research expenditures), was 30%. In discussing the policy implications of this finding, Cox noted that such a rate was an average and thus would not address the considerable variation among R&D investments in the difference between their private and social returns. Using tax incentives to boost pre-tax returns on R&D investment by 30% across all industries would inevitably provide excessive subsidies for projects with below-average spillover benefits and insufficient subsidies for projects with above-average spillover benefits. According to Cox, lawmakers should be aware that "this imprecision is unavoidable, and its consequences are hard to assess."[35]

How do existing federal tax subsidies for R&D investment compare with Cox's assessment of the optimal R&D tax subsidy? To determine the incentive effect of those subsidies, he estimated the pre-tax and after-tax rates of return under 1995 federal tax law for a variety of hypothetical R&D projects. The projects differed in the share of R&D expenditures devoted to depreciable assets like structures and equipment, the share of R&D expenditures eligible for both expensing under IRC Section 174 and the regular research credit, and the economic lives of the intangible assets created by the investments. Cox compared the combined effect of expensing and the credit on

[32] See CRS Report 95-871, *Tax Preferences for Research and Experimentation: Are Changes Needed?* by William A. Cox. (This report is out of print but available to congressional clients from Gary Guenther upon request.) (Hereinafter cited as Cox, *Tax Preferences for Research and Experimentation*.)

[33] Ibid., p. 8.

[34] See, for example, Edwin Mansfield, *The Positive Sum Strategy*, pp. 309-311.

[35] Ibid., p. 9.

after-tax returns to investment in capital-intensive, intermediate, and labor-intensive R&D projects producing intangible assets with economic lives of 3, 5, 10, and 20 years.[36]

Expensing equalizes the pre-tax and after-tax rates of return on an investment, since it taxes the income earned by affected assets at a marginal effective rate of zero.[37] For the typical business R&D investment, only part of the total cost may be expensed under IRC Section 174, as tangible depreciable assets like structures and equipment do not qualify for such treatment. Therefore, how expensing affects an R&D investment's after-tax rate of return depends on two factors: (1) the percentage of the total cost that may be expensed, and (2) the marginal effective tax rate on income earned by the assets (including labor) eligible for expensing.

The regular research credit raises the after-tax rate of return for a portion of current-year QREs: those above a base amount. So its effect on the after-tax returns to an R&D investment depends on both the percentage of the investment's total cost that qualifies for the credit and the effective tax rate on income earned by assets eligible for the credit.

In light of these limitations on the benefits of expensing and the regular credit, Cox estimated that expensing and the credit together produced median after-tax rates of return ranging from 101.0% of pre-tax returns for a hypothetical capital-intensive project yielding intangible assets with an economic life of 20 years to 124.7% for a hypothetical labor-intensive project yielding intangible assets with an economic life of three years.[38] As these percentages are less than the threshold tax subsidy of 130%, he concluded that the research tax subsidies in existence in 1995 did not increase private after-tax returns to R&D investments to the "levels warranted by the spillover benefits that are thought to be typical" for these investments.[39]

Difference Between the Credit's Average Effective Rate and Its Statutory Rate

Some critics of the regular credit and the ASC assess their incentive effects using a different measure. For them, a more important concern than either credit's potential to boost business investment in research to socially optimal levels is discrepancies between the regular credit and ASC's average effective rates and their statutory rates. The discrepancies are not the same for all companies, and they are largely a product of several of the rules governing the use of the credit.

One of those rules is the basis adjustment under IRC Section 280C(c) (1). Under this rule, taxpayers investing in qualified research must reduce their deduction for research expenditures under IRC Section 174 by the amount of any research credit they claim. This adjustment effectively adds the credit to a firm's taxable income and taxes it at the firm's income tax rate. This means that for business taxpayers subject to the maximum corporate tax rate of 35%, the basis adjustment decreases the marginal effective rate for the regular credit from 20% to 13%, and the marginal effective rate for the ASC from 14% to 9.1%. Firms have the option of computing the regular research credit with a statutory rate of 13% in exchange for not reducing their Section 174 deduction by the amount of the credit.

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[36] In the case of capital-intensive projects, 50% of outlays go to structures and equipment, 35% qualify for expensing and the credit, and 15% qualify for expensing alone. In the case of intermediate projects, 30% of outlays go to structures and equipment, 50% qualify for expensing and the credit, and 20% qualify for expending alone. And in the case of labor-intensive projects, 15% of outlays go to structures and equipment, 65% qualify for expensing and the credit, and 20% qualify for expensing only.

[37] See Jane G. Gravelle, "Effects of the 1981 Depreciation Revisions on the Taxation of Income from Business Capital," *National Tax Journal*, vol. 35, no. 1, March 1982, pp. 2-3.

[38] Cox, *Tax Preferences for Research and Experimentation*, p. 15.

[39] Ibid., p. 17.

A second rule is the requirement that the base amount for the regular credit must equal 50% or more of a firm's current-year QREs. This rule applies to the computation of the ASC. One implication of the rule is that it curtails the credit's potential benefit to established firms whose ratio of current-year QREs to gross income is more than double their fixed-base percentages, or more than double the 16% cap on the fixed-base percentage. Basically, these are firms that historically have invested heavily in qualified research. Start-up firms, whose current-year ratio of QREs to gross income exceeds 6% during their first five tax years, or whose current-year ratio is more than double their fixed-base percentages in the ensuing six tax years, also are affected by the rule. For both sets of firms, the rule further reduces the marginal effective rate of the regular credit to 6.5%.

The third rule is the exclusion of expenditures for equipment and structures and overhead costs from the expenses eligible for the two credits. Many business research projects involve the acquisition of elaborate buildings and sophisticated equipment, and all research projects have overhead costs. As a result, the rule's effect on the marginal effective rate for the two research credits depends on the share of an R&D investment's cost that is ineligible for the credit. As this share increases, the credit's marginal effective rate declines, all other things being equal. For example, if expenditures for physical capital account for half of the cost of an R&D investment, then the marginal effective rate of either credit for the entire investment would be half of what it would be if the entire cost were eligible for the credit. For firms subject to the 50% rule that invest in research projects where physical capital represents 50% of the total cost, the marginal effective rate for the regular credit would fall to 3.25%.

Another factor shaping the marginal effective rate of the regular credit and the ASC is delays in using the credit. In a 2009 report on problems with the credit's design and possible solutions, the GAO considered the impact of delays in the use of the credit on the credit's marginal effective rate. In essence, such delays lower the present value of the credit, and such a reduction in turn lowers the rate. The longer the delay and the larger a taxpayer's discount rate, the larger the rate decline. GAO estimated the marginal effective rate for all the corporations in the IRS database that claimed the credit from 2003 to 2005 and used them to compute a weighted average rate for all taxpayers. It found that the rate ranged from 6.4% to 7.3%, depending on the assumptions about the discount rate and the length of any delay in using the credit.[40]

Possible Solutions

As these considerations suggest, the key to bolstering the incentive effect of the regular credit is to increase its marginal effective rates. There are three ways to do so: (1) keep the current statutory rate and relax or repeal one or more of the three rules; (2) retain the rules but raise the credit's statutory rate to offset their effects; and (3) relax the rules and raise the statutory rate.

Cox analyzed the effects of both options on after-tax rates of return for the same hypothetical R&D investments discussed above. In the case of labor-intensive R&D projects, he estimated that the 1995 research tax preferences produced a median after-tax return that was 124.7% of the pre-tax return for projects yielding intangible assets with an economic life of three years, and 115.5% for projects yielding intangible assets with an economic life of 20 years. Repealing the basis adjustment for the credit caused median after-tax return to increase to 146.0% of the pre-tax return for assets with a three-year economic life, and 130.1% for assets with a 20-year economic life.[41] Increasing the statutory rate of the credit to 25% but retaining existing rules (including the

[40] GAO, *The Research Tax Credit's Design and Administration Can Be Improved*, p. 14.

[41] Ibid., p. 27.

basis adjustment) led to similar results: the median after-tax return for assets with a three-year economic life was an estimated 133.9% of the pre-tax return, and an estimated 121.9% of the pre-tax return for assets with a 20-year economic life.[42] As one might expect, increasing the rate to 25% and removing the basis adjustment led to the biggest boost in the ratio of the median after-tax return to the re-tax return: 165.8% for assets with a three-year economic life, and 143.4% for assets with a 20-year economic life.

If it is true that the optimal R&D tax subsidy would raise after-tax returns to 130% of pre-tax returns and no more, then Cox's analysis suggested that keeping the regular credit's statutory rate at the current level of 20% but eliminating the basis adjustment would be the preferred approach on efficiency grounds to boosting the credit's incentive effect.

Lack of Refundability

The research tax credit is non-refundable. This means that only firms with sufficient income tax liabilities may benefit from the full amount of the credit allowed in a tax year. In addition, the credit is a component of the general business credit (GBC) under IRC Section 38 and therefore subject to its limitations. For firms undertaking qualified research, a key limitation is that the GBC cannot exceed a taxpayer's net income tax liability, less the greater of its tentative minimum tax under the alternative minimum tax or 25% of its regular income tax liability above $25,000. Unused GBCs may be carried forward 20 years or back one year. Although there are some advantages to having an unused tax credit to apply against future or past tax liabilities, the advantages do not necessarily outweigh the disadvantages for firms investing in R&D. One disadvantage is that a business taxpayer is better off using the full amount of a credit today, rather than 5 or 10 years from now, when its present value will be lower than the credit's value in the year it is claimed.

Critics contend that the credit's lack of refundability can pose a special problem for small young firms that invest heavily in R&D relative to their income. In recent decades, numerous new technologies have been launched by such firms, many of which spend substantial sums on R&D during their first few years while losing money. Some argue that a non-refundable research credit could do more harm than good for the typical small start-up firm, as it cannot count on having access to the credit when it is needed to help the firm stay afloat.

Possible Solutions

To remedy this shortcoming, some advocate making the credit wholly or partially refundable for firms under a certain asset or employment size or age.[43] Other options include allowing small start-up firms that cannot use the current-year credit to sell it to other firms or use it to offset their employment taxes.[44]

Under current law, companies that are less than five years old and have less than $5 million in gross receipts in the current tax year are allowed to apply up to $250,000 of any research tax credit they claim against the employer share of the Social Security tax. This means that eligible companies making this election on their tax returns could have as much as $250,000 in additional funds to spend on R&D, or any other activity for that matter. It is unclear how beneficial this

[42] Ibid., p. 27.

[43] For further discussion of the possible benefits to small firms of making the credit wholly or partially refundable, see Scott J. Wallsten, "Rethinking the Small Business Innovation Research Program," in *Investing in Innovation*, Lewis M. Branscomb and James H. Keller, eds. (Cambridge, MA: MIT Press, 1998), pp. 212-214.

[44] Michael D. Rashkin, "The Dysfunctional Research Credit Hampers Innovation," *Tax Notes*, June 6, 2011, p. 1066.

option will be for small research-intensive start-up firms that otherwise would be unable to use the full credit owing to insufficient tax liability or a net operating loss.

Ambiguity and Uncertainty in the Definition of Qualified Research and QREs

Some critics maintain that another reason the current research tax credit's incentive effect is not as robust as it could or should be lies in the many disputes in each tax year between the IRS and companies claiming the credit over the definition of qualified research and the expenditures that qualify for the credit. For the large corporations that account for most of the credit allowed in a year, these disputes can take five or more years to resolve and impose substantial costs on both the IRS and the affected companies.[45]

The credit is now permanent, which erases the uncertainty over the availability of the credit that prevailed from July 1981 until December 2015. But there is continuing uncertainty over which expenditures will qualify, and this doubt can weaken the credit's incentive effect, especially among companies that undertake long-term R&D projects requiring multi-year planning. IRS audits of claims for the credit result in some companies receiving smaller credits than the amount they claimed.[46] In addition, the prospect of having a claim audited, having to provide the required documents to support the claim, and engaging in a lengthy dispute with the IRS over its legitimacy deters an unknown number of firms from even claiming the credit.

Original Definition

Under the original credit, which was in effect from 1981 through 1985, research expenditures generally qualified for the credit if they were also eligible for expensing under IRC Section 174. There were three exceptions to this general rule: no credit could be claimed for (1) research conducted outside the United States, (2) research in the social sciences or humanities, and any portion of research funded by another entity. Section 174 allows business taxpayers to deduct all "research or experimental expenditures" incurred in connection with their trade or business in the year they were incurred.

In regulation 1.174-2(a), the IRS defined research or experimental expenditures as "research and development costs in the laboratory sense," especially "all such costs incident to the development or improvement of a product." Expenditures can be considered R&D costs in the "experimental or laboratory sense" if they relate to activities intended to discover information that would eliminate uncertainty concerning the development or improvement of a product. Uncertainty exists in the R&D process when the information available to researchers does not clearly show how they should proceed in developing a new product or improving an existing one. According to the regulation, the proper standard in determining whether research expenditures qualify for expensing under Section 174 is the "nature of the activity to which the expenditures relate, not the nature of the product or improvement being developed."

[45] Tyson and Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, p. 49.

[46] There are no data on the number of audits of claims for the credit or the amount of the credit allowed by the IRS. The most recent estimate of the reduction in the credit claimed comes from a 1995 report on the credit by the now-defunct Office of Technology Assessment. According to the report, nearly 80% of audits done in the early 1990s resulted in an average reduction of 20% in the amount of the credit claimed. See Office of Technology Assessment, *The Effectiveness of Research and Experimentation Tax Credits* (Washington: September 1995), p. 17.

In practice, the expenditures that qualify for expensing under section 174 are all the direct and indirect costs a company incurs in developing or improving a product or process, including allowances for the depreciation of tangible assets like buildings and equipment. Expenditures for the cost of acquiring land and depreciable assets used in conducting R&D and certain other costs do not qualify.[47]

Changes Under the Tax Reform Act of 1986

Responding to a concern that businesses were claiming the credit for activities that had more to do with product development than technological innovation, Congress tightened the definition by adding three tests in the Tax Reform Act of 1986 (TRA86).[48] Under the act, qualified research still had to match the activities eligible for expensing under Section 174, but those activities also had to satisfy the following criteria:

- They were directed at discovering information that is "technological in nature" and useful in the development of a new or improved business component for the taxpayer.
- They constituted "elements of a process of experimentation."
- They were intended to improve the function, performance, quality, or reliability of a business component.[49]

TRA86 defined a business component as "a product, process, computer software, technique, formula, or invention" held for sale or lease or used by a taxpayer in its trade or business. It also specified that research aimed at developing new or improved internal-use software could qualify for the credit only if it met the general requirements for the credit, was intended to develop software that was innovative and not commercially available, and involved "significant economic risk."

Subsequent IRS Guidance

The significant changes in the definition of qualified research made by the TRA86 put pressure on the IRS to issue final regulations clarifying the meaning and limits of the three new tests for qualified research. But for reasons that are not entirely clear, the IRS did not issue proposed regulations (REG-105170-97) on the tests until December 1998, more than 12 years after the enactment of TRA86.

The regulations set forth guidelines for determining whether or not a business taxpayer has discovered information that is "technological in nature" and "useful in developing a new or improved business component of the taxpayer" through a "process of experimentation that relates to a new or improved function, performance, reliability, or quality." The IRS proposed that a research project would meet the "discovery test" if it were intended to obtain "knowledge that exceeds, expands, or refines the common knowledge of skilled professionals in the particular field of technology or science." At the same time, according to the proposed regulations, such a standard did not necessarily mean the credit would be denied to companies that made technological advances in an "evolutionary" manner, that failed to achieve the desired result, or

[47] Those other costs pertain to quality control testing, efficiency and consumer surveys, management studies, advertising and promotions, acquisition of another entity's patent, model, process, or production, and research in the humanities or social sciences.

[48] See P.L. 99-514, Section 231.

[49] U.S. Congress, Joint Committee on Taxation, *General Explanation of the Tax Reform Act of 1986*, JCS-10-87 (Washington: GPO, 1987), pp. 132-134.

that were not the first to achieve a particular technological advance. In addition, the IRS proposed that research would meet the experimentation test if it relied on the "principles of physical or biological sciences, engineering, or computer science (as appropriate)" to evaluate "more than one alternative designed to achieve a result where the means of achieving the result are uncertain at the outset." Such an evaluation should entail developing, testing, and refining or discarding hypotheses related to the design of new or improved business components.

The release of the proposed regulations seemed to attract more criticism than praise from the business community. Many of the critical comments addressed the proposed guidelines for the discovery test. A widely shared objection was that the "common knowledge" test violated the intent of Congress and would prove burdensome and unworkable for tax practitioners because it was too subjective. Most of the tax practitioners and businesses that commented on the proposal urged the IRS to scrap the test.[50]

After reviewing the comments it received and examining recent case law and the legislative history of the research tax credit, the IRS issued what was supposed to be a final set of regulations (T.D. 8930) on the definition of qualified research in late December 2000. The final regulations differed in several significant ways from the proposed regulations. While the final regulations retained the common knowledge test for determining if information gained through research was technological in nature and useful in the development of a new or improved business component, they clarified how the test could be met by specifying that the "common knowledge of skilled professionals in a particular field of science or engineering" referred to information that would be known by those professionals if they were to investigate the state of knowledge in a field of science or engineering before undertaking a research project. The final regulations also stipulated that a taxpayer was presumed to have passed the common knowledge test if the taxpayer could prove it had been awarded a patent for a new or improved business component. They also established new standards for determining when the development of computer software for internal use qualified for the credit. Specifically, research on internal-use software was eligible for the regular credit only if it satisfied the general requirements for the credit, entailed "significant economic risk," and resulted in the development of innovative software that was not commercially available.

In spite of these changes, the final regulations aroused almost as much opposition within the business community as the proposed regulations. A principal objection was the IRS's insistence on retaining the discovery test. Many tax practitioners also complained that a number of the provisions in the final regulations were not included in the proposed regulations, precluding public comment on them.[51]

This second round of criticisms spurred the IRS to take an unusual procedural step. About one month after the release of the regulations, the Treasury Department retracted them (Notice 2001-19). Treasury also requested further comment "on all aspects" of the suspended regulations, promised that the IRS would carefully review all questions and concerns, and committed the IRS to issue any changes to the final regulations in proposed form for additional comment.[52]

In December 2001, the IRS issued another set of proposed regulations (REG-112991-01). They departed in some significant ways from previous guidance. Among other things, the regulations

[50] Sheryl Stratton and Barton Massey, "Major Changes to Research Credit Rules Sought at IRS Reg Hearing," *Tax Notes*, May 3, 1999, pp. 623-624.

[51] David L. Click, "Treasury Discovers Problems With New Research Tax Credit Regulations," *Tax Notes*, March 12, 2001, p. 1531.

[52] Sheryl Stratton, "Treasury Puts Brakes on Research Credit Regs; Practitioners Applaud," *Tax Notes*, vol. 90, no. 6, February 5, 2001, pp. 713-715.

did not include the requirement set forth in T.D. 8930 that qualified research should seek to discover "knowledge that exceeds, expands, or refines the common knowledge of skilled professionals in a particular field of science or engineering." The regulations also modified the definition of the experimentation test so that it became a "process designed to evaluate one or more alternatives to achieve a result where the capability or the method of achieving that result, or the appropriate design of that result is uncertain as of the beginning of the taxpayer's research activities." The determination of whether a taxpayer engaged in such a process would be made on the basis of facts and circumstances. In addition, the proposed regulations stipulated that internal-use software could not to be sold, leased, or licensed to third parties and was eligible for the credit only if it is intended to be novel in its design or applications. Tax practitioners and businesses generally endorsed the proposed changes.[53]

About two years later, the IRS published a second set of final regulations (T.D. 9104) intended to clarify the definition of qualified research and certain other matters related to use of the credit.[54]

The regulations noted that information is technological in nature if the process of experimentation used to discover it relies on the principles of the physical or biological sciences, engineering, or computer science. Though they discarded the discovery test included in T.D. 8930, the regulations made it clear that taxpayers would be deemed to have discovered information that is technological in nature by applying "existing technologies.... and principles of the physical or biological sciences, engineering, or computer science" in the process of experimentation. Such a discovery would not depend on whether a taxpayer succeeded in developing a new or improved business component. At the same time, having a patent for a business component would be deemed "conclusive evidence that a taxpayer has discovered information that is technological in nature that is intended to eliminate uncertainty concerning the development or improvement of (such a) component."

In addition, T.D. 9104 shed additional light on what constituted a "process of experimentation." Basically, the regulations specified that such a process had three critical aspects. First, the actual outcome must be uncertain at the outset. Second, the process must allow researchers to identify more than one approach to achieving the desired outcome. And third, researchers must use scientific methods to evaluate the efficacy of these alternatives (e.g., modeling, simulation, and a systematic trial-and-error investigation). The regulations noted that a process of experimentation "often involves refining throughout much of the process a taxpayer's understanding of the uncertainty the taxpayer is trying to address." A taxpayer's facts and circumstances should be considered in determining whether it had engaged in such a process.

Main Sources of Contention Between the IRS and Companies

According to a variety of sources, including a 2009 report on the efficacy of the credit by the GAO, several issues related to the definition of qualified research and QREs have long served as sources of contention between numerous companies investing in R&D and the IRS. These issues are the following:

- The interpretation and application of the key tests for determining which activities constitute qualified research, particularly with regard to improvements

[53] For more details on the latest set of proposed regulations and reactions to them in the business community, see David Lupi-Sher and Sheryl Stratton, "Practitioners Welcome New Proposed Research Credit Regulations," *Tax Notes*, December 24, 2001, vol. 93, no. 13, pp. 1662-1665.

[54] Alison Bennett, "IRS Issues Final Research Credit Rules With Safe Harbor for Qualified Activities," *Daily Report for Executives*, Bureau of National Affairs, December 23, 2003, p. GG-2.

in existing products and processes and the testing that is done to determine the appropriate design for a new product once the development process has ended.

- Continuing uncertainty over the criteria for determining when expenditures for the development of internal-use software qualify for the credit.[55]
- The criteria for determining the amount of wages paid to employees involved in the direct supervision and direct support of qualified research activities that are eligible for the credit.
- The criteria for determining which activities are deemed to have commenced after commercial production of a new product has begun; expenditures for those activities are ineligible for the credit.
- The eligibility of research aimed at achieving significant cost reductions.
- Substantiation of claims for the credit: many companies complain that the IRS expects them to provide supportive evidence without giving useful guidance on the required documentation standards.

Possible Solutions

Some critics think that the best way to minimize time-consuming and costly disputes over claims for the research tax credit is to jettison the current definition of qualified research and QREs and replace it with the broader and simpler definition of research expenses that qualify for the Section 174 expensing option.[56] Others argue that to reduce the frequency of disputes, the Treasury Department should issue regulations that clarify the following issues: (1) the conditions under which expenses for the development internal-use software qualify for the credit, (2) the activities that offer direct support for qualified research, and (3) when the commercial production of a new product commences.[57] The same critics recommend that Treasury form working groups that include businesses to develop standards for the substantiation of claims for the credit.

Inadequate Emphasis on Research Projects with Large Social Returns

Another problem with the current research credit, according to some critics, is that it does a poor job of targeting research projects with significant potential to generate substantial economic benefits over time. They note that the economic rationale for the credit lies in underinvestment in

[55] In January 2015, the IRS issued proposed regulations (REG-153656-03) to determine whether or not expenditures for the development of software are eligible for the credit. In general, since the enactment of TRA86, expenditures for the development of software that is primarily intended for internal use by the developer have not been eligible for the credit. A key issue has been the definition of internal-use software (IUS). The proposed regulations define IUS as software developed by a company for use in functions that support the company's trade or business; these functions are limited to back-office operations such as support services and financial and human resource management. Non-IUS software, by contrast, is software that is developed to be commercially sold, leased, licensed, or otherwise marketed to other parties for their benefit. Under the 2015 proposed regulations, software that permits the developer to interact with third parties in ways that do not solely benefit the developer would be considered non-IUS software. In addition, since the enactment of TRA86, expenditures for the development of IUS software that meet a three-part innovation test could be eligible for the credit. The three tests are: (1) the software must be innovative, (2) it must entail a significant economic risk on the part of the developer, and (3) the developer cannot acquire software from other companies for the same intended purposes without alteration. The proposed regulations further clarify these tests. The IRS may issue final regulations by the end of June 2016.

[56] See Tyson and Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, p. 51.

[57] Government Accountability Office, *The Research Tax Credit's Design and Administration Can Be Improved*, p. 40.

R&D that produces greater social returns than private returns. And yet, in their view, the design of the credit makes it likely that one dollar of the credit creates less bang for the buck in the long run than does one dollar of a federal research grant, on average.

In general, businesses seek the highest possible return on their investments. So in selecting research projects to fund, they can be expected to assign a higher priority to projects that are likely to earn substantial profits in the short run than to projects directed at expanding the frontiers of knowledge in a scientific field that seem to have relatively low prospects of yielding profits in the short run.

Such pattern of R&D investment is consistent with several significant trends in U.S. research spending stretching back to the 1950s. As **Figure 1** illustrates, the federal government has long served as the major source of funding for basic research performed in the United States; from 1955 to 2008, its share of total spending (in current dollars) for this purpose was about three times greater than the share for businesses, though the gap has narrowed somewhat since the early 1980s. At the same time, U.S. and foreign-based companies steadily expanded their share of total domestic funding for applied research and development in that period; by 2008, the business share was 88% greater than the federal share for applied research and more than five times greater for development.

These trends show that the most companies are inclined to invest much more in applied research and development than in basic research. This is to be expected, as the returns on investment in basic research tend to be more difficult to appropriate and more uncertain at the outset, than are the returns to investment in applied research and development. The trends also suggest that the credit mainly subsidizes research projects with relatively small spillover benefits.

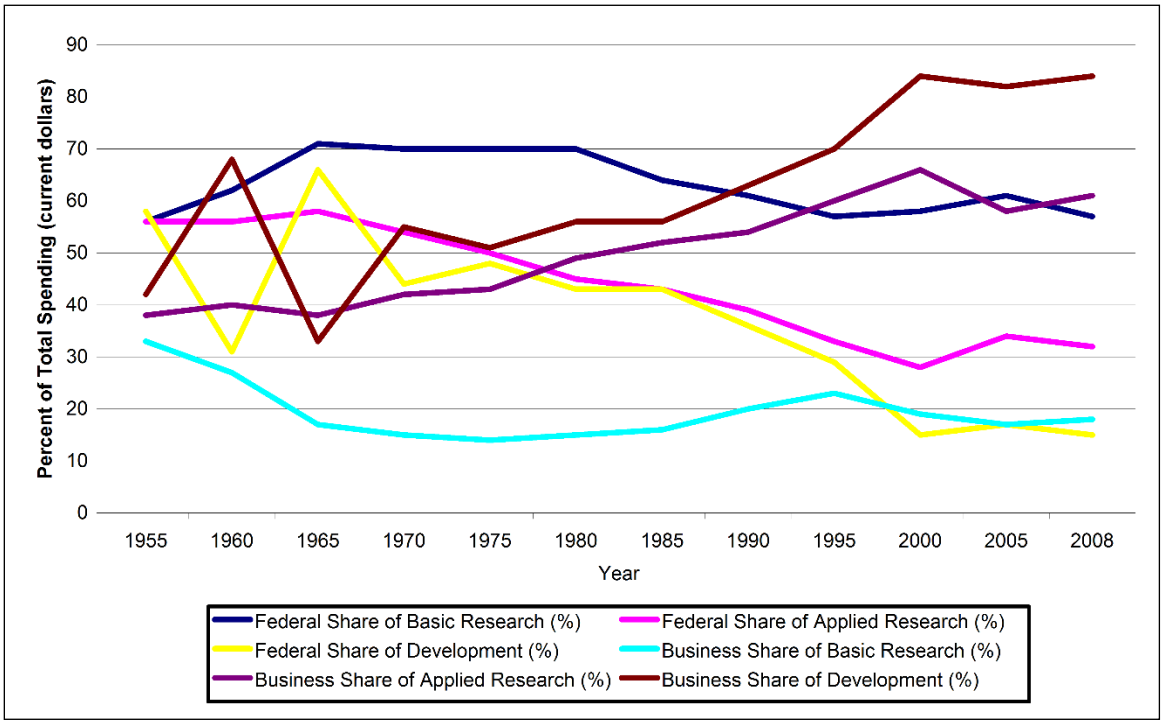
Possible Solutions

One option for increasing the spillover benefits from the credit is to modify it so that the credit expressly targets investment in research aimed at developing "breakthrough products that create new product categories or innovative enhancements to existing products."[58] Among the ways to accomplish this would be to (1) create a larger incremental credit (say 30%) for such business spending on basic research, (2) establish a flat credit for such expenditures, and (3) allow the NSF to administer the new basic research credit. A possible advantage of using the NSF rather than the IRS to administer the credit is that the NSF would be likely to have more of the expertise required to evaluate the potential social returns of basic research projects.[59]

[58] Rashkin, "The Dysfunctional Research Credit Hampers Innovation," pp. 1066-1067.

[59] Rashkin, The Dysfunctional Research Credit Hampers Innovation, p. 1069.

Figure 1. Share of U.S. Spending (current dollars) on Research and Development Held by the Federal Government and Businesses, 1955 to 2008



Source: National Science Foundation, Division of Science Resources Statistics, *National Patterns of R&D Resources: 2008 Data Update*, NSF 10-314, tables 6-8.

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