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Federal Research Tax Credit: Current Law and Policy Issues

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Federal Research Tax Credit: Current Law and Policy Issues

Technological innovation is a primary engine of long-term economic and productivity growth, and research and development (R&D) helps fuel the innovation process. The federal government has fostered private R&D investment in several ways, including two tax incentives: (1) an option to deduct eligible research expenses as current expenses under Internal Revenue Code (IRC) Section 174(a) that expired in 2022 and (2) two versions of a tax credit for increases in qualified research expenditures (QREs) above a base amount under IRC Section 41.

The IRC Section 41 research and experimentation (R&E) tax credit entered the tax code in 1981 and became a permanent provision in 2015, after having been extended 16 times.

Although the credit is often referred to as a single credit, it actually consists of four discrete credits: (1) a regular credit (RC), (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, if eligible. Only the first two credits are widely used. The RC is equal to 20% of a company's current-year QREs above a base amount composed of its recent gross receipts and a ratio of QREs to gross receipts from a base period. The maximum ASC is equal to 14% of a company's current-year QREs above a base amount equal to 50% of its average annual QREs in the past three tax years; the minimum ASC is 6% of current-year QREs for companies with no QREs in at least one of their three previous tax years.

The R&E credit is intended to encourage companies to invest more in basic and applied research and some stages of development than they would if there were no such credit. The credit reduces the after-tax cost of qualified research, which in turn lowers the user cost of capital for this purpose. In theory, a reduction in the user cost of capital would increase the number of R&D investments a company could profitably undertake.

To assess the credit's economic impact, analysts have focused on the credit's incentive effect for business R&D investment and its effectiveness in spurring increases in this investment. The credit's incentive effect refers to the extent to which it encourages companies to invest more in qualified R&D than they otherwise would. One measure of this effect is how the credit affects the user cost of capital for R&D investments. The Treasury Department's Office of Tax Analysis has estimated that, under 2016 tax law, the user cost of capital for R&D investment was 15% to 26% lower than the user cost of capital for equipment investment because of the combined effect of the R&E credit and IRC Section 174(a) expensing.

Studies of the R&E credit's effectiveness have indicated that one dollar of the R&E credit stimulated, on average, one dollar of additional R&D investment from the 1980s to the early 1990s.

While many lawmakers endorse the use of tax incentives to boost domestic business R&D investment, there is widespread agreement that the R&E credit could be more effective than it is. Critics say that the credit's effectiveness is diminished by several factors, including uneven and inadequate incentive effects, uncertainty about and disputes over IRS's administration of the credit, lack of full refundability for cash-strapped start-up firms, insufficient targeting of R&D projects with relatively high social returns, and more generous R&D tax incentives in other countries.

This report describes how the tax credit works, examines what is known about its economic effects, and addresses policy issues associated with the current credit. A legislative history of the credit, a review of the debate over defining qualified research, and a description of the basic research and energy research components of the IRC Section 41 tax credit can be found in the report's appendices.

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Introduction

An economy grows under the following circumstances: (1) when its labor force increases; (2) when its stock of physical capital expands; (3) when technological innovations make these inputs more productive, allowing companies to provide more goods and services with the same (or a smaller) amount of capital and labor; and (4) when there are institutional structures that encourage ownership of private property and keep a wealthy minority from gaining a high degree of power. Economists generally agree that technological innovation is the primary driver of sustained economic growth, especially in high-wage developed countries.¹

Technological innovation can be defined as the complex and uncertain process of developing new or improved goods, services, and production processes and integrating them into the buying decisions of consumers and the operations of companies. Innovation can encompass a range of business activities, including performing basic and applied research and experimental development; acquiring intellectual property (e.g., patents and copyrights) developed by others; using technologically advanced equipment, software, and database design; and training employees in the use of new processes.²

Some have referred to research and development (R&D) as the lifeblood of innovation. Generally, R&D makes it possible for companies to identify feasible options for developing new or improved technologies or discovering groundbreaking solutions to difficult technical or scientific problems.

Businesses finance and/or perform much of the R&D done in the United States. According to the National Science Board, companies performed 75% and funded 73% of the R&D undertaken in the United States in 2019.³

R&D has three components: basic and applied research and experimental development. *Basic research* refers to experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. *Applied research* refers to investigations undertaken to acquire new knowledge that is primarily intended to achieve a specific, practical aim or objective. The final component is *experimental development*, which denotes systematic work that draws on knowledge gained from research and practical experience to develop new products and processes or improving existing ones.

Most U.S. business R&D investment is focused on applied research and experimental development, since these activities are much more attuned to current market conditions than is basic research. In 2019, businesses funded nearly 33% of domestic basic research, 55% of applied research, and 87% of experimental development. The federal government is the leading funding source for domestic basic research, accounting for 41% of such funding in 2019.

The federal government supports U.S. R&D activities in several ways, including providing a tax credit under Internal Revenue Code (IRC) Section 41 for increases in R&D spending above a base amount. From 1954 to 2021, another federal tax provision—IRC Section 174(a)—supported R&D investments by providing the option to deduct in full (or expense) qualified research

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

² Bronwyn H. Hall, *Tax Policy for Innovation*, working paper 25773, National Bureau of Economic Research, April 2020, p. 3.

³ National Science Foundation, National Center for Science and Engineering Statistics, *National Patterns of R&D Resources: 2019-2020 Update*, NSB-22-320, February 22, 2022, tables 2 and 6, <https://ncses.nsf.gov/pubs/nsf22320>.

expenses (QREs) in the year they were incurred or paid. This option became unavailable for QREs starting in 2022.

This report examines the design and current status of the IRC Section 41 credit and its economic effects with and without the IRC Section 174 expensing allowance. A legislative history of the credit, a review of the debate over defining research that qualifies for it, and a description of two lesser-used components of the credit—the university basic research credit and the energy research credit—appear in appendices.

Economic Rationale for Government Intervention in the Market for New Knowledge and Know-How

Companies invest in R&D largely to obtain new knowledge and know-how they can exploit for greater profits and enhanced competitiveness. Most economists argue that business R&D investment, over time, is likely to be suboptimal, relative to its overall economic returns. Research indicates that companies investing in R&D do not capture all the returns, despite the availability of patents, trademarks, and other forms of intellectual property protection. There are several channels through which these returns might spill over to other firms, such as reverse engineering by other firms, migration of research scientists and engineers from innovators to other firms, and the increase in general technical knowledge from R&D investments. In addition, the returns on R&D investment can spill over to consumers and other firms through access to new or improved goods and services at prices below the prices they would be willing to pay for these goods and services.⁴ Empirical evidence suggests that R&D spillovers are “most powerful and diffuse most rapidly at the local and national levels.”⁵

The spillover effects (or external benefits) from R&D investments can be measured as the excess of the total (or social) returns to R&D investments over the private returns. Numerous studies found that the average social returns to R&D investments were two to four times greater than the average private returns.⁶ This finding applied regardless of whether a firm invested in research projects narrowly focused on existing lines of business, or in research projects aimed at expanding the boundaries of knowledge in particular scientific disciplines with no obvious and immediate commercial applications.

From the perspective of standard economic theory, R&D’s external benefits represent a market failure. Government intervention is required to boost business R&D investment to amounts commensurate with its social returns.

A common remedy for this market failure is for a country to adopt policies intended to increase business R&D investment. 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, advancing health care, and boosting national defense. Indirect support is mainly provided through federal funding of higher education in engineering and the

⁴ 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.

⁵ Laura Tyson and Greg Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, Center for American Progress, January 2012, p. 9, https://cdn.americanprogress.org/wp-content/uploads/issues/2012/01/pdf/corporate_r_and_d.pdf.

⁶ *Ibid.*, pp. 7-8.

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 R&D Tax Incentives

Current federal tax law provides one incentive for firms to invest in R&D: a tax credit under IRC Section 41 for eligible R&D expenses above a base amount intended to approximate how much a firm would invest in R&D without the credit. Its structure is explained below.

Before 2022, federal tax law contained a second R&D incentive: an unlimited expensing allowance for QREs. Details on how it worked follow.

IRC Section 174 Expensing Allowance for QREs

Federal tax law allows companies to deduct all ordinary and necessary expenses they pay or incur in determining their taxable income. Those expenses can be current (i.e., purchases of inputs with useful lives of one year or less, such as materials and labor compensation) or capital (i.e., purchases of assets with longer useful lives, such as patents and computer systems). Current expenses are written off in the year when they are paid or incurred. Capital expenses, by contrast, are recovered using the method and class life specified in the tax code.

Between 1954 and 2021, companies were allowed to deduct the full amount of QREs in the year when they were paid or incurred when calculating their taxable income. This treatment is known as expensing and was allowed for QREs from domestic and foreign research under IRC Section 174(a).

The following expenses qualified for expensing: (1) wages and salaries of researchers, (2) materials and supplies directly used in qualified research, and (3) the costs of operating and maintaining research facilities (e.g., rent, utilities, and insurance).⁷ The cost of equipment and buildings used in R&D did not qualify for expensing and instead was capitalized and recovered through the allowable depreciation schedules.

Starting in 2022, companies no longer are allowed to expense their QREs. Under current tax law, companies have two options for recovering the cost of QREs. IRC Section 174(b) allows companies to capitalize QREs and amortize them over five years, beginning with the month when a company first realizes benefits from an R&D investment.⁸ IRC Section 59(e) allows companies to amortize QREs over 10 years, starting with the year when the expenditures were paid or incurred.

IRC Section 41 Research Tax Credit

The only federal tax incentive for R&D investment at the moment is the IRC Section 41 tax credit. It has four components: (1) a regular research credit (RC), (2) an alternative simplified credit (ASC), (3) a basic university research credit, and (4) a credit for collaborative energy research.⁹ Each credit is nonrefundable. In any tax year, a firm may claim no more than the basic

⁷ It is worth noting that these expenses also may be deductible as current business expenses under IRC section 162(a), but doing so makes them ineligible for the IRC Section 41 research tax credit.

⁸ Amortization involves deducting the same amount in each year of an amortization period, until the original cost of an asset has been fully recovered.

⁹ Firms investing in qualified research that could not claim the regular credit had the option of taking what was known

and energy research credits, and either the RC or the ASC. The four components of the research tax credit were extended permanently in December 2015. This report covers the RC and ASC only, as the other two credits are used to a much smaller extent, suggesting that they have little influence on domestic R&D investment.¹⁰ (Henceforth, the RC and ASC are referred to jointly as the research and experimentation [R&E] tax credit.)

Enacted in 1981, the R&E tax credit was extended 16 times before the Protecting Americans from Tax Hikes Act of 2015 (PATH Act, Division Q of P.L. 114-113) extended it permanently. It has been significantly modified five times.

The RC and ASC are incremental, which means they apply only to a taxpayer's QREs above a base amount. This amount is intended to approximate how much a business might spend on qualified research in the absence of the credit. But there is no evidence that the base amount is an accurate and reliable measure of such an amount. An incremental credit is less generous than a flat credit, which applies to a taxpayer's full spending for a targeted purpose. On the whole, an incremental credit is more economically efficient than a flat credit if the policy aim is to encourage companies to spend more on specific activities than they otherwise would.

Regular Credit

Taxpayers have two choices for claiming the credit: the RC or the ASC. The RC equals 20% of a firm's base amount for the current tax year. In general, that amount is the product of its "fixed base percentage" and its average annual gross receipts during the previous four years. For firms with QREs and gross receipts between 1984 and 1988, the fixed base percentage is the ratio of a company's aggregate QREs to aggregate gross receipts in that period, with the percentage capped at 16%. For firms established after 1988, the fixed base percentage is calculated according to a formula that covers a company's first 10 years with QREs and gross receipts and is set at 3% for the first 5 of those years. Regardless of a firm's age, the base amount cannot be less than 50% of a company's current-year QREs.

Whether or not a company benefits from the RC depends on its fixed-base percentage. As this percentage decreases, the company's chance of claiming the regular credit increases, all other things being equal. A firm is also likely to benefit from the RC if its ratio of current-year QREs to its average annual gross receipts in the previous four tax years is larger than its fixed-base percentage.

Alternative Simplified Credit

The ASC equals 14% of a company's QREs above a base amount, which is equal to 50% of the company's average QREs in the three previous tax years. The credit rate is 6% of current-year QREs for companies with no QREs in any of the three preceding tax years. The ASC was added to IRC Section 41 by the Health Care and Tax Relief Act of 2006 (P.L. 109-432). A decision to

as an alternative incremental R&E tax credit (or AIRC), under IRC Section 41(c)(4), for tax years from 1996 to 2008. The Tax Extenders and Alternative Minimum Tax Relief Act of 2008 (Division C of P.L. 110-343) repealed the AIRC for the 2009 tax year, and Congress has not reinstated it. Details on the AIRC can be found in a later section of the report.

¹⁰ A brief summary of the basic research and energy research credits is provided in Appendix C. In 2017, according to estimates by the IRS, QREs for the two credits totaled \$426 million, or 0.1% of total QREs for the four components of the IRC Section 41 credit. Historical data on use of the credit by industry, firm size, and method of computation are available from IRS's Statistics of Income (SOI) Division. For more details, see SOI Tax Stats—Corporation Research Credit, <https://www.irs.gov/pub/irs-pdf/p5108.pdf>.

use the ASC remains in effect unless a company secures the Internal Revenue Service's (IRS's) consent to switch to the RC.

Owing to differences in the base amounts of the RC and the ASC, a company is unlikely to benefit equally from both. A company may benefit more from the ASC under the following circumstances:

- a company's RC base amount is larger than its ASC base amount;
- records for determining the company's base period as a start-up firm are incomplete;
- a company's gross receipts have increased faster than its QREs in recent years; and
- a company has been involved in a series of business mergers, reorganizations, acquisitions, or dispositions.

Tables 1 and 2 illustrate the extent to which an established firm and a start-up firm might have benefited from the RC and ASC in 2022. The established firm has a base period of 1984-1988, and the base period for the start-up firm is 2012-2016.

Table 1. Regular Credit and ASC in 2022 for a Hypothetical 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 |
| 2017 | 835 | 45 |
| 2018 | 915 | 50 |
| 2019 | 1,005 | 53 |
| 2020 | 1,215 | 60 |
| 2021 | 1,100 | 60 |
| 2022 | 1,300 | 55 |

Source: Congressional Research Service.

Established Firm's Regular Research Tax Credit in 2022

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%.

Compute the base amount:

1. Calculate the average annual gross receipts for the four previous years (2018-2021): \$1,059 million.
2. Multiply this average by the fixed-base percentage to determine the base amount: \$42.4 million.

Compute the regular tax credit:

1. Reduce the \$55 million in qualified research expenses for 2022 by the greater of the base amount (\$42.4 million) or 50% of the 2022 qualified research expenses (\$27.5 million): \$12.6 million.
2. Multiply this amount by 20% to determine the regular research tax credit for 2022: **\$2.5 million.**

Established Firm's Alternative Simplified Research Credit in 2022

1. Calculate the average annual qualified research expenditures in the three previous years (2019-2021): \$58 million.
2. Divide this amount by 2: \$29 million.
3. Subtract this amount from qualified research expenditures in 2022: \$26 million.
4. Multiply this amount by 0.14 to determine the established company's 2022 alternative simplified research credit: **\$3.6 million.**

Table 2. Regular Credit and ASC in 2022 for a Hypothetical Start-Up Firm
(\$ millions)

| Year | Gross Receipts | Qualified Research Expenses |
|------|----------------|-----------------------------|
| 2012 | \$60 | \$55 |
| 2013 | 210 | 65 |
| 2014 | 305 | 73 |
| 2015 | 400 | 82 |
| 2016 | 475 | 90 |
| 2017 | 600 | 105 |
| 2018 | 650 | 115 |
| 2019 | 700 | 125 |
| 2020 | 750 | 135 |
| 2021 | 650 | 125 |
| 2022 | 725 | 130 |

Source: Congressional Research Service.

Start-Up Firm's Regular Research Tax Credit in 2022**Compute the fixed-base percentage:**

1. A start-up firm's fixed-base percentage is set at 3% for the first five years (after 1988) when it has both gross receipts and qualified research expenses. That percentage then adjusts

according to a formula over the next six years to ultimately reflect the firm's actual research intensity. Thus, in this example, the fixed-base percentages are 3% for 2012 through 2016 and 16% in 2022. (The actual 2021 percentage is 17.9%, but it is capped at 16% under current law.)

Compute the base amount:

1. Calculate the average annual receipts for the four previous years (2018-2021): \$688 million.
2. Multiply this amount by the fixed-base percentage (16.0%) to determine the base amount: \$110 million.

Compute the regular tax credit:

1. Reduce qualified research expenses for 2022 (\$130 million) by the greater of the base amount (\$110 million) or 50% of the qualified research expenses for 2022 (\$65 million): \$20 million.
2. Multiply this amount by 20% to determine the regular R&E tax credit: **\$4 million.**

Start-Up Firm's Alternative Simplified Research Credit for 2022

1. Calculate the average qualified research expenditures for the three previous years (2019-2021): \$128 million.
2. Divide that amount by 2: \$64 million.
3. Subtract that amount from qualified research expenditures in 2022: \$66 million.
4. Multiply this amount by 0.14 to determine the alternative simplified research credit: **\$9.2 million.**

In these hypothetical examples, the established firm and the start-up firm would be better off claiming the ASC in 2022. This result reflects recent usage of the credit. According to IRS tax return data, corporate claims for the ASC in 2014 totaled \$7.8 billion, which was 73% more than total claims for the RC.¹¹ There are at least two general reasons for the greater use of the ASC. One is that it is easier to calculate, on average, than the RC. A second reason is that many companies are likely to benefit more from the ASC, since its base amount takes into account a firm's recent QREs only.

There is one drawback to using the ASC, however. An increase in a company's QREs in one year raises its ASC base amount by 33% of that increase in each of the next three years, making the credit harder to claim in that period.

Basis Adjustment

Some of the R&E credit's rules reduce the RC's and ASC's effective credit rate. A case in point is IRC Section 280C. Companies that amortize QREs under IRC Section 174 are required to take one of two steps: (1) lower their deduction by the amount of any R&E credit they claim, or (2) take a smaller credit based on their marginal income tax rate.¹² This rule is known as a *basis*

¹¹ Historical data on the use of the R&E credit are available from the IRS's Statistics of Income Division. See <https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit>.

¹² The smaller credit is equal to the product of the original credit amount and $(1 - \text{MTR})$, where MTR is a company's marginal tax rate. Under current law, a corporation's credit is reduced by 21% ($1 - 0.21$), which means that the credit's effective rate falls from 20% to 17.6%.

adjustment and is intended to prevent a company from benefiting twice from the same expenditure. The vast share of corporations taking the R&E credit choose the reduced credit as their basis adjustment. More than 90% of corporations elected the reduced credit in 2014, the most recent year for which data are available. A basis adjustment is typical in the federal tax code for business tax credits, though it was not required for the R&E credit from 1981 to 1988. The Treasury Department's Office of Tax Analysis (OTA) noted in a 2016 report that a basis adjustment was needed if the R&E credit was to reduce the user cost of capital by the credit's rate.¹³

General Business Credit

The R&E credit is a component of the IRC Section 38 general business credit (GBC), and thus subject to the GBC's limitations. In general, a company may claim a GBC that does not exceed its regular tax liability (reduced by any credits except for the GBC) plus its alternative minimum tax liability (AMT), less the larger of the company's tentative AMT or 25% of its regular tax liability (less any credits) above \$25,000.¹⁴ A current-year GBC that cannot be fully used may be carried back 1 year and carried forward 20 years.

Regardless of this general rule, IRC Section 41(h) allows eligible companies to apply any R&E credit they cannot use against a portion of their share of the Social Security trust fund tax.¹⁵ To qualify for this treatment, a company cannot have had gross receipts in a tax year before the past five tax years, and its current-year gross receipts cannot exceed \$5 million. The payroll tax credit a qualified company may take is limited to the least of the following amounts: (1) \$250,000; (2) the research credit calculated for the current year; or (3) in the case of a C corporation, the GBC carried forward from the previous tax year. The payroll tax credit cannot exceed a company's Social Security tax liability during a calendar quarter for the wages paid to employees; any excess may be used as a credit against the company's payroll tax liability in the following quarter. A company may use the IRC Section 41(h) option for as many as five tax years.

Definition of Qualified Research

Under IRC Section 41(d), a firm's research must satisfy each of the following criteria to qualify for the R&E credit:

- The research must involve expenses that were eligible for amortization under IRC Section 174(a), which means that those expenses are derived from activities considered "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 seek to gain new technical knowledge that is useful in the development of a new or improved "business component"; such a component can

¹³ U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&E) Credit*, October 12, 2016, p. 2, <https://home.treasury.gov/system/files/131/RE-Credit.pdf>.

¹⁴ The law commonly known as the Tax Cuts and Jobs Act of 2017 (P.L. 115-97) repealed the corporate AMT, though the individual AMT remains in effect. Since noncorporate businesses typically submit a tiny share of claims for the R&E credit, the AMT has virtually no influence on the impact of IRC Section 38 limitations on current-year use of the credit.

¹⁵ Social Security is funded through a dedicated payroll tax. The tax is 12.4% of wages up to \$147,000 in 2022. Employers and employees share the tax equally by each paying 6.2% of eligible wages. The self-employed pay the full amount of the 12.4% tax. For more information, see CRS Report R47062, *Payroll Taxes: An Overview of Taxes Imposed and Past Payroll Tax Relief*, by Anthony A. Cilluffo and Molly F. Sherlock.

be 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 include a process of experimentation intended to develop a product or process with “a new or improved function, performance or reliability or quality.”

IRC Section 41(d)(4) lists activities for which the credit may not be claimed:

- research conducted after the start of commercial production of a “business component”;
- research to modify an existing business component to meet a customer’s specific needs;
- research to modify a business component according to “style, taste, (and) cosmetic or seasonal design factors”;
- research to duplicate an existing business component;
- surveys and studies to collect data or assess a market, production efficiency, quality control, or managerial techniques;
- research to develop computer software for a firm’s internal use (except as allowed in IRS regulations);
- research conducted outside the United States, Puerto Rico, or any other U.S. possession;
- research in the social sciences, arts, or humanities; or
- research paid for by another entity.

Expenses Eligible for the Credit

Under IRC Section 41(b)(1), certain expenses associated with in-house and contract research are eligible for the R&E credit. With regard to in-house research performed by a company in carrying on a trade or business, the credit applies to the following expenses:

- wages and salaries of employees and supervisors directly engaged in qualified research;
- cost of materials and supplies used in such research; and
- leased computer time used in qualified research.

The trade-and-business requirement does not apply to start-up firms conducting research to enter a trade or business in the future, under IRC Section 41(b)(4).

In the case of contract research, the credit covers

- 100% of payments 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.

The R&E credit covers some but not all expenses linked to R&D investments. Most notably, it does not apply to the cost of depreciable tangible assets used in qualified research (e.g., buildings and equipment), overhead expenses (e.g., heating, electricity, rents, leasing fees, insurance, and

property taxes), and the fringe benefits of research personnel (e.g., health insurance and retirement benefits). According to one estimate, excluded expenses may represent one-quarter to one-half of business R&D spending.¹⁶

Among QREs, researcher wages and salaries are the largest component. In 2014, the most recent year for which IRS data are available, wages and salaries accounted for 70% of QREs, and supplies and contract research each accounted for 15%.¹⁷

The preponderance of wages and salaries among QREs raises the possibility that the R&E tax credit operates primarily as a wage tax credit for scientists, engineers, and other research personnel. To the extent that the credit has this effect, it may contribute to increases in researchers' wages and salaries. Such increases might reduce the credit's effectiveness as a policy tool for spurring increased R&D investment. If a company claiming the credit uses it to pay its research staff higher salaries for the same amount of work, the company arguably would not be using the credit to undertake additional R&D.

Alternative Incremental Research Credit

Between 1996 and 2008, a firm had the option of claiming an alternative incremental research tax credit (AIRC) under IRC Section 41(c)(4). Firms choosing the AIRC were required to use it until they received permission from the IRS to switch to the RC or the ARC (in 2007 and 2008).

Congress made several changes to the AIRC's complicated rate structure during its lifetime (see **Appendix B** for more details). The final change was made in 2008. As a result, the AIRC 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 rather than the RC if at least one of these conditions was present:

- Their QREs exceeded 1% of average annual gross receipts during the past four years.
- They had relatively high fixed-base percentages.
- Their research spending declined while their gross receipts grew.

Use of the R&E Credit

The R&E credit is one of the largest business tax subsidies, as measured by revenue foregone.¹⁸ According to the Joint Committee on Taxation (JCT), the expected revenue reduction from the credit in FY2020 to FY2024 (\$81.1 billion) ranked fourth among all business tax expenditures.¹⁹

¹⁶ U.S. Office of Technology Assessment, *The Effectiveness of Research and Experimentation Tax Credits* (Washington: 1995), p. 29.

¹⁷ Historical data on the use of the R&E credit are available from the IRS's Statistics of Income Division. See <https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit>.

¹⁸ A tax expenditure is the reduction in revenue from special provisions in the federal tax code that benefit certain taxpayers. These provisions can take the form of a credit, tax deferral, preferential tax rate, exclusion, exemption, or deduction.

¹⁹ U.S. Congress, Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2020 to 2024*,

In 2014, according to publicly available IRS data, companies claimed \$12.6 billion in R&E credits. C corporations accounted for 98% of those claims, and partnerships and S corporations for the remainder.²⁰

The total amount of credit claims in a year does not necessarily equal the actual revenue loss from the credit. IRS audits of claims for the credit may reduce the actual amount of credit use. Credit claims do not include the basis adjustment made in claiming the credit, and the total amount of credit claims does not account for carryovers of the credit from previous years. According to a 2016 report on the R&E tax credit by the Treasury Department's Office of Tax Analysis (OTA), roughly half of credit claims are not used in the current year.²¹ As noted earlier, unused credits may be carried back 1 year or carried forward 20 years under the GBC rules.

Historically, the manufacturing sector has been by far the biggest user of the R&E credit among industries. In 2014, it accounted for 59% of the value of total claims, followed by the information sector (17%) and the professional, scientific, and technical services sector (10%).²² Within manufacturing, the main recipients are companies involved in chemical production (including prescription drugs) and producers of computers and electronic products and transportation equipment; in 2014, they accounted for nearly two-thirds of the manufacturing sector's credit claims.²³

Reflecting their preponderance as sources of private R&D investment, large corporations account for a small share of the number of credit claims but the vast share of the total value of those claims. In 2013, corporations with \$250 billion or more in receipts accounted for 14% of the total number of credit claims, but 85% of their total value.²⁴

Economic Effects of the R&E Tax Credit

Assessing the economic effects of the R&E tax credit is difficult. Within the context of the U.S. economy, the credit's direct effects are small. These effects concern the business spending on researcher wages and salaries and materials that can be attributed to use of the credit in a given year. For example, in 2019, the domestic R&D workforce totaled an estimated 1.8 million, which was 1.1% of total domestic employment that year.²⁵

Of greater interest to policymakers in general are the R&E tax credit's indirect economic effects. These effects concern innovations derived from R&D that were financed to some degree by the credit, as well as the social and private returns from these innovations. It is hard to assign a dollar value to such returns, and even if it were possible, there is generally no reliable and accurate way to attribute those returns to the credit.

As a result, research on the economic impact of an R&D tax credit has tended to focus on how such a credit affects a company's incentive to invest more in R&D and how much domestic

JCX -23-20, November 5, 2020, Table 1.

²⁰ Historical data on the use of the R&E credit are available from the IRS's Statistics of Income Division. See <https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit>.

²¹ U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&E) Credit*, October 12, 2016, p. 2, <https://home.treasury.gov/system/files/131/RE-Credit.pdf>.

²² See <http://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit>.

²³ *Ibid.*

²⁴ *Ibid.*

²⁵ National Science Foundation, National Center for Science and Engineering Statistics, Research and Development: U.S. Trends and International Comparisons, *Science and Engineering Indicators 2002*, NSB-2022-5, Table RD-10, <https://ncses.nsf.gov/pubs/nsb20225/u-s-business-r-d#key-characteristics-of-domestic-business-r-d-performance>.

business R&D investment might be due to the credit. Both facets of the R&E tax credit are examined below.

Incentive Effect of the R&E Tax Credit

In general, a tax credit's incentive effect refers to its influence on a taxpayer's decision to engage in a targeted activity. In the case of the R&E credit, that activity is business R&D investment above a base amount. The R&E credit's overall incentive effect is a product of its marginal effective rate (i.e., the increase in after-tax profit from an additional dollar of R&D investment above the base amount) and the sensitivity of R&D investment to reductions in the after-tax cost of R&D (i.e., the tax-price elasticity of demand for qualified R&D).

The R&E credit's marginal effective rate (MER) varies by company and industry and can vary over time for the same company. Foremost among the factors determining the credit's MER are whether a firm uses the RC or the ASC, its pattern of R&D investment in recent years, and the firm's tax position when it claims the credit.

The OTA's 2016 report on the R&E tax credit looked at several scenarios highlighting variation in the credit's MER.²⁶ In one scenario, a corporation claimed the RC when its current-year QREs were not subject to the 50% minimum base amount.²⁷ In a second scenario, the same corporation claimed the RC when its QREs were constrained by the 50% minimum base amount.²⁸ In the third scenario, the corporation claimed the ASC, which incorporates this base amount rule requiring that the ASC base amount is 50% of average annual QREs during the three previous tax years. For each scenario, the OTA assumed that the corporation reported \$100 in current-year QREs; increased its QREs by \$10 in the next year; claimed the reduced credit as its basis adjustment; and used the full amount of its credit to offset current-year tax liability.

The OTA calculated the R&E credit's MER for the \$10 increase in second-year QREs in each case. The results showed the extent to which the credit's incentive effect depends on which credit a firm elects and the difference between its current-year QREs and its base amount. The RC's MER, when the credit was unconstrained by the 50% minimum base amount rule, was 16.0% [$20\% \times (1 - 0.20)$]. The rate dropped to 11.2% [$14\% \times (1 - 0.20)$] for the maximum ASC. And the rate fell to 8.0% when the RC was constrained by the 50% minimum base amount; in this instance, half of the \$10 increase in the corporation's second-year QREs qualified for the credit.

In reality, not all firms can use the full amount of their current-year R&E credit. In 2012, according to the OTA report, corporations and individuals claimed \$27.3 billion and \$0.8 billion, respectively, in credits that they had carried forward from previous tax years.²⁹ Based on those results, the OTA estimated that only 82% of the present value of the average current-year R&E credit would eventually be used.³⁰ Applying this factor to the three scenarios reduced the credit's

²⁶ U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&E) Credit*, October 12, 2016, p. 5, <https://home.treasury.gov/system/files/131/RE-Credit.pdf>.

²⁷ This means that the company could use the full amount of current-year QREs above its base amount to calculate the credit because the company's base amount is greater than the 50% minimum base amount but less than double the minimum amount.

²⁸ In this scenario, the company could use only 50% of its QREs above the base amount to calculate the credit because the tentative base amount is less than the 50% minimum base amount.

²⁹ U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&E) Credit*, October 12, 2016, p. 3, <https://home.treasury.gov/system/files/131/RE-Credit.pdf>.

³⁰ Calculated using a 5% discount rate.

MER to 12.8% for the RC unconstrained by 50% minimum base amount; 9.0% for the maximum ASC; and 6.4% for the RC constrained by the 50% minimum base amount.³¹

The credit's MER affects the user cost of capital for an R&D investment. This cost is a key consideration in business investment decisions. It combines the opportunity cost of an investment (e.g., the highest pretax rate of return a company could earn by investing in a low-risk asset like a U.S. Treasury bond) with the investment's direct costs (i.e., depreciation, the investment's actual cost, and income taxes). In effect, the user cost of capital establishes the after-tax rate of return an investment must earn to be profitable—and thus worth undertaking. The OTA estimated that the user cost of capital for R&D investment in 2016 was 15% to 26% lower than the user cost of capital for equipment investment because of the combined effect of the R&E credit and IRC Section 174 expensing.³²

Economic Implications of QRE Amortization

The impact of the now-expired IRC Section 174 on a firm's incentive to invest in R&D is also worth examining. The option to expense QREs had several advantages for firms investing in R&D. First, it lowered the tax burden on the returns to their R&D investments. Second, expensing increased their short-term cash flow—but at the expense of a decreased cash flow in future years from the same investment. Third, expensing simplified their tax accounting for R&D investments.

The loss of these advantages, starting in 2022, may reduce a firm's incentive to invest in R&D. One way to illustrate the impact of this loss is to compare the tax burden on the profits from an R&D investment with and without expensing. A widely used measure of tax burden is the effective tax rate (ETR), which indicates the share of pretax returns from a new investment that is used to pay for income taxes, taking into account a firm's statutory income tax rate and any tax preferences (e.g., credits, deferrals, and exclusions) it may claim.

In a 2018 report, the Congressional Budget Office (CBO) estimated that the ETR in 2017 for a 100% equity-financed R&D investment was -14% with QRE expensing and the IRC Section 41 credit. But the ETR rose to 11% with the credit and the five-year amortization of QREs required under current law. A negative ETR indicates that the tax code is subsidizing an investment. The 25-percentage point increase in the ETR between 2017 and 2022 was due to the loss of QRE expensing.

The loss of QRE expensing is likely to raise the user cost of capital for R&D investments. A 2019 CRS report estimated the user cost of capital for investment in the same set of intangible assets under the R&E tax credit and with and without full expensing of QREs. The results showed that this cost was 1.8% greater with five-year QRE amortization than it was with full expensing.³³

³¹ The Government Accountability Office (GAO) also addressed this issue in a 2009 report on problems with the R&E credit's design and possible solutions. The GAO considered the impact of delays in the use of the credit on its marginal effective rate. According to the report, such delays lowered the present value of the credit, and such a reduction in turn lowered its marginal effective 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. See Government Accountability Office, *The Research Tax Credit's Design and Administration Can Be Improved*, GAO-10-136, November 6, 2009.

³² *Ibid.*, p. 7.

³³ CRS Report R45736, *The Economic Effects of the 2017 Tax Revision: Preliminary Observations*, by Jane G.

The scenarios considered here suggest that the R&E credit boosts a company's incentive to invest more in R&D by lowering its user cost above a base amount. This boost was larger when the credit was claimed along with IRC Section 174 QRE expensing, resulting in a negative effective tax rate on the returns to qualified R&D investments. Such a rate meant that federal tax subsidies for R&D investment before 2022 exceeded the tax liability on those returns.

Effectiveness of the R&E Credit

The effectiveness of the R&E credit refers to the credit's ability to increase business R&D investment. Determining how effective the R&E tax credit has been requires estimating how much R&D in a given year can be attributed to the credit.

One measure of the R&E credit's effectiveness is the additional business R&D stimulated by one dollar of the credit. This measure 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 tax price of qualified R&D. Another variable is added to the equation to account for the availability of the R&E credit; it is equal to one when credit can be claimed and to zero when no credit can be claimed. The estimated coefficient for this variable indicates the amount of R&D spending induced by a unit of the credit

How much qualified research might be stimulated by the R&E credit? Several studies have addressed this issue. A 1999 review of studies of the effectiveness of the federal research tax credit by Bronwyn Hall and John van Reenen had two significant findings.³⁴ First, the authors found that studies based on the use of the credit between 1981 and 1983 generated lower estimates of the credit's effectiveness than did studies based on the use of the credit in periods starting after 1983. Second, using only company R&D data reported in public sources, Hall and van Reenen found that the one dollar of the research tax credit generated "roughly" a one dollar increase in reported R&D spending. They had reservations, however, 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 such a method could produce inflated estimates, because the credit gave companies an incentive to reclassify nonresearch expenditures to qualify for the credit.³⁵

Similarly, Tyson and Linden came to a similar conclusion after examining the findings of 11 studies of the credit's effectiveness using different analytical methods, time periods, and data sets.³⁶ They found that the estimated benefit-to-cost ratio of the credit was significantly below 1.0 for the studies covering the early years of the credit (1981 to 1985). They also noted that the estimated benefit-to-cost ratio from 1985 to 1997 was much higher: 0.95 to 2.96. Tyson and Linden concluded that the credit was effective "in the sense that each dollar of foregone tax

Gravelle and Donald J. Marples, p. 18, and an email calculation from Jane Gravelle on January 13, 2021. These estimates assumed a real rate of return on investment in intangible assets of 7.7%, a nominal interest rate of 7.5%, an inflation rate of 2.0%, a rate of economic depreciation for those assets of 17.0%, and debt financing of 36%.

³⁴ 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).

³⁵ *Ibid.*, p. 18.

³⁶ Laura Tyson and Greg Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, Center for American Progress, January 2012, pp. 42-43, https://cdn.americanprogress.org/wp-content/uploads/issues/2012/01/pdf/corporate_r_and_d.pdf.

revenue or tax expenditure for the credit causes businesses to invest at least one additional dollar in R&D.”³⁷

The Congressional Budget Office noted in a 2007 report that many of the studies of the R&E tax credit’s effectiveness “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.”³⁸

These estimates have implications for the comparative effectiveness of the R&E credit as a policy instrument for increasing private R&D. If the actual ratio of claims for the R&E credit to QREs above a baseline amount is at least 1.0, then one could argue that the credit is as effective as federal grants in increasing business R&D investment. In theory, one dollar of foregone revenue because of the R&E credit increases business R&D spending by the same amount as one dollar of a federal R&D grant. But this parity does not necessarily extend to the overall economic effects of the projects subsidized by the credit and the projects funded by federal grants. These effects could differ by wide margins, depending on the scope and purpose of the project.

Research suggests that an R&D tax credit’s effectiveness varies by firm size. A 2020 analysis of firm-level tax records in 20 OECD countries (excluding the United States) for the years 2000 to 2017 focused on a representative sample of firms’ responses to available R&D tax incentives.³⁹ The researchers found that, on average, 1.0 euro of R&D tax subsidy led to a 1.4 euro rise in business R&D investment. The response differed significantly by firm size: (1) firms with fewer than 50 employees responded to the subsidy with an average increase in R&D investment that exceeded 1.4 euros; (2) firms with 50 to 249 employees matched the subsidy with an average increase in R&D investment of 1.0 euro; and (3) firms with 250 or more employees increased their R&D investment by an average of 0.4 euros. According to the researchers, these differences seemed to have less to do with employment size than with differences among the sampled firms in their levels of R&D investment when they first benefited from the tax subsidy.

The figures in **Table 3** shed light on the R&E credit’s efficacy. Two trends are noteworthy. First, the credit’s share of domestic business R&D spending and total QREs has changed little between 2007 and 2014. (The business R&D figures are higher than QREs because the former include spending on structures and equipment and the latter do not.)⁴⁰ Still, both series indicate that the average effective rate of the credit was stable, and that the rate was significantly below the statutory rates of the RC and ASC. Second, the credit arguably grew in importance as a federal policy instrument for boosting U.S. R&D investment from 2007 to 2014: its share of federal R&D spending was about 50% greater at the end of the period than at the beginning.

³⁷ *Ibid.*, p. 44.

³⁸ Congressional Budget Office, *Federal Support for Research and Development*, June 2007, p. 24.

³⁹ See Silvia Appelt, Matej Bajgar, Chiara Criscuolo, and Fernando Galindo-Rueda, *Effectiveness of R&D Tax Incentives in OECD Economies*, October 14, 2020, Voxeu Policy Portal, <https://voxeu.org/article/effectiveness-rd-tax-incentives-oecd-economies>.

⁴⁰ The average ratio of claimed R&E credits to U.S. business R&D spending from 2007 to 2014 was 3.3%, while the average ratio of credits to QREs was 5.4%.

Table 3. Business and Federal Spending on Domestic Research and Development, and Claims for the Federal Research and Experimentation Tax Credit, 2007 to 2014
(\$ billions)

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|--|-------|-------|-------|-------|-------|-------|---------|-------|
| Business Spending on Domestic R&D (BSDRD) ^a | \$269 | \$258 | \$247 | \$279 | \$294 | \$302 | \$322.5 | \$341 |
| Qualified Research Expenditures (QREs) ^b | 158 | 151 | 143 | 160 | 172 | 196 | 209 | 227 |
| Federal R&D Spending (FRS) ^c | 127 | 127 | 133 | 140 | 135.5 | 138.5 | 125 | 130 |
| Current-Year Research Tax Credit ^d | 8.3 | 8.3 | 7.9 | 8.5 | 9.2 | 10.8 | 11.3 | 12.6 |
| Ratio of Credit to BSDRD (%) | 3.1% | 3.2% | 3.2% | 3.0% | 3.1% | 3.6% | 3.5% | 3.7% |
| Ratio of Credit to QREs (%) | 5.2 | 5.5 | 5.5 | 5.3 | 5.3 | 5.5 | 5.4 | 5.6 |
| Ratio of Credit to FRS (%) | 6.5 | 6.5 | 5.9 | 6.1 | 6.8 | 7.8 | 9.0 | 9.7 |

Sources: National Science Foundation, Division of Science Resources Statistics, *Science and Engineering Indicators 2018*, appendix table 4-3; National Science Foundation, Division of Science Resources Statistics, *Federal Funds for Research and Development* (various years), table 1; Internal Revenue Service, available at <http://www.irs.gov/uac/SOI-Tax-Stats-Corporation-Research-Credit>.

Notes:

- Total spending on domestic basic and applied research, as well as development, by companies only.
- 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.
- Budget authority for defense and nondefense R&D spending by fiscal year.
- 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.

The R&E credit was equal to 3% of domestic business R&D in this period. This may indicate that the credit was indirectly responsible for a small portion of any intangible assets created by this investment. But estimating the credit's contribution to the economic benefits from those assets is difficult. The credit applies to many R&D projects, the degree to which it subsidizes those projects varies, and there is not necessarily a clear connection among the credit, specific R&D projects, and innovations derived from those projects.

Policy Issues Raised by the Current R&E Credit

Most economists and lawmakers support the use of tax incentives to encourage firms to invest more in domestic R&D, especially in R&D projects that generate large external benefits. But this

general consensus does not necessarily mean they also agree that the current R&E credit is an optimal way to do so.

The credit has been available since July 1981. For much of that period, it has been subject to a variety of criticisms. One perennial concern is that the credit is not as effective as it could or should be in advancing the competitiveness of U.S. companies and improving the welfare of domestic workers. Critics have proposed a range of options for improving its effectiveness over the years. This section looks at some of those options and the concerns they would address.

Permanence of the R&E Credit

A primary concern during the credit's first 34 years (1981 to 2015) was its lack of permanence. Many argued that sustained uncertainty about the credit's future availability undercut its effectiveness because companies were unlikely to take it into account in planning their multiyear R&D budgets, lowering the number of projects they undertook. This concern was resolved with the passage of the PATH Act of 2015, which permanently extended the R&E credit.

Administrative Challenges

According to critics, the regulations and procedures set by the IRS for claiming the R&E credit are one reason it is not as effective as it could (or should) be. Critics say that this framework poses a variety of unnecessary administrative challenges for companies wanting to benefit from the credit. The result, according to critics, is two-fold: (1) fewer claims for the credit by small and medium companies deterred by the complexity and cost of complying with the IRS's requirements, and (2) numerous costly and lengthy disputes between the IRS and larger companies over the amount of credit claims.⁴¹

According to a variety of sources, the following administrative issues still are problematic for some firms wanting to benefit from the credit:⁴²

- how to interpret and apply key tests for determining which activities constitute qualified research, particularly improvements in existing products and processes and testing done to determine the appropriate design for a new product once the development process has ended;
- how to determine which activities commence after commercial production of a new product begins;
- how to determine when providers of engineering and architectural services may claim the credit;⁴³
- how to determine when research aimed at achieving significant cost reductions is eligible for the credit; and
- how to substantiate claims for the credit without clear guidance from the IRS on the required documentation.

⁴¹ Laura Tyson and Greg Linden, *The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness*, Center for American Progress, January 2012, p. 51, https://cdn.americanprogress.org/wp-content/uploads/issues/2012/01/pdf/corporate_r_and_d.pdf.

⁴² U.S. Government Accountability Office, *The Research Credit's Design and Administration Can Be Improved*, GAO-10-136, November 6, 2009.

⁴³ Julio Gonzalez, "A Turn for Worse in IRS Treatment of the R&D Credit," *Accounting Today*, July 8, 2021.

Policy Options

One option for mitigating some of these administrative challenges to claiming the R&E credit is to simplify the credit by defining QREs in the same way as research expenditures that were eligible for the IRC Section 174 expensing allowance before 2022.⁴⁴ The definition of QREs under IRC Section 174 was simpler and broader than their definition under IRC Section 41. Making it easier for companies to identify QREs that qualify for the credit might result in less complexity and greater transparency in IRS rules and procedures regarding the credit. A potential drawback to this option is that total QREs for IRC Section 174 expensing were often 50% larger than total QREs for the credit. To avoid a spike in the credit's revenue cost under this option, the credit's statutory rate may need to be reduced, a shift that would decrease its incentive effect.

Another option is for the IRS to issue regulations that clarify the activities that offer direct support for qualified research, when commercial production of a new product begins, and reasonable standards for substantiating claims for the credit.⁴⁵

Calculation of the Base Amount

Critics have also blamed the rules determining the R&E credit's base amount for what they view as the credit's suboptimal incentive effect. While such an amount is essential if the credit is to be incremental, the rules for the RC and ASC prevent the credits from having their maximum benefit, according to these critics.

For the RC, the base amount depends on its base period, which can go as far back as 1984 to 1988. This method detaches the base amount from a company's recent R&D investments, which may result in a base amount that differs substantially from how much it would invest in R&D without the credit. Further diluting the RC's incentive effect is the "50% rule," which is intended to limit credit windfalls for companies that have greatly increased their QREs since their base period.

The ASC's base period is a company's previous three years with QREs. Its base amount is 50% of average QREs in those years. It is simpler to calculate than the RC's base amount, and the ASC's base amount is more closely tied to a company's recent R&D investments. Yet this moving-average base period has the effect of decreasing the credit's future incentive effect. An increase in current-year QREs automatically leads to increases in the ASC's base amount for the next three years equal to one-third of the initial increase. The same issue arose with the initial

⁴⁴ According to C.F.R. §1.174-2, "the term research or experimental expenditures, as used in section 174, means expenditures incurred in connection with the taxpayer's trade or business which represent research and development costs in the experimental or laboratory sense. The term generally includes all such costs incident to the development or improvement of a product. The term includes the costs of obtaining a patent, such as attorneys' fees expended in making and perfecting a patent application. Expenditures represent research and development costs in the experimental or laboratory sense if they are for activities intended to discover information that would eliminate uncertainty concerning the development or improvement of a product. Uncertainty exists if the information available to the taxpayer does not establish the capability or method for developing or improving the product or the appropriate design of the product. Whether expenditures qualify as research or experimental expenditures depends on the nature of the activity to which the expenditures relate, not the nature of the product or improvement being developed or the level of technological advancement the product or improvement represents. The ultimate success, failure, sale, or use of the product is not relevant to a determination of eligibility under section 174."

⁴⁵ Government Accountability Office, *The Research Tax Credit's Design and Administration Can Be Improved*, GAO-10-136, November 6, 2009, p. 40.

IRC Section 41 credit, which was equal to 25% of a company's QREs above a base amount equal to its average QREs in the three previous tax years.

Policy Options

There are at least three options for addressing concerns with the base amount problem. One option would repeal the RC and retain the ASC's formula for determining the base amount, but with a five-year rolling average rather than a three-year rolling average.⁴⁶ This would lessen the future impact of an increase in present-year QREs, softening the blow to the credit's effectiveness.

Another option would be to link the R&E credit's base amount to a company's gross receipts.⁴⁷ This could be accomplished by multiplying its average ratio of QREs to receipts in the previous three years by the company's current-year QREs. The result would be its base amount for the current-year credit. For example, if a company's R&D-to-receipts ratio were 10% in the past three years and its QREs in the current year were \$500, then its base amount for the credit would be \$50 (0.10 x \$500).

A potentially simpler approach would be to revise the credit so that it would apply to increases in QREs from the previous year. The base amount would be prior-year QREs. Under this option, the credit would encourage increases in R&D investment from one year to the next without the drawbacks of the base amount formulas for the RC and ASC.

Then there is the option of replacing the current credit with a flat credit. In this case, the credit would be equal to a specified percentage of current-year QREs. This option could have a higher revenue cost than the existing credit, depending on the effective rate of a flat credit. If that rate were equal to that of the ASC, for instance, a flat credit would produce greater revenue losses and exert a weaker incentive effect, as companies could benefit from it when they decrease their domestic R&D investments.

Boost the Credit's Effective Rate

Some argue that the credit's effective rate is too low to fix the market failure linked to business R&D investment. According to one study, the socially optimal level of U.S. R&D is two to four times larger than its current level.⁴⁸ Considering that the average effective rate of the credit relative to domestic business R&D spending may be around 5%, this estimate of the gap between social returns and private returns to U.S. R&D leaves plenty of room for more robust R&D tax incentives.

Few studies have examined the question of how much larger the R&E credit's effective rate would have to be to increase business R&D investment to amounts commensurate with its potential spillover benefit. One such study was done in the mid-1990s by Bill Cox, then a CRS economist. The study's main focus was the efficacy of the research tax credit.⁴⁹

⁴⁶ Robert D. Atkinson, *Effective Corporate Tax Reform in the Global Innovation Economy*, Information Technology and Innovation Foundation, 2009, https://itif.org/files/090723_CorpTax.pdf.

⁴⁷ U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&E) Credit*, October 12, 2016, p. 12.

⁴⁸ Charles I. Jones and John C. Williams, "Measuring the Social Return to R&D," *Quarterly Journal of Economics*, vol. 113, no. 4 (1998), pp. 1119-1135.

⁴⁹ 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

Cox sought to determine the right tax incentives to lift business R&D investment to levels consistent with the overall economic returns from such investment. For tax incentives to have this effect, according to Cox, they could be designed to do what the R&E credit tries to do: subsidize R&D spending above what firms would undertake on their own. This meant that the tax incentives 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.”⁵⁰ Cox noted that a variety of studies had concluded that the median private rate of return on R&D investment was roughly half of the median social rate of return.⁵¹ Thus, assuming that the average social pretax rate of return is two times the average private pretax 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 21%, after-tax returns would equal 79% of pretax returns for corporations without tax subsidies. In this case, the optimal R&D tax subsidy would double the private after-tax returns to R&D investment by increasing them to 158% of pretax returns: $[2 \times (1 - 0.21)]$.

Cox’s analysis suggested that the optimal average effective rate for an R&D tax subsidy, or a combination of such subsidies (e.g., a research tax credit plus full expensing of research expenditures), was 58%, since corporations finance the vast share of business R&D. One caveat in using this finding for policymaking, Cox said, was that such a rate was an average and thus did not address the considerable variation among R&D investments in the difference between their private and social returns. Using tax incentives to boost pretax returns on R&D investment by 58% for all industries would inevitably provide excessive subsidies for projects with below-average spillover benefits and insufficient subsidies for projects with above-average spillover benefits. In Cox’s view, lawmakers should be aware that “this imprecision is unavoidable, and its consequences are hard to assess.”⁵²

How did federal tax subsidies for R&D investment compare with Cox’s assessment of the optimal R&D tax subsidy? To determine those subsidies’ incentive effect, he estimated the pretax 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 tangible assets like structures and equipment, the share of R&D expenditures eligible for both expensing under IRC Section 174 and the RC (no ASC was available then), and the economic lives of the intangible assets created as a result of the investments. Cox compared the combined effect of expensing and the RC on 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.⁵³

Expensing equalizes the pretax and after-tax rates of return on an investment, since it taxes income earned by the resulting assets at a marginal effective rate of zero.⁵⁴ Cox assumed that only

cited as Cox, *Tax Preferences for Research and Experimentation*.)

⁵⁰ Ibid., p. 8.

⁵¹ Edwin Mansfield, “Microeconomics of Technological Innovation,” in *The Positive Sum Strategy*, Ralph Landau and Nathan Rosenberg, eds. (Washington: National Academy Press, 1986), pp. 309-311.

⁵² Cox, *Tax Preferences for Research and Experimentation*, p. 9.

⁵³ 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 expensing 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.

⁵⁴ 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.

part of the total cost of the average R&D investment could be expensed under IRC Section 174. Consequently, expensing's effect on an R&D investment's after-tax rate of return depended on two factors: (1) the percentage of an investment's total cost that was expensed, and (2) the marginal effective tax rate on income earned by assets eligible for expensing.

Similarly, the RC raised the after-tax rate of return for only a portion of current-year QREs: those above a base amount equal to 50% or more of those QREs. Its effect on an R&D investment's after-tax returns depended on the same two factors: (1) the share of the investment's total cost that qualifies for the credit and (2) the marginal effective tax rate on income earned by assets eligible for the credit.

In light of these limitations, Cox estimated that expensing and the credit together produced median after-tax rates of return ranging from 101.0% of pretax 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 3 years.⁵⁵ As these percentages were considerably below the estimated threshold tax subsidy of 158%, he concluded that the federal research tax subsidies available in 1995 were too small to come close to increasing private after-tax returns to R&D investments to “levels warranted by the spillover benefits that are thought to be typical” for these investments.⁵⁶

Policy Options

Cox estimated the effect on after-tax rates of return on corporate R&D investments of several scenarios involving changes in the statutory rate for the R&E credit and the rules governing the use of the credit.

For 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 pretax return for projects yielding intangible assets with an economic life of 3 years, and 115.5% for projects yielding intangible assets with an economic life of 20 years. Repealing the basis adjustment for the RC lifted the median after-tax return to 146.0% of the pretax return for assets with a 3-year economic life, and 130.1% for assets with a 20-year economic life.⁵⁷ Increasing the RC's statutory rate to 25% without changing existing rules (including the basis adjustment) led to similar results: the median after-tax return for assets with a 3-year economic life was an estimated 133.9% of the pretax return, and an estimated 121.9% of the pretax return for assets with a 20-year economic life.⁵⁸ 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 pretax return: 165.8% for assets with a 3-year economic life, and 143.4% for assets with a 20-year economic life. Each scenario was based on full expensing for QREs.

If Cox is correct in concluding that the optimal average corporate R&D tax subsidy would raise after-tax returns to 158% of pretax returns, the options under current tax law for reaching that threshold are different than they were in 1995. The R&E tax credit has a second option, the ASC, which has grown to account for 70% or so of corporate R&E credit claims. In addition, companies no longer have the option of expensing QREs under IRC Section 174; the fastest cost recovery option currently available is to amortize QREs over five years. Some combination of an increase in the ASC's or RCs statutory rate, a restoration of full QRE expensing, and a decrease

⁵⁵ Cox, *Tax Preferences for Research and Experimentation*, p. 15.

⁵⁶ *Ibid.*, p. 17.

⁵⁷ *Ibid.*, p. 27.

⁵⁸ *Ibid.*, p. 27.

in the IRC Section 280C basis adjustment may be needed to achieve Cox's optimal R&D tax subsidy.

Nonrefundability

Another concern some raise about the R&E tax credit is that it is nonrefundable. This means that only firms with income tax liability would be in a position to use some or all of a current-year credit. Unused credits may be carried back 1 year or carried forward up to 20 years. Depending on how many years elapse before a current-year R&E credit is fully used, its present value could be a relatively small share of its original value.

Under current law, companies under five years old with less than \$5 million in gross receipts in the current tax year are allowed to apply up to \$250,000 of any R&E tax credit they cannot use because of insufficient tax liability as a credit against their share of the Social Security tax. In effect, companies making this election on their tax returns could have up to \$250,000 in additional funds to spend on R&D, or any other activity. It is unclear how beneficial this option has been for small, young, research-intensive firms with net operating losses.

Critics contend that the credit's lack of total refundability could be especially problematic for small, young firms that spend substantial sums on R&D during their early years while recording a string of net operating losses. For them, the R&E credit provides no immediate benefit. According to critics, if it were fully refundable, the credit might help such entrepreneurial firms stay afloat until they begin to realize returns on their investments.

Policy Options

To increase the value of the R&E credit to young, small firms with financial losses, some urge Congress to make the credit wholly or partially refundable for firms under a certain asset size, employment size, or age.⁵⁹

Another option would be to allow such firms that cannot use all their current-year credit to sell the unused portion to profitable firms at rates set through negotiations among affected firms.⁶⁰

Inadequate Focus on Research Projects with Large Social Returns

According to critics, another concern about the current R&E credit is that it does not target research projects with relatively large social returns. In their view, although the economic rationale for the credit lies in the potentially large spillover benefits from R&D, the credit's design encourages companies to invest more in R&D projects with private returns that represent a large share of total returns.

Businesses generally seek the highest possible return on their investments. Therefore, in selecting R&D investments, they are likely to assign a higher priority to investments that might earn substantial short-term profits than to projects that expand or clarify basic knowledge in engineering and scientific fields, which are unlikely to produce substantial profits anytime soon, if ever.

⁵⁹ 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.

⁶⁰ Michael D. Rashkin, "The Dysfunctional Research Credit Hampers Innovation," *Tax Notes*, June 6, 2011, p. 1066.

The pattern of U.S. R&D investment since the 1950s substantiates such a preference. The federal government has long served as the dominant source of funding for basic research, although academic institutions and nonprofit organizations have grown in importance as sources of basic research funding since 2000 (see **Table 4**). From the years in the table, the federal government's average share of U.S. spending (in current dollars) for this purpose was about three times greater than the business share (63.0% compared to 21.6%) from 1953 to 2000; the difference decreased from 2000 to 2018.

At the same time, businesses expanded their share of domestic funding for applied research and development from 1953 to 2018 (see **Table 4**). For the years shown in the table, businesses grew their share of applied research funding from 35.4% in 1953 to 66.0% in 2000, before the share fell back in 2010 and 2018. Similarly, businesses came to dominate domestic investment in development, as their share rose from 31.5% in 1960 to 85.6% in 2018.

Table 4. Percentage of Funding for Domestic Basic Research, Applied Research, and Experimental Development Accounted for by the Federal Government and Businesses in Selected Years, 1953 to 2018

| | 1953 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2018 |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Federal Government | | | | | | | | |
| Basic Research ^a | 57.6% | 61.7% | 69.6% | 70.3% | 61.0% | 57.8% | 52.4% | 41.1% |
| Applied Research ^b | 58.6 | 56.5 | 53.9 | 45.5 | 39.2 | 27.3 | 37.5 | 34.2 |
| Development ^c | 51.5 | 68.3 | 55.4 | 43.2 | 36.0 | 16.2 | 22.6 | 12.4 |
| Businesses | | | | | | | | |
| Basic Research | 33.5% | 26.7% | 14.8% | 14.7% | 20.5% | 19.3% | 22.9% | 29.9% |
| Applied Research | 35.4 | 40.0 | 42.2 | 48.7 | 54.2 | 66.0 | 52.0 | 54.2 |
| Development | 47.9 | 31.5 | 44.2 | 56.3 | 63.3 | 83.0 | 75.5 | 85.6 |
| Other Entities^d | | | | | | | | |
| Basic Research | 8.9% | 11.6% | 15.6% | 15.0% | 18.5% | 22.9% | 24.7% | 29.0% |
| Applied Research | 6.0 | 3.5 | 3.9 | 5.8 | 6.6 | 6.7 | 10.5 | 11.6 |
| Development | 0.6 | 0.2 | 0.4 | 0.5 | 0.7 | 0.8 | 1.9 | 2.0 |

Source: Compiled by CRS from data provided in: National Science Foundation, National Center for Science and Engineering Statistics, *National Patterns of R&D Resources: 2018-19 Update*, NSF 21-325, April 9, 2021.

Notes:

- a. Refers to experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.
- b. Refers to original investigations undertaken to acquire new knowledge. Unlike basic research, applied research is primarily intended to achieve a specific, practical aim or objective.
- c. Refers to systematic work that draws on knowledge gained from research and practical experience, and that produces added knowledge, for the purpose of developing new products and processes or improving existing ones.
- d. This category encompasses academic institutions and nonprofit organizations.

An increased business focus on applied research and development after 1980 has led some to argue that the R&E credit may subsidize mostly research projects with relatively small spillover benefits. The social returns to R&E-credit-subsidized R&D are not known. To the extent that they generally are not much larger or smaller than private returns, the credit may fall short of its

primary economic justification: that it spurs increased investment in R&D with social returns much greater than private returns.

Policy Options

Aligning the R&E credit with its economic rationale would require modifying the credit so it is available only for business R&D aimed at developing “breakthrough products that create new product categories or innovative enhancements to existing products.”⁶¹ There are several ways this might be done:

- creating a larger incremental credit (say 30%) for business spending on basic research, as currently defined in IRC Section 41,
- replacing the RC and ASC with a flat credit (say 20%) for such expenditures, or
- enlisting the National Science Foundation (NSF) to help the IRS administer a new basic research credit.

A possible advantage of having the NSF collaborate with the IRS to administer such a credit is that the NSF may have more expertise than the IRS in determining what constitutes basic research on a case-by-case basis.⁶² A possible disadvantage is that the NSF would add another layer of administrative review for claims for a basic research credit, increasing the time needed to process such claims. Another potential disadvantage is that a federal agency would exercise greater influence over private-sector R&D investment decisions.

Other Countries Provide More Generous R&D Tax Incentives

Some critics of the R&E tax credit, especially now that full QRE expensing under IRC Section 174(a) is no longer available, find it concerning that a number of other countries provide greater support for R&D investment through their tax codes than the United States does. In their view, these differences are eroding the competitiveness of the United States as a location for R&D investment, harming its innovation potential. Critics say that this loss of competitiveness warrants a boost in federal tax subsidies for R&D investment to at least offset R&D tax advantages in other countries. Such a boost might be done in several ways, including increases in the statutory rates for the RC and ASC, a simplification and enhancement of the R&E credit by repealing the RC and raising the rate for the ASC, and the restoration of QRE expensing under IRC Section 174(a).

Evidence that the United States lags behind other countries in the generosity of R&D tax incentives comes from recent studies by the Organisation for Economic Co-operation and Development (OECD). The most recent data are for 2021, when 34 out of the 38 OECD member countries provided tax incentives for business R&D. According to an analysis by the OECD, the U.S. implied tax subsidy rate for an additional \$1 of R&D in 2021 was 0.07 for loss-making and profitable small and medium firms and 0.07 for loss-making and profitable large firms.⁶³ A rate of 0.0 means that qualified R&D expenditures are fully deductible in the year they are incurred or paid but no other R&D tax subsidy is available; this is the base case. The estimated U.S. tax subsidy rate for firms of all sizes signifies that the R&E tax credit lowers the marginal tax burden on the returns to qualified R&D investments by 7%, on average, relative to the base case. By

⁶¹ Ibid., pp. 1066-1067.

⁶² Ibid., p. 1069.

⁶³ Organisation for Economic Co-operation and Development (OECD), *R&D Tax Incentives: United States, 2021*, <http://www.oecd.org/sti>.

contrast, the median tax subsidy rate for loss-making and profitable small and medium firms among all OECD countries was 0.20, and the median rate for loss-making and profitable large firms was 0.17.

In considering the relative generosity of U.S. R&D tax incentives, it is useful to note that there is a weak correlation between a country's R&D tax subsidy ranking and its importance as a location for R&D investment. According to the latest OECD data, in 2021, the top 6 nations (out of 38 OECD nations plus 11 "partner" nations including China) ranked by implied R&D tax subsidy for profitable and loss-making firms of all sizes were Colombia, Slovakia, Iceland, Portugal, the Netherlands, and France.⁶⁴ By contrast, in 2019 (the most recent year for which NSF data are available), the top 6 countries ranked by the total amount of R&D investment were the United States, China, Japan, Germany, and South Korea.⁶⁵

These differences in ranking have been the norm for some time. They suggest that nontax considerations typically have more influence over companies' international R&D location decisions than do tax considerations. Research in the past three decades has found that R&D location decisions by multinational companies hinge on a variety of factors. They include the size of foreign markets; the location of a firm's activities, such as production operations; the supply of well-educated scientists and engineers and their salaries; proximity to foreign customers; and the potential for a firm's R&D operations to form close ties with clusters of foreign firms engaged in R&D projects. Available evidence indicates that factors like these outweigh the influence of other countries' taxes in R&D location decisions. Tax incentives may come into play in cases where two or more foreign countries rank nearly equally in key nontax considerations.

⁶⁴ OECD, *R&D Tax Incentives Database, 2021 Edition*, <https://www.oecd.org/sti/rd-tax-stats-database.pdf>.

⁶⁵ See National Science Foundation, National Science Board, *Science and Engineering Indicators 2022: The State of U.S. Science and Engineering*, "U.S. and Global Research and Development," NSB-2022-1, <https://ncses.nsf.gov/pubs/nsb20221>.

Appendix A. 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 (e.g., steel and consumer electronics) 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.”⁶⁶

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%. It appears that the rate was not 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 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.⁶⁷

⁶⁶ U.S. Congress, Joint Committee on Taxation, *General Explanation of the Economic Recovery Tax Act of 1981*, joint committee print, 97th Cong., 1st sess., p. 120.

⁶⁷ 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%: $.20 \times [1 - (.5 \times .30)]$.

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 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.⁶⁸

To address 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 extended the credits to December 31, 1990 by requiring companies to prorate QREs incurred before January 1, 1991, allowed firms to apply the regular credit to QREs related to possible future lines of business, and required firms claiming the regular and university basic research credits to reduce any deduction they claimed 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 nondefense 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, and 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.

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%,

⁶⁸ 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., pp. 17-22.

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 Tax Extenders and Alternative Minimum Tax Relief Act of 2008 (Division C of P.L. 110-343) retroactively extended the research credit through 2009. It also raised the rate of the ASC 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; Division Q of 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.

Appendix B. Definition of Qualified Research

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 (3) any portion of research funded by another entity. Section 174 allowed businesses to deduct all “research or experimental expenditures” incurred in connection with their trade or business in the year they were paid or incurred.

In Treasury 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 qualified for Section 174 expensing was the “nature of the activity to which the expenditures relate, not the nature of the product or improvement being developed.”

In practice, the expenditures that qualified for expensing under Section 174 were all the direct and indirect costs a company incurred 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 did not qualify.⁶⁹

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).⁷⁰ 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.⁷¹

⁶⁹ 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.

⁷⁰ See P.L. 99-514, Section 231.

⁷¹ U.S. Congress, Joint Committee on Taxation, *General Explanation of the Tax Reform Act of 1986*, JCS-10-87, pp. 132-134.

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 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 congressional intent 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.⁷²

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

⁷² Sheryl Stratton and Barton Massey, “Major Changes to Research Credit Rules Sought at IRS Reg Hearing,” *Tax Notes*, May 3, 1999, pp. 623-624.

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.

Despite 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.⁷³

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.⁷⁴

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 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 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 was intended to be novel in its design or applications. Tax practitioners and businesses generally endorsed the proposed changes.⁷⁵

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.⁷⁶

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

⁷³ David L. Click, “Treasury Discovers Problems with New Research Tax Credit Regulations,” *Tax Notes*, March 12, 2001, p. 1531.

⁷⁴ Sheryl Stratton, “Treasury Puts Brakes on Research Credit Regs; Practitioners Applaud,” *Tax Notes*, February 5, 2001, pp. 713-715.

⁷⁵ 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, pp. 1662-1665.

⁷⁶ 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.

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, according to the regulation, should be considered in determining whether it had engaged in such a process.

Appendix C. Two Other Components of the IRC

Section 41 Research Tax Credit

University Basic Research Credit (UBRC)

Firms that enter into contracts with certain nonprofit organizations to perform basic research may be able to claim a separate nonrefundable research credit for some of their expenditures for this purpose under IRC Section 41(e). The credit is intended to foster collaborative research between 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 calculation of this amount differs from the determination of the base amount for the regular research tax credit or the ASC, although both amounts are intended to approximate the amount firms would spend on qualified research in the absence of the credit.⁷⁷

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 UBRC does not apply to qualified basic research done outside the United States, or to basic research in the social sciences, arts, or the humanities.

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 may not claim the credit for QREs related to their own basic research, but the spending may be included in their QREs for the regular credit or ASC. If a company’s basic research payments in a tax year are less than the base amount, they 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 claim a tax credit equal to 20% of a portion (usually 65%) of payments to certain entities for energy research. Such payments must satisfy several requirements to qualify for the credit. First, they must 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 the research must have a minimum of five contributing members, and no member may account for more than 50% of the annual payments for energy research received by a qualified organization.

A taxpayer may claim a credit equal to 100% of payments to colleges and universities, federal laboratories, and certain small firms for qualified energy research. In the case of eligible small

⁷⁷ 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.

firms, a taxpayer 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 C corporation, or hold 50% or more of the small firm's capital and profits if the firm is a pass-through business such as a partnership. Second, average annual employment of the firm performing the research cannot exceed 500 employees in at least one of the two previous calendar years.

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

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