CRS Model Estimates of Marginal Effective Tax Rates on Investment Under Current Law

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SUMMARY

For more than 40 years, the Congressional Research Service (CRS) has maintained a model for estimating marginal effective tax rates (METRs) on new investment. This report uses the CRS model to provide estimates of METRs, which can be used to understand how changes to tax law affect the size and allocation of investment in the economy. It compares METRs across assets, sectors, and sources of finance, identifying which are treated more or less favorably by the tax system. The Appendices document the CRS model used to generate these estimates.

The METR is a forward-looking measure that estimates, in present-value terms, the share of the rate of 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 income.

Under the current tax regime, as well as past tax regimes, METRs are lowest on intangible assets, followed by equipment; oil, gas, and mining structures; and power structures in both the corporate and the noncorporate sectors. Some assets, notably research and development and certain other noncorporate intangible assets, as well as owner-occupied housing, are subject to subsidies (negative METRs). The highest METRs are on land, inventories, nonresidential structures, and residential structures in that order. These METRs reflect the differences in the speed with which investment costs can be deducted, the research credit, and the exclusion of imputed rent on owner-occupied housing.

The tax system heavily favors debt-financed investments over equity-financed investments. In the noncorporate sector, and for many assets in the corporate sector, debt-financed assets are subject to tax subsidies. Debt-financed assets are subject to subsidies or low tax rates because nominal interest rates are deducted while the returns on those investments are taxed at a lower rate, coupled with a limited amount of interest being subject to tax by creditors.

Overall, assets in the noncorporate sector are taxed at higher rates than in the corporate sector, in part because the asset composition in the noncorporate sector is more heavily weighted toward assets with higher METRs.

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This report provides estimates of effective tax rates using a measure of tax burden called the marginal effective tax rate (METR), which can be used to understand how changes to tax law affect the size and allocation of investment in the economy. It compares METRs across assets, sectors, and sources of finance, identifying which are treated more or less favorably. The estimates were made using a model that CRS has maintained for more than 40 years, which is detailed in the Appendices.

Overview

The marginal effective tax rate (METR) is a forward-looking measure that estimates, in present-value terms, the share of the rate of 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 income.

The METR is measured by comparing the pretax return on an investment with its after-tax return. In the neoclassical model of investment, the pretax return is derived from the first-order condition of a profit-maximizing firm with respect to its capital decision. That is, the pretax return is the return necessary to pay taxes and to earn the required after-tax return to investors. The after-tax return is the break-even return on an investment; in other words, it is the return required by investors to justify making an investment. It accounts for the timing of income and deductions by using the present-value concept so that future dollars are less valuable than current dollars. By accounting for the value of when deductions can be taken, the after-tax return reflects major investment incentives that depend on timing, such as accelerated depreciation that is taken earlier than economic depreciation. The METR is then calculated by measuring the difference between the pretax and after-tax returns, relative to the pretax return.

The METR accounts for the major features of the tax code that affect the incentives for investment. It includes the statutory rate; cost recovery (depreciation deductions, allowance for the depletion of natural resources, and the deductions for inventory sold); the research tax credit; deductions for interest payments; and, for owner-occupied housing, deductions for mortgage interest and property taxes. It also captures taxes paid by creditors and shareholders (both U.S. and foreign) on interest, dividends, and capital gains. The effective tax rate calculation assumes that the current tax regime will continue indefinitely.

The METR differs from the average effective tax rate, both because the METR only accounts for the major elements of the tax system that affect investment and because it captures the value of the timing of income and deductions. The average effective tax rate, in contrast, is a snapshot that reflects taxes paid in a single year on past as well as current investments. It reflects elements of the tax system that are not currently included in the CRS METR model, including credits that apply to selected investments (such as credits for investments in renewable energy and affordable housing).[1] The average effective tax rate can be a misleading measure of the tax on prospective investments and cannot distinguish between the taxes paid on different types of investments. It also differs from the METR because it reflects the limits on the deduction of losses; under current law, losses must be carried forward to offset future positive income.

The statutory tax rate is an input into the METR. For corporations subject to a flat rate, the input is the tax rate in the tax code. Where tax rates vary across taxpayers, such as with owners of pass-

[1] Future versions of the CRS model may incorporate credits for selected investments.

through businesses, the input reflects the average statutory tax rate on an additional dollar of taxable income.

METRs in the Corporate Sector

Table 1 reports estimated METRs for corporate-sector investment, which is subject to a 21% effective tax rate. It illustrates how different assets are subject to a range of tax rates and how the tax system strongly favors debt over equity. The mixed-finance estimates reflect the average shares of debt and equity finance in the corporate sector (see **Table A-1** for financing shares). The rates across different assets reflect how quickly costs are deducted compared to the deductions that would reflect economic depreciation, along with a credit in the case of research and development.

Table 1. Marginal Effective Tax Rates for Investment, Corporate Sector, by Broad Asset Type and Form of Finance, 2025

Asset Type	Mixed Finance	Equity Financed	Debt Financed
Equipment	10.8%	16.1%	-10.7%
Intangible	-5.4%	3.1%	-43.8%
Advertising	1.9%	7.8%	-22.3%
Firm-Specific Human Capital	1.9%	7.8%	-22.3%
Prepackaged Software	20.2%	24.5%	3.4%
Custom Software	13.3%	18.2%	-6.4%
R&D	-28.5%	-13.7%	-113.6%
Theatrical Movies	11.9%	17.2%	-9.2%
TV Programs	14.7%	19.6%	-4.7%
Books, Music	21.4%	25.8%	4.2%
Inventories	25.0%	29.0%	8.7%
Land	22.5%	27.2%	3.4%
Nonresidential Structures	21.5%	26.2%	2.7%
Oil, Gas, Mining Structures	12.3%	17.1%	-6.8%
Power Structures	13.8%	19.5%	-9.3%
Residential Structures	17.9%	23.2%	-3.6%

Source: CRS model for estimating marginal effective tax rates under current law.

Returns from land are the only assets subject to an effective rate at the *corporate level* equal to the statutory rate of 21%, though the rate is lowered through debt finance and increased through additional taxes on dividends, capital gains, and interest (producing the 22.5% METR rate in **Table 1**). The lowest rate applies to research and development, which is eligible for the research tax credit, as well as cost recovery that is faster than economic depreciation, resulting in a negative rate (i.e., a tax subsidy). The next-lowest rate is for intangible investment in advertising and human capital, for which costs are deducted immediately (fully expensed), resulting in an effective *corporate* rate of zero, with the remaining 1.9% tax reflecting *individual-level* tax.

Equipment (with the exception of regulated electric transmission equipment), software, movies, and TV programs benefit from expensing of 40% of investment and, in the case of equipment, accelerated recovery of the remainder of costs. Some power structures are also eligible for 40% expensing, and a significant share of oil, gas, and mining structures are also deducted immediately. Residential structures and books and music are taxed at close to the statutory rate, while inventories are taxed at a rate higher than the statutory rate. Residential structures are taxed at a lower rate than nonresidential structures due to their more rapid depreciation, but at a higher rate than most other assets.

Debt finance is a major contributor to overall lower rates, as can be seen by comparing all three columns. Most investment types financed by debt are subsidized by the tax system (negative tax rates), while—with the exception of research and develop—tax rates on equity finance are positive.

Overall, these estimates show significant variation in effective tax rates across assets and finance method, with most intangible assets, equipment, power structures, and oil, gas, and mining structures the most favored investments, leading to a reallocation of investment into these assets and out of other structures.

METRs for the Noncorporate Sector and Owner-Occupied Housing

Table 2 reports tax rates for the same assets and forms of finance as **Table 1**, but for the noncorporate sector, which is composed of proprietorships, partnerships, and Subchapter S corporations (small corporations that elect to be taxed as partnerships). The pattern across assets is the same, although the noncorporate sector uses a smaller share of debt finance (see **Table A-1** for financing shares). The estimates reflect the average marginal tax rate on investment by these firms based on the average marginal statutory rate, the additional employment taxes, and the reduction in rates for the Section 199A passthrough deduction, which reduces taxable income by 20% for some taxpayers. After making these adjustments, the average statutory rate that applies to the next dollar of income is 28.3%, which is higher than the corporate rate. This higher rate, however, increases the benefits of deducting interest, and noncorporate equity investments are not subject to another level of tax.

Table 2. Marginal Effective Tax Rates for Investment, Noncorporate, and Owner-Occupied Housing, by Broad Asset Type and Form of Finance, 2025

Asset Type	Mixed Finance	Equity Financed	Debt Financed
Noncorporate			
Equipment	8.2%	13.0%	-30.8%
Intangible	-9.4%	-1.9%	-71.0%
Advertising	-5.4%	0.0%	8.7%
Firm-Specific Human Capital	-5.4%	0.0%	3.4%
Prepackaged Software	21.6%	25.0%	2.7%
Custom Software	11.9%	16.1%	-6.8%
R&D	-32.3%	-19.3%	-9.3%

Asset Type	Mixed Finance	Equity Financed	Debt Financed
Theatrical Movies	9.8%	14.4%	-3.6%
TV Programs	13.9%	18.0%	8.7%
Books, Music	23.1%	26.7%	3.4%
Inventories	27.8%	31.0%	5.0%
Land	24.4%	28.3%	-3.9%
Nonresidential Structures	23.1%	27.0%	-4.2%
Oil, Gas, Mining Structures	9.0%	13.2%	-19.5%
Power Structures	12.8%	17.9%	-20.8%
Residential Structures	18.0%	22.6%	-14.6%
Owner-Occupied Housing			
Land	-0.9%	-0.2%	-2.6%
Residential Structures	-0.9%	-0.2%	-2.6%

Source: CRS model for estimating marginal effective tax rates under current law.

Owner-occupied housing is subject to negative tax rates because the imputed rent on homes is not taxed, but deductions are allowed for interest and property taxes (subject to limits) for taxpayers who itemize deductions. This sector has the highest debt share of finance. Under current law, however, only a small share of interest and property taxes is deducted because the 2017 tax revision reduced the share of itemizers from about 30% to about 10%. Without these deductions, the tax rate would be zero, and property taxes account for a -0.2% negative tax rate (see the equity-financed column). Adding in debt finance results in a small negative tax rate of -2.6%. Owner-occupied housing is a broad category of assets that are slightly subsidized.

Economy-Wide and Sector-Wide METRS

Table 3 aggregates taxes across the entire economy and across each sector. Overall, the METR is 10.3%, reflecting the effect of cost recovery, the research credit, tax rates, debt finance, and the treatment of owner-occupied housing. An economy-wide tax rate that excludes land (which is in fixed supply) is also provided, so the METR relevant to overall investment is 9.3%. In addition, inventories are extremely short-lived investments on average, and unlikely to be responsive to tax rates, so the relevant estimate for investment could be better represented by excluding both land and inventories. That METR is 8.1%. **Table 3** also reports an estimate that excludes advertising and human capital investment because the size of the assets is relatively uncertain. This last exclusion makes little difference, however.

Table 3. Economy-Wide and Sector-Wide Marginal Effective Tax Rates, 2025

Asset Type	Economy Wide	Corporate Sector	Noncorporate Sector	Owner-Occupied Housing
All Assets	10.7%	14.9%	20.0%	-0.9%
All Assets Excluding Land	9.9%	13.9%	17.1%	-0.9%
All Assets Excluding Land and inventories	8.7%	12.5%	16.1%	-0.9%
All Assets Excluding Land, Inventories, Advertising, and Human Capital	9.0%	13.3%	16.5%	-0.9%

Source: CRS model for estimating marginal effective tax rates under current law.

Focusing on the measure that excludes land and inventories, the noncorporate sector is subject to a higher METR than the corporate sector—13.9% for the corporate sector compared to 17.1% for the noncorporate sector—so that the corporate sector is favored for business investment.

Absent legislative change, these rates will increase when most of the individual provisions of the 2017 tax revision, commonly referred to as the Tax Cuts and Jobs Act (TCJA, P.L. 115-97), expire (after 2025) and expensing is phased out entirely (after 2026).[2]

[2] See CRS Report R48153, *Marginal Effective Tax Rates on Investment and the Expiring 2017 Tax Cuts*, by Jane G. Gravelle and Mark P. Keightley for 2027 tax rates using slightly different individual marginal tax rates.

Appendix A. Overview of the CRS Model for Estimating METRS on Investment

For more than 40 years, the Congressional Research Service (CRS) has maintained a model for estimating marginal effective tax rates (METRs) on capital income. This model allows CRS to analyze past, current, and proposed tax policies' impacts on investment. The original CRS model traces its roots back to the work of Gravelle (1981) and Gravelle (1994), which, in turn, are based off the pioneering work of Jorgenson (1963) and Hall and Jorgenson (1967) and their application of the neoclassical theory of capital accumulation to study the impact of tax policy on investment.[3] The Hall and Jorgenson (1967) approach continues to form the basis for investment-tax models used by researchers across governments, think tanks, and academia.[4] The model summarized here updates and expands CRS's long-standing model. It relies on more recent data, research, and modeling techniques to estimate METRs on investments in equipment, structures, inventories, land, and intangible assets across the corporate, noncorporate (or "pass-through"), and owner-occupied housing sectors of the economy.

The Marginal Effective Tax Rate Concept

The general formula for estimating the marginal effective tax rate (METR) on an investment in a given asset is:

$$METR = \frac{\rho - s}{\rho}$$

where ρ is an investment's required real pretax rate of return and s is the required real after-tax return to savers. An investment's required real pretax return is the minimum return that a marginal investment must earn to justify making the investment; it is also called the hurdle rate. The required real after-tax return to savers is the return savers require, after taxes, to supply savings to finance investment.[5]

It is the estimation of the pretax return (ρ) and after-tax return (s) that allows the model to capture the fundamental features of the tax system and relevant aspects of the economy. These are explained in turn, followed by a discussion of computing various weighted METRs,

[3] Jane G. Gravelle, *Non-Neutral Taxation of Depreciating Assets: Theory and Empirical Application to the United States* (Ph.D. Dissertation, The George Washington University, 1981); Jane G. Gravelle, *The Economic Effects of Taxing Capital Income* (MIT Press, 1994); Dale W. Jorgenson, "Capital Theory and Investment Behavior," *The American Economic Review*, vol. 53, no. 2 (May 1963), pp. 247-259; and Robert. E. Hall and Dale W. Jorgenson, "Tax Policy and Investment Behavior," *The American Economic Review*, vol. 57, no. 3 (June 1967), pp. 391-414.

[4] See, for example, Congressional Budget Office, *CBO's Model for Estimating the Effect That Federal Taxes Have on Capital Income From New Investment*, Working Paper 2022-01, February 9, 2022, https://www.cbo.gov/publication/57429; Tracy Foertsch, *U.S. Cost of Capital Model Methodology*, Department of the Treasury, Office of Tax Analysis, Technical Paper 10, May 2022, https://home.treasury.gov/system/files/131/TP-10.pdf; Tax Policy Center, *Documentation for the Tax Policy Center's Business Tax Model*, August 10, 2018, https://www.taxpolicycenter.org/resources/documentation-tax-policy-centers-business-tax-model; Huaqun Li and Kyle Pomerleau, *Measuring Marginal Effective Tax Rates on Capital Income Under Current Law*, Tax Foundation, January 2020, https://taxfoundation.org/research/all/federal/measuring-marginal-effective-tax-rates-on-capital-income-under-current-law/; and Alan J. Auerbach and William G. Gale, "Tax Policy Design with Low Interest Rates," in *Tax Policy and the Economy*, ed. Robert. A. Moffitt, vol. 36 (University of Chicago Press, 2022).

[5] Alternatively, another effective tax rate can be computed for corporate investment using the firm's discount rate (r) instead of the after-tax return to savers. This alternative measure does not account for individual-level effective tax rate on saving (s).

parameterization of the model, and data sources. The Appendices provide detail on the additional calculations and data underpinning the model.

The Pretax Return

The pretax returned ρ is determined by the user cost of capital formula in Hall and Jorgenson (1967). The user cost of capital, also known as the rental price of capital, is the cost of using one unit of capital.[6] For assets that do not depreciate, this cost is the cost of funds as measured by the appropriate interest rate. For depreciating assets, the user cost is the cost of funds plus the rate of economic depreciation. And for depreciating assets in the presence of taxes, the user cost is the cost of funds, plus economic depreciation, adjusted for any taxes (or subsidies).

The general formula for the user cost of capital (*ucc*) is:[7]

$$ucc = (r + \delta)\frac{(1 - \tau(\mu + (1 - \mu)z)(1 - \psi\kappa) - \kappa)}{(1 - \tau)}$$

The first portion of this formula $(r + \delta)$ captures the cost of funds and depreciation. The second portion of the formula captures the interaction of these costs with the tax system, and thus the impact of the tax system on investment.

An investment's real pretax return (ρ), also known as the "net of depreciation" user cost of capital, is equal to the user cost of capital minus depreciation:

$$\rho = (r + \delta)\frac{(1 - \tau(\mu + (1 - \mu)z)(1 - \psi\kappa) - \kappa)}{(1 - \tau)} - \delta$$

where:

- r is the firm's real after-tax discount rate computed as a weighted average of the cost of debt and equity financing, which will differ for investments in the corporate and noncorporate sectors (see **Appendix D**);
- δ is the economic depreciation rate of the asset;
- τ is the statutory business tax rate; either the corporate tax rate or noncorporate tax rate;
- μ is the share of the asset that is eligible to be expensed;
- z is the presented discounted value of tax depreciation deductions as specified by the Internal Revenue Code (IRC) and discounted at the nominal interest rate;
- κ is the present value of any investment tax credit rate; and
- ψ is the fraction of the investment tax credit κ that reduces the cost recovery (depreciation) basis of the asset.

[6] The user cost is the same whether capital is owned or rented. For pedagogical purposes, the user cost is often presented from the perspective of a firm renting capital, but this is equivalent to the firm's opportunity cost of using a unit of capital it owns rather than renting it out for a period.

[7] For more on this, see the general formula in **Appendix B** and **Appendix C** for special cases when there are deviations from the general pretax return formula.

The After-Tax Return to Savers

The after-tax return to savers is equal to a weighted average of after-tax return to debt and equity, or:

$$s = f(i(1-\alpha_{int}\tau_{int})-\pi)+(1-f)E$$

where:

- f is the share of debt financing, which differs for the corporate, noncorporate, and owner-occupied sectors;
- i is the nominal interest rate;
- α_{int} is the share of interest taxable to individuals;[8]
- τ_{int} is the individual-level tax rate on interest;
- π is the inflation rate; and
- E is the required real return on equity *after* business-level and individual-level taxes, which is equal across sectors in equilibrium.

Computing Weighted METRS

Weighted METRS can be used to analyze the effect of tax policy on specific sectors, on broad asset types within a sector (e.g., equipment in the corporate sector), or on the economy-wide incentive to invest.

Weighted METRS by Sectors

The weighted METR formula for sector *j* (i.e., corporate, noncorporate, and owner-occupied housing) is:

$$METR_j = \frac{\rho_j - s_j}{\rho_j}.$$

where ρ_j is the weighted average pretax return in sector *j* and s_j is the after-tax return to savers providing funds to sector *j* as given by the formula in "The After-Tax Return to Savers." Specifically, the weighted average pretax return in sector *j* is:

$$\rho_j = \frac{\sum_{i=1}^{I_j} K_{i,j}\rho_{i,\mathrm{j}}}{\sum_{i=1}^{I_j} K_{i,j}}$$

where $K_{i,j}$ are the *i* individual assets in sector *j*.

[8] An important modeling note: imputed interest accounts for a significant amount of interest received by individuals; for example, "free" services provided to account holders at financial institutions. Imputed income is not subject to tax. See Bureau of Economic Analysis, "National Income and Product Accounts," Table 7.11, Interest Paid and Received by Sector and Legal Form of Organization, https://www.bea.gov/products/national-income-and-product-accounts. Interest in tax-exempt retirement accounts is also not subject to tax.

Weighted METRS by Broad Asset Types

Similarly, the formula for the weighted METR for asset type *a* (e.g., equipment or nonresidential structures) in sector *j* is:

$$METR_{j,a} = \frac{\rho_{j,a} - s_j}{\rho_{j,a}}$$

where $\rho_{j,a}$ is the weighted average pretax return of asset type *a* in sector *j* and the weights are equal to the individual assets' capital stock shares. Specifically:

$$\rho_{j,a} = \frac{\sum_{i=1}^{I_{j,a}} K_{i,j,a}\rho_{i,j,a}}{\sum_{i=1}^{I_{j,a}} K_{i,j,a}}$$

where $K_{i,j,a}$ are the *i* individual assets comprising asset type *a* in sector *j*.

Economy-Wide METRS

The formula for a single economy-wide tax rate (i.e., for the corporate, noncorporate, and owner-occupied sectors combined) is:

$$METR_{econ} = \frac{\rho_{econ} - s_{econ}}{\rho_{econ}}$$

where ρ_{econ} is the economy-wide weighted average pretax return and s_{econ} is the economy-wide weighted average after-tax return to savers.

The economy-wide pretax return is given by:

$$\rho_{econ} = \frac{\sum_{i=1}^{I} K_i\rho_i}{\sum_{i=1}^{I} K_i}$$

where ρ_i and K_i are the individual pretax returns and assets in the entire economy. The after-tax return to savers is:

$$s_{econ} = f_{econ}(i(1 - \alpha_{int}\tau_{int}) - \pi) + (1 - f_{econ})E_{nc}$$

where:

- f_{econ} is the weighted average share of debt financing in the economy across the three sectors;
- i is the nominal interest rate;

- α_{int} is the share of interest taxable to individuals;
- τ_{int} tax rate on interest faced by individuals;
- π is the inflation rate; and
- E_{nc} is the required real return on noncorporate equity (see **Appendix D**) *after* individual-level taxes. In equilibrium, this must be the required return that is earned by individuals across all three sectors after (individual) taxes.

The weighted average share of debt financing f_{econ} across the *J* sectors is:

$$f_{econ} = \frac{\sum_{j=1}^{J} K_j f_j}{\sum_{j=1}^{J} K_j}$$

where K_j and f_j are the capital stock and share of debt-financed investment in sector *j*.

The $METR_{econ}$ can be computed differently in certain cases. For example, economy-wide tax rate estimates often exclude land (or at least present METRs with and without land separately) because its inclusion can skew the $METR_{econ}$ calculation given its large share of the economy's capital stock. Additionally, land is not reproducible, which means acquiring land is not a "new" investment. Other assets may be excluded depending on a particular policy or research interest. An asset can be excluded from the economy-wide METR calculation by removing it from both the economy-wide pretax return (ρ_{econ}) and average debt financing share (f_{econ}) calculations.

Model Parameterization

The model requires that values for over 70 parameters that capture the fundamental features of the tax code and economy be specified. These parameters include such things as various tax rates, shares of debt versus equity financing, inflation, economic depreciation, and tax depreciation methods. **Table A-1** lists the values and sources of the parameters related to the tax system and economy. **Table A-2** lists the economic depreciation rates and tax depreciation methods. It is important to note that parameters are *estimates* and different METR models may use different parameters (or model a feature of the tax system differently).

Table A-1. CRS Marginal Effective Tax Rate Model Parameters

(2025 Current Law)

Parameter	Value	Source
General		
Inflation rate (π)	0.020	Congressional Budget Office (CBO)[a]
Nominal interest rate (i)	0.0682	Damodaran[b]
Corporate and Noncorporate		
Corporate tax rate (τ_c)	0.2100	Current Law
Noncorporate tax rate (τ_{nc})	0.2834	Current Law, CBO[c]
Real after-tax corporate dividend (div)	0.0361	Damodaran, Bureau of Labor Statistics (BLS), Bureau of Economic Analysis (BEA)[b]

Parameter	Value	Source
Real after-tax capital gains rate ($capg$)	0.0317	Damodaran, BLS, BEA[b]
Share of corporate debt financing (f_c)	0.3226	Treasury[d]
Share of noncorporate debt financing (f_{nc})	0.2285	Treasury[d]
Dividend tax rate (τ_{div})	0.1953	CBO[e]
Capital gains rate (τ_{capg})	0.2164	CBO, Joint Committee on Taxation (JCT), Internal Revenue Service (IRS), CRS[f]
Interest tax rate (τ_{int})	0.2985	CBO[e]
Withholding rate on dividends paid to foreigners (τ_{whold})	0.1820	IRS[g]
Share of US taxable dividends/shareholders (α_{stock})	0.2400	Rosenthal and Burke[h]
Share of stock held by foreigners (α_{fstock})	0.4000	Rosenthal and Burke[h]
Share of taxable capital gains (α_{capg})	0.5900	CRS
Share of taxable interest (α_{int})	0.3000	CRS
Share of corporate interest that is deductible (θ_c)	0.9617	CBO[e,i]
Share of noncorporate interest that is deductible (θ_{nc})	0.9911	CBO[e,i]
Investment tax credit (ITC) (k)	0.0000	Current law
Share of ITC credit that reduces basis (ψ)	0.0000	Current law
Research and experimentation (R&E) tax credit (k_{RE})	0.0818	CRS[j]
Share of R&E tax credit that reduces basis (ψ_{RE})	0.0000	Current law[k]
Share of asset expensed (μ_{asset}):		
Equipment	0.4000	Current law
Structures with 20 year or less recovery period	0.4000	Current law[l]
Structures with greater than 20 year recovery period	0.0000	Current law
Regulated assets	0.0000	Current law[i]
Research and development (R&D)	0.0000	Current law
Software	0.4000	Current law
Theatrical movies and TV programs	0.4000	Current law
Holding period of inventories - fraction of year (T_{inv})	0.3850	CBO[m]
Share of inventories using first-in-first-out (FIFO) (γ)	0.5000	CBO[n]
Share of oil & gas eligible for percentage depletion (σ)	0.7000	CRS[o]
Percentage depletion for shale (Δ_{shale})	0.1500	Current law
Percentage depletion for mining (Δ_{mining})	0.1000	Current law (avg)
Owner-Occupied Housing		
Marginal individual income tax rate for mortgage interest deduction (τ_{mi})	0.1968	CBO[e]
Marginal individual income tax rate for property tax deduction (τ_{propt})	0.1836	CBO[e]
Average property tax rates (ω)	0.0100	Tax Foundation[p]

Parameter	Value	Source
Share of mortgage financing (f_{ooh})	0.4241	Treasury[d]
Share of mortgage interest deductible λ_{mi}	0.5259	CBO[e]
Share of property tax deductible λ_{propt}	0.0534	CBO[e]

Source: CRS Model as of November 2024.

Notes:

a. Congressional Budget Office, *The Budget and Economic Outlook: 2024 to 2034*, February 2024, https://www.cbo.gov/publication/59946.

b. Aswath Damodaran, *Historical Returns on Stocks, Bonds and Bills: 1928-2023*, Stern School of Business at New York University, January 2024, https://pages.stern.nyu.edu/~adamodar/; U.S. Bureau of Labor Statistics, "Consumer Price Index for All Urban Consumers (CPI-U) 12-Month Percent Change," https://www.bls.gov/cpi/data.htm; U.S. Bureau of Economic Analysis, *Table 1.1.1. Percent Change From Preceding Period in Real Gross Domestic Product*, https://www.bea.gov/. The nominal interest rate was computed as the average nominal Baa corporate bond rate, 1930-2023, using Damodaran's data. The capital gains rate was set equal to real GDP growth, 1930-2023 using BEA data. If firms grow at the growth rate of GDP then capital gains should too (in steady state). The dividend rate was computed as the real average return on the S&P 500 (including dividends) minus the capital gains rate. The real average return on the S&P 500 was computed using Damodaran's nominal return data and CPI-U data from BLS.

c. Includes SECA and 199A pass-through deduction as modeled by CBO. Congressional Budget Office, "CBO's CapTax Model: Update data and code for January 2025 baseline," January 2025, https://github.com/US-CBO/captax.

d. Tracy Foertsch, *U.S. Cost of Capital Model Methodology*, Department of the Treasury, Technical Paper 10, May 2022, https://home.treasury.gov/system/files/131/TP-10.pdf.

e. Congressional Budget Office, "CBO's CapTax Model: Update data and code for January 2025 baseline," January 2025, https://github.com/US-CBO/captax.

f. Computed as a weighted average of the short- and long-term capital gains tax rate used in the CBO's CapTax Model, where the weights were estimated using IRS Statistics of Income (SOI) data on capital gains, and Exhibit 13 in U.S. Government Accountability Office, *A Joint CBO/JCT Report: The Distribution of Asset Holdings and Capital Gains*, August 2016, https://www.cbo.gov/publication/51831.

g. Scott Luttrell, *Foreign Recipients of U.S. Income, Calendar Year 2019*, U.S. Internal Revenue Service, Statistics of Income Bulletin, Summer 2023, https://www.irs.gov/statistics/soi-tax-stats-foreign-recipients-of-us-income-statistics.

h. Steve Rosenthal and Theo Burke, *Who's Left to Tax? US Taxation of Corporations and Their Shareholders*, October 2020, New York University School of Law, https://www.law.nyu.edu/sites/default/files/Who%E2%80%99s%20Left%20to%20Tax%3F%20US%20Taxation%20of%20Corporations%20and%20Their%20Shareholders-%20Rosenthal%20and%20Burke.pdf.

i. Regulated assets (e.g., certain utilities) are not allowed expensing, but are not subject to interest deduction limits.

j. Computed as a weighted average of the alternative and regular R&E credit after accounting for the reduction in future alternative credits due to a dollar of spending reducing the bases in each of the three future years, the regular credit's 50% minimum base requirement, and adjusting for limits on contract work. The weights were determined from data reported on U.S. Internal Revenue Service, *Corporation Income Tax Returns Line-Item Estimates (Publication 5108),* Statistics of Income, 2020, https://www.irs.gov/statistics/soi-tax-stats-corporation-income-tax-returns-line-item-estimates-publication-5108.

k. See the discussion of intangibles in **Appendix C**.

l. This does not apply to regulated assets. See Share of regulated assets expensed.

m. 20 weeks divided by 52 weeks, Congressional Budget Office, *International Comparisons of Corporate Income Tax Rates*, March 8, 2017, p. 32, https://www.cbo.gov/publication/52419.

n. Congressional Budget Office, *CBO's Model for Estimating the Effect That Federal Taxes Have on Capital Income From New Investment*, Working Paper 2022-01, February, 9, 2022, p. 28, https://www.cbo.gov/publication/57429.

o. Computed using U.S. Energy Flow Data 2022 from the U.S. Energy Information Administration, https://www.eia.gov/totalenergy/data/monthly/; the U.S. Energy Information Administration's estimates of shale oil and shale gas as percentages of total crude oil production (64%) and total natural gas production (77%), https://www.eia.gov/tools/faqs/faq.php?id=847&t=6 and https://www.eia.gov/tools/faqs/faq.php?id=907&t=8; oil prices and gas prices from the U.S. Energy Information Administration, https://www.eia.gov/dnav/ng/hist/ngm_epg0_plc_nus_dmmbtuA.htm and https://www.eia.gov/electricity/annual/html/epa_07_01.html.

p. Andrey Yushkov, *Where Do People Pay the Most in Property Taxes?*, Tax Foundation, September 12, 2023, https://taxfoundation.org/data/all/state/property-taxes-by-state-county-2023/.

Table A-2 lists the economic depreciation rates and tax deprecation methods used in the CRS model. Tax depreciation methods vary across asset types, lives, and potentially industry and sector. CRS used IRS Publication 946 to map asset types into asset lives; however, these mappings should be interpreted as approximate because an exact mapping is not always possible.[9] The tax depreciation abbreviations are as follows: Straight Line, X years (SLX); 150% Declining Balance, X years (150DBX); Double Declining Balance, X years (DDBX); Mixed Method (MM), which computes a weighted average of two or more depreciation methods; Income Forecast Method (ICF); Expensed (EXP).

Table A-2. Economic Depreciation Rates and Tax Depreciation Methods

Asset	Economic Depreciation	Tax Depreciation
Equipment:		
Autos	0.3333[a]	DDB5
Office/Computing Equipment	0.2729[a]	DDB5
Trucks, Buses, and Trailers	0.1725[b]	DDB5
Aircraft	0.0660[b]	DDB7
Construction Machinery	0.1550[b]	DDB5
Mining and Oilfield Machinery	0.1500[b]	DDB7
Service Industry Machinery	0.1650[b]	DDB7
Instruments	0.1350[b]	DDB5
Other Nonresidential Equipment	0.1473[b]	DDB7
General Industrial Equipment	0.1072[b]	DDB7
Metal Working Machinery	0.1225[b]	DDB7
Electric Transmission Equipment (Unregulated)	0.0500[b]	150DB15
Electric Transmission Equipment (Regulated)	0.0500[b]	150DB20
Communications Equipment	0.1100[b]	DDB5
Other Electrical Equipment	0.1834[b]	DDB7
Furniture and Fixtures	0.1375[b]	DDB7
Special Industrial Equipment	0.1031[b]	DDB7
Agricultural Equipment	0.1179[b]	DDB7
Fabricated Metal Products	0.0917[b]	DDB7
Engines and Turbines	0.0516[b]	MM

9 Internal Revenue Service, *Publication 946: How to Depreciate Property*, 2023, https://www.irs.gov/publications/p946.

Asset	Economic Depreciation	Tax Depreciation
Ships and Boats	0.0611[b]	DDB10
Railroad Equipment	0.0589[b]	DDB7
Structures:		
Oil & Gas Structures	0.0450[b]	MM
Mining Structures	0.0450[b]	MM
Other Structures	0.0272[b]	SL39
Manufacturing Structures	0.0314[b]	SL39
Electric Power Structures (Unregulated)	0.0211[b]	150DB20
Electric Power Structures (Regulated)	0.0211[b]	150DB20
Other Power Structures (Unregulated)	0.0237[b]	150DB15
Other Power Structures (Regulated)	0.0237[b]	150DB15
Communication Structures	0.0237[b]	150DB15
Commercial and Health Care Structures	0.0247[b]	SL39
Farm Structures	0.0239[b]	150DB20
Residential Structures	0.0140[b]	SL27.5
Owner-occupied housing	0.0140[b]	n/a
Inventories:		
Inventories	0.0000	n/a
Intangibles:		
Prepackaged Software	0.7083[c]	SL3
Custom Software	0.3813[c]	SL3
R&D	0.1745[c]	SL5
Theatrical Movies	0.0930[b]	ICF
TV Programs	0.1680[b]	ICF
Books, Music, Other	0.1657[b]	ICF
Advertising	0.6000[d]	EXP
Firm-Specific Human Capital	0.4000[d]	EXP
Land:		
Land	0.0000	n/a

Source: CRS Model as of November 2024.

Notes: Tax depreciation abbreviations are as follows: Straight Line, X years (SLX); 150% Declining Balance, X years (150DBX); Double Declining Balance, X years (DDBX); Mixed Method (MM), which computes a weighted average of two or more depreciation methods; Income Forecast Method (ICF); Expensed (EXP).
n/a = asset not depreciable under the tax code.

a. Charles R. Hulten and Frank C. Wykoff, "The Measurement of Economic Depreciation," in *Depreciation, Inflation, & The Taxation of Income from Capital*, ed. Charles R. Hulten, (Urban Institute Press, 1981).

b. U.S. Bureau of Economic Analysis, *BEA Depreciation Estimates*, https://apps.bea.gov/national/pdf/BEA_depreciation_rates.pdf.

c. Congressional Budget Office, "CBO's CapTax Model: Update data and code for February 2024 baseline," February 2024, https://github.com/US-CBO/captax.

d. Carol Corrado, Charles Hulten, and Daniel Sichel, "Intangible Capital and U.S. Economic Growth," *Review of Income and Wealth*, series 55, no. 3 (September 2009), p. 674.

Data Sources

Table A-3 summarizes the data sources used as inputs into the CRS METR model.

Table A-3. Summary of Data Sources

Model Variable or Parameter	Data Source	Notes
Capital Stock	Bureau of Economic Analysis (BEA) Fixed Asset Table 2.1	Primary data source for most capital measures.
Capital Stock	BEA Table 5.1 Current-Cost Net Stock of Residential Fixed Assets by Type of Owner, Legal Form of Organization, and Tenure Group	Used to compute corporate and noncorporate housing stocks, and the stock of owner-occupied housing.
Capital Stock	BEA Fixed Assets Table 4.1. Current-Cost Net Stock of Private Nonresidential Fixed Assets by Industry Group and Legal Form of Organization	Used to allocate equipment, structures, and intangibles between the corporate and noncorporate sectors.
Capital Stock	IRS SOI Tax Stats—Corporation Income Tax Returns Complete Report—Tables 2.1 (All corps) and Table 2.4 (S corps only)	Used to assign a share of the BEA corporate assets to the noncorporate sector because BEA corporate assets include S corporations.
Capital Stock	BEA Fixed Asset Table 2.1 and Detailed Data for Fixed Assets and Consumer Durable Goods: Nonresidential Detailed Estimates, Net stocks, current cost; Edison Electric Institute, 2023 Financial Review: Annual Report of the U.S. Investor Owned Electric Utility Industry, 2023	Used to assign shares of regulated and unregulated Electric Transmission Equipment, Electric Power Structures, and Other Power Structures.
Capital Stock	Federal Reserve Board's Financial Accounts of the United States: B.101 Balance Sheet of Households and Nonprofit Organizations B.103 Balance Sheet of Nonfinancial Corporate Business B.104 Balance Sheet of Nonfinancial Noncorporate Business	Used to compute land values for the corporate, noncorporate, and owner-occupied housing sectors, as well as inventories for the corporate and noncorporate sectors.
Capital Stock	Carol Corrado, Charles Hulten, and Daniel Sichel, "Intangible Capital and U.S. Economic Growth," *Review of Income and Wealth*, series 55, no. 3 (September 2009), p. 674	Used for capital stocks for advertising and firm-specific human capital.
Tax Depreciation	Internal Revenue Code (IRC); IRS Publication 946, *How to Depreciate Property*	Used for determining tax deprecation method for assets.

Model Variable or Parameter	Data Source	Notes
Tax Depreciation	BEA Fixed Asset Table 2.1 and Detailed Data for Fixed Assets and Consumer Durable Goods: Nonresidential Detailed Estimates, Net stocks, current cost	Used for determining tax depreciation mixed-methods weights for Engines and Turbines.
Tax Depreciation	U.S. Geological Survey, Mineral Commodities Summaries, 2023; U.S. Energy Information Administration, Domestic Uranium Production Report—Annual, 2022; Federal Reserve Bank of St. Louis, Global Price of Uranium, 2022	Used to inform assumption of percentage depletion for mining.
Tax Depreciation	Congressional Budget Office (CBO), *How Taxes Affect the Incentive to Invest in New Intangible Assets*, 2018; Ernst & Young, *U.S. Oil and Gas Reserves, Production and ESG Benchmarking Study*, 2023	Used to determine oil and gas depreciation weights.
Various Model Parameters	CBO, Federal Reserve Bank of St. Louis, CRS calculations.	

Appendix B. General Pretax Rate of Return Formula

The most general formula for the pretax rate of return allows for full or partial expensing and a full or partial basis reduction for claiming an investment tax credit. It is not uncommon, however, for a simplified pretax rate of return formula to be presented in the literature representing a specific scenario. One example is the formula for the pretax rate of return when there is no investment tax credit or expensing:

$$\rho = (r + \delta)\frac{(1 - \tau z)}{(1 - \tau)} - \delta$$

As shown below, this and other specific cases can be derived from the general pretax rate of return formula:

$$\rho = (r + \delta)\frac{(1 - \tau(\mu + (1 - \mu)z)(1 - \psi\kappa) - \kappa)}{(1 - \tau)} - \delta$$

No Expensing

When $\mu = 0$ (no expensing), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau z(1 - \psi\kappa) - \kappa)}{(1 - \tau)} - \delta$$

Full Expensing

When $\mu = 1$ (full expensing), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau(1 - \psi\kappa) - \kappa)}{(1 - \tau)} - \delta$$

No Basis Adjustment

When ψ= 0 (no basis adjustment), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau(\mu + (1 - \mu)z) - \kappa)}{(1 - \tau)} - \delta$$

Full Basis Adjustment

When ψ = 1 (full basis adjustment), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau(\mu + (1 - \mu)z)(1 - \kappa) - \kappa)}{(1 - \tau)} - \delta$$

No Expensing, No Basis Adjustment

When $\mu = 0$ and $\psi = 0$ (no expensing, no basis adjustment), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau z - \kappa)}{(1 - \tau)} - \delta$$

Full Expensing, No Basis Adjustment

When $\mu = 1$ and $\psi = 0$ (full expensing, no basis adjustment), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau - \kappa)}{(1 - \tau)} - \delta$$

No Expensing, No Investment Tax Credit

When $\mu = 0$ and $\kappa = 0$ (no expensing, no investment tax credit), the pretax rate of return is:

$$\rho = (r + \delta)\frac{(1 - \tau z)}{(1 - \tau)} - \delta$$

Appendix C. Pretax Rate of Returns: Special Cases

Owner-Occupied Housing

For owner-occupied housing (the structure and land), the formula for the real pretax rate of return (ρ_{ooh}) is:

$$\rho_{ooh} = f_{ooh}(i(1 - \lambda_{mi}\tau_{mi}) - \pi) + (1 - f_{ooh})E_{nc} - \omega\lambda_{propt}\tau_{propt}$$

where:

- τ_{ooh} is the average marginal individual income tax rate for mortgage interest deduction purposes;
- τ_{propt} is the average marginal individual income tax rate for property taxes for deduction purposes;
- ω is the average property tax rate;
- f_{ooh} is the share of mortgage financing;
- λ_{mi} is the share of mortgage interest that is deductible;
- λ_{propt} is the share of property taxes that is deductible; and
- π is the inflation rate.

Land

Land does not depreciate nor does the purchase of land represent the creation of a "new investment." The formula for the pretax rate of return (corporate and noncorporate) is therefore:

$$\rho_{land} = \frac{r}{1 - \tau}$$

where:

- r is the firm's real after-tax discount rate, which will differ for land in the corporate and noncorporate sectors; and
- τ is the statutory business tax rate, either the corporate tax rate or noncorporate tax rate.

Inventories

For inventories (corporate and noncorporate), the formula for the pretax rate of return is:

$$\rho_{inv} = \gamma\left[\frac{1}{T_{inv}} ln\left(\frac{e^{(r+\pi)T_{inv}} - \tau}{1 - \tau}\right) - \pi\right] + (1 - \gamma)\,\frac{1}{T_{inv}} ln\left(\frac{e^{rT_{inv}} - \tau}{1 - \tau}\right)$$

where:

- γ is the share of inventories subject to first-in-first-out (FIFO) accounting;

- T_{inv} is the average holding period of inventories;
- r is the firm's real after-tax discount rate, which will differ for investments in the corporate and noncorporate sectors;
- τ is the statutory business tax rate; either the corporate tax rate or noncorporate tax rate;
- e is the mathematical constant; and
- π is the inflation rate.

The user cost of capital is computed slightly differently for inventories because they earn income and depreciate fully at the time of sale. Inventories must sell for the pretax rate of return plus recovery of acquisition cost measured at current prices:[10]

$$ucc = e^{\rho T_{inv}}$$

The formulas for the pretax returns under FIFO (first-in, first-out) and LIFO (last-in, first-out) accounting are derived from the following equations:

FIFO (First-In, First-Out)

By definition, the after-tax receipts from the sale of one unit of inventory (left-hand side) are equal to the accrued value of the inventory minus the tax at time of the sale, plus the tax deduction for the cost of creating or acquiring the inventory (the right-hand side):

$$e^{(r+\pi)T_{inv}} = e^{(\rho+\pi)T_{inv}}(1-\tau) + \tau$$

Because FIFO allows for the deduction of the oldest item in inventory, the deduction is for the original cost (not adjusted for inflation). Solving for the pretax return produces:

$$e^{(r+\pi)T_{inv}} - \tau = e^{(\rho+\pi)T_{inv}}(1-\tau)$$

$$e^{(\rho+\pi)T_{inv}} = \frac{e^{(r+\pi)T_{inv}} - \tau}{(1-\tau)}$$

$$\rho = \frac{1}{T_{inv}} ln\left(\frac{e^{(r+\pi)T_{inv}} - \tau}{1-\tau}\right) - \pi$$

LIFO (Last-In, Last-Out)

Similar to FIFO, and by definition, the after-tax receipts from the sale of one unit of inventory (left-hand side) are equal to the accrued value of the inventory minus the tax at time of the sale, plus the tax deduction for the cost of creating or acquiring the inventory (the right-hand side):

$$e^{(r+\pi)T_{inv}} = e^{(\rho+\pi)T_{inv}}(1-\tau) + e^{\pi T_{inv}}\tau$$

[10] The user cost could also be viewed in terms of the opportunity cost of holding inventories, which is the return on alternatively holding a bond earning the pretax return plus the return of the principal.

Because the deduction for cost is the last item acquired in inventory it is measured at current prices ($e^{\pi T_{inv}}\tau$), the inflation term cancels out of the equation. Solving for the pretax return produces:

$$e^{rT_{inv}} - \tau = e^{\rho T_{inv}}(1-\tau)$$

$$e^{\rho T_{inv}} = \frac{e^{rT_{inv}} - \tau}{(1-\tau)}$$

$$\rho = \frac{1}{T_{inv}} ln\left(\frac{e^{rT_{inv}} - \tau}{1-\tau}\right)$$

Intangibles

The pretax rate of return for investments in intangible assets involving research and development (R&D) is given by the general pretax rate of return formula, but some investments involving R&D are eligible for the research and experimentation (R&E) credit. Specifically, R&D intangibles and in-house developed software (also called "own account software") are eligible for the credit, whereas prepackaged or contractor-developed software is not. In-house developed software is embedded in the R&D capital stock measure used in the model. For eligible investments, the R&E credit is modeled through the investment tax credit parameter (κ_{RE}) in the pretax rate of return formula. From 2022 onward, the pretax rates of return for the corporate and noncorporate sectors are given by:

$$\rho_c = (r + \delta)\frac{(1-\tau_c z - \kappa_{RE})}{(1-\tau_c)} - \delta$$

$$\rho_{nc} = (r + \delta)\frac{(1-\tau_{nc} z - \kappa_{RE})}{(1-\tau_{nc})} - \delta$$

Prior to the TCJA and through 2021, investment in R&D was eligible for full expensing ($z = 1$) with a basis adjustment. Alternatively, taxpayers could take a full deduction for research expenditures but were required to reduce the R&E credit by the corporate tax rate. Evidence suggests that most businesses opted for the reduced credit, likely due in part to state-level tax concerns given that reducing expense deductions raises taxable income and many states use federal taxable income as a starting point for their own tax systems.[11] CRS assumes that firms opted for the reduced credit prior to 2022, and the pretax returns are given by:

$$\rho_c = (r + \delta)\frac{(1-\tau_c - (1-\tau_c)\kappa_{RE})}{(1-\tau_c)} - \delta$$

$$\rho_{nc} = (r + \delta)\frac{(1-\tau_{nc} - (1-\tau_c)\kappa_{RE})}{(1-\tau_{nc})} - \delta$$

The following discusses the issue of basis adjustment and the estimation of the effective tax credit rate (κ_{RE}), followed by a comparison of the formula for the pretax return when claiming a reduced credit versus adjusting the basis.

[11] U.S. Department of the Treasury, Office of Tax Analysis, *Research and Experimentation (R&E) Credit*, October 12, 2016, p. 1, https://home.treasury.gov/system/files/131/RE-Credit.pdf.

Basis Adjustment

Tax credits often require a basis adjustment, that is, a reduction in the cost that can be recovered through depreciation equal to the credit amount (or percentage of it) to prevent two tax benefits from being claimed on the same expenditure. This was the case for the R&E credit prior to the TCJA and through 2021; businesses could expense R&D expenditures but were required to either (1) reduce their expense deduction by the amount of the R&E credit claimed, or (2) deduct the full amount, but reduce the R&E credit claimed by the maximum corporate tax rate.[12] Under expensing, the two options are equivalent for corporate taxpayers but not for noncorporate taxpayers since statute required that they deduct expenses at (potentially higher) marginal individual tax rates but reduce their credit according to the (lower) corporate tax rate. As mentioned above, the evidence indicates most firms claimed the reduced credit.

When the TCJA changed the cost recovery method for R&D expenditures from expensing to five-year amortization starting in 2022, it also changed the prior basis adjustment rules contained in IRC Section 280C(c).[13] The prior statutory language stated that the immediate expenditure deduction was to be reduced by the amount of the credit while the new language stated that costs eligible for amortization would be reduced by the *excess* of the credit over the deduction. This appeared to eliminate the basis adjustment because the amortization deduction would be as large or larger than the credit in most circumstances.[14] Thus, CRS assumes that from 2022 onward both corporate and noncorporate taxpayers claim the full credit and do not make a basis adjustment.

Effective Credit Rate

Firms may choose between two R&E credits. One credit is the "regular" or "traditional" credit equal to 20% in excess of a rolling base that is unrelated to prior R&E spending. However, the regular credit has a 50% minimum base requirement and nearly all firms are constrained by this requirement which thus implies a marginal effective credit rate of 10%.[15] That is:

$$\kappa_{reg} = 0.10$$

The other credit, known as the "alternative" credit, is equal to 14% of qualified research expenditures in excess of 50% of the past three-year average of qualified research expenditures. Because each dollar of research today increases the base in each of three future years, it reduces

[12] "Old" IRC Section 280C. Prior to 1990, the basis reduction was equal to 50% of the amount of the credit. The Omnibus Budget Reconciliation Act of 1989 (P.L. 101-239) increased the basis reduction to the full amount of the credit.

[13] This change was made by the TCJA (P.L. 115-97) and is permanent.

[14] See, for example, Anthony J. Coughlan, "Be Careful What You Lobby For: R&E Expensing's Heavy Baggage," *Tax Notes Federal*, March 4, 2024; Martin A. Sullivan, "Inflation and Capitalization Scramble Research Tax Incentives," *Tax Notes*, March 6, 2023; and Mike Tenenboym and John J. Zhang, "The 280C(c) Barber Shop No Longer Requires You to Always Get Your Research-Related Haircut," *International Tax Journal*, vol. 50, no. 4 (2024), pp. 15-21. The Treasury and IRS have, however, provided guidance (Notice 2023-63) that suggests one interpretation would allow the basis adjustment and another would not.

[15] 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, 2020, https://www.irs.gov/statistics/soi-tax-stats-corporation-income-tax-returns-line-86item-estimates-publication-5108. The estimation was made by solving: $xLine\ 12 + (1 - x)Line 14 = Line\ 15$. CRS also used the 2019 data as a cross-check due to a potential anomaly arising from the pandemic. Using the 2019 data produced a similar percentage.

future credits, and this offset must be taken into account. The effective credit rate for the alternative credit is then:

$$\kappa_{alt} = 0.14\left(1 - \frac{1}{3}\left(\frac{0.50}{(1+i)} + \frac{0.50}{(1+i)^2} + \frac{0.50}{(1+i)^3}\right)\right)$$

where i is the nominal interest rate (set at 6.82%, see **Table A-1**). This produces an alternative credit rate of 8.1%

The CRS model uses a single value for κ that is equal to the weighted average of the regular and alternative credits, where the weights are based on research expenses under both credits, which are listed on Form 6765 in the Corporation Income Tax Returns Line-Item Estimates (Publication 5108).[16] This produces an estimated R&E credit of 8.18%. The estimate accounts for 65% of contract expenses being eligible and the regular credit's 50% minimum base requirement.

The pretax return for advertising intangibles and human or firm-specific intangibles is given by the general formula, but these costs are immediately expensed under current law.

Reduced Credit vs Basis Adjustment

The pretax return formulas are slightly different for the corporate and noncorporate taxpayers claiming the reduced R&E credit because noncorporate taxpayers electing a reduced credit do so according to the corporate tax rate (τ_c) and not the noncorporate rate (τ_{nc}):

$$\rho_c = (r + \delta)\frac{(1 - \tau_c z - (1-\tau_c)\kappa_{RE})}{(1-\tau_c)} - \delta$$

$$\rho_{nc} = (r + \delta)\frac{(1 - \tau_{nc} z - (1-\tau_c)\kappa_{RE})}{(1-\tau_{nc})} - \delta$$

To see that under expensing the above pretax formula for corporate taxpayers taking the reduced credit is equivalent to the pretax return with a full credit and a basis adjustment, consider the formula for this alternative option:

$$\rho_c = (r + \delta)\frac{(1 - \tau_c z(1-\kappa_{RE}) - \kappa_{RE})}{(1-\tau_c)} - \delta$$

When $z = 1$ (i.e., expensing) the two formulas for ρ_c produce the same value. When $z < 1$ (i.e., amortization) the formulas are not equivalent and the taxpayer will prefer the full credit with a reduced deduction because the full credit is more valuable in terms of tax savings (κ_{RE} vs $\tau_c z \kappa_{RE}$)

The equation for ρ_{nc} in the case of a full credit with a basis adjustment is:

$$\rho_{nc} = (r + \delta)\frac{(1 - \tau_{nc} z(1-\kappa_{RE}) - \kappa_{RE})}{(1-\tau_{nc})} - \delta$$

[16] 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.

This formula is not equivalent to the above formula for ρ_{nc} in the case of a reduced credit, either under expensing or amortization because the deduction for R&E expenditures is at the noncorporate tax rate while any reduction in the credit is at the corporate tax rate.

Oil, Gas, and Mining

Oil and gas use the general pretax rate of return formula, but shale oil and gas are provided with 15% percentage depletion. Shale oil and gas is estimated to be responsible for 70% of oil and gas production.[17] Accounting for this results in an adjusted pretax return formula:

$$\rho = (r + \delta)\frac{(1 - \tau z)}{\left(1 - \tau(1 - 0.15\sigma)\right)} - \delta$$

where σ is the share of oil and gas produced from shale which is provided with percentage depletion.

Mining also uses the general pretax return formula, but is provided with percentage depletion that depends on the resource being extracted (ranging from 5% to 22%). Accounting for this results in an adjusted pretax formula:

$$\rho = (r + \delta)\frac{(1 - \tau z)}{\left(1 - \left(1 - \Delta_{mining}\right)\tau\right)} - \delta$$

where Δ_{mining} is average percentage depletion.

Any investment in mineral deposits not recovered through percentage depreciation is recovered through cost depletion, which is accounted for in the present value of tax depreciation deductions (z). When percentage depletion is used, z excludes any recovery of these costs.

[17] See **Table A-1**, note n.

Appendix D. Computing the Firm's Real After-Tax Discount Rates

A firm's real after-tax discount rate depends on a weighted average of debt and equity financing. Discount rates differ between the corporate and noncorporate sectors, although discount rates are equalized across assets in a given sector. CRS sets the real after-tax discount rate for owner-occupied housing equal to the noncorporate discount rate:

$$r_{corp} = f_c(i(1-\theta_c\tau_c)-\pi)+(1-f_c)E_c$$

$$r_{noncorp} = f_{nc}(i(1-\theta_{nc}\tau_{nc})-\pi)+(1-f_{nc})E_{nc}$$

$$r_{ooh} = r_{noncorp}$$

where:

- f is the share of debt financing;
- i is the nominal interest rate;
- θ is the limit on deductibility of interest;[18]
- π is the inflation rate;
- E_c is the required real return on corporate equity *before* individual-level taxes. It is equal to the dividend rate plus the capital gains rate; and
- E_{nc} is the required real return on noncorporate equity *after* individual-level taxes (see below).

Computation of the return to noncorporate equity requires explanation. Investors must earn the same after-tax return on their equity investments in the noncorporate and corporate sectors. Corporate equity is subject to an additional layer of taxation due to personal taxes on capital gains and dividends. Recalling the assumption that corporate equity earns an after-corporate-tax real return comprised of a dividend and capital gains, and imposing the equilibrium condition regarding equity returns in the corporate and noncorporate sectors produces:

$$E_{nc} = E_c(1-v)$$

and:

$$v = \alpha_{stock}\left(\left(\frac{div}{E_c}\right)\tau_{div} + \alpha_{cg}\left(\frac{capg}{E_c}\right)\tau_{cg}\right)+\alpha_{foreign}\left(\frac{div}{E_c}\right)\tau_{whold}$$

where:

- div is the real after-corporate-tax dividend;
- $capg$ is the real after-corporate-tax capital gain;
- $E_c = div + capg$;

[18] CRS used CBO's estimates for the 2024 interest deduction limit parameters in its 2024 baseline model calibration. Prior to 2021, the interest limits were set as a percentage of earnings (income) before interest, taxes, depreciation, amortization, or depletion (EBITDA). After 2021, the TCJA changed the measure of income to earnings (income) before interest and taxes (referred to as EBIT). To use the model to study policies prior to 2021 requires adjusting the CBO's estimates based on EBIT to reflect the broader EBITDA measure. CRS made such adjustments using Ernst & Young, *Economic Impacts of a Stricter 163(j) Interest Expense Limitation*, 2023, p. 4, https://documents.nam.org/COMM/EY_NAM_Economic_Analysis_163j_Limitation_FINAL_10_06_2023.pdf.

- ν is the effective individual tax rate on corporate equity;
- α_{stock} is the share of shareholders that are taxable;
- α_{cg} is the share of capital gains that are taxable (one minus the share of capital gains that go untaxed at death);
- $\alpha_{foreign}$ is the share of foreign-held U.S. shares;
- τ_{div} is the average individual tax rate on dividend;
- τ_{cg} is the average individual tax rate on capital gains; and
- τ_{whold} is the average effective withholding tax on foreign shares.

The formula for the after-tax discount rate can be modified to accommodate analyzing alternative policies, such as allowing a deduction for corporate dividend payments. In this case, the corporate firm's real after-tax discount rate is:

$$r_{corp} = f_c(i(1-\theta_c\tau_c)-\pi)+(1-f_c)\big(E_c(1-\gamma\tau_c div)\big)$$

where γ is the share of dividends that is deductible.

Appendix E. Computing the Present Discounted Value of Depreciation

The estimation of the pretax rate of return depends on estimates of the present value of tax depreciation deductions (z). The model allows for five possible depreciation methods: straight-line (SL), sum of the years-digits (SYD), declining balance (DB), 10-year income forecast (IFC), and mixed methods (MM), which is a combination of two or more depreciation methods. Sum of digits is not currently used, but has been in the past. Tax depreciation methods vary across asset types, lives, and potentially industry and sector. CRS used IRS Publication 946 to map asset types into asset lives, however, these mappings should be interpreted as approximate because an exact mapping is not always possible.[19] Present-value depreciations values must be computed separately for the corporate and noncorporate sectors.

Straight-Line

$$z = \frac{1 - e^{-(r+\pi)T}}{(r+\pi)T}$$

where T is an asset's tax life and r is corporate or noncorporate real after-tax discount rate.

Declining Balance Method

$$z = \frac{x\left(1 - e^{-\left(r+\pi+\frac{x}{T}\right)T^*}\right)}{(r+\pi)T + x} + e^{-\left(r+\pi+\frac{x}{T}\right)T^*} \frac{\left(1 - e^{-(r+\pi)(T-T^*)}\right)}{(r+\pi)(T-T^*)}$$

where:

- T is an asset's tax life;
- T^* is the point at which it is optimal to switch from the declining balance method to the straight-line method of depreciation;[20] and
- x determines the variety of declining balance method being used:
    - Double declining balance method, $x = 2$
    - 150% declining balance method, $x = 1.5$
    - Double Declining Balance ($x = 2$, and $T^* = T/2$).

10-Year Income Forecast Method

The 10-year income forecast method is currently only used for entertainment assets, and it allows for an asset to be fully depreciated over the first 10 years with the depreciation deduction based on income each year as a share of total expected income over that first 10 years. For example, if

[19] Internal Revenue Service, *Publication 946: How to Depreciate Property*, 2023, https://www.irs.gov/publications/p946.

[20] The declining balance method does not result in assets being fully depreciable, so taxpayers are allowed to switch from the declining balance method to the straight-line method. The optimal switching time solves $x/T = 1/(T-T^*)$, or $T^* = T(x-1)/x$. See Jane G. Gravelle, *The Economic Effects of Taxing Capital Income* (MIT Press, 1994), Appendix B for more information.

60% of forecasted 10-year income is earned in year one, then 60% of depreciation may be deducted in the first year. Whether or not the 10-year income forecast method is accelerated (more generous) relative to economic depreciation depends on two forces that may be working counter to each other. On the one hand, high inflation relative to economic depreciation will tend to decelerate tax deprecation relative to economic depreciation. On the other hand, the fact that all deprecation is taken within the first 10 years will accelerate tax depreciation relative to economic deprecation. Which force is greater will determine if tax depreciation is accelerated.

$$z = \frac{(\delta - \pi)}{(r + \delta)} \left(\frac{1 - e^{-10(r+\delta)}}{1 - e^{-10(\delta-\pi)}} \right)$$

Derivation of this formula requires explanation that follows four steps. First, the present value of tax depreciation in the first 10 years is computed. Second, the undiscounted tax depreciation in the first 10 years is computed. Third, this undiscounted tax deprecation is used to calculate an adjustment factor that ensures the asset is fully depreciated in the first 10 years. Fourth, the adjustment factor is applied to the present value of tax depreciation in the first 10 years.

Step 1:

The present value of tax depreciation in the first 10 years ($\tilde{z}_{10yr}$) before adjusting for the increase to recover the full investment cost is given by:

$$\begin{aligned} \tilde{z}_{10yr} &= (\delta - \pi) \int_0^{10} e^{-(\delta-\pi)t} e^{-(r+\pi))t} \, dt \\ &= \frac{(\delta - \pi)}{(r + \delta)} (1 - e^{-10(r+\delta)}) \end{aligned}$$

The first term within the integral captures the income (and depreciation) profile of the asset over the first 10 years, where income is declining over time at rate δ and rising at the rate of inflation π. The second term within the integral is the (nominal) discount factor.

Step 2:

The undiscounted tax depreciation in the first 10 years (z^*_{10yr}) is:

$$\begin{aligned} z^*_{10yr} &= (\delta - \pi) \int_0^{10} e^{-(\delta-\pi)t} \, dt \\ &= \frac{(\delta - \pi)}{(\delta - \pi)} \left(1 - e^{-10(\delta-\pi)}\right) \\ &= \left(1 - e^{-10(\delta-\pi)}\right) \end{aligned}$$

Step 3:

Under the income forecast method, the undiscounted tax depreciation must equal 100%. That is:

$$z^*_{10yr} \times adjustment\ factor = 1$$

which implies:

$$adjustment\ factor = \frac{1}{(1 - e^{-10(\delta-\pi)})}$$

Step 4:

Applying the adjustment factor to the present value of tax depreciation in the first 10 years ($\tilde{z}_{10yr}$) produces the present value of depreciation under the 10-year income forecast method:

$$z = \tilde{z}_{10yr} \times adjustment\ factor$$

$$= \frac{(\delta - \pi)}{(r + \delta)} \left(\frac{1 - e^{-10(r+\delta)}}{1 - e^{-10(\delta - \pi)}} \right)$$

Sum of The Years-Digits

$$z = \frac{2}{(r + \pi)T} \left[1 - \frac{1}{(r + \pi)T} \left(1 - e^{-(r+\pi)T} \right) \right]$$

Mixed-Methods

Mixed-methods is an "average" approach and takes two or more depreciation calculations (e.g. 150% DB and 200% DB) and computes a weighted depreciation value. The mixed-methods approach was needed for the following assets. The weighted average depreciations are included for each:

Engines and Turbines

$$z = 0.015(150DB7) + 0.126(150DB15) + 0.86(150DB20)$$

Oil and Gas Structures

For both corporate and noncorporate oil and gas structures, cost recovery depends on the type of cost incurred: (1) reserve acquisition costs; (2) exploration costs; (3) development/intangible drilling costs; and (4) dry holes. Acquired reserves are recovered through either cost or percentage depletion depending on the type of oil and gas—shale oil and gas are eligible for 15% percentage depletion, whereas all other acquired reserves of oil and gas are eligible for cost depletion. The remaining costs—exploration, development/intangible, and dry holes—are recovered through a mixture of straight-line deprecation and expensing.

Corporate

Combined, the present value of tax depreciation for corporate oil and gas structures is:

$$z = 0.375 \times 0.30 \times \frac{\delta}{r + \pi + \delta} + 0.625 \times [0.03(0.48SL7 + 0.52SL2) + 0.116(SL5) + 0.854]$$

It was estimated that 37.5% of expenses represented acquired reserves, which are recovered through either cost or percentage depletion, and that 62.5% of expenses are recovered through some other form of depreciation.[21] Of the 37.5% of expenses that are for acquiring reserves, it

[21] These estimates were computed as the average of capital expenditures on proved and unproved properties acquired divided by total capital expenditures from 2018 to 2022 using Ernst & Young, *U.S. Oil and Gas Reserves, Production and ESG Benchmarking Study*, 2023, p. 7, https://assets.ey.com/content/dam/ey-sites/ey-com/en_us/topics/oil-and-gas/ey-us-oil-and-gas-reserves-study-2023-final.pdf.

was estimated that 30% are recovered through cost depletion and 70% are recovered through percentage depletion.[22]

Cost depletion follows economic depreciation, and the present value of economic depreciation is given by:

$$z_{econ} = \int_0^\infty \delta e^{-(r+\pi+\delta)t} dt$$

or:

$$z_{econ} = \frac{\delta}{r+\pi+\delta}$$

Thus, the first product of terms in z represents the share of oil and gas recovered through cost depletion. Percentage depletion is not reflected in the formula for z; instead, it reduces the effective tax rate in the pretax rate of return (see **Appendix C**) by$(1-0.15\sigma)$, where σ is the share of acquired reserves (70%) recovered through percentage depletion (15%).

The remaining 62.5% of costs are recovered through straight-line depreciation or expensing, depending on the type of cost: exploration costs, development/intangible drilling costs, or dry holes.[23]

Noncorporate

The explanation for the present value of tax depreciation deductions for the noncorporate sector is similar to above. Technically, cost recovery depends on a firm's legal form of organization and also whether a firm is an "integrated" or an "independent" producer. The CRS model assumes all noncorporate producers are independent. Independent producers recover exploration costs using SL2 and expense all intangible drilling costs and dry holes. Thus, the present value of depreciation is:

$$\mathrm{z} = 0.375 \times 0.30 \times \frac{\delta}{r+\pi+\delta} + 0.625 \times [0.03 * \mathrm{SL2} + 0.97]$$

[22] The share of oil and gas recovered through percentage depletion is accounted for in the model by the parameter σ in the pretax return formula for oil and gas (see **Appendix C**). The share recovered through cost depletion is therefore 1-σ. See **Table A-1**.

[23] Exploration costs are recovered by either SL2 or SL7. Development costs are recovered by SL5 or are expensed. Dry holes are expensed. Which method is used also depends on whether the producer is integrated or an independent.

Mining

The CRS model assumes that 100% of mining is corporate. Under current law, 30% of corporate mining costs that are not acquisition related are recovered over five years and the remaining 70% are expensed. The CRS model assumes the breakdown of costs between those that are related to acquisitions of mines and those that are not is the same as for oil and gas (37.5% and 62.5%, respectively). All mining acquisition costs are recovered through percentage depletion, which varies depending on the resource being extracted. Therefore:[24]

$$z = 0.625 \times [0.30 * \mathrm{SL5} + 0.70]$$

As with oil and gas, percentage depletion reduces the effective tax rate in the pretax rate of return (see **Appendix C**) by $\left(1 - \Delta_{mining}\right)$, where Δ_{mining} is average percentage depletion.

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[24] The remaining 37.5% is for acquisitions costs and 100% of mining acquisitions costs are recovered through percentage depletion, which is accounted for in the pretax rate of return formula. For oil and gas, 37.5% of total costs were for acquisition, which is recovered through either cost or percentage depletion. Specifically, shale is provided with 15% percentage depletion and accounts for 70% of total production.