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The Federal Research and Development (R&D) Tax Credit

February 6, 2026

Congressional Research Service
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R48848

CRS REPORT
Prepared for Members and
Committees of Congress

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The Federal Research and Development (R&D) Tax Credit

SUMMARY

R48848

February 6, 2026

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Investments in research and development (R&D) are the most favored type of investment in the federal tax code, subject not to taxes but to subsidies (negative taxes). These subsidies arise from the combination of expensing (deducting intangible investment costs from taxable income immediately rather than over the life of the investment), deductibility of interest for debt financing, and the R&D tax credit available under Section 41 of the Internal Revenue Code (IRC).

Companies are allowed two options when claiming the R&D credit: a 20% credit commonly referred to as the regular credit, or a 14% credit known as the alternative simplified credit (ACS). Because of the specific designs of each of the credit options, the effective credit percentages are lower than these headline percentages. CRS estimates that the current effective average R&D tax credit for marginal investments is 8.2%. These design features reflect an attempt to apply the credit only to incremental investment, but that approach has not been successful. Due to its current structure, the credit is no more efficient at targeting marginal investment than a flat credit for all research. The credit is part of the general business credit, which is limited to 75% of taxable income.

Without corporate tax benefits, the marginal effective tax rate (METR) on new investment is estimated at 27.2%, reflecting the corporate rate of 21% and additional taxes at the shareholder level. Expensing alone results in a 7.8% METR, as it leads to a METR of 0% for the corporate-level tax. The credit, along with expensing, results in a marginal effective tax rate on new investment of *minus* 30.3%; that is, a subsidy rather a tax. When the benefits of debt finance are added, the effective rate is minus 47.2%. The effect on investment incentives can be seen through the *tax wedge*, the percentage change in the minimum pretax return on an investment required by investors. For an investment without corporate tax benefits subject to the 27.2% METR, the pretax required return increases by 37.4%. The tax incentives for R&D result in a decrease of 32.1%, with the pretax required return falling below the after-tax required return.

The effect of the credit on investment can be estimated based on the change in the *user cost* and the responsiveness of investment to the user cost. The user cost is the sum of required return to pay investors, the taxes, and the decline in the value of the asset over time. The user cost rises by 7.4% with no tax benefits, but falls by 8.6% with the credit, and by 12.6% with debt included. To estimate the effect on investment, these percentages are multiplied by the elasticity (the percentage change in investment divided by the percentage change in cost). Earlier studies estimated an elasticity of -1.0, although recent estimates indicate that R&D is responsive to the user cost with an elasticity between -2.0 and -4.0. These estimates suggest that, compared to expensing, the credit increases R&D investment by 8.6% to 34.3%, and with the benefits of debt finance as well, increases the R&D investment by 12.6% to 50.5%.

Research spending and the innovation it generates can create spillovers, or benefits or costs that are not captured by the firm undertaking the research. Positive spillovers exist when the social benefits of research exceed the private returns. In such a scenario, too little research is undertaken and there exists an economic justification for government intervention via tax and nontax subsidies. Estimates typically indicate that the social returns to R&D are two to four times the private return to firms (and one estimate found a ratio of 20). That suggests that too little investment is made in R&D with the current credit. Under the assumption that the ratio of social to pretax return is constant as investment expands, CRS estimates that an increase in the current effective average R&D tax credit rate of 8.2% to 14% or 21% is required to optimize economic efficiency depending on if the social returns to R&D are either two or four times the private returns.

A number of policy options for the credit might be considered. The credit could be simplified and have the same incentive effect as substituting a flat credit around 8.2%. Another option is to increase the credit to encourage more investment because of the high social returns to this investment. There are also options to make the credit more available to start-ups and firms with losses, including offsetting against payroll taxes, removing the general business credit limit, or making the credit refundable. Another option is to attempt to target projects with higher social returns by increasing subsidies for collaborative research, or by increasing funding for government research.

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Introduction

Investments in research and development (R&D) are the most favored type of investment in the federal tax code, subject not to taxes but to subsidies (negative taxes).[1] These subsidies arise from the combination of expensing (deducting intangible investment costs from taxable income immediately rather than over the life of the investment), deductibility of interest for debt financing, and the R&D tax credit available under Section 41 of the Internal Revenue Code (IRC).[2] Although investments in equipment and non-R&D intangibles are also eligible for expensing, they are not eligible for an investment tax credit comparable to the R&D credit.

Companies are allowed two options when claiming the R&D credit: a 20% credit commonly referred to as the *regular credit*, or a 14% credit known as the *alternative simplified credit* (ACS). Because of the specific designs of each of the credit options (discussed later in this report), the effective credit percentages are lower than these headline percentages. CRS estimates that the current effective average R&D tax credit for marginal investments is 8.2%. Due to its current structure, the credit is no more efficient at targeting marginal investment than a flat credit for all research.

The R&D credit was first implemented in the Economic Recovery Tax Act of 1981 (P.L. 97-34). The credit was originally a temporary provision set at 25% of R&D and was scheduled to expire after 1985. After numerous modifications to the credit and years of it being a temporary provision, the Protecting Americans from Tax Hikes Act of 2015 (PATH Act; Division Q of P.L. 114-113) made the credit permanent in its current form starting with the 2015 tax year.[3]

Economics of Subsidizing R&D

Research spending and the innovation it generates can create spillovers, or benefits or costs that are not captured by the firm undertaking the research. Positive spillovers exist when the social benefits of research exceed the private returns. In such a scenario, the result is that too little research is undertaken, and there exists an economic justification for government intervention via tax and nontax subsidies. This rationale is the main justification for the R&D tax credit as well as for other forms of intervention, such as protection of intellectual property through patents, government research grants, and direct government research.

To the extent that negative spillovers exist there can be overinvestment in R&D. One potential source of negative spillovers is product market rivalry, where a race among competitive firms to first discover an innovation results in society collectively devoting too many resources to R&D. Thus, whether and how R&D should be subsidized may be thought of as an empirical question.

Extensive and continuing research by economists has found that R&D's positive spillover effects outweigh the effects of product market rivalry.[4] Research has found social returns to be

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[1] See CRS Report R48631, *Marginal Effective Tax Rates: Changes in P.L. 119-21, the 2025 Reconciliation Act*, by Mark P. Keightley and Jane G. Gravelle.

[2] Technically, Section 41 allows a credit for research and experimentation (R&E) expenditures. Thus, the credit is also known as the R&E credit.

[3] See **Appendix B** for a legislative history of the credit.

[4] For a review of earlier work, see Charles I. Jones and John C. Williams, "Measuring the Social Return to R&D," *Quarterly Journal of Economics*, vol. 113, no. 4 (November 1998), pp. 1119-1135, and Bronwyn H. Hall et al., "Measuring the Returns to R&D," *Handbook of the Economics of Innovation*, vol. 2, 2010, https://www.sciencedirect.com/science/article/abs/pii/S0169721810020083. The full text of the Jones and Williams (continued...)

significantly higher than private returns, with estimates of social returns ranging from at least twice the private return to four times the private return, and up to 20 times the private return.[5] These high social returns provide a rationale for tax subsidies for research investments.

According to data from the National Center for Science and Engineering Statistics (NCSES), R&D in the United States totaled $892 billion in 2022, and preliminary estimates indicate this figure increased to $940 billion in 2023.[6] The NCSES data show that R&D as a percentage of gross domestic product (GDP) has been hovering around 3.4%, placing it at historic highs in recent years (see **Figure 1**). Recent Organisation for Economic Co-operation and Development (OECD) data indicate that in 2023 the United States ranked fifth in terms of its R&D-to-GDP ratio, below Israel (6.35%), South Korea (4.96%), Taiwan (3.97%), and Sweden (3.64%).[7] Large industrialized economies with comparable levels of R&D spending include Japan (3.44%) and Germany (3.13%). The OECD average R&D-to-GDP ratio was 2.70%, while the EU average was 2.14%. China, a non-OECD country, ranked 15th (2.58%).

The United States saw R&D growth of 1.7% which was below both the OECD average (2.8%) and EU average (2.6%). Although China's R&D-to-GDP ratio ranked 15th in 2023, it experienced the highest growth in R&D among OECD and non-OECD countries at 8.7%.[8]

The NCSES data indicate that in the United States businesses conduct the overwhelming majority of R&D investment (78%), followed by higher education institutions (11%), the federal government and federally funded R&D centers (8%), nonprofits (3%), and nonfederal governments (0.1%). The finding that U.S. businesses account for the majority of R&D is in line with the overall OECD, where businesses accounted for 74% of total R&D expenditures.[9] The NCSES data also break down total R&D by funding source. Businesses accounted for the majority of R&D funding in 2022 (76%), followed by the federal government (18%), higher education (3%), nonprofits (2%), and nonfederal governments (1%). This same ranking holds

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paper at the Federal Reserve Board is at https://www.federalreserve.gov/pubs/feds/1997/199712/199712pap.pdf. The Full text of the Hall, National Bureau of Economic Research Working Paper 15622 is available at https://www.nber.org/system/files/working_papers/w15622/w15622.pdf.

[5] Nicholas Bloom et al., "Identifying Technology Spillovers and Product Market Rivalry," *Econometrica*, vol. 81. no. 4 (2013), pp. 1347-1393, https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA9466, found a social return at least twice the private return; Brian Lucking et al., "Have R&D Spillovers Declined in the 21st Century?," *Fiscal Studies*, vol. 40, no. 4 (December 2019), pp. 561-590, https://onlinelibrary.wiley.com/doi/10.1111/1475-5890.12195, found a social return four times the private return; and Benjamin F. Jones and Lawrence H. Summers, "A Calculation of the Social Returns to Innovation" in *Innovation and Public Policy*, ed. Austan Goolsbee and Benjamin F. Jones, National Bureau of Economic Research, 2022, https://www.degruyterbrill.com/document/doi/10.7208/chicago/9780226805597-005/html?lang=en&srsltid=AfmBOoqUtYwn733Sf2R-AjUNDQWDY-to0D_AhehfaCyiBHhJIUvIuQTB, found returns from 4 to 20 times private returns. The full text of the National Bureau of Economic Research Working Paper 27863 can be found at https://www.degruyterbrill.com/document/doi/10.7208/chicago/9780226805597-005/html?lang=en&srsltid=AfmBOoqUtYwn733Sf2R-AjUNDQWDY-to0D_AhehfaCyiBHhJIUvIuQTB.

[6] See National Center for Science and Engineering Statistics (NCSES), *U.S. R&D Totaled $892 Billion in 2022; Estimate for 2023 Indicates Further Increase to $940 Billion*, NSF 25-327, Alexandria, VA, 2025, https://ncses.nsf.gov/pubs/nsf25327/. This figure does not include federal tax incentives.

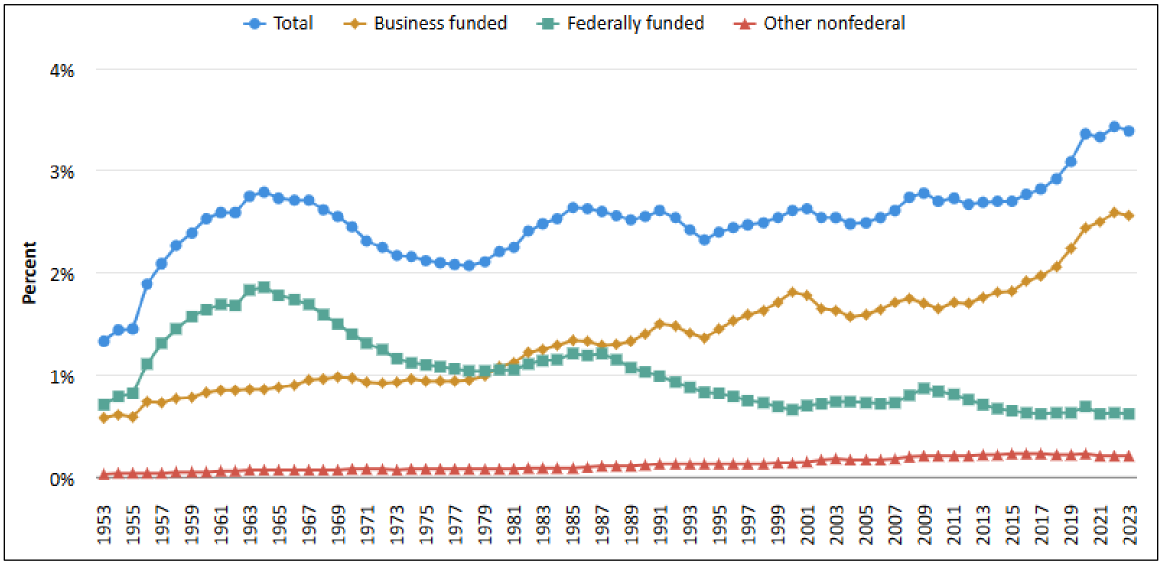
[7] Organisation for Economic Co-operation and Development, "Main Science and Technology Indicators (MSTI) Database," September 2025, https://oe.cd/msti.

[8] Organisation for Economic Co-operation and Development, "R&D spending growth slows in OECD, surges in China; government support for energy and defence R&D rises sharply," March 31, 2025, https://www.oecd.org/en/data/insights/statistical-releases/2025/03/rd-spending-growth-slows-in-oecd-surges-in-china-government-support-for-energy-and-defence-rd-rises-sharply.html.

[9] Organisation for Economic Co-operation and Development, "R&D spending growth slows in OECD, surges in China; government support for energy and defence R&D rises sharply," March 31, 2025, https://www.oecd.org/en/data/insights/statistical-releases/2025/03/rd-spending-growth-slows-in-oecd-surges-in-china-government-support-for-energy-and-defence-rd-rises-sharply.html.

when looking at sources of funding as a percentage of GDP (see **Figure 1**). From the 1950s through the early 1980s, the federal government was the largest source of R&D funding; currently, businesses provide roughly four times as much R&D funding as the federal government.

Figure 1. U.S. R&D as a Percentage of GDP, by Source of Funds: 1953-2023



Source: National Center for Science and Engineering Statistics, "National Patterns of R&D Resources (annual series)," https://ncses.nsf.gov/data-collections/national-patterns/2022-2023#data.

Notes: Some data for 2022 are preliminary and may be revised. The data for 2023 include estimates and are likely to be revised as well. The federally funded data represent the federal government as a funder of R&D by all performers (i.e., regardless of whether the federal government performs the research itself); similarly, the business-funded data cover the business sector as a funder of R&D by all performers. The other nonfederal category includes R&D funded by all other sources—mainly, by higher education, nonfederal governments, and nonprofit organizations. The gross domestic product data reflect the U.S. Bureau of Economic Analysis statistics as of October 2024.

Overview of R&D Tax Credits

Although "the R&D credit" is often referred to as a single credit, it actually consists of four discrete credits: the regular credit, the alternative simplified credit (ASC), the university basic research credit, and the energy research credit.[10] A taxpayer may claim either the regular credit or the ASC, and each of the other two, if eligible. Only the regular and alternative credits are widely used, and they are the focus of this report.[11] All of the credits are codified under Section 41 of the Internal Revenue Code (IRC). The R&D credit offsets the costs of qualified research expenditures (QREs), which generally include (1) the wages and salaries of researchers, (2) the costs of materials and supplies directly used in qualified research, (3) the costs of operating and maintaining research facilities (e.g., rent, utilities, and insurance), and (4) contract research expenses, subject to limits.[12] The costs of investments in equipment and buildings used in R&D generally do not qualify.

[10] The *energy research credit* is not to be confused with the Section 48 tax credit for investment in renewable energy.

[11] See **Appendix C** for more information on the university basic research credit and the energy research credit.

[12] For more information on the definitions of *qualified research* and *qualified research expenditures*, see **Appendix A**.

Separate from the R&D tax credit, federal tax law provides another incentive for R&D under IRC Section 179: expensing of QREs. Expensing allows for 100% of eligible R&D expenditures to be deducted in the year they are incurred. This is in contrast to an alternative approach known as amortization that requires firms to spread their deductions over multiple years. Section 179 expensing and its interaction with the R&D credit are discussed below.

Regular Credit and Alternative Simplified Credit

The regular credit is equal to 20% of a company's current-year QREs in excess of a base amount determined as the product of a "fixed base percentage" and a firm's average annual gross receipts during the previous four years. For firms with both 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 from 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. However, the regular credit has a requirement that a firm's base amount cannot be less than 50% of current-year QREs. Since nearly all firms are constrained by this 50% requirement, the regular credit typically has an effective rate of 10%, not 20%.[13]

The ASC is equal to 14% of a company's current-year QREs in excess of 50% of the past three years' average QRE ratio. Because each dollar of research today increases the base in each of three future years, today's research reduces future credits and thus the effective credit rate. After accounting for this offsetting effect, the ASC has an effective subsidization rate of about 8%, not 14%.[14] The credit rate is set at 6% of current-year QREs for companies with no QREs in any of the three preceding tax years.

Based on IRS data, CRS estimates that the weighted average effective R&D credit rate is 8.2%. The weights used in computing this average are based on research expenses under both credits. The estimate accounts for 65% of contract expenses being eligible for the credit, the regular credit's 50% minimum base requirement, and the reduction in future ASC rates stemming from a dollar of research today increasing the base in each of the subsequent three years.[15]

General Business Credit

The R&D credit is a component of the IRC Section 38 general business credit (GBC), and thus is 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 (AMT) liability, less the larger of the company's tentative AMT or 25% of its regular tax liability

[13] CRS estimates that 98% of corporations are constrained by the minimum base requirement using the U.S. Internal Revenue Service, "Corporation Income Tax Returns Line-Item Estimates (Publication 5108), Form 6765 Money Amounts, Statistics of Income, 2019-2021," https://www.irs.gov/statistics/soi-tax-stats-corporation-income-tax-returns-line86item-estimates-publication-5108. The estimation was made by solving: $xLine\ 12 + (1 - x)Line 14 = Line\ 15$.

[14] The effective rate depends on the nominal interest rate used to discount future reductions in credits because of the increase in the base in those years. CRS uses a nominal interest rate of 6.82%. For specifics on the calculation, see CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

[15] CRS computed the relevant weights and accounted for ineligible contract expenses using Internal Revenue Service, "SOI Tax Stats—Corporation Income Tax Returns Line Item Estimates (Publication 5108), 2020," https://www.irs.gov/statistics/soi-tax-stats-corporation-income-tax-returns-line-item-estimates-publication-5108.

above $25,000.[16] A current-year GBC that cannot be fully used may be carried back one year and carried forward up to 20 years.

Small Business and Startup Payroll Tax Credit Option

Small businesses and startups are more likely than larger and older businesses to have little or no income tax liability against which to apply the R&D tax credit. To address this, eligible small businesses may apply any R&D credit they cannot use against the employer share of the Social Security payroll tax.[17] To qualify, 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 lowest of the following amounts: (1) $500,000; (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 payroll liability during a calendar quarter; any excess amounts may be used as a credit against the company's payroll tax liability in the following quarter. A company may use the payroll tax credit option for up to five tax years.

Section 174 Expensing and Basis Adjustment

Federal tax law allows businesses to deduct all ordinary and necessary expenses when determining taxable income.[18] Deductible expenses fall under two general categories: current expenses for inputs with a useful life under a year (e.g., wages, salaries, interest, materials) and capital expenses for inputs with a longer life (e.g., machines and structures). Current expenses may be deducted the year they are paid or incurred. Capital expenses, by contrast, are typically deducted over time using methods and asset lives specified in the tax code. Whether investments in R&D can be deducted immediately or recovered over time, and how this interacts with the R&D credit, affects the incentives to make such investments.

Under current law, businesses are allowed to immediately deduct or "expense" QREs. However, current law also requires a reduction in the cost that can be expensed equal to the credit amount (or percentage of it) under IRC Section 280C(c). This reduction is sometimes referred to as a "basis adjustment." Alternatively, firms can claim a full expense deduction in exchange for reducing the R&D credit by the corporate tax rate, which is equivalent to the basis reduction for corporate taxpayers (but not for noncorporate taxpayers).[19]

Expensing of R&D along with a basis adjustment (or reduced credit) had been the long-standing law prior to the enactment of P.L. 115-97, the 2017 reconciliation law commonly known as the Tax Cuts and Jobs Act of 2017. Starting in 2022, P.L. 115-97 changed the deductibility of R&D expenditures by moving from expensing to five-year amortization (i.e., costs deducted ratably

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[16] 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 (which can affect noncorporate businesses that "pass through" their business income to individual owners) remains in effect. Since noncorporate businesses submit relatively few R&D credit claims, the AMT has virtually no influence on current-year use of the credit.

[17] Social Security is funded through a dedicated payroll tax. The tax is 12.4% of wages up to $176,100 in 2025. 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.

[18] IRC Section 162.

[19] The vast majority of corporations taking the R&D credit choose the reduced credit as their basis adjustment. More than 90% of corporations opted for the reduced credit in 2014, the most recent year for which data are available. See U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&D) Credit*, October 12, 2016, p. 1, https://home.treasury.gov/system/files/131/RE-Credit.pdf.

over five years). This change reduced the incentive to undertake R&D by increasing the effective tax rate on such investments. However, P.L. 115-97 also changed how the deduction of research costs interacted with the R&D tax credit by removing the basis adjustment requirement; this partly offset the increased tax rate on R&D investments from five-year amortization. CRS estimates that elimination of the basis adjustment offset 44% of the reduction in the benefit as measured by changes in the tax wedge that would have occurred had the basis reduction been retained with the switch to five-year amortization.[20] P.L. 119-21, the FY2025 reconciliation law commonly known as the One Big Beautiful Bill Act, restored expensing of R&D and the basis adjustment (i.e., returning to pre-P.L. 115-97 rules) starting in 2026.

Credit Revenue Implications and Use

The R&D credit is one of the largest business tax subsidies as measured by foregone revenue. The Joint Committee on Taxation (JCT) estimates that the credit will reduce federal revenues by $188.9 billion from FY2025 to FY2029, ranking it second among all corporate tax expenditures.[21] The other significant tax incentive for research—expensing—is estimated to cost $104.1 billion over the same time frame.

Publicly available IRS data on use of the credit are somewhat dated, but there is no reason to believe that the data are not reflective of current general usage. According to IRS data, companies claimed $12.6 billion in R&D credits in 2014 (the mostly recent available data). C corporations accounted for 98% of those claims, and partnerships, S corporations, estates, and trusts accounted for the remainder.[22] These older tax return data are still in line with the most recent JCT revenue estimates cited above, which show that C corporations account for 97% of the projected revenue loss from the credit.

In 2014 corporate claims for the ASC totaled $7.8 billion, which was 73% more than total claims for the regular credit. There are at least two reasons for the greater use of the ASC. One is that it is easier to calculate, on average, than the regular credit. A second is that many companies are likely to benefit more from the ASC, since its base amount takes into account only a firm's recent QREs.

Across industries, manufacturing has historically been by far the biggest user of the R&D credit. In 2014, it accounted for 59% of total credit claims, followed by the information sector (17%); the professional, scientific, and technical services sector (10%); and wholesale and retail trade (8%).[23] Within manufacturing, the main recipients are companies involved in chemical production (including prescription drugs) and producers of computers, electronic products, and transportation

[20] For more information on the basis adjustment change stemming from P.L. 115-97, see CRS In Focus IF12815, *How the "Tax Cuts and Jobs Act" (TCJA, P.L. 115-97) Changed Cost Recovery and the Tax Credit for Research*, by Jane G. Gravelle and Mark P. Keightley. The tax wedge is the percentage change in the required pretax return. Also see the section "The Marginal Effective Tax Rate and Tax Wedges for Investment in Research" in this report.

[21] U.S. Congress, Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2025 to 2029*, JCX-45-25, December 3, 2025, Table 1. A tax expenditure is the reduction in revenue from a special provision in the federal tax code that benefits certain taxpayers.

[22] Historical data on the use of the R&D credit are available from IRS, Statistics of Income Division, "Corporation Research Credit," https:// https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit.

[23] IRS, Statistics of Income Division, "Corporation Research Credit, Table 1: Corporations Claiming a Credit, by Industrial Sector," https:// https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit.

equipment; in 2013 (the most recent available data), they accounted for 76% of the manufacturing sector's credit claims (and 46% of all credit claims).[24]

Large corporations are a small share of R&D credit recipients yet account for the vast majority of R&D credit spending. In 2013 (the most recent available data), corporations with $250 million or more in receipts (i.e., revenues) accounted for 14% of the total number of credit claims, but 85% of their total value.[25]

Economic Effects: Marginal Effective Tax Rates, Tax Wedges, and User Costs

Economists use three related measures to understand the effects tax policy has on firm investment decisions: marginal effective tax rates, tax wedges, and the user cost of capital. These concepts are explained, and estimates for each are presented, below.

The Marginal Effective Tax Rate and Tax Wedges for Investment in Research

The *marginal effective tax rate (METR)* is a forward-looking measure that estimates, in present-value terms, the share of the return on a prospective investment that is paid in taxes over the life of that investment. It differs from the *statutory tax rate*, which measures the rate on taxable income, and the *average effective tax rate*, which measures taxes paid in a year as a percentage of total income (including untaxed income). The METR accounts for major features of the tax code that impact investment incentives, including statutory tax rates on corporate and noncorporate business income, the timing of income and deductions (such as accelerated tax depreciation), the R&D tax credit, deductibility of interest, and taxes paid by creditors and shareholders (both U.S. and foreign) on interest, dividends, and capital gains.

Table 1 shows the effects of various provisions that impact the METR on research investment. It starts by presenting the METR on a 100% equity-financed investment taxed at the 21% statutory corporate rate. The METR on such an investment is estimated to be 27.2%, reflecting the statutory corporate tax of 21% and additional taxes on dividends and capital gains at the shareholder level. Expensing of R&D reduces the tax rate at the corporate level to zero, leaving an overall METR of 7.8% that reflects shareholder-level taxes on dividends and capital gains.[26] The R&D credit further reduces the METR to -30.3% for equity-financed research investments. Finally, allowing R&D to be partially debt-financed and allowing a deduction for the associated interest results in an overall METR on R&D of -47.2%, making R&D the most favored investment in the tax code.[27] In effect, federal tax benefits reduce the return required by investors

[24] IRS, Statistics of Income Division, "Corporation Research Credit, Table 2: Corporations Claiming a Credit, by Manufacturing Subsector," https:// https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit.

[25] IRS, Statistics of Income Division, "Corporation Research Credit, Figure B: Number of Research Credit Claimants", and "Figure C: Totals of Research Credit Amounts," https:// https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit.

[26] The combined rate is not the sum of the corporate rate and the individual rate because the individual rate is applied net of the corporate tax rate.

[27] See Table 1 in CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

on intangible assets by half.[28] This subsidy arises from three main sources: the R&D tax credit, expensing of research investments, and the deductibility of debt financing.

Table 1 also reports what is known as the *tax wedge*, the percentage increase (or decrease) in the required pretax return an investment must earn because of taxes (or subsidies). It is computed as *t/(1-t)*, where "t" stands for the METR. Tax wedges serve as a better gauge of investment incentives than the METR alone, as there is a nonlinear relationship between the tax rate and the tax wedge, which becomes especially important with low and negative tax rates.[29] As indicated by changes in the tax wedges, expensing and the R&D credit reduce the required pretax return on R&D investments by similar amounts, lowering it by 28.9 percentage-points (from 37.4% to 8.5%) and 31.8 percentage-points (from 8.5% to -23.3%), respectively. The effect of debt financing is smaller (8.8 percentage-points).

Table 1. Effect of Different Provisions on Research Investment, Corporate Sector

Treatment	METR	Tax Wedge
Full Taxation at Statutory Rate	27.2%	37.4%
With Expensing	7.8%	8.5%
Plus Research Credit	-30.3%	-23.3%
Plus Debt Financing	-47.2%	-32.1%

Source: CRS calculations. METR from CRS Report R48631, *Marginal Effective Tax Rates: Changes in P.L. 119-21, the 2025 Reconciliation Act*, by Mark P. Keightley and Jane G. Gravelle. For details on the model and sources, see CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

Looking beyond R&D for context, most assets benefit from tax provisions that reduce the METR below the statutory rate. Aside from debt financing, the most important provision is expensing, which applies to most equipment, most intangible assets (advertising, human capital investments, movies and theatrical productions, TV programs, and computer software), power structures, and manufacturing structures. Owner-occupied housing also has a low METR of -0.9%, largely because the imputed net return on homeowner equity is not taxed.[30] CRS estimates that the economy-wide corporate METR is 10.9%, while the economy-wide METR in the noncorporate sector is 17.8%. This higher tax rate in the noncorporate sector is largely because the noncorporate sector has a larger share of less-favored assets, primarily buildings, including residential buildings.[31]

The User Cost of Capital and Estimated Effects on Investment

Changes in R&D investment stemming from tax incentives can be estimated using changes in the user cost of capital, which is the ratio of required pretax earnings per dollar of investment. The

[28] If R is the after-tax return, the pretax return is R/(1-0.272) with full taxation and R/(1+0.472) with the three benefits, reducing the required pretax return by 50.5%, or 1-(1-0.272)/(1+0.472).

[29] As an example of the differential effects of tax rates on the tax wedge, compare the tax wedge for a positive 25% tax rate, 33.3% (0.25/(1-0.25)), with the tax wedge for a negative 25% tax rate, -20% (-.25/1.25). That is, a 25% positive tax rate requires a 33.3% increase in the pretax required return, while a negative 25% tax rate reduces the required return by 20%.

[30] The phrase "the imputed net return on homeowner equity" refers to net rent (market value of rent in excess of costs) that could be earned on the home.

[31] For tax rates by asset and sector, see CRS Report R48631, *Marginal Effective Tax Rates: Changes in P.L. 119-21, the 2025 Reconciliation Act,* by Mark P. Keightley and Jane G. Gravelle.

user cost is also called the rental price of capital because it can be thought of as the price that would have to be paid to rent the asset; it reflects the price of capital inputs in the production process in the same way that wages reflect the price of labor inputs. The user cost of capital incorporates all the costs of using depreciable assets: the after-tax rate of return necessary to attract investment; taxes; and the decline in value as the asset is used up (i.e., economic depreciation). Subtracting tax payments from pretax returns yields the after-tax rate of return, which is assumed to be the same for all assets.[32]

Depreciation rates vary substantially by asset, with equipment and software depreciating more quickly than buildings.[33] The user costs of shorter-lived assets (i.e., those with faster rates of depreciation) are less responsive to changes in taxes than the user costs of longer-lived assets (those with slower rates of depreciation), meaning more of the price of using short-lived assets is their rapid depreciation. Estimates of economic depreciation for R&D indicate that it is a relatively short-lived asset, with an estimated economic depreciation rate of 17.45%.[34]

The change in the user cost is only one factor that determines how a tax incentive will impact investment. The other factor is how responsive investment is to a change in the cost of capital, which is generally measured by an elasticity, specifically the percentage change in research spending divided by the percentage change in the user cost. Estimates of this elasticity have varied considerably. Earlier estimates were around -1.0, but recent studies have found larger elasticities, ranging from -2.0 to -4.0.[35] Multiplying the change in user cost by the elasticity produces an estimate of the percentage change in investment due to the tax incentive.

Table 2 provides estimates of the effects of the tax system on the user cost of R&D for an all-equity-financed investment with expensing. This benchmark is useful because expensing with an

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[32] If one asset yielded higher returns than another asset, individuals would shift their assets out of the low-return asset into the high-return asset; this would in turn drive up returns for the low-return asset and drive down returns for the high-return asset. Investors have incentives to shift their investments into high-return assets up through the point where the investors' own decisions eventually equalize returns across assets.

[33] For a list of economic depreciation rates, see Table A-2 in CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

[34] The average depreciation rate (excluding land and inventories), weighted by the share of capital stock, is 6.2%. For a list of depreciation rates in the CRS model, see CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

[35] Chang finds an elasticity of -2.8 to -3.8 using state variation in R&D tax incentives. These estimates are larger than those found in the past, and Chang suggests the earlier elasticities are understated because of endogeneity in the dependent variable. See Andrew Chang, "Tax Policy Endogeneity: Evidence From R&D Tax Credits," *Economics of Innovation and Technology*, vol. 27, no. 8, (2018), pp. 809-833, https://www.tandfonline.com/doi/full/10.1080/10438599.2017.1415001?journalCode=gein20#abstract. Thomson finds a short-run elasticity of -0.5 but a much larger long-run elasticity of around- 4, though he cautions that the long-run estimate is less certain. See Russell Thomson, "The Effectiveness of R&D Tax Credits," *Review of Economics and Statistics*, vol. 99, no. 3 (July 2017), pp. 544-549. Rao finds an elasticity of- 2.0 for R&D as a percentage of sales with respect to a change in the user cost of capital. See Nirupama Rao, "Do Tax Credits Stimulate R&D Spending? The Effect of the R&D Tax Credit in Its First Decade," *Journal of Public Economics*, vol. 140 (August 2016), pp. 1-12, https://www.sciencedirect.com/science/article/abs/pii/S0047272716300482. Gupta et al. estimate that a dollar of additional cost results in a reduction of $2.08 of additional spending, indicating an elasticity of -2.1. See Sanjay Gupta et al., "Structural Change in the Research and Experimental Tax Credit," *National Tax Journal*, vol. 64, no. 2, Part 1 (June 2011), pp. 285-322. Earlier studies found an elasticity of around -1.0. For reviews, see 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; Congressional Budget Office, *Federal Support for Research and Development*, June 2007, p. 24, https://www.cbo.gov/sites/default/files/110th-congress-2007-2008/reports/06-18-research.pdf; and Bronwyn Hall and John van Reenen, "How Effective are Fiscal Incentives for R&D? A Review of the Evidence," *Research Policy*, vol. 29. iss. 4-5 (April 2000), pp. 449-469, https://www.sciencedirect.com/science/article/abs/pii/S0048733399000852?getft_integrator=tfo&pes=vor&utm_source=tfo.

all-equity-financed investment is equivalent to no tax (e.g., the METR is 0%). In this scenario, the user cost of capital is 24.23 cents per dollar of annual investment, as shown in the second row. The user cost increases by 7.4% without any tax subsidies (i.e., tax depreciation matches economic depreciation and there is no R&D credit, so R&D is taxed at the statutory rate). The impact on investment is to reduce R&D expenditures, including quite significantly at higher elasticities. The R&D credit and expensing reduce the user cost by 8.6% and thereby increase investment. Adding the deductibility of interest for debt financing further reduces the user cost to 12.6%, and has a larger impact on R&D spending. As compared with the results presented in older studies, the recent higher elasticity estimates suggest that the tax subsidies for R&D have a larger effect on total R&D investment.

Table 2. Estimated Effects of Tax Policy on User Cost and Investment, Corporate. Sector

Treatment	User Cost	Percentage Change in User Cost	Percentage Change in Investment		
			Elasticity: 1.0	Elasticity: 2.0	Elasticity: 4.0
Taxation at Statutory Rate	0.2603	7.4%	-7.4%	-14.9%	-29.7%
Expensing/No Tax	0.2423				
Plus Research Credit	0.2215	-8.6%	8.6%	17.2%	34.3%
Plus Debt Financing	0.2117	-12.6%	12.6%	37.3%	50.5%

Source: CRS calculations. Pretax returns are from CRS Report R48631, *Marginal Effective Tax Rates: Changes in P.L. 119-21, the 2025 Reconciliation Act*, by Mark P. Keightley and Jane G. Gravelle. For details on the model and sources, see CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

Notes: The user cost is the pretax return plus 0.1745.

Investments in most assets benefit from tax subsidies (e.g., accelerated depreciation and deductibility of interest), and the relative effect of tax subsidies for R&D is reduced by those other benefits. It is also possible that the elasticities are not constant across price levels. Nevertheless, the evidence suggests that R&D tax subsidies have significant effects on the level of R&D spending.

Are Tax Benefits Commensurate With Spillover Effects?

The existing economic research on R&D indicates that the social return is likely higher than the private return, implying that too little R&D would occur from society's perspective without government intervention. Tax subsidies like the R&D credit and accelerated depreciation can encourage more R&D and lead to an improvement in economic efficiency, resulting in more economic value to society as a whole than would occur without these subsidies. In economics jargon, subsidies for R&D investment can correct a market failure stemming from positive externalities (spillovers) from such investments. The optimal amount of subsidization (i.e., where economic efficiency is maximized) would be set such that the private return to R&D investment is equal to the social return. Policymakers face the question: Are current tax subsidies generating this outcome?

The first step toward answering this question is estimating the subsidy amount that would equate the private return with the social return. **Table 3** provides estimates of the efficiency-maximizing tax credit rate needed for the range of estimates of the ratio of social to private returns found in the literature, along with marginal effective tax rates for equity-financed and mixed-financed investments.[36] The METRs for the highest ratios of social to private returns should be interpreted with caution, as they stem from a mathematical feature of the calculation and do not lend to a meaningful economic interpretation (although the estimated necessary credit rate is still valid).[37]

As discussed previously, CRS estimates that under current law, the weighted average effective R&D credit rate is 8.2%, which is well below any of the efficiency-maximizing credit rates in **Table 3**, suggesting that the current R&D credit rate is too low. While the estimated credit rate needed to account for spillover effects suggests a higher credit, the calculations depend on the measure of social returns, which is difficult to estimate. In addition, the social return relative to private return of R&D investments varies by investment, as firms choose projects based on private returns and not on social returns.

Table 3. Credit Rate Needed to Equate Social and Private Returns

Ratio of Social to Private Equity Return	Efficiency-Maximizing Credit Rate	Marginal Effective Tax Rate for Equity-Financed Investment	Marginal Effective Tax Rate for Mixed-Financed Investment
2.0	14.0%	-100.1%	-127.9%
4.0	21.0%	-300.8%	-570.6%
20.0	26.6%	-1,925.0%	1,311.0%

Source: CRS calculations, see **Appendix D**. A mixed finance investment uses the average share of debt, which is around a third in the corporate sector.

The government also has alternatives to R&D tax credits, such as grants and patent protections. However, patents, while an important tool to encourage private R&D, can restrain and delay the social returns to innovation. There is also evidence that government R&D, or at least nondefense R&D, yields higher social returns than private R&D, so government could expand its direct research funding.[38] The federal government funds accounted for 41% of basic research funding in 2022.[39] Basic research may not have obvious applications at the time the research is undertaken, but can lead to important advances in knowledge that subsequently prove useful. An illustration is

[36] See **Appendix D** for more information on the estimation.

[37] The formula for the METR is (ρ-s)/ρ, where ρ is the pre-tax return and s is the required after-tax return for savers. Plotting the METR as a function of ρ produces a hyperbola existing in the second and fourth quadrants of the Cartesian coordinate system. The limit as ρ approaches 0 from below is infinity, and the limit as ρ approaches 0 from above is negative infinity. Thus, as the pretax return is driven down due to diminishing marginal returns to investment, the METR breaks down in an economic sense. This is evident in the case where the social return is 20 times the private return; the METR for an equity-financed investment is large and negative, but switches to be large and positive with a mixed-finance investment.

[38] See Andrew J. Fieldhouse and Karel Mertens, *The Social Returns to Public R&D*, Federal Reserve Bank of Dallas, Working Paper 2519, May 2025, for a review.

[39] National Center for Science and Engineering Statistics, "National Patterns of R&D Resources (annual series)," https://ncses.nsf.gov/data-collections/national-patterns/2022-2023#data.

the revolutionary GLP-1 drugs for diabetes and weight loss, which originated from government-funded scientists studying the Gila monster, a lizard that can go months without eating.[40]

P.L. 115-97 and P.L. 119-21

P.L. 115-97 replaced expensing with five-year amortization after 2021. At the same time, the law (perhaps inadvertently) effectively eliminated the basis adjustment, providing a benefit that offset slightly more than half the loss from amortization in terms of cost per dollar of investment.[41] P.L. 115-97 also lowered the corporate tax rate, which provided a benefit for equity financing when five-year amortization was in place, but reduced the value of deductions for interest.

P.L. 119-21 reinstated expensing as well as the basis adjustment starting in 2025 (with retroactive basis adjustments for research spending by certain small businesses).[42]

Table 4 indicates how eliminating or keeping the basis adjustment affects the METR, the tax wedge, and the user cost of capital under expensing and five-year amortization. The actual tax treatments under P.L. 115-97 and P.L. 119-21 are also indicated.

Table 4. Estimated Effects of Expensing and the Basis Adjustment for R&D Investments with Mixed Financing

Tax Treatment	Marginal Effective Tax Rate	Tax Wedge	User Cost of Capital	Percentage Change in User Cost of Capital
5-year Amortization No Basis Adjustment (P.L. 115-97)	-28.9%	-22.4%	0.2179	—
Expensing Basis Adjustment (Pre- P.L. 115-97 and P.L. 119-21)	-47.2%	-32.0%	0.2125	-2.5%
5-year Amortization Basis Adjustment (Hypothetical)	-17.5%	-14.9%	0.2221	1.9%
Expensing No Basis Adjustment (Hypothetical)	-69.6%	-41.4%	0.2074	-4.8%

Source: CRS calculations based on the CRS model. For details on the model and its sources, see CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

Notes: These calculations do not reflect the change in the limit on interest deductions, which would have a small effect.

[40] Ezra Klein and Derek Thompson, *Abundance* (Avid Reader Press), 2025, p. 157.

[41] See CRS In Focus IF12815, *How the "Tax Cuts and Jobs Act" (TCJA, P.L. 115-97) Changed Cost Recovery and the Tax Credit for Research*, by Jane G. Gravelle and Mark P. Keightley.

[42] CRS Report R48611, *Tax Provisions in P.L. 119-21, the FY2025 Reconciliation Law*, coordinated by Anthony A. Cilluffo, p.11.

It is possible to estimate how much of the tax wedge reduction from restoring expensing under P.L. 119-21 was offset by reinstating the basis adjustment. To do this, consider that the tax wedge under five-year amortization *without* the basis adjustment was -22.4%, the tax wedge under expensing *with* a basis adjustment (the actual policy change stemming from P.L. 119-21) is -32.0%, and the tax wedge under expensing *without* a basis adjustment is estimated to be -41.4%. Had the move from five-year amortization to expensing not included reinstating the basis adjustment, the tax wedge would have been reduced by 19 percentage points (from -22.4% to -41.4%). But reinstating the basis adjustment reduced this potential tax wedge reduction by 9.4 percentage points (-41.1% minus -32.0%), implying that reinstating the basis adjustment offset 49.5% (9.4 divided by 19) of the tax wedge reduction from moving back to expensing.

Similarly, it is possible to estimate how much of the increased tax wedge associated with moving from *expensing with a basis adjustment* (the pre-P.L. 115-97 system) to five-year amortization under P.L. 115-97 was offset by elimination of the basis adjustment. The tax wedge under pre-P.L. 115-97 expensing *with* a basis adjustment was -32.0%; the wedge under five-year amortization *without* a basis adjustment (from P.L. 115-97) was -22.4%; and the wedge under five-year amortization *with* a basis adjustment would be -14.9% (a hypothetical scenario). Had the move from expensing to five-year amortization retained the basis adjustment, the increase in the tax wedge would have been 17.1 percentage-points (-32.0% minus -14.9%). But elimination of the basis adjustment reduced this potential tax wedge increase by 7.6 percentage-points (-22.4% minus -14.9%). Thus, eliminating the basis adjustment offset 44% of the tax wedge increase when moving from expensing to five-year amortization under P.L. 115-97.

American Multinationals

The research credit can affect where multinational firms decide to locate their research operations. Firms serving an overseas market have several options. First, they can invest in R&D in the United States and retain ownership of the asset in the United States. The firm can then export products that utilized the R&D, such as shipping drugs to other countries, or firms can charge royalties for the use of the technology by their subsidiaries who manufacture the drugs abroad. Second, the firm's subsidiaries can invest in research abroad, own the asset (the intellectual property), and then sell the products that utilized the R&D abroad. Third, firms can conduct R&D in the United States and sell the right to use the technology abroad through an asset sale to one of their foreign subsidiaries. In the last case, once the rights to the initial technology are sold, multinationals commonly use a method called *cost sharing* to transfer rights to further advances in their technology. Under cost sharing, the foreign subsidiary pays a share of the R&D costs and in return has a right to the additional technology.

The decision over where to conduct R&D is a complex one and is influenced by a variety of rules; it also depends on whether the investment is marginal or inframarginal. These rules include the following:

- Only research in the United States is eligible for the R&D credit.
- Half of income from exported goods can be sourced to foreign-source income under a provision called the *title passage rule*, which was repealed by P.L. 115-97 but restored by P.L. 119-21. Thus, products whose profits reflect U.S. R&D can be eligible for lower taxes on foreign-source income. The U.S. corporate tax rate is also reduced to 14% (instead of 21%) by the foreign-derived deduction-eligible income (FDDEI) deduction.

- Income from R&D assets held in the United States and licensed to foreign firms in exchange for royalties is taxed under the U.S. tax system and subject to the 14% rate.
- Income from assets held abroad is subject to a reduced U.S. tax rate of 12.6%.
- Investments in R&D made abroad are recovered (i.e., amortized) in equal amounts over 15 years.
- Income from investments abroad may be subject to foreign taxes.
- The U.S. tax on foreign-source income can be offset by a foreign tax credit of 90% of foreign income taxes paid. The credit is limited to the amount of U.S. tax due. For purposes of the limit on the foreign tax credit, deductions for interest and research in the United States, formerly partially allocable to foreign-source income, are no longer required under P.L. 119-21. This change increases foreign-source income and the limit on the foreign tax credit. Foreign tax credits are based on overall worldwide credits, and higher foreign taxes on other investments can offset U.S. taxes on lower-taxed investments, potentially leading to overall tax rates lower than 12.6%.
- Foreign tax systems often offer tax credits and other benefits for R&D.

The combination of these effects can make conducting research in the United States more or less tax-favored than conducting it abroad, regardless of whether the research serves foreign or domestic markets.

Taxes are only one factor, and possibly a minor one, in determining both the location of R&D and the location of income from intangible assets. The United States has some of the least generous R&D tax incentivizes, but it has more R&D than any other country.[43] Studies of R&D location choices indicate that they are influenced by agglomeration economies from locating in research-intensive areas.[44] A survey found that reasons for locating abroad are, most importantly, protection of intellectual property and availability of research personnel; tax breaks ranked last out of the nine factors surveyed.[45]

Pillar 2, a proposal by the Organisation for Economic Co-operation and Development (OECD) for a global minimum tax based on financial income, could reduce the value of tax benefits in other countries. It has been adopted by other countries, but the OECD has announced arrangements to exclude the United States from the proposal.[46] Pillar 2 could also lead to R&D

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[43] RandD Tax, "Comparing Global R&D Tax Incentives: Which Country Offers the Best Support?," March 7, 2025, https://www.randdtax.co.uk/comparing-global-rd-tax-incentives-which-country-offers-the-best-support/#:~:text=For%20businesses%20looking%20to%20maximize,sought%20to%20use%20for%20comparison; Daniel Bunn, *Tax Subsidies for R&D Spending and Patent Boxes in OECD Countries*, Tax Foundation, March 17, 2021, https://taxfoundation.org/research/all/global/rd-tax-credit-rd-tax-subsidies-oecd/#Expenses Davide Bonaglia et al., "End of Year Edition – Against All Odds, Global R&D Has Grown Close to USD 3 Trillion in 2023," World Intellectual Property Organization (WIPO), December 18, 2024, https://www.wipo.int/web/global-innovation-index/w/blogs/2024/end-of-year-edition#:~:text=Stylized%20Fact%205:%20The%20United,See%20Chart%206.

[44] See, for example, Iulia Siedschlag et al., "What Determines the Location Choice of R&D Activities by Multinational Firms?" *Research Policy*, vol. 42, no. 8. (September 2013), pp. 1420-1430, https://www.sciencedirect.com/science/article/abs/pii/S0048733313001078.

[45] "Factors in the Selection of R&D Sites," in National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, *Here or There?: A Survey of Factors in Multinational R&D Location—Report to the Government-University-Industry Research Roundtable*, The National Academies Press, 2006, https://nap.nationalacademies.org/read/11675/chapter/7#26.

[46] This agreement was reached with the G-7 after Congress agreed to drop measures in P.L. 119-21 for a retaliatory tax. See CRS In Focus IF13023, *Enforcement of Remedies Against Unfair Foreign Taxes*, by Jane G. Gravelle.

credits offered by foreign countries being made refundable since the proposal treats refundable credits as grants rather than as reductions in tax rates.[47]

Policy Options

Several options might be considered for revising the R&D credit, including creating a simplified uniform credit, increasing the credit to achieve additional social returns, expanding access to the credit for start-up and loss firms by expanding payroll tax offsets or making the credit refundable, providing a more generous credit for collaboration with universities and nonprofits, and conforming the definition of expenditure between the expensing and credit provisions.[48] Aside from reforms to the credit itself, the federal government may also consider expanding direct funding for R&D.

Simplifying the Credit

The current R&D credit regime is generally viewed as complex and administratively burdensome for small and medium-sized firms, especially when looking at the regular credit. As evidence, the alternative simplified credit is used approximately twice as much as the regular credit, although the value of the alternative credit is generally smaller than the value of the regular credit.[49] The popularity of the alternative simplified credit, even though it is less valuable, may be due to the complexity and difficulty of providing a base from data many years in the past for the regular credit.[50]

Two alternatives might be considered to simplify the regular credit. One is to simply allow a credit for expenditures in excess of a percentage of gross receipts. Such a credit (the alternative incremental research credit, or AIRC) was allowed as an alternative from 1998 to 2008. The difficulty with this approach is the significant variation across firms in the ratio of research to gross receipts. For example, estimates indicated that the R&D-to-sales ratio for all firms claiming the credit was 4.9%, but it varied across industries from 1.2% to 16.9%. It also varied by size, from 3.7% to 13%, with small companies having higher ratios.[51] Some firms would get no incentives, while others would have a smaller base of excluded expenditures.

Another option is to eliminate any base and apply the credit to all eligible expenditures, but at a lower subsidization rate, that is, move away from attempts to provide an incremental credit. One could argue that providing an incremental credit by adopting a base is not effective in targeting incremental investments. Moreover, other credits, both past and current, have generally not been structured as incremental credits. (One incremental tax deduction has suffered from the same

[47] See CRS Report R47174, *The Pillar 2 Global Minimum Tax: Implications for U.S. Tax Policy*, by Jane G. Gravelle and Mark P. Keightley, for a discussion of the treatment of refundable and nonrefundable credits.

[48] See U.S. Government Accountability Office, *The Research Tax Credit's Design and Administration Can Be Improved*, GAO-10-136, November 2009, https://www.gao.gov/assets/gao-10-136.pdf.

[49] Data for the shares of investment are from Form 6765 of the IRS Statistics of Income corporate line item estimates data, at https://www.irs.gov/statistics/soi-tax-stats-corporation-income-tax-returns-line-item-estimates-publication-5108. Ignoring the effect of discounting, the effect of increasing the base in future years would reduce the 14% credit by half. Accounting for discounting of the reduction is estimated at 8.1% at an approximate 9% discount rate. The overall credit is also affected by certain other restrictions, such as the inclusion of only 65% of contract expenses.

[50] This reason was suggested in U.S. Treasury, Office of Tax Analysis, *Research and Experimentation (R&D) Tax Credit*, https://home.treasury.gov/system/files/131/RE-Credit.pdf.

[51] National Center for Science and Engineering Statistics, "Business R&D Performance in the United States Nears $700 Billion in 2022," https://ncses.nsf.gov/pubs/nsf24334

complexity and low take-up as the regular R&D credit.[52]) A simple, flat-rate credit of around 8.2% for all eligible expenditures would have approximately the same revenue cost and effective credit rate as the current approach.

Increasing the R&D Credit to Address High Social Returns

Analyses in this report suggest that to induce more R&D commensurate with estimates of social returns, a higher credit rate is needed. For example, in the conservative case where social returns are twice private returns and the current 20% and 14% credit structures are retained, these credits would need to be increased to 30% and 20%, respectively. Alternatively, if a credit applying to all eligible expenditures (without a base) were enacted, the credit rate would be 12% rather than 8.2% (see **Table 3**). In the case consistent with most recent studies, where social returns are four times private returns, the 20% and 14% credits would need to be increased to 52% and 36%, whereas a single credit applied to all eligible expenditures without a base would be 21%.

Making the Credit Available to Start-Ups and Firms with Net Losses

The current credit cannot be used by firms with net income losses (i.e., negative profits) and is subject to restrictions for firms with low taxable incomes relative to the size of their potential credits. The R&D credit, as part of the general business credit, cannot exceed 75% of income tax liability for corporations.[53]

The credit can reduce payroll tax liability for small start-up firms (firms with no gross receipts before the past five years and with receipts of $5 million or less), capped at $250,000 per year.

The credit could be made more generally available by (1) eliminating the general business credit limit, (2) expanding eligibility for the payroll tax offset to larger and older firms, or (3) making the credit fully refundable (i.e., allowing firms to receive a refund if their R&D credits exceeded their tax liabilities). These options are not mutually exclusive and could be enacted with other reforms aimed at simplifying or expanding the credit.

Directing Benefits at Projects Earning Higher Social Rates of Return

This issue is the most difficult to confront with federal subsidies for private investment. Firms will choose the investments with the highest after-tax private returns and not necessarily the highest social returns. The government has three options for supporting R&D: tax subsidies, direct spending (either in government research or supporting private research), and granting patents.

One option is to increase the credit for selected industries or investments; an example from current law is the orphan drug credit, designed to encourage the development of drugs for rare conditions. However, there is little evidence to guide choices of industries or investments.

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[52] See CRS In Focus IF12862, *The Section 179D Energy Efficient Commercial Buildings Deduction*, by Nicholas E. Buffie, for discussion of the complexities of the IRC Section 179D tax deduction.

[53] It cannot exceed the regular minus the alternative minimum tax, if smaller, for individual taxpayers. Individual taxpayers claim about 3% of the R&D credit's expenditures. See Joint Committee on Taxation, *Estimates of Federal Tax Expenditures for Fiscal Years 2025-2029*, JCX-45-25, December 3, 2025, p. 34, https://www.jct.gov/publications/2025/jcx-45-25/.

A recent proposal, which also included greater refundability and a larger credit, made a number of specific suggestions.[54] One suggestion was to provide a larger credit for collaborative research, whether with other companies or with universities, since this type of research tends to be more exploratory and targeted at basic research. The recommendations also included allowing passive investors in research to offset losses against ordinary income, allowing the carryover of net operating losses when ownership changes, making expenditures on employee training eligible for the credit, and allowing tax-deferred investment accounts for small and mid-sized companies in which funds could be withdrawn tax free if used for research.

Another option—increasing public funding of R&D, rather than increasing the credit or its cost—has been estimated to yield higher social returns.[55]

Compliance and Administration Costs

It is generally recognized that complying with the regulations is difficult for firms, especially smaller firms, and that the regulations are costly for the IRS to administer. One study found that the compliance costs of the credit reduce its utilization.[56] It is difficult to address this issue, since focusing on the objectives of the R&D credit (a business component based on science and reflecting uncertainty involving the process of experimentation) cannot be achieved without requiring significant documentation and oversight. In addition, most R&D is carried out by large firms with adequate resources to comply with the regulations.[57]

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[54] Robert D. Atkinson, "Twelve Tax Reforms to Spur Innovation and Competitiveness," Information Technology and Innovation Foundation (ITIF), September 25, 2024, https://itif.org/publications/2024/09/25/twelve-tax-reforms-to-spur-innovation-and-competitiveness/.

[55] See Andrew J. Fieldhouse and Karel Mertens, *The Social Returns to Public R&D*, Federal Reserve Bank of Dallas, Working Paper 2519, May 2025, https://www.dallasfed.org/~/media/documents/research/papers/2025/wp2519.pdf, for a review.

[56] See Mary Cowx, "Tax Enforcement and R&D Credits," *Journal of Accounting and Economics*, vol. 80, no. 1 (August 2025), Article 101784, https://www.sciencedirect.com/science/article/abs/pii/S0165410125000205. For other discussions of this issue, see Nathan Goldman, "Simplifying Tax Compliance Criteria May Increase Corporate Innovation," *Forbes*, April 22, 2025, https://www.forbes.com/sites/nathangoldman/2025/04/22/simplifying-tax-compliance-criteria-may-enhance-corporate-innovation/, and ADP, "R&D tax Credit Calculation," .

[57] Firms with $250 million in business receipts claim 85% of the credits. IRS, Statistics of Income Division, "Corporation Research Credit, Figure B: Number of Research Credit Claimants," and "Figure C: Totals of Research Credit Amounts," https://www.irs.gov/statistics/soi-tax-stats-corporation-research-credit.

Appendix A. Qualified Research and Qualified Research Expenditures

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&D credit:

- The research must involve expenses that are 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 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."[58]

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 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; and
- 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&D 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:

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[58] IRC Section 41(d)(3)(B) states that research which "relates to style, taste, cosmetic, or seasonal design factors" cannot qualify for the credit under this criterion.

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

The requirement that taxpayers carry on a trade or business (i.e., be actively engaged in ongoing trade or business activities) 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&D 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 certain equipment), overhead expenses (e.g., heating, electricity, rent, 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 represent approximately one-quarter to one-half of business R&D spending.[59]

Among qualified research expenditures (QREs), researcher wages and salaries are the largest component. In 2014, the most recent year for which data are available, wages and salaries accounted for 70% of QREs, and supplies and contract research each accounted for roughly 15%.[60]

The preponderance of wages and salaries among QREs raises the possibility that the R&D tax credit operates primarily as a wage subsidy boosting the earnings of scientists, engineers, and other research personnel. Such increases may reduce the credit's effectiveness as a policy tool for spurring increased R&D. 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.

[59] U.S. Office of Technology Assessment, *The Effectiveness of Research and Experimentation Tax Credits*, 1995, p. 29.

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

Appendix B. Legislative History

The research tax credit was enacted in the Economic Recovery Tax Act of 1981 (P.L. 97-34). The initial credit was equal to 25% of a company's qualified QREs above a base amount, which was equal to its average QREs in the three previous tax years or 50% of current-year QREs, whichever was greater. Unused credits in excess of tax liability could be carried back up to 3 tax years or carried forward as many as 15 tax years. The credit was originally scheduled to remain in effect from July 1, 1981, to December 31, 1985.

Congress made the first significant changes to the original research tax credit with the passage of the Tax Reform Act of 1986 (TRA86; P.L. 99-514). 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 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 half of a taxpayer's marginal income tax rate.[61]

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, reducing the value of the credit. 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 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 years from 1984 to 1988; these firms were assigned a fixed-base percentage of 3%. In addition, the act (1) extended the credits to December 31, 1990, by requiring companies to prorate QREs incurred before 1991; (2) allowed firms to apply the regular credit to QREs related to possible future lines of business; and (3) 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 legislative changes, temporarily extended the credits. The Omnibus Budget Reconciliation Act of 1990 (P.L. 101-508) extended

[61] 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% based on the formula: 0.20 x [1 - (0.5 x 0.30)].

the credits through December 31, 1991, and repealed the requirement that companies prorate QREs incurred before 1991. The Tax Extension Act of 1991 (P.L. 102-227) moved the expiration date for the credits to June 30, 1992. At the time, a major obstacle to longer extensions of the credits lay in a congressional budget rule that required the revenue cost of lengthy or permanent extensions to 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 unrelated to 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 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. The credits remained in abeyance until the enactment of the Small Business Job Protection Act (P.L. 104-188) in August 1996. That act reinstated the credits from July 1, 1996, to May 31, 1997, leaving a one-year gap in the credit's coverage since its inception in mid-1981. The act also expanded the definition of a start-up firm to include any firm whose first tax year with both gross receipts and QREs was 1984 or later; added a three-tiered alternative incremental research credit (AIRC) with rates of 1.65%, 2.2%, and 2.75%; and allowed companies to include 75% of their payments for qualified research performed under contract by nonprofit organizations "operated primarily to conduct scientific research" in the QREs eligible for the regular credit and the AIRC.

The credits expired 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, 1999 (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 other U.S. territories.

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, in the American Taxpayer Relief Act of 2012 (P.L. 112-240), Congress retroactively extended the credit through 2013. Congress also tweaked the rules governing the allocation of research credits among members of controlled groups of companies. Finally, Congress modified the use of the credit by parties to business acquisitions.

The Tax Increase Prevention Act of 2014 (P.L. 113-295) extended all four components of the credit—that is, the regular credit, the alternative simplified credit, the university basic research credit, and the energy research credit—through 2014.

After decades of the research credit being a temporary provision, the 114th Congress permanently extended the credit, 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 owed and against the employer share of the Social Security tax. The latter option was capped at $250,000 per year for qualified employers.

P.L. 115-97 changed the immediate expensing in Section 174 to five-year amortization (i.e., deduction of costs in equal amounts over five years) and, perhaps unintentionally, eliminated the basis adjustment, which reduced the credit by the amount of the deductions. P.L. 119-21 restored expensing and the basis adjustment.

Appendix C. The University Basic Research Credit and the Energy Research Credit

University Basic Research Credit (UBRC)

Firms that enter into contracts with certain nonprofit organizations to perform basic research may sometimes claim a separate nonrefundable research credit for some of these expenditures 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, though both amounts are intended to approximate what firms would spend on qualified research in the absence of the credit.[62]

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 university basic research credit (UBRC) does not apply to qualified basic research done outside the United States, nor to basic research in the social sciences, arts, or 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 UBRC for their own basic research, but such spending may be included in their QREs for the regular credit or the 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 credit equal to 20% of a portion (usually 65%) of payments to certain entities for energy research. Such payments must satisfy several requirements. First, they must go to a nonprofit organization exempt from taxation under IRC Section 501(a) that is "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 the organization.

[62] 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.

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

Appendix D. Estimating the Corrective Subsidy

Three rates of return are relevant for estimating the tax subsidy needed to correct for the positive spillovers from R&D: the firm's private pretax return on R&D investment (ρ), society's return on R&D investment (r_S), and the firm's private required return, or its cost of funds (r_P).[63] Under the assumption of diminishing marginal private and social returns, both ρ and r_S fall as investment increases. The firm's required return is constant.

Regardless of spillover effects, economic efficiency requires that enough R&D investment occur to the point that the social return is equal to the firm's private required return:

$$r_S = r_P$$

Absent spillover effects, efficiency is achieved because the firm's private pretax return and the social return are equivalent, and a profit-maximizing firm will invest until its private pretax return (which is also the social return) is equal to its required return:

$$\rho = r_S = r_P$$

In the presence of positive spillovers, however, the firm's private pretax return is less than society's return ($\rho < r_S$). Put differently, there are returns (i.e., positive spillovers) to society that firms are not considering when making their R&D investment decisions. The profit-maximizing firm will still invest until its private pretax return is equal to its required return ($\rho = r_P$), but this results in too little R&D investment from society's perspective, so the aforementioned efficiency criterion is not satisfied:

$$r_S > r_P$$

As a result, a corrective subsidy is needed to encourage the firm to invest more, specifically to the point where the social return equals the firm's required return. At this point, the firm's pretax return is below its required return. The corrective subsidy can be estimated using the literature in this report suggesting that the social return is between 2 and 20 times the firm's private required return on corporate equity. That is:

$$r_S = br_P$$

where the constant $b > 1$ captures how much higher the social return is than the private required return on an all equity-financed investment. At the point where the social return is b times the private return, and before any subsidy, it is also true that the social return is b times the pretax return as well. That is:

$$r_S = b\rho$$

Under the assumptions that (1) this relationship holds as investment increases and (2) the social and pretax returns fall due to diminishing marginal returns, it is possible to compute the corrective subsidy by using the firm's new profit-maximizing condition and the standard efficiency condition:

$$(1-t)\rho = r_P$$

[63] The firm's private required return is the firm's real after-tax discount rate, computed using the weighted average of the cost of debt financing and equity financing. The literature examines the ratio of social to private returns on equity-financed investments in the corporate sector, which implies that the appropriate private return to use to determine the optimal credit rate is the required return on corporate equity before individual-level taxes. See Appendix D in CRS Report R48277, *CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law*, by Mark P. Keightley and Jane G. Gravelle.

$$r_S = r_P$$

After incorporating the assumption that the relationship $r_S = b\rho$ holds as investment increases, solving for the corrective tax subsidy produces:

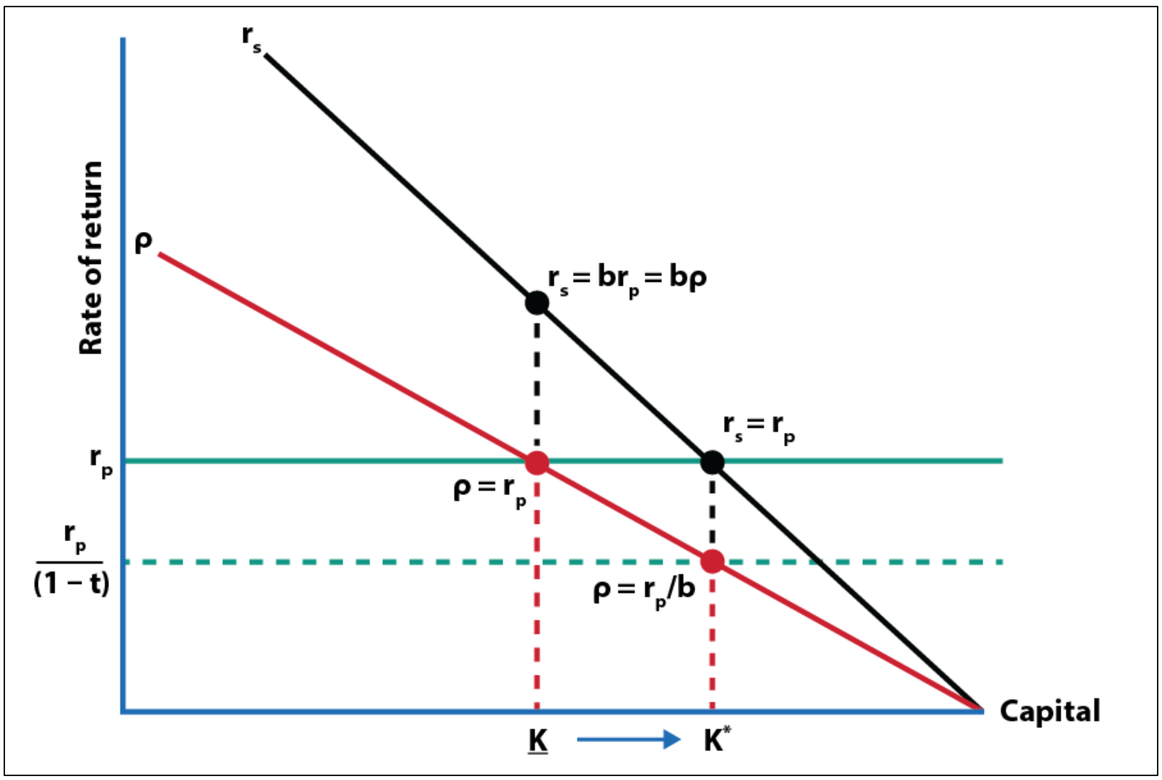
$$t = 1\text{-}b$$

As mentioned earlier, the corrective subsidy must induce enough investment to drive down the pretax return to a fraction of the after-tax return such that:

$$\rho = r_P/b$$

The equations above are shown graphically in **Figure D-1**. Without a subsidy, the social return to R&D exceeds the firm's private return ($r_S > r_P$), and an inefficient level of technological knowledge (i.e., R&D capital) is attained as represented by K. Providing firms with a corrective subsidy leads firms to undertake more R&D to the point where the social return is equal to the firm's required return and the efficient level of R&D capital is attained as represented by K*.

Figure D-1. Corrective Subsidy for R&D with Positive Spillovers



Source: CRS.

Notes: The relationship between the lines labeled ρ and r_S is the result of the assumptions that (1) $r_S = b\rho$ holds as investment increases, and (2) $\rho = 0$ implies that $r_S = 0$.

Based on the ratio of social to private returns found in the literature, the corrective tax subsidies are shown in **Table D-1**.

Table D-1. Corrective Tax Subsidy to Equate Private and Social Return

Ratio of Social to Private Equity Return	Corrective Tax Subsidy
2.0	-100%
4.0	-300%
20.0	-1,900%

Source: CRS.

With the corrective subsidy in place, the relationship between the firm's private return and the pretax return is:

$$r_P = (1-t)\rho$$

Subbing in t =1-b, and solving for ρ, shows that the corrective subsidy must induce enough investment to drive down the pretax return to a fraction of the after-tax return:

$$\rho = r_P/b$$

The pretax return (and social return) is driven down because of diminishing marginal returns to investment.

The tax subsidy can be translated into a tax wedge defined as:

$$\text{Tax wedge} = t/(1-t)$$

In the case of a tax subsidy, the tax wedge indicates the percentage decrease in the required pretax return that is needed for an investment to achieve the socially efficient level of R&D. For example, when the social return is twice the private return, the optimal subsidy must induce enough investment to drive down the pretax return to half the after-tax return. It also implies that the subsidy will provide half of the after-tax return. When the social return is four times the private return, the optimal subsidy must induce enough investment to drive the pretax return to a quarter of the after-tax return. In this case, the subsidy will provide 75% of the private after-tax return.

Table D-2. Tax Wedge Needed to Equate Private and Social Return

Ratio of Social to Private Equity Return	Tax Wedge Needed to Equate Private and Social Return
2.0	-0.50
4.0	-0.75
20.0	-0.95

Source: CRS

The user cost of capital framework can be used to estimate the efficiency-maximizing R&D credit rate. With full expensing and a basis adjustment, the pretax return is:

$$\rho = (r_P+\delta)(1-k) - \delta$$

where r_P is the corporate after-tax required rate of return on equity, δ is the economic depreciation rate, and k is the tax credit. Recall that if the social return is b times the private return r_P, then the optimal subsidy should be such that the corresponding increase in investment drives down the pretax return (ρ) to r_P/b.[64] Substituting $\rho = r_P / b$ into the formula for the pretax return and solving for the optimal corrective tax credit gives:

$$k = 1-(r_P/b+\delta)/(r_P+\delta)$$

This formula produces the estimates presented in **Table 3**.[65]

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[64] For example, in the case where b is 20, the tax wedge is -0.95, meaning that the pre-tax return provides 5% of the return, and the subsidy provides 95%.

[65] The estimated economic depreciation rate is 0.1745 and the corporate level required return is 0.0678.