

CBO

How Taxes Affect the Incentive to Invest in New Intangible Assets



At a Glance

In a 2014 report, the Congressional Budget Office calculated the tax burden on income from investments in tangible assets—that is, assets whose value is derived from physical attributes. In this report, the agency extends its analysis to investments in intangible assets, or assets that do not derive their value from physical attributes, such as software, chemical formulas arising from research and development, and literary works. Two key findings are these:

- The tax burden on income from investment in intangible assets is generally lower than the tax burden on income from investment in tangible assets.
- With respect to equity-financed investments by C corporations, the 2017 tax act (Public Law 115-97) increases the tax burden on research and development from 2022 on but reduces the tax burden on most other types of investments in intangible assets.

Compared with tangible assets, intangible assets generally take more time to develop and have a higher risk of failure. Because those factors are especially important for understanding how taxes affect investments in intangible assets, CBO implemented a new analytical method in this report that incorporates their effects.



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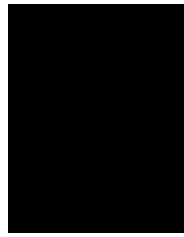
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Numbers in the text and tables may not add up to totals because of rounding.

Unless otherwise indicated, all years referred to in this report are calendar years.



How Taxes Affect the Incentive to Invest in New Intangible Assets

Summary

A business's worth includes not only its tangible assets, such as equipment, structures, land, and inventory, but also its intangible assets. In contrast to tangible assets, intangible assets have value because of attributes that have no physical substance. For example, the value of a typical book resides in its content, not in the paper it is printed on—unlike the value of a car, which is based on physical attributes. That lack of physical substance makes the value of intangible assets more difficult to determine. The value of a book cannot be firmly established immediately after the book is written; it can be determined only through the book's sales. By contrast, the existence of a well-developed market for cars makes it easy to place a value on any automobile without selling it.

Investing in intangible assets is also different from investing in tangible assets—in part because the time it takes to develop intangible assets is typically longer, and in part because the investments are generally riskier.

The importance of intangible assets relative to tangible assets has grown over time. For example, the Bureau of Economic Analysis (BEA) finds that intellectual property products—which represent over two-thirds of the intangible assets covered in this report—rose as a share of business assets (excluding land and inventory) from 5 percent in 1982 to 10 percent in 2016.

In *Taxing Capital Income: Effective Marginal Tax Rates Under 2014 Law and Selected Policy Options* (hereafter referred to as *Taxing Capital Income*), the Congressional Budget Office analyzed the tax burden on income from investments in tangible assets. In this report, CBO extends its analysis to debt- and equity-financed investments in intangible assets by corporations and other business entities and implements a new method that incorporates the effects of multiyear development periods and the risk of failure. The report contains estimates of the tax burden on income from investment by

established profitable companies in five types of intangible assets:

- Purchased software;
- Assets resulting from research and development (R&D);
- Entertainment, literary, and artistic (ELA) originals;
- Assets derived from mineral exploration and development (ME&D); and
- Brand identity arising from advertising.

The new method is illustrated using the permanent features of the tax law in place during 2017 (hereafter referred to as pre-2018 law).¹ That method is also applied to an analysis of selected features of Public Law 115-97 (originally called the Tax Cuts and Jobs Act and called the 2017 tax act in this report) for equity-financed investments of businesses subject to the corporate income tax.²

CBO finds that under pre-2018 law, the tax system favored investments in many types of intangible assets over those in tangible assets. For example, the cost of investing in most intangible assets was expensed—that is, deducted in the year the cost was incurred. The cost of investing in tangible assets, by contrast, was deducted over a multiyear period. As a result, the before-tax rate

1. Under the tax rules in place in 2017, certain tax rules were scheduled to expire on December 31, 2017, and others were scheduled to be phased out over the next two years. Those temporary provisions are not reflected in the estimates of tax burden under pre-2018 law.
2. CBO has not yet fully modified its analytical methods to incorporate the more complex provisions of the 2017 tax act affecting debt-financed investments or investments by businesses not subject to the corporate income tax.

of return needed to induce an investment in tangible assets was higher than that required for intangible assets. Furthermore, investment in certain intangible assets benefited from the research and experimentation (R&E) tax credit. Those tax benefits offset, to some extent, the discouraging effects of lengthy development times and risk of failure.

The 2017 tax act increases incentives to invest in most types of assets, but not all. Specifically, the act changes the methods of deducting investment costs in ways that will reduce the incentive to invest in R&D.

How Does CBO Measure the Tax Burden on Investments in Intangible Assets?

CBO estimates the tax burden—including both corporate and individual income taxes—on capital income over the lifetime of a marginal investment. A marginal investment is expected to generate a rate of return that, after taxes, is just high enough to attract investors. For this analysis, that threshold is the rate investors could receive from a comparable index fund (that is, one in which the ratio of corporate bonds to equities is the same as the ratio of debt to equity financing that is anticipated for the marginal investment). To achieve that after-tax rate of return, an investment must clear a *hurdle rate*—a before-tax rate of return that compensates the investor for the taxes due on the resulting income.

CBO uses three measures to estimate the magnitude of the tax burden. The first measure, the difference between the before-tax rate of return and the after-tax rate of return, is referred to as the *standard tax wedge*. A second measure of the tax burden, the *effective marginal tax rate* (hereafter referred to as the effective tax rate, or ETR), is derived by dividing the standard tax wedge by the before-tax rate of return. Those two measures are useful for analyzing most investments with short development periods and negligible failure risks. Because those conditions do not apply to most intangible assets, however, CBO introduces a third measure in this report—the *success-state tax wedge*, which accounts for the above-market rates of return that investors require from successful investments in order to compensate for long development periods and the risk of failure.

What Was the Tax Burden on Different Types of Investments Under Pre-2018 Law?

With regard to the ETR under pre-2018 law—the measure of the tax burden reported in *Taxing Capital Income*—CBO estimates:

- The ETR on capital income from investment in the five examined types of intangible assets was, on average, 3 percent (see Table 1). That ETR was 25 percentage points lower than the average ETR on the income from investments in tangible assets.
- Of the five examined types of intangible assets, purchased software—which generally cannot be expensed—had the highest ETR, at 37 percent. R&D had the lowest, at -31 percent (meaning that it was actually subsidized, not taxed).

CBO also finds that the success-state tax wedge increases relative to the standard tax wedge as development periods grow lengthier and the risk of failure rises—a phenomenon that the ETR fails to capture. That pattern is illustrated by CBO's estimates for investments in three types of intangible assets for which sufficient data were available:

- The success-state tax wedge for the development of oil wells by integrated oil and gas companies (that is, those that also own refineries or retail outlets) was 0.9 percentage points, compared with a standard tax wedge of 0.7 percentage points. That estimate reflects an average development period of 6 years and a failure rate of 10 percent.
- The success-state tax wedge for R&D for a new drug was 0.4 percentage points, compared with a standard tax wedge of -0.9 percentage points. That estimate reflects an average development period of 12 years and a failure rate of 90 percent.
- The success-state tax wedge for motion picture development and production was 4.7 percentage points, compared with a standard tax wedge of 3.1 percentage points. That estimate reflects an average development time of 3 years and a hypothetical failure rate of 50 percent.

Table 1.

Effective Tax Rates and Tax Wedges Under Pre-2018 Law, by Asset Type

	Effective Tax Rate (Percent)	Standard Tax Wedge (Percentage points)
All Intangible Assets	3	0.1
Purchased software	37	2.5
Research and development	-31	-1.0
ELA originals	31	1.8
Mineral exploration and development	6	0.3
Brand identity arising from advertising	-2	-0.1
All Tangible Assets ^a	28	1.6

Source: Congressional Budget Office.

The effective tax rate is the tax wedge divided by the before-tax rate of return that must be achieved to justify an investment. The tax wedge is the difference between the before-tax rate of return and the after-tax rate of return; the standard measure represents circumstances in which an investment's development period is less than one year and there is no risk of failure.

CBO's computations account only for permanent features of pre-2018 tax law. They exclude provisions that were scheduled to expire and provisions of the 2017 tax act. Values apply to typically financed investment (with debt-to-equity ratios varying by industry but averaging roughly one-third debt and two-thirds equity) by businesses of all organizational forms.

ELA = entertainment, literary, and artistic.

a. Equipment, structures, land, and inventories.

How Does the 2017 Tax Act Affect the Tax Burden on Investments in Intangible Assets?

The 2017 tax act contained a number of provisions that affect investment. The maximum corporate tax rate has been lowered permanently, and most individual income tax rates have been lowered through the end of 2025. Those changes increase incentives to invest in both tangible and intangible assets. Other provisions in the act—particularly those affecting methods of recovering the costs of investments—also affect investment incentives, but the effects of those changes are not uniform among different types of assets or sources of financing. Through 2026, for example, the act allows more of the cost of investing in certain types of tangible and intangible assets (specifically, equipment, prepackaged software, and movies and television programs) to be expensed. Beginning in 2022, however, companies can no longer expense the costs of investments in R&D but must deduct those

costs over five years. Other changes affect businesses not subject to the corporate income tax and the use of debt (but not equity) to finance investments.

Considering only the equity-financed investments of businesses subject to the corporate income tax, CBO estimates that the change in the treatment of R&D will increase the overall ETR on capital income from investments in the five examined types of intangible assets. Specifically, CBO arrived at the following conclusions with respect to the permanent features of the 2017 tax act:

- The ETR on capital income from investments in tangible assets will fall from 35 percent to 24 percent, whereas the ETR associated with intangible assets will rise from 11 percent to 15 percent.
- Only investments in R&D, among all five types of intangible assets, will experience an increase in the ETR, from -14 percent to 11 percent. The largest drop will be for investments in purchased software, from 41 percent to 28 percent.

Those results cannot be generalized to investments financed by debt or undertaken by businesses not subject to the corporate income tax.

Intangible Assets in the U.S. Economy

In this report, CBO defines an asset as a factor used in the production of goods or services that retains value for more than one year. Most assets are tangible. Businesses also hold financial assets, such as cash, stocks, and bonds, but those are not directly used in the production of goods and services. When a profitable business is sold, the sales price typically exceeds the value of the business's tangible and financial assets. That difference in value reflects the value of the business's intangible assets. Similarly, the total value of intangible capital in the entire economy is the difference between the market value of all businesses and the total worth of their tangible and financial assets.

This report is focused on only a subset of intangible assets—those that arise from investments made by a business that are analogous to the purchase of a building, a vehicle, or a machine. Such assets are the result of a deliberate decision to invest, rather than the by-product of some other business activity (such as the experience

employees acquire on the job). In addition, the assets included in the analysis are new and not those, for example, that are acquired when a business purchases another company. Within those parameters, the total value of intangible capital is equal to cumulative investment minus the cumulative depreciation of the resulting assets over time (generally due to obsolescence).³

Classifying Deliberate Investments in New Intangible Assets

For the analysis in this report, CBO grouped new intangible assets arising from deliberate investments into five categories, using asset types defined by the Commerce Department's Bureau of Economic Analysis as a guide. Those categories do not encompass all investments in new intangible assets, however: They cover only those for which there are sufficient data to estimate effective tax rates.

Purchased Software. This is the only intangible asset covered in the report that businesses acquire by purchasing it from another company—the rest are what the tax code calls “self-created.” Purchased software includes prepackaged software (which is available to the general public for download or off-the-shelf purchase) and custom software (which is software written to specifications provided by the buyer).

Assets Resulting From Research and Development, Including Developed Software. Assets resulting from R&D include experimental protocols, chemical formulas and recipes, product prototypes, and patents protecting the developed products.⁴ Developed software is created in-house and is considered an intangible asset if it is to be used by the business rather than placed on the market for sale. It corresponds to BEA's category of own-account software.⁵

3. Most intangible assets reported on balance sheets filed with corporate and partnership tax returns are not covered under that definition (see Appendix A for details).
4. Although the term “research and development” refers to investment, BEA uses that term to refer to assets arising from such investment. In this report, CBO retains BEA's naming convention and extends it to the analogous category of mineral exploration and development.
5. Section 174 of the Internal Revenue Code defines “research and experimentation” expenses, which account for most investments in this category. That section does not explicitly address software development, but the IRS has acknowledged that “the costs of developing computer software . . . in many respects so closely resemble the kind of research and experimental expenditures that

Entertainment, Literary, and Artistic Originals.

Examples of assets in this category are films, scripted television programs, books, and music recordings. Those assets are referred to as “originals” to distinguish them from the medium on which they are stored.

Assets Derived From Mineral Exploration and Development. Exploring for minerals and developing a means of extracting them is analogous to conducting research with the goal of creating effective drugs and developing a means to deliver them. Despite that similarity, BEA includes ME&D in its definition of mining and drilling structures, effectively treating it as investment in a tangible asset.⁶ Examples of ME&D investments explicitly addressed in the tax code include geological and geophysical expenses (which go toward sampling subsurface rock and mapping underground formations prior to drilling exploratory wells) and intangible drilling costs (which go toward items that create value for a producing well—such as surveys, drainage systems, and drilling mud—but have no salvage value if the well turns out to be dry). The tax code also recognizes analogous investments in the exploration for coal and hard minerals and the development of any resulting mines.

Brand Identity Arising From Advertising. Many businesses invest in advertising as a way to generate interest in their brand, thus increasing demand for their goods or services among potential customers. Not all advertising expenses, however, are properly characterized as investments. A significant portion of advertising expenses are intended not to create assets but to move inventory as quickly as possible.⁷

fall within the purview of §174 as to warrant similar accounting treatment.” (See Rev. Proc. 2000-50, 2000-52 I.R.B. 601.) Because of that similar tax treatment, internally developed software is grouped with R&D rather than with purchased software.

6. Treating ME&D as investment in an intangible asset follows the practice of Carol Corrado, Charles Hulten, and Daniel Sichel in “Intangible Capital and U.S. Economic Growth,” *Review of Income and Wealth*, vol. 55, no. 3 (September 2009), pp. 661–685, <https://tinyurl.com/y79cgvnp>.
7. Brand identity can be enhanced by means other than advertising, such as event sponsorship and favorable product placement in stores. The ETRs on brand identity not arising from advertising are the same as those on advertising-driven brand identity. However, CBO's calculation of an all-inclusive ETR on intangible assets accounts only for the advertising-related portion.

Intangible Assets Not Included in This Analysis. Other intangible assets that arise from deliberate investment are sometimes characterized as “firm-specific resources.” Examples of investments in firm-specific resources include an employer’s provision of training for employees in skills that serve a specific need for their company but would not be valuable to another employer, or a business’s hiring of management and marketing consultants to enhance operations particular to that business. Because data on investments in firm-specific assets are sparse, such assets are excluded from the quantitative analysis that follows, but a separate analysis of a hypothetical case is provided in Appendix A.

Key Differences Between Investments in Tangible and Intangible Assets

Investors in a tangible asset generally can anticipate both the amount of time it will take to develop the asset and how useful that asset will be to production. In the case of equipment (such as computers or machinery), a business orders the equipment, takes delivery when it is ready, installs it, and starts using it. The process is typically measured in months. (With large structures, the design and construction can stretch into years, but typically there is at least some degree of certainty about when a structure can be occupied.)

Those shorter timelines apply to purchased software, but they do not apply to other (self-created) intangible assets. Investment in such intangible assets typically takes years before resulting in a useful product. One study has estimated that drugs that are derived from a new chemical formula (as opposed to a variation on an existing chemical formula) take an average of about 12 years to develop, test, and bring to market.⁸ Searching for new oil fields and producing movies are also multiyear projects. Such long development times affect the decision to invest. Because no revenues are realized during the development period, potential investors will invest only if they can expect a rate of return on the final product that is high enough to compensate for the years with no returns. By contrast, investors in equipment that generates income relatively quickly (say, in less than a year) will demand only the after-tax market rate of return (roughly the equivalent of the return on a comparable

index fund—that is, one in which the ratio of corporate bonds to equities is the same as the ratio of debt to equity financing that those investors anticipate using).

Another difference between investments in tangible and intangible assets is the degree of uncertainty in the return from the venture. Generally, investments in tangible assets are less risky. In addition to being subject to inspection, equipment and structures tend to be purchased in competitive markets, which helps ensure that assets offered for sale are of consistent quality (if they are not, investors will simply turn to a competing supplier). That consistency leads to a fairly predictable rate of return. The outcome of investment in most intangible assets, however, is highly uncertain. Such assets are rarely purchased in a competitive market—more often, businesses develop them internally or hire another company to do so. Even after a long development period, an investment might fail, resulting in a negative rate of return. For example, roughly 90 percent of drugs undergoing testing before submission for FDA approval fail those tests at one stage or another.⁹ But a successfully developed product that is demonstrably superior to existing products can be extraordinarily profitable.¹⁰

8. Joseph A. DiMasi, Ronald W. Hansen, and Henry G. Grabowski, “The Price of Innovation: New Estimates of Drug Development Costs,” *Journal of Health Economics*, vol. 22, no. 2 (March 2003), pp. 151–185, <https://tinyurl.com/y8naa2w6>.

9. Recent studies have found success rates of 9.6 percent and 11.8 percent—see Biotechnology Innovation Organization, Biomedtracker, and Amplion, “Clinical Development Success Rates 2006–2015” (June 2016), <https://tinyurl.com/jhg52dr> (PDF, 4 MB), and Joseph A. DiMasi, Henry G. Grabowski, and Ronald W. Hansen, “Innovation in the Pharmaceutical Industry: New Estimates of R&D Costs,” *Journal of Health Economics*, vol. 47 (May 2016), pp. 20–33, <https://tinyurl.com/yb93lbt7>.

10. One might argue that rates of return, even for businesses that engage in little investment in intangible assets, are anything but predictable. It is certainly true that two companies investing the same amount in comparable tangible assets can realize very different rates of return. But those differences are rarely attributable to the performance of the tangible assets. Instead, they are usually attributable to one firm’s superior marketing or management—both firm-specific resources. For a graphic illustration of how rates of return differ between tangible and intangible assets, see John R. M. Hand, “The Increasing Returns-to-Scale of Intangibles,” in John R. M. Hand and Baruch Lev, eds., *Intangible Assets: Values, Measures, and Risks* (Oxford University Press, 2003), Figure A.1, p. 327.

Measuring Intangible Assets: Investment, Depreciation, and Value

CBO's primary source for data on intangible assets is the Detailed Fixed Asset Tables generated by BEA.¹¹ Those tables contain information on:

- *Current-year investment*—the amount spent during the year to purchase or internally develop new assets;
- *Current-year economic depreciation*—the reduction in assets' value during the year due to wear and tear or obsolescence; and
- *Net capital stocks (or asset value)*—the cumulative amount of new investment through the current year minus the cumulative amount of depreciation over that period.

Until 2013, BEA provided data separately for only one type of intangible asset: software. In July 2013, BEA expanded the categories of intangible assets to include R&D and ELA originals. Collectively, the intangible assets measured by BEA are termed “intellectual property products.”

CBO's categories of intangible assets do not align precisely with BEA's groupings of intellectual property products—specifically, internally developed software is grouped with R&D instead of purchased software. CBO used data from BEA, the Census, and tax returns to create additional categories. BEA defines ME&D to be an asset but combines it with mining and drilling structures, which are tangible assets. CBO used Census data to separate the value of ME&D from the value of those structures. And because BEA does not include advertising in its investment categories, CBO estimated the value of the resulting brand identity from data on advertising deductions claimed on tax returns. (See Appendix A for a description of the method used to measure the values of ME&D and brand identity arising from advertising.)

Snapshot of 2013

CBO estimates that in 2013, \$957 billion was invested in the types of intangible assets covered in this report

(see Table 2).¹² Of that amount, about two-thirds was reported by BEA as investment in intellectual property products—31 percent in software, 29 percent in R&D, and 8 percent in ELA originals. Investment in the remaining types of intangible assets was estimated by CBO—10 percent in ME&D and 22 percent in advertising.

At the end of 2013, the measurable stock of intangible assets arising from deliberate investment had a value of \$3.6 trillion, according to CBO's estimates. The distribution of that value among different types of assets did not mirror the distribution of investment. An asset's value depends not only on the amount invested in it but also on its rate of economic depreciation. Asset types that depreciate rapidly must be replaced more frequently and therefore account for a higher share of investment than they do of asset value. Thus, software and advertising-driven brand identity, which depreciate rapidly, account for much less of the capital stock (17 percent and 7 percent, respectively) than they do of investment. Conversely, R&D, ELA originals, and ME&D account for more of the capital stock (37 percent, 13 percent, and 27 percent, respectively) than they do of investment.

Historical Trends Through 2016

BEA's addition of more intellectual property products to its definition of assets makes it possible to illustrate the increase in investment in such assets and the growth of their value over time. However, data on long-term trends through 2016 are not available for investments in ME&D or brand identity arising from advertising.

Between 1966 and 1982, investment in intellectual property products made up between 11 percent and 14 percent of total investment in business assets (which also include structures and equipment; see Figure 1). Since then, that share has increased, especially during those recessions in which investment in structures has declined sharply. BEA reported that in 2016, investment in intellectual property products accounted for 31 percent of all investment in business assets. That is less than

11. See the spreadsheets for the current cost of net stocks and investment under “Nonresidential Detailed Estimates,” Bureau of Economic Analysis, “Detailed Data for Fixed Assets and Consumer Durable Goods” (accessed August 10, 2015), <https://tinyurl.com/yb7xg2y>.

12. Although BEA data are available for more recent years, corporate income tax return data—a key source of data on advertising—are not. The implications of excluding deliberate investment in firm-specific resources (such as employee training and management consulting services) and the value of assets arising from such investment are addressed in Appendix A.

Table 2.

Investment in and Corresponding Stock of Intangible Business Assets in 2013

	Investment		Capital Stock		Rate of Economic Depreciation
	Billions of Dollars	Percentage of Total	Billions of Dollars	Percentage of Total	
Software					
Prepackaged (Purchased)	77.6	8	95.4	3	0.742
Custom (Purchased)	108.6	11	257.8	7	0.386
Own-account (Developed)	108.5	11	262.7	7	0.388
Total	294.6	31	615.9	17	n.a.
Research and Development					
By chemical manufacturers	77.3	8	533.7	15	0.109
By computer and electronic products manufacturers	61.6	6	182.4	5	0.305
By other manufacturers	74.2	8	322.3	9	0.170 ^a
By nonmanufacturing businesses	42.2	4	204.1	6	0.171 ^b
By private universities and nonprofit organizations	23.1	2	99.1	3	0.164
Total	278.5	29	1,341.6	37	n.a.
Entertainment, Literary, and Artistic Originals					
Theatrical movies	21.0	2	173.3	5	0.096
Long-lived television programs	34.7	3	158.7	4	0.179
Books	10.0	1	81.9	2	0.128
Music	6.5	1	23.2	1	0.310
Other	2.7	*	27.2	1	0.114
Total	74.9	8	464.3	13	n.a.
Mineral Exploration and Development					
Oil and natural gas	89.7	9	877.8	24	0.076
Coal and hard minerals	10.3	1	94.8	3	0.043
Total	99.9	10	972.6	27	n.a.
Brand Identity Arising From Advertising	208.7	22	237.7	7	0.600
Total Intangible Assets	956.7	100	3,632.2	100	n.a.
Excluded Assets					
Business equipment and structures	1,518.5	n.a.	21,771.8	n.a.	n.a.
Intangible assets not reported by BEA ^c	n.a.	n.a.	3,133.8	n.a.	n.a.

Source: Congressional Budget Office, using data from the Bureau of Economic Analysis, the Census Bureau, and the Internal Revenue Service.

BEA = Bureau of Economic Analysis; n.a. = not applicable; * = between zero and 0.5 percent.

- a. Different rates of economic depreciation apply to two types of businesses in this category: motor vehicle manufacturers (0.360) and other transportation equipment manufacturers (0.243).
- b. Different rates of economic depreciation apply to two types of businesses in this category: publishing (0.228) and computer systems design (0.486).
- c. This category encompasses all forms of brand identity, including that arising from advertising (which is shown separately above). It also includes intangible assets that do not result from deliberate investment—a category not otherwise considered in this report.

in 2009 or 2010, when the share was 33 percent, but is still higher than in any year before 2009.

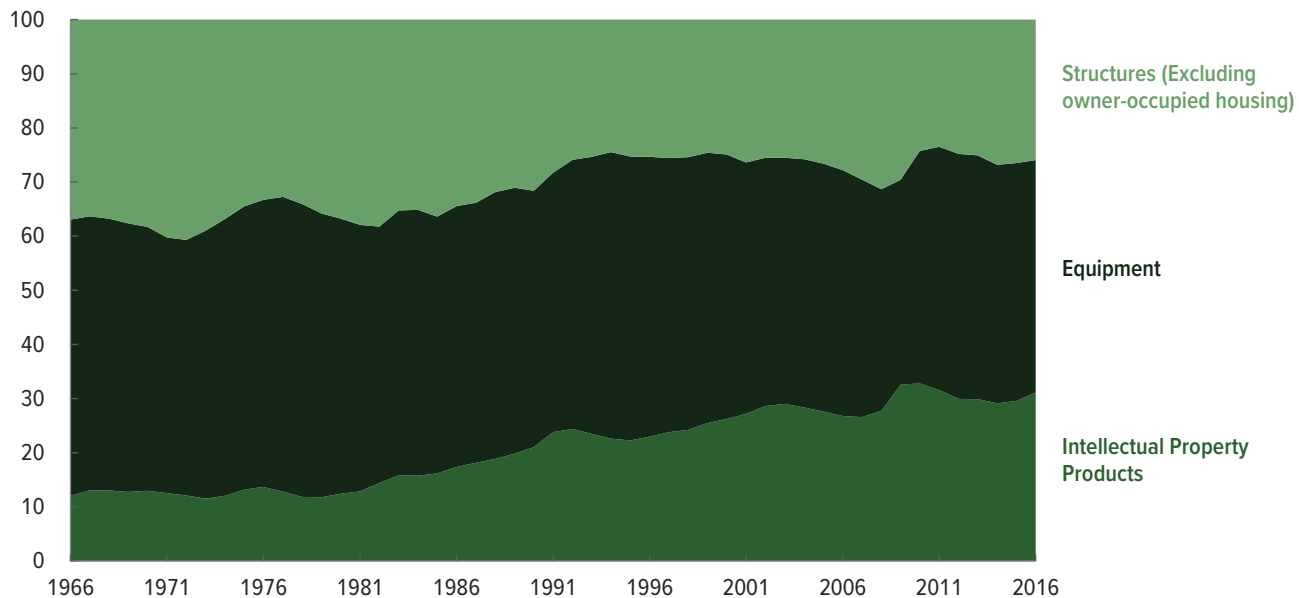
Because many intellectual property products depreciate rapidly, the shift away from tangible assets has been

less pronounced for capital stocks than for investment. Nevertheless, intellectual property products have risen steadily as a share of business assets, from 5 percent in 1982 to 10 percent in 2016 (see Figure 2).

Figure 1.

Distribution of Business Investment Among Structures, Equipment, and Intellectual Property Products, 1966 to 2016

Percent



Source: Congressional Budget Office, using data from the Bureau of Economic Analysis.

The Taxation of Capital Income From Investments in New Intangible Assets

In many respects, the tax system does not distinguish between capital income resulting from investments in tangible assets and investments in intangible assets. The taxation of capital income largely depends on the form of organization selected by the firm making the investment and how the underlying investment is financed. The taxation of income from intangible assets, however, differs from that deriving from tangible assets in two ways. The most important difference is in how the costs of such investments are recovered through tax deductions. The other difference concerns the provision of tax credits: Whereas a tax credit is available for most research and development expenses, only a small subset of investments in tangible assets are eligible for a tax credit.

Most of the estimates in this report are based on the permanent features of the tax code that were in place at the beginning of 2017. However, many features of the tax code were changed as a result of Public Law 115-97, referred to here as the 2017 tax act. Those features are detailed in the following sections.

The Taxation of Business Profits

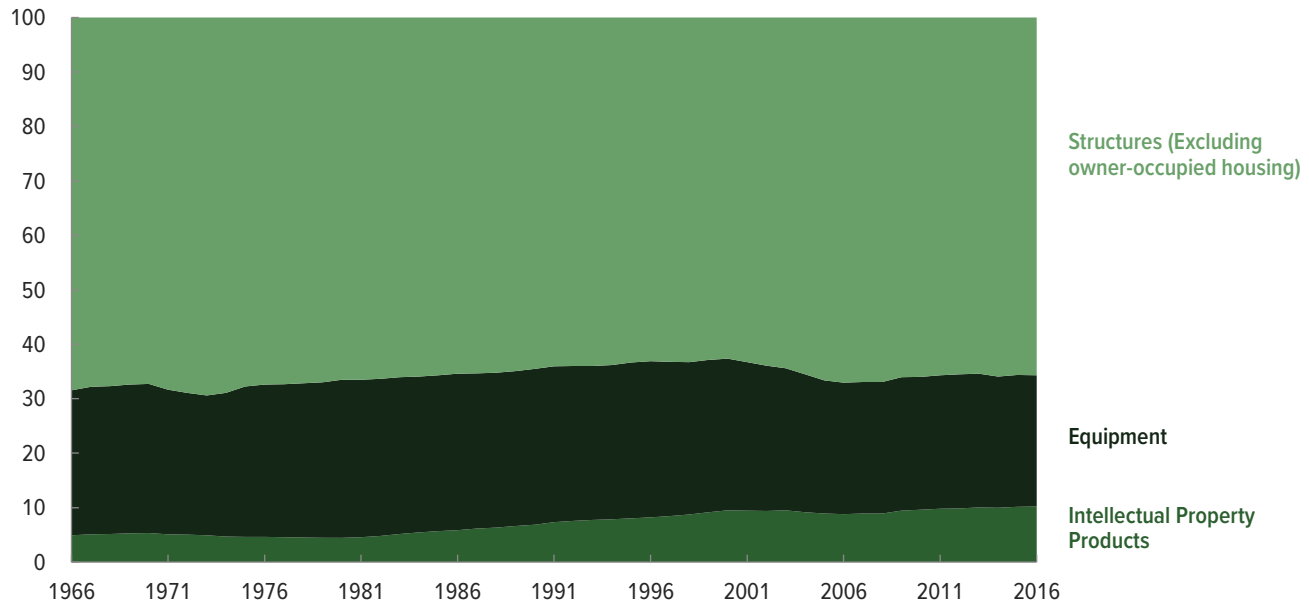
The taxation of business profits varies by the business's form of organization and its sources of financing. Various features of the 2017 tax act change incentives to invest, although their effects differ within each of those categories.

General Rules. C corporations (which are taxed under subchapter C of the Internal Revenue Code) pay taxes on receipts net of expenses (such as the costs of raw materials and labor) incurred in the production of goods and services. Corporations can finance their investments using debt (by issuing bonds or borrowing from a bank) or equity (by issuing new stock or reinvesting after-tax profits). If they rely on debt for financing, they can deduct at least a portion of the interest they paid. By contrast, if corporations use equity, they may not claim any analogous deduction for dividends they distribute to shareholders. Hence, the tax burden on equity-financed investment is greater than that on debt-financed investment.

Figure 2.

Distribution of Business Assets Among Structures, Equipment, and Intellectual Property Products, 1966 to 2016

Percent



Source: Congressional Budget Office, using data from the Bureau of Economic Analysis.

After being taxed at the level of the entity, the profits of C corporations are generally taxed a second time, at the level of the shareholder. Corporations can distribute profits as dividends or retain after-tax profits for future investment, thus increasing the value of the corporations' stock. Unless the stock is held by a tax-exempt entity or in a tax-favored retirement account, shareholders pay individual income tax (at a rate no higher than 23.8 percent) on qualified corporate dividends or on the capital gains they realize when they sell their shares after holding them for at least one year.¹³ (Qualified dividends are those paid by domestic corporations and certain foreign corporations to shareholders who have held the stock for a specified length of time.) Like the dividends paid to shareholders, interest payments to bondholders are generally taxable at the individual level but at the higher rates that apply to taxable income other than dividends and capital gains. However, income from stocks and

bonds held in tax-favored retirement accounts is not taxed at the shareholder level.

Businesses other than C corporations calculate net business income similarly to C corporations, but the income is taxed differently: All of it, including income that is retained for reinvestment, is allocated (or "passed through") to the owners and added to their taxable income. Thus, profits are taxed only at the individual level. Pass-through entities can be S corporations (taxed under subchapter S of the Internal Revenue Code) or unincorporated businesses, such as sole proprietorships and partnerships.¹⁴ Sole proprietors and many partners must contribute to Social Security and Medicare through a Self-Employment Contributions Act tax of up to 15.3 percent on their profits.

13. The 23.8 percent maximum rate on dividends and capital gains includes the 3.8 percent tax imposed on the investment income of high-income taxpayers. That additional tax also applies to interest income.

14. S corporations can have no more than 100 shareholders, none of which can be foreigners, partnerships, or C corporations. A C corporation can participate in a partnership, but in this report, the portion of partnership income that is attributable to C corporations is treated as being subject to the corporate income tax.

Superseded Features of Pre-2018 Law. Before 2018, tax liabilities of C corporations were computed according to a graduated rate schedule, but the top statutory corporate tax rate of 35 percent applied to most of their taxable profits. Profits from pass-through entities were taxed, on average, at a marginal rate (the percentage of an additional dollar of income that is paid in taxes) that was less than the top rate of 39.6 percent because the graduated rate structure of the individual income tax, unlike that of the corporate income tax, affected a significant share of taxpayers. Interest expenses of both C corporations and pass-through entities were fully deductible.

Key Changes in the 2017 Tax Act. The 2017 tax act changed the taxation of business profits in many ways that will affect investment. Among the key changes affecting domestic business activity (the focus of the analysis in this report) were the following:

- The graduated rate structure for the corporate income tax was abolished, and a flat rate of 21 percent now applies to all taxable C corporation profits.
- Through 2025, individual income tax rates are lower, with a new top rate of 37 percent.
- Also through 2025, many owners of pass-through entities can exclude 20 percent of their business profits from their taxable income.
- Interest expenses are no longer fully deductible.

Cost-Recovery Methods

One type of expense that a business can deduct when calculating its taxable profits is the value of a productive asset that has been lost through wear and tear or obsolescence. However long the time period over which those deductions are spread, they ultimately result in the full recovery of the original cost of the asset. The tax code, however, assigns different cost-recovery methods to tangible and intangible assets and to various types of assets within each of those two broad categories. The 2017 tax act changed some of the rules for recovering costs for investments in both tangible and intangible assets.

General Rules. For tangible assets, the amount of the cost-recovery deduction generally differs by asset category. The cost of most structures is subtracted in equal amounts over a fixed number of years—a method known as straight-line depreciation. As a result, the cost recovery

is usually slower than the asset's economic depreciation. The cost of equipment is typically recovered using the declining-balance method. That method generally allows taxpayers to recover the cost of most equipment at a rate faster than its economic depreciation.

Three methods of cost recovery are applied to intangible assets:

- **Expensing.** The amount invested during the year is deducted in the same year. (Expensing can be limited to a certain percentage of an investment, with a different method applying to the rest.)
- **Amortization.** Amounts are deducted in equal shares over a fixed period—the equivalent of straight-line depreciation.¹⁵
- **The Income-Forecast Method.** Amounts are deducted over time in proportion to the expected flow of income deriving from the investment. Companies generate a forecast of how much income they expect the investment to generate in each of the next 10 years. They calculate each year's cost-recovery deduction by multiplying the total cost of the investment by that year's share of total income over the 10-year period.

For some types of intangible assets, only a single cost-recovery method can be used—for example, three-year amortization for custom software and expensing for advertising (see Table 3). However, the rules are more complicated for other types of assets. In some cases, taxpayers can choose the method most advantageous to them. In other cases, the cost-recovery method is dependent on the success of the investment. For example, the cost of creating books or sound recordings is recovered using the income forecast method if the project makes it into production; if it does not, the entire investment is written off when the project is abandoned. Finally, the specific application of some approaches can differ among intangible asset types. For example, a variant of expensing that applies only to the exploration for coal and hard

15. For purchased software, the tax code describes this cost-recovery method as “straight-line depreciation.” In this report, however, CBO refers to this type of cost-recovery method as “amortization” whenever it applies to an intangible asset.

Table 3.

Cost-Recovery Methods, by Type of Intangible Asset

Type of Intangible Asset	Cost-Recovery Method
Purchased Software	
Prepackaged	3-year amortization ^{a,b}
Custom	3-year amortization
Research and Development (Including developed software)	
Expenses incurred in an “experimental or laboratory sense” ^c	Full expensing <i>or</i> 5-year amortization beginning upon realization of income <i>or</i> 10-year amortization beginning in the year of investment ^d
Other development expenses	Full expensing <i>or</i> full recovery upon sale
Entertainment, Literary, and Artistic Originals	
Qualified creative expenses of freelance authors, photographers, and artists	Full expensing
Development of films and television programs	Income forecast method (successful projects) <i>or</i> 15-year amortization (unsuccessful projects) ^b
Development of books and music	Income forecast method (successful projects) <i>or</i> full recovery upon abandonment (unsuccessful projects)
Mineral Exploration and Development	
Geological and geophysical expenses (Oil and gas exploration)	
Integrated oil and gas companies ^e	7-year amortization
Independent oil and gas companies	2-year amortization
Intangible drilling costs (Oil and gas development)	
Integrated oil and gas companies ^e	70 percent expensing and 30 percent 5-year amortization <i>or</i> 5-year amortization
Independent oil and gas companies	Full expensing <i>or</i> 5-year amortization
Other costs of unsuccessful exploration	Full recovery upon abandonment
Mineral exploration (Not including oil and gas)	
C corporations	70 percent expensing with recapture and 30 percent 5-year amortization <i>or</i> 10-year amortization
Pass-through entities	Full expensing with recapture <i>or</i> 10-year amortization
Mine development (Not including oil and gas wells)	
C corporations	70 percent expensing and 30 percent 5-year amortization <i>or</i> 10-year amortization
Pass-through entities	Full expensing <i>or</i> 10-year amortization
Brand Identity Arising From Advertising	Full expensing

Source: Congressional Budget Office.

Methods shown apply in 2017 and subsequent years unless otherwise noted. Investment in intangible assets not listed above is fully expensed.

- Eligible for bonus depreciation under pre-2018 law, with the percentages set at 50 percent for 2017, 40 percent for 2018, 30 percent for 2019, and zero for 2020 and later.
- Eligible for bonus depreciation under the 2017 tax act, with the percentages set at 100 percent for 2018 through 2022, 80 percent for 2023, 60 percent for 2024, 40 percent for 2025, 20 percent for 2026, and zero for 2027 and later.
- As defined in section 174 of the Internal Revenue Code.
- Under the 2017 tax act, the recovery method will change in 2022 to five-year amortization beginning in the year of investment.
- Integrated oil and gas companies are those that, in addition to extracting oil and gas, also own refineries or retail outlets.

minerals requires the expensed amounts to be recaptured once production begins.¹⁶

Superseded Features of Pre-2018 Law. Before the enactment of the 2017 tax act, the Internal Revenue Code allowed some businesses—under certain circumstances—to use cost-recovery methods that were more advantageous to those businesses than the declining-balance method. Under section 179, businesses that acquired relatively small amounts of certain new or used tangible assets—as well as prepackaged software—in a year were able to expense all or part of the cost. Between 2012 and 2017, businesses acquiring less than \$2 million in qualified tangible assets could expense up to \$500,000. In addition to section 179 expensing, the Congress sometimes enacted, on a temporary basis, a partial expensing provision known as bonus depreciation. Bonus depreciation rules permitted businesses to expense a certain percentage of the costs of acquiring equipment, regardless of the dollar amount of such acquisitions during the year. From 2012 through 2017, that percentage was set at 50 percent.¹⁷ Investments in qualified tangible assets that could not be expensed under section 179 or bonus depreciation were recovered using the declining-balance method.

Another feature of pre-2018 law concerned investments in R&D. Generally, such investments were expensed, but taxpayers had the option to amortize them—either over a 10-year span beginning in the year the cost was incurred or over a 5-year period beginning when income from that investment was realized. The expensing of R&D was allowed under section 174 and was independent of section 179 and bonus depreciation.

Key Changes in the 2017 Tax Act. More investments in tangible assets (and prepackaged software) can be expensed as a result of the 2017 tax act. The act increases the maximum amount of investment in qualified tangible assets that can be expensed under section 179 to \$1 million, and it raises the level of investment at which that expensing begins to be phased out to \$2.5 million. The act also broadens the scope of bonus depreciation

to cover the production of films and television programs and temporarily increases the percentage of a qualifying investment that businesses can expense as bonus depreciation to 100 percent; between 2023 and 2027, that percentage will be phased down to zero in 20-percentage-point increments. Beginning in 2022, however, expensing will no longer be allowed for investments in R&D: The 2017 tax act will require five-year amortization of R&D starting in the year the cost is incurred.

Credits for Research and Experimentation

Under both prior and current law, some taxpayers have been able to claim a tax credit for costs incurred for R&E. The 2017 tax act reduced the amount available for certain types of research.

General Rules. In 1981, the Congress enacted a tax credit to encourage businesses to engage in research and development. That credit—now officially known as the credit for increasing research activities but more commonly referred to as the research and experimentation credit—was initially temporary. Since its enactment, the credit has undergone frequent cycles of expiration, renewal, and modification. In 2016, it was made permanent by the Consolidated Appropriations Act.¹⁸ The credit directly reduces the amount of income taxes owed, but the amount of R&D costs that can be expensed is reduced by the amount claimed for the credit.

Not all of the costs of R&D as defined by BEA are eligible for the tax credit. For example, an investment does not qualify for the tax credit if the subject of the research is not deemed to be “technological in nature.” In 2012, just over 67 percent of businesses’ R&D costs (including the costs of developing software) were considered qualified research expenditures for purposes of the credit.

To ensure that the credit encourages new investment in research rather than rewarding firms for research they would have conducted regardless, the credit is designed to be incremental—that is, it applies only to the amount of qualified research expenditures in excess of a base level. Firms can choose between two approaches to compute the base and the credit amount. The statutory rates associated with those approaches are 20 percent and

16. The recapture of the expensed amount is achieved by either adding the deducted amounts back into income or forgoing other cost-recovery deductions until they equal the amounts already deducted.

17. Before the enactment of the 2017 tax act, the bonus depreciation rate was scheduled to gradually decrease to 40 percent in 2018 and 30 percent in 2019, after which expensing was to be limited to acquisitions that met the requirements of section 179.

18. For a comprehensive history and a detailed description of the R&E credit, see Congressional Research Service, *Research Tax Credit: Current Law and Policy Issues for the 114th Congress*, Report for Congress RL31181 (March 15, 2015).

14 percent; however, because of the incremental structure of the credit, its average value (combining the two approaches) is equal to 5.5 percent of qualified research expenditures.

In 1983, Congress enacted what is known as the orphan drug credit, which is equal to a certain percentage of expenses associated with the clinical testing of drugs designed to treat rare diseases and conditions. Costs applied to the orphan drug credit cannot also be applied to the R&E credit, nor can they be expensed.

Superseded Feature of Pre-2018 Law. Before the 2017 tax act, the orphan drug credit rate was 50 percent.

Key Change in the 2017 Tax Act. The 2017 tax act made no changes to the R&E credit, but the orphan drug credit rate was reduced by half, to 25 percent.

Effective Tax Rates on Income From Investment in Intangible Assets Under Pre-2018 Law

In *Taxing Capital Income*, CBO presented ETRs on income from investment in tangible assets as a measure of the tax burden on such investment. The ETR is a single rate that accounts for the effects of statutory tax rates and other features of the tax code (such as cost-recovery deductions) on after-tax rates of return over the lifetime of a marginal investment. A marginal investment is expected to generate a rate of return that, after taxes, is just high enough to attract investors. For this analysis, CBO defined that threshold as the rate of return that investors could expect from a comparable index fund. The same threshold applies to similarly financed investments in all types of assets, regardless of the tax laws in place.

ETRs can also be used to measure the tax burden on investment in intangible assets. In this section, CBO presents ETRs for intangible assets under conditions comparable to those underlying the estimates in *Taxing Capital Income*—that is, reflecting the permanent features of the tax law in effect prior to the enactment of the 2017 tax act.¹⁹

19. ETRs in this report are based on 2017 levels of income, in contrast to those in *Taxing Capital Income*, which were based on 2012 levels of income. For all of the sources of the difference between the all-inclusive ETR on capital income from new business investments presented in this report and that presented in *Taxing Capital Income*, see the supplemental material posted online with this report.

Table 4.

Effective Tax Rates and Standard Tax Wedges for Capital Income From Intangible and Tangible Assets Under Pre-2018 Law

	Intangible Assets	Tangible Assets	All Assets
Effective Tax Rate (Percent)			
All Businesses ^a	3	28	26
C corporations ^a	4	28	25
Equity financed	11	35	32
Debt financed	-92	-18	-24
Pass-through entities ^a	-7	28	28
Equity financed	-1	33	32
Debt financed	-79	-1	-2
Standard Tax Wedge (Percentage points)			
All Businesses ^a	0.1	1.6	1.4
C corporations ^a	0.2	1.6	1.4
Equity financed	0.6	2.6	2.3
Debt financed	-1.2	-0.4	-0.5
Pass-through entities ^a	-0.3	1.5	1.5
Equity financed	-0.1	2.3	2.2
Debt financed	-1.0	*	*

Source: Congressional Budget Office.

The effective tax rate is the tax wedge divided by the before-tax rate of return that must be achieved to justify an investment. The tax wedge is the difference between the before-tax rate of return and the after-tax rate of return; the standard measure represents circumstances in which an investment's development period is less than one year and there is no risk of failure.

CBO's computations account only for permanent features of pre-2018 tax law. They exclude provisions that were scheduled to expire and provisions of the 2017 tax act.

* = between -0.05 and 0.05 percentage points.

a. These values apply to typically financed investment, with debt-to-equity ratios varying by industry but averaging roughly one-third debt and two-thirds equity.

CBO estimates that in 2017, the ETR on capital income arising from deliberate investment in new intangible business assets was, on average, 3 percent (see Table 4). By contrast, the ETR on capital income arising from investment in tangible business assets was 28 percent. For both tangible and intangible assets, ETRs varied significantly depending on the form of business organization, the source of financing, and the type of asset. (Differences in ETRs by industry are presented in supplemental material posted online with this report.)

CBO used the same formulas employed in *Taxing Capital Income* to calculate ETRs at the most detailed level (for example, equity-financed R&D of C corporations in the chemical manufacturing industry).²⁰ Those formulas do not account for multiyear development periods or failure risks. (In the next section of this report, CBO introduces a new measure that takes those factors into account.) Furthermore, the method used to compute the average ETR in a broader category (for example, all R&D) has been modified in this report to incorporate various nontax factors, such as how assets in that category are typically financed, that affect the tax burden on each type of intangible asset.

General Characteristics of Effective Tax Rates

ETRs are commonly used as a measure of how much a tax system deters investment or otherwise distorts investment decisions. An important component of the ETR is the tax wedge (the percentage-point difference between before- and after-tax rates of return on an investment). The ETR (derived by dividing the tax wedge by the before-tax rate of return) represents the percentage change in the rate of return due to taxes.²¹ The characteristics of ETRs discussed below also apply to tax wedges.

For purposes of the analysis in this report, ETRs have the following properties:

- They are forward-looking—that is, they measure how taxes distort investment decisions that have yet to be made.
- They focus on the marginal (or “break-even”) investment—one that is expected to earn just enough to yield the after-tax market rate of return. The after-tax market rate of return does not vary by type of asset, industry, or form of organization, but the hurdle rate (the before-tax rate of return that must be

achieved to justify an investment) does: The greater the tax wedge, the higher the hurdle.

- They can be calculated separately for different types of assets in different industries, for different forms of organization (C corporations and pass-through entities), and for different combinations of debt and equity financing. Thus, they are useful for comparing the tax burden among those categories of potential investments.

Given those properties, CBO’s estimates of ETRs cannot be used for the following types of analyses:

- Evaluating the tax burden on existing investments,
- Evaluating prospective investments for which the average expected rate of return (after factoring in development periods and failure risks) is above the market rate, or
- Comparing the tax burden among taxpayers in different income or age groups.

CBO simplified its estimation of ETRs in several ways that are consistent with its approach in *Taxing Capital Income*. Specifically, CBO’s calculations apply only to domestic investment by U.S. residents. They do not account for the tax implications of selling assets before the end of their useful life. The estimates do not reflect changes in taxpayers’ behavior in response to changes in the tax law, nor do they account for noncompliance with current law. Furthermore, the estimates apply the tax structure in place in the year of the investment to income and deductions throughout the useful life of an asset, even if that structure is scheduled to change (as it is, for example, in 2026 under the 2017 tax act). Finally, CBO’s calculations do not include the estate and gift tax or state and local income taxes.

In its analysis of pre-2018 law, CBO disregarded tax provisions that were scheduled to expire because they would not have the same effect on investment decisions in the future as they had in 2017. Most notably, the calculations did not cover the provision in effect in 2017 that allowed 50 percent of the cost of most equipment to be expensed. That rate was scheduled to decline in 2018 and 2019, after which the provision was to expire altogether. Also excluded was a provision allowing up to \$15 million of investment in the production of

20. For information about the derivation of those formulas, see Congressional Budget Office, *Computing Effective Tax Rates on Capital Income* (December 2006), pp. 2–24, www.cbo.gov/publication/18259.

21. With respect to C corporations, an ETR can represent the tax burden at the entity level or at the level of the investor who pays taxes on dividends and capital gains. In this report, ETRs always represent the tax burden at the investor level. (For an explanation of how the individual income tax rate faced by investors was determined, see “Marginal Tax Rates” in Appendix A of *Taxing Capital Income*, pp. 33–34.) ETRs representing the tax burden at the entity level are presented in the supplemental material posted online with this report.

motion pictures to be expensed, because it was scheduled to expire in 2018.

Categories of Effective Tax Rates

Because of the different ways that capital income is taxed, CBO's estimation of ETRs (and tax wedges) accounted for various features of investments, as follows:

- Source of financing (equity or debt),
- Type of asset (59 tangible and 20 intangible types),
- Industry in which an asset is deployed (62 industries), and
- Form of organization (C corporation or pass-through entity).

CBO computed ETRs for every combination of characteristics in those categories. To summarize those results, CBO also calculated average ETRs for broader categories (for example, all R&D investments, all equity-financed investments, and all investment by C corporations), generally by using weighted-average values of the various components.

The weights used were based on the distribution of assets in the economy in 2012. The weights account for differences in how each type of asset is typically financed and how it is distributed among forms of organization and industries.²² As a result, CBO could examine how those factors—in addition to the tax code—affect the taxation of each type of intangible asset.²³ The disadvantage of

that approach, however, is that by introducing nontax factors, the variation among categories that is due solely to the tax code cannot be observed. (For an assessment of the uniformity of tax burdens among asset types that is independent of nontax factors, see Appendix B.)

Effective Tax Rates by Form of Organization and Source of Financing

The ETR of 3 percent for intangible assets represents an average over all types of intangible assets, forms of organization, and sources of financing. ETRs for different forms of organization and sources of financing varied considerably but followed predictable patterns. For example, for every combination of organizational form and source of financing, the ETR on income from intangible assets was lower than that on income from investment in tangible assets (see Table 4). That finding reflects that expensing is more often used to recover the costs of investments in intangible assets than the costs of investments in tangible assets.

Otherwise, most of the patterns reported in *Taxing Capital Income* for tangible assets held for intangible assets as well. The ETR for debt-financed investment was lower than that for equity-financed investment, regardless of businesses' form of organization, because of the deductibility of interest payments. Furthermore, for equity-financed investments in both tangible and intangible assets, the ETR for C corporations was higher than that for pass-through entities because corporate income is taxed at both the entity and the individual level.²⁴ The ETRs on income from debt-financed investments, however, were lower (meaning more negative) for C corporations than for pass-through entities because the marginal tax rate at which interest could be deducted was higher for C corporations—thus, the deduction was worth more to C corporations than to pass-through entities.

22. Although data on the source of financing by asset type are not available, differences in debt-financed shares of investment among industries (ranging from less than 15 percent for agriculture other than farms to over 80 percent for nursing and residential facilities) can be inferred from balance sheets submitted with business tax returns. CBO estimated those shares for each type of asset by multiplying the share specific to each applicable industry by that industry's share of the asset and summing over all industries. Debt-financed shares of investment by industry and form of organization are presented in the supplemental material posted online with this report.

23. In *Taxing Capital Income*, CBO used a different weighting method that was designed to isolate the tax differences among types of assets and industries. For example, CBO weighted each source of financing by the typical mix of financing sources among all asset types (roughly one-third debt and two-thirds equity) so that disparities in ETRs among asset types would reflect only differences in how the tax code treats each asset type—not differences in how each asset type is typically financed.

24. The difference in the ETRs on income from equity-financed investments in tangible assets by C corporations and pass-through entities is smaller than that shown in *Taxing Capital Income* for three reasons. First, that report excluded the Self-Employment Contributions Act taxes paid by certain owners of pass-through entities. Including those taxes increases the ETR on pass-through entities but not C corporations, thereby narrowing the gap between them. Second, rising inflation-adjusted incomes between 2012 (the year for which ETRs were estimated in the 2014 report) and 2017 pushed self-employed taxpayers into higher individual income tax brackets, which further narrows the gap. Third, the new weighting method (see the previous footnote) shifts more of the higher tax burden on land and inventories from C corporations to pass-through entities.

Effective Tax Rates by Type of Intangible Asset

CBO estimates that among all the intangible assets, purchased software had the highest ETR, at 37 percent (see Table 5). The rate was high because the applicable cost-recovery method (three-year amortization) is particularly unfavorable—even less favorable than would be recovering the cost in proportion to economic depreciation. Because both C corporations and pass-through entities recover the cost of purchased software using the same method, there was little difference in ETR by form of organization.

ELA originals had the next-highest ETR, at 31 percent. The difference by form of organization was greater for ELA originals than for purchased software because of variation in cost-recovery rules. Freelance writers, composers, and artists—who mostly organize their businesses as pass-through entities—are allowed to expense their costs, resulting in an ETR of 5 percent for that organizational form. By contrast, C corporations—which include most movie studios, record labels, and publishers—generally recover their costs using the income-forecast method, yielding an ETR of 33 percent.

A gap of 25 percentage points separated the ETRs for investments in ELA originals and ME&D. At 6 percent, the rate for ME&D was much lower than for purchased software and ELA originals, primarily because expensing can be used to recover more of the costs of development. ETRs for investments in ME&D by C corporations (6 percent) were higher than those for pass-through entities (1 percent) because of the additional layer of taxation (that is, on dividends and capital gains) and because a greater share of pass-through entities are eligible for full expensing.

Advertising-driven brand identity had an ETR of -2 percent because of the prevalence of both expensing and debt financing. For debt-financed investments (by both C corporations and pass-through entities), the deductibility of interest pushed the ETR to rates substantially below zero. For investments funded entirely through equity by pass-through entities, the use of expensing as the sole method of recovering the cost of advertising resulted in an ETR of zero. Thus, for typically financed investments, the ETR was negative. For equity-financed investments by C corporations, however, the ETR was positive because of the individual-level taxes on dividends and capital gains, which are not affected by the cost-recovery method. Nevertheless, the positive ETR for

equity-financed investments did not offset the negative ETR for debt-financed investments, so the ETR for typically financed investments in brand identity by C corporations was negative.

In the absence of the R&E credit, the ETRs on R&D would have been similar to those on advertising-driven brand identity. The precredit ETR for typically financed investments in R&D was slightly higher than that for investments in advertising, reflecting the different mix of organizational forms and sources of financing—R&D is more likely to be undertaken by C corporations and to be equity financed than is advertising. With the R&E credit in place, the ETR on R&D dropped to -31 percent and was negative even for equity-financed investments of C corporations (-14 percent).

Capturing the Tax Effects of Multiyear Development Periods and the Risk of Failure

Although ETRs and tax wedges as calculated in *Taxing Capital Income* are reliable measures of the tax burden associated with different cost-recovery methods, they do not adequately capture the effects of multiyear development periods or the risk of failure.²⁵ Those phenomena require an investor to consider rates of return in three different states in order to decide whether to invest:

- *The development state*, in which the investment temporarily generates no return, although its success is anticipated;
- *The failure state*, in which the investment does not generate any return, and success is no longer anticipated; and
- *The success state*, in which an investment generates an above-market return offsetting the lack of returns in the development and the potential failure state.²⁶

The overall after-tax rate of return required to induce investment—calculated as a weighted average of the rates

25. The analysis in this section does not apply to prepackaged software, which can be placed in service as soon as it is purchased and carries a negligible risk of failure.

26. Investments in intangible assets can also be only partially successful. However, the method for estimating tax burdens when the possible outcomes encompass total success, total failure, and one or more outcomes in between is not fundamentally different from the method for estimating tax burdens when total success and total failure are the only possible outcomes.

Table 5.

Effective Tax Rates and Standard Tax Wedges for Capital Income Under Pre-2018 Law, by Form of Organization, Source of Financing, and Type of Intangible Asset

	Effective Tax Rate (Percent)		Standard Tax Wedge (Percentage points)	
	Typically Financed ^a	Equity Financed	Typically Financed ^a	Equity Financed
All Businesses				
All Intangible Assets ^b	3	10	0.1	0.6
Purchased software	37	40	2.5	3.3
Research and development with the R&E tax credit	-31	-16	-1.0	-0.7
Research and development without the R&E tax credit	*	7	**	0.4
Entertainment, literary, and artistic originals	31	37	1.8	2.8
Mineral exploration and development	6	11	0.3	0.6
Brand identity arising from advertising	-2	6	-0.1	0.3
C Corporations				
All Intangible Assets ^b	4	11	0.2	0.6
Purchased software	37	41	2.5	3.3
Research and development with the R&E tax credit	-29	-14	-1.0	-0.6
Research and development without the R&E tax credit	1	8	**	0.4
Entertainment, literary, and artistic originals	33	38	2.0	3.0
Mineral exploration and development	6	11	0.3	0.6
Brand identity arising from advertising	-1	8	**	0.4
Pass-Through Entities				
All Intangible Assets ^b	-7	-1	-0.3	-0.1
Purchased software	35	36	2.2	2.7
Research and development with the R&E tax credit	-54	-38	-1.5	-1.3
Research and development without the R&E tax credit	-4	0	-0.2	0
Entertainment, literary, and artistic originals	5	15	0.2	0.8
Mineral exploration and development	1	3	0.1	0.2
Brand identity arising from advertising	-6	0	-0.2	0

Source: Congressional Budget Office.

The effective tax rate is the tax wedge divided by the before-tax rate of return that must be achieved to justify an investment. The tax wedge is the difference between the before-tax rate of return and the after-tax rate of return; the standard measure represents circumstances in which an investment's development period is less than one year and there is no risk of failure.

CBO's computations account for only the permanent features of tax law in effect during 2017. They exclude provisions of pre-2018 tax law that were scheduled to expire and provisions of the 2017 tax act.

R&E = research and experimentation; * = between -0.5 and 0.5 percent; ** = between -0.05 and 0.05 percentage points.

a. Debt-to-equity ratios vary by industry, but they average roughly one-third debt and two-thirds equity.

b. Includes the effects of the R&E tax credit.

in those three states—is necessarily the same as the rate that applies when there is no development period and no risk (the *standard after-tax rate of return*). Thus, any measure of the tax burden calculated using the overall after-tax rate of return cannot capture the effects of multiyear development periods and risk of failure. To capture those

effects, CBO estimated an alternative measure of the tax burden using the before- and after-tax rates of return in the success state.

Data on development periods and failure rates are sparse for most types of assets. To illustrate the effects of those

factors, CBO focused on three examples for which such data were available:

- Development of oil wells by integrated companies (that is, companies that own refineries or retail outlets in addition to drilling for oil),
- R&D of new drugs, and
- Development and production of motion pictures.

Defining the Success-State Tax Wedge

For businesses that are both established and profitable, ETRs do not always capture the additional tax burden resulting from an increase in the risk of failure or development time. The clearest illustration of that is the case of a risky investment for which no R&E credit is allowed. If the hurdle rate on a risk-free investment is 6 percent and the market after-tax rate of return is 4 percent, the tax wedge is 2 percentage points ($6 - 4$) and the ETR is 33.3 percent ($[(6 - 4) \div 6]$). If there is a 50 percent risk of failure, however, the before- and after-tax rates of return in the success state must be twice as high to compensate for the risk.²⁷ Nevertheless, the ETR is still 33.3 percent ($[(12 - 8) \div 12]$). Thus, ETRs are not useful for measuring the tax burden in the presence of failure risk. There are also conditions under which ETRs do not accurately reflect the tax burden on investments with multiyear development periods.

Although ETRs cannot consistently reflect the impact of taxes on investments with long development periods and failure risks, tax wedges can. In the hypothetical scenario above, the tax wedge in the absence of risk was 2 percentage points ($6 - 4$). When the risk of failure rose from zero to 50 percent, the tax wedge doubled. Similarly, the longer it takes to develop a product, the greater the magnification of the tax wedge.

In the presence of multiyear development periods and failure risks, whether an investment will be undertaken is determined by the hurdle rate that must be achieved in the success state—that is, conditional on the completion of development and the success of the investment (in contrast to the standard hurdle rate that applies when development durations are short and

success is guaranteed). Those are the only conditions under which a positive return is realized, and it must be high enough to make up for any shortfall experienced during the development period or if the investment fails. In this report, therefore, CBO calculated estimates of the *success-state tax wedge*—that is, the difference between the before- and after-tax rates of return in the success state. Note that in addition to the success-state tax wedge, the hurdle rate also encompasses changes to the after-tax rate of return required to compensate for the lack of a return in the development and failure states (the *development-period wedge* and the *risk wedge*, respectively).

In *Taxing Capital Income*, CBO did not refer to success-state tax wedges, although that concept was implicitly embedded in the analysis. The estimates of the tax burden associated with tangible assets treated the before- and after-tax rates of return as fixed values that apply with certainty in every year of an asset's useful life, beginning in the year the investment is made. That treatment is consistent with the nature of tangible assets: They are typically acquired and placed in service in less than a year, their quality is predictably high, and their prospects for being resold mitigate the risk of failure.²⁸ Thus, the success-state tax wedge for tangible assets is roughly equal to the standard tax wedge.

For this analysis, CBO decomposed the success-state tax wedge into three components:

- The standard tax wedge,
- The contribution of the development period, and
- The contribution of failure risk.

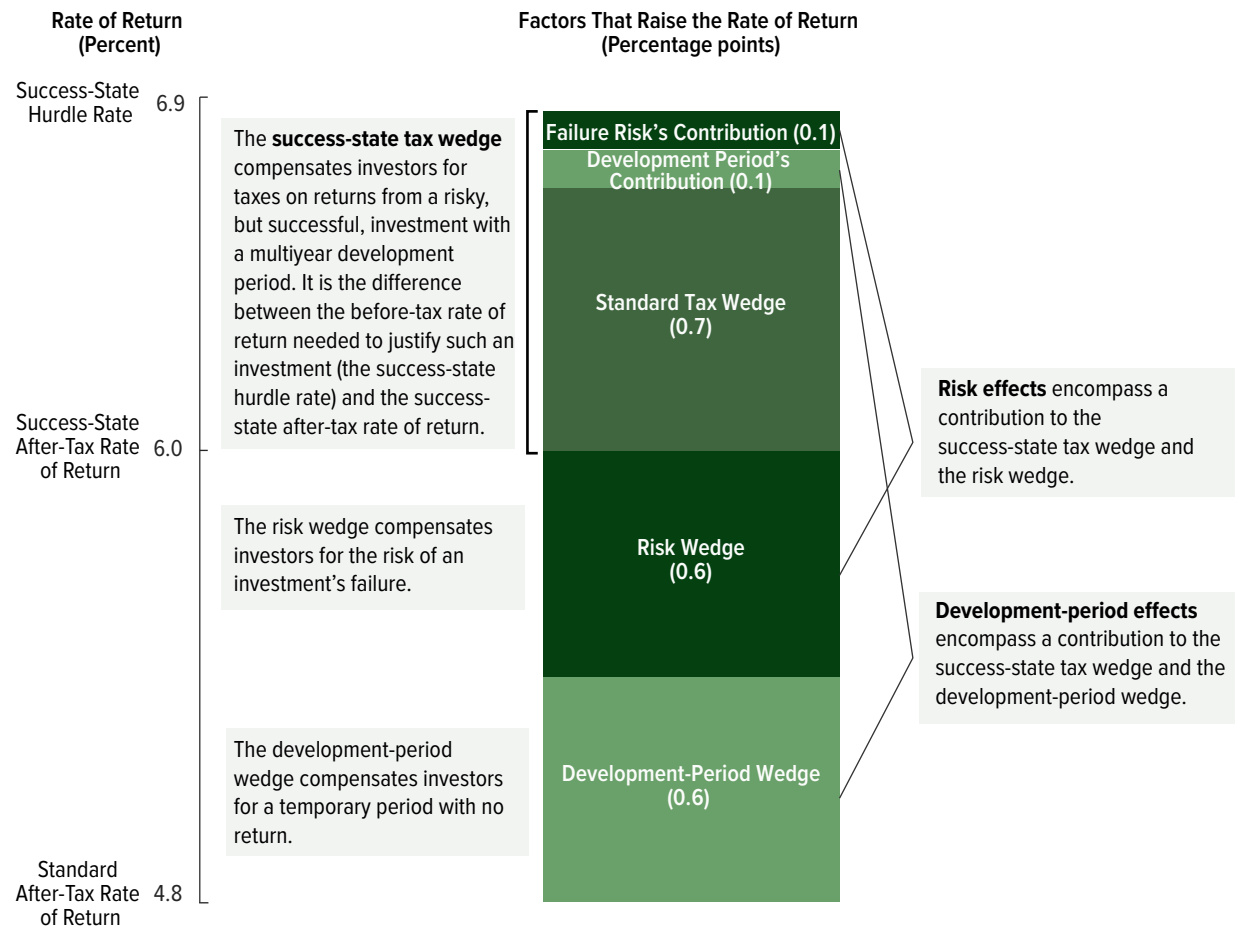
For established profitable businesses, the success-state tax wedge is the sum of those three components (see Figure 3). Start-up companies face even higher success-state tax wedges. Unlike established profitable businesses, which typically have income from other projects against which to apply cost-recovery and interest deductions, start-up companies must defer their deductions until at least the end of the development period.

27. If the investor is risk-averse, however, an investment with a 50 percent risk of failure would have to yield an after-tax rate of return in the success state that is more than double the market rate. CBO did not include a premium to account for risk aversion.

28. For examples of earlier ETR studies that follow the same convention, see James B. Mackie III, "Unfinished Business of the Tax Reform Act of 1986," *National Tax Journal*, vol. 55, no. 2 (June 2002), pp. 293–338, and Jane G. Gravelle, *The Economic Effects of Taxing Capital Income* (MIT Press, 1994).

Figure 3.

Factors Raising the Rate of Return Needed to Justify Investment Above the Standard After-Tax Rate of Return, Using the Case of Oil Well Development



Source: Congressional Budget Office.

The standard tax wedge compensates investors for the taxes due on the returns from a risk-free investment with a development period of less than one year. It is the difference between the before-tax rate of return that must be achieved to justify such an investment and the standard after-tax rate of return.

Development Period Effects. For most intangible assets, the before- and after-tax rates of return are not fixed over the life of the asset. When development periods are longer than a year, for example, the overall after-tax rate of return on marginal investments, from an investor's point of view, must still be roughly equal to the returns on a comparable index fund. But the overall after-tax rate is an average of the zero rate of return in the development state (when no income is earned) and the above-market rate of return in the postdevelopment period that is necessary to compensate for the lack of income in the development state (see Box 1). Only the latter rate is used in calculating the success-state tax wedge. The amount by which the difference between

the above-market before- and after-tax rates of return in the postdevelopment period exceeds the standard tax wedge is the development period's contribution to the success-state tax wedge. The difference between the postdevelopment and standard after-tax rates of return constitutes the development-period wedge (see Figure 3).

Risk Effects. Another difference between tangible assets and intangible assets is that investments in intangible assets are more likely to fail. When there is a risk of a project's failing, the overall after-tax rate of return must be a weighted average of a rate that reflects the asset's loss of value in the failure state and an above-market rate that must be achieved in the success state to compensate for

Box 1.

Calculating Overall After-Tax Rates of Return on Investments in Intangible Assets With Multiyear Development Periods and Failure Risks

The calculation of the required after-tax rate of return for a marginal investment is based on the premise that the present value of future income must exactly offset the present value of the investment cost. A present value is a single number that expresses a flow of current and future income, or payments, in terms of a lump sum received, or paid, today; the present value depends on a discount rate that is used to translate future cash flows into current dollars. In this example, the discount rate is 4.8 percent, meaning that a nominal value of \$1,048 available one year from now is equivalent to a present discounted value of \$1,000.

The least complicated calculation is for a risk-free investment without a development period. To earn a 4.8 percent rate of return on an investment of \$100,000, the investor must receive \$4,800 in net annual income in perpetuity beginning in the year after the investment is made. Although that implies an infinite amount of nominal income, the application of the discount rate to income earned in each subsequent year reduces the present value of that income such that the sum of present values for all years equals \$100,000.

To calculate the success-state tax wedge, it is necessary to first identify the after-tax rate of return that must be realized once an investment has “succeeded”—that is, completed its development and begun generating income. The wedge between the after-tax rate of return in the success state and the standard after-tax rate of return (which is the same as the discount rate) consists of two parts: a development-period wedge and a risk wedge.

To understand the development-period wedge, it is simplest to consider a case in which the investment does not generate any income during the development period. If the investment in the first year of a five-year development period is \$100,000, then the investor must receive \$5,790 ($\$4,800 \times 1.048^4$) annually in perpetuity beginning in the fifth year after the investment. The return in excess of 4.8 percent is required to compensate the investor for the returns that could have been earned by investing in an index fund of equities yielding a 4.8 percent rate of return and holding it for five years instead of forgoing income over that period. Although the postdevelopment after-tax rate

of return would be 5.8 percent, the *average* after-tax rate of return, including over the development period, would still be 4.8 percent. The difference between those two rates (1 percentage point) is the development-period wedge.

A more realistic scenario would be for the investor to spread the \$100,000 investment out over the five-year period. In that case, the return required on the second year’s investment would be less than that required on the first year’s investment because the period before income was realized would be shorter. The same would be true in each subsequent year. As a result, the investor would have to realize a postdevelopment rate of return of 5.3 percent in order to achieve an average after-tax return rate of 4.8 percent. In this case, the development-period wedge is 0.5 percentage points (5.3 – 4.8).

The risk of failure introduces another consideration for investors. If there is some probability that the investor will never receive income from an investment, that risk must be offset by an even higher return in the event that the investment is successful. If there is a 50 percent chance that the \$100,000 investment spread out over five years would fail, an investor who is indifferent to risk must realize a success-state rate of return of 10.6 percent—double the rate required if the success of the investment was assured (a risk-averse investor would require an even higher return). The *expected* postdevelopment rate of return, however, remains at 5.3 percent—the result of equally weighting the rates of return under two possible outcomes: zero in the case of failure and 10.6 percent in the case of success. The difference between those two rates (5.3 percentage points) is the risk wedge. Furthermore, the *average expected* (or overall) rate of return, including losses during the development period, remains 4.8 percent.

To summarize, the required after-tax rate of return in the success state (10.6 percent) is equal to the sum of the discount rate (4.8 percent), the development-period wedge (0.5 percentage points), and the risk wedge (5.3 percentage points). From that base, one can proceed to estimate the success-state tax wedge, including the portions attributable to the development period and failure risk.

the lack of a return in the failure state, with the weights reflecting the probability of each outcome. The failure risk's contribution to the success-state tax wedge is the amount by which the success-state tax wedge exceeds the sum of the standard tax wedge and the development period's contribution to the success-state tax wedge. The difference between the postdevelopment after-tax rate of return on a successful investment that is subject to failure and the postdevelopment after-tax rate of return on a risk-free investment constitutes the risk wedge (see Figure 3).²⁹

Additional Effects on Start-Up Businesses. The development period has a greater effect on the success-state tax wedge for start-up businesses because they do not benefit from deductions for cost recovery and interest payments until that period is over.³⁰ At that point, the businesses will start earning income on a successful investment, and those deferred deductions can be used to reduce the amount that is taxable. But delaying the deductions reduces their value and increases the tax wedge—the longer the delay, the larger the increase in the tax wedge. Furthermore, in the case of failure, those deductions may never be claimed. Appendix C contains estimates of the postdevelopment tax wedges faced by start-up companies.

Illustrating Success-State Tax Wedges

Three examples illustrate the effects of development periods and failure risks on success-state tax wedges:

- Development of oil wells by integrated companies with a 6-year development period and 10 percent failure rate,
- R&D of a new drug with a 12-year development period and 90 percent failure rate, and

- Development and production of motion pictures with a 3-year development period and a hypothetical 50 percent failure rate.³¹

The success-state tax wedges presented for those examples apply to equity-financed investments of established profitable C corporations.³² The patterns evident for C corporations also hold for pass-through entities, but the success-state tax wedges are much smaller.

Oil Well Development. Among the three examples, it was investments in oil well development by integrated companies for which the duration of development and the failure rate had the smallest impact on the success-state tax wedge. The standard after-tax rate of return and tax wedge, which ignore those factors, were 4.8 percent and 0.7 percentage points, respectively, resulting in a standard hurdle rate of 5.5 percent (see Table 6).³³ The six-year development period and the 10 percent failure rate combined to increase the required after-tax rate of return by 1.2 percentage points (the sum of the 0.6-percentage-point development-period wedge and 0.6-percentage-point risk wedge). Each also magnified the effect of taxes by 0.1 percentage points,

29. The development-period wedge and the risk wedge are not independent of each other. Their interaction is included with the risk wedge reported in the text and in Table 6.

30. The end of the development period does not necessarily signal the beginning of profitability, even for successful investments. For convenience, however, CBO treats the length of the development period and the delay prior to profitability as being the same. CBO's treatment is consistent with that of previous literature on effective tax rates, in which investments are routinely deemed to generate profits in the first year after investment.

31. One study that estimated an 11.8-year development period for new drugs is cited in footnote 8. The 6-year development period for oil wells is near the midpoint of a range provided by one oil company in its breakdown of the entire exploration-development-production cycle (see <https://tinyurl.com/y8qu3tut>). The 3-year development (and production) period for motion pictures corresponds to a value reported to the Securities and Exchange Commission by one studio (see <https://tinyurl.com/yb3nfvkk>). Studies that show a failure rate for new drugs of around 90 percent are listed in footnote 9. The 10 percent failure rate for oil wells is extrapolated from the trend in dry holes as a percentage of exploratory oil wells between 2003 and 2009 (see U.S. Energy Information Administration, Performance Profiles of Major Energy Producers 2009, Table T-23, <https://tinyurl.com/ybu7kyqs>). Less information is available on the failure rate in the motion-picture industry; the 50 percent failure rate is for illustrative purposes.

32. CBO did not extend the analysis of the effect of development periods and failure rates to debt-financed investment. The notion of an above-market rate of return that compensates for the lack of income during development or loss of income from failed investments generally does not apply in that context because the interest rate is fixed—that is, not linked to the success of the investment, as the rate of return on equity is.

33. The three industry-asset combinations examined in this section are examples of the many combinations represented in the five broader categories of asset types listed in Table 5. Thus, the estimates in Table 6 do not match those in Table 5.

Table 6.

Rates of Return and Tax Wedges for Three Types of Investments in Intangible Assets

	Oil Well Development ^a	New Drug Research and Development ^b	Motion Picture Development and Production ^c
Success-State After-Tax Rate of Return			
Standard after-tax rate of return (Percent)	4.8	4.8	4.8
Development-period wedge ^d (Percentage points)	0.6	1.4	0.2
Risk wedge ^e (Percentage points)	0.6	55.6	5.0
Total (Percent)	<u>6.0</u>	<u>61.8</u>	<u>10.0</u>
Success-State Tax Wedge			
Standard tax wedge (Percentage points)	0.7	-0.9	3.1
Development period's contribution ^f (Percentage points)	0.1	0.1	0.1
Failure risk's contribution ^g (Percentage points)	0.1	1.2	1.5
Total (Percentage points)	<u>0.9</u>	<u>0.4</u>	<u>4.7</u>
Success-State Hurdle Rate (Percent)	<u>6.9</u>	<u>62.2</u>	<u>14.7</u>

Source: Congressional Budget Office.

The tax wedge is the difference between the before-tax rate of return that must be achieved to justify an investment (referred to here as the “hurdle rate”) and the after-tax rate of return. Success-state measures represent circumstances in which investments are successful after a multiyear development period despite a risk of failure; standard measures represent circumstances in which investments have a development period of less than one year and no risk of failure.

Reported values apply to equity-financed investments by C corporations. CBO’s computations account for only the permanent features of tax law in effect during 2017. They exclude provisions that were scheduled to expire and provisions of the 2017 tax act.

- a. Results in this category apply to integrated oil and gas companies (that is, those that also own refineries or retail outlets) and reflect a 6-year development period and 10 percent failure rate.
- b. Results in this category reflect a 12-year development period and 90 percent failure rate.
- c. Results in this category reflect a 3-year development period and 50 percent failure rate.
- d. Equal to the difference between the postdevelopment after-tax rate of return (applying to investments with a multiyear development period and no risk of failure) and the standard after-tax rate of return.
- e. Equal to the difference between the success-state after-tax rate of return and the postdevelopment after-tax rate of return. Includes the interaction with the development-period wedge.
- f. Equal to the difference between the postdevelopment tax wedge (applying to investments with a multiyear development period and no risk of failure) and the standard tax wedge.
- g. Equal to the difference between the success-state tax wedge and the postdevelopment tax wedge. Includes the interaction with the development period’s contribution to the success-state tax wedge.

causing the success-state tax wedge to be 0.9 percentage points—0.2 percentage points higher than the standard tax wedge. Accounting for the development period and the risk of failure, the success-state hurdle rate was 6.9 percent.

New Drug Research and Development. In the case of R&D of a new drug, the development period and, in particular, the very high risk of failure play a much bigger role in determining the success-state tax wedge. The standard after-tax rate of return and tax wedge were 4.8 percent and -0.9 percentage points, respectively.

(The standard tax wedge was negative because the R&E tax credit provides a subsidy for the investment.) The 12-year development-period wedge increased the required after-tax rate of return by 1.4 percentage points. That effect was dwarfed by the impact of the very high failure rate of 90 percent, which created a risk wedge of another 55.6 percentage points—resulting in a success-state after-tax rate of return of 61.8 percent. Additionally, the riskiness of the investment more than offset the effect of the R&E tax credit, making the success-state tax wedge positive, at 0.4 percentage points. The success-state hurdle rate was 62.2 percent—more

than 63 percentage points higher than if the development time and failure risk had not been factors.

Motion Picture Development and Production. The example of motion picture development and production falls between the other two, even though it has the shortest development period. The standard tax wedge and hurdle rate that apply to such activity were 3.1 percentage points and 7.9 percent, respectively—higher than the standard tax wedge and hurdle rate for the other two examples because expensing was not available as a cost-recovery method. Mainly because of the 50 percent failure rate, the success-state tax wedge rose to 4.7 percentage points. Under those conditions, the success-state hurdle rate that must be cleared by a motion picture investment was 14.7 percent.

Effects of Certain Provisions of the 2017 Tax Act

The 2017 tax act contains three provisions relevant to the specific intangible assets covered in this report:

- Bonus depreciation, which is extended through 2026, is also expanded in scope to include the development and production of motion pictures and television programs;
- Research and development and the in-house development of software must be amortized over five years, beginning in 2022; and
- The credit rate for the orphan drug credit is reduced by half.

Several other provisions apply to all capital income and have a noticeable effect on ETRs on income from investment in intangible assets. The most notable of those are:

- The statutory tax rate on all taxable corporate income is set at 21 percent—a 14-percentage-point reduction from the top rate under pre-2018 law;
- The statutory tax rates on taxable individual income are temporarily reduced through 2025;
- Section 179 expensing is permanently increased; and
- The rate of bonus depreciation is temporarily increased, relative to pre-2018 law, through 2026.

Other features of the 2017 tax act will probably affect ETRs and success-state tax wedges for certain types of investments in both tangible and intangible assets, but those provisions are complicated, and their interpretation and implementation by both businesses and the Internal Revenue Service are still evolving.³⁴ They include limitations on the deductibility of interest expenses and a temporary deduction of 20 percent of the net income of pass-through entities. Rather than delve into the complexities inherent in those two provisions, this analysis illustrates the effects of the 2017 tax act by focusing on equity-financed investments of C corporations. CBO calculated ETRs and tax wedges under the provisions in effect in 2022 (the only year in which all three provisions specifically targeting intangible assets apply) and in 2027 (the first year in which only the permanent provisions—that is, those not identified above as temporary—are still in effect).³⁵

Effects on Effective Tax Rates by Type of Intangible Asset

The provisions of the 2017 tax act in effect in 2022 (hereafter, 2022 law) have little net impact on the ETR for all equity-financed investments in intangible assets by C corporations. That measure, which does not account for development periods or failure risks, rises from 11 percent to 12 percent (see Table 7). Under the permanent provisions of the act (hereafter, post-2026 law), however, the corresponding ETR rises to 15 percent. That stands in contrast to the ETR for tangible assets, which declines from 35 percent to 24 percent. Furthermore, the 2017 tax act's effects differ significantly among types of intangible assets.

Purchased Software. The ETR for purchased software declines significantly under 2022 law—from 41 percent to 22 percent—because the increase in the rate of

34. See, for example, Howard Gleckman, “Uncertainty Around Tax Overhaul May Lead Taxpayers to Push The Envelope,” *Forbes* (April 5, 2018), <https://tinyurl.com/y99j4rrs>.

35. The effect of temporary provisions on the estimates of ETRs and tax wedges typically depends on whether investors view those provisions as truly temporary or assume that they will be made permanent. In 2022, only one temporary provision—bonus depreciation—affects the ETRs and tax wedges for C corporations' equity-financed investments in intangible assets. If corporations use bonus depreciation and thus immediately recover all the costs of investments made in that year, they will not be required to use the less favorable cost-recovery methods in future years. As a consequence, they are indifferent to the cost-recovery methods in place after 2022, so it does not matter whether they view bonus depreciation as temporary.

Table 7.

Effective Tax Rates and Standard Tax Wedges on Capital Income Under Pre-2018 Law and the 2017 Tax Act, by Type of Asset

	Pre-2018 Law ^a	Provisions of the 2017 Tax Act in Effect in 2022	Permanent Provisions of the 2017 Tax Act ^b
Effective Tax Rate (Percent)			
All Intangible Assets ^c	11	12	15
Purchased software	41	22	28
Research and development with the R&E tax credit	-14	11	11
Research and development without the R&E tax credit	8	25	25
Entertainment, literary, and artistic originals	38	13	27
Mineral exploration and development	11	10	10
Brand identity arising from advertising	8	8	8
All Tangible Assets	35	21	24
Standard Tax Wedge (Percentage points)			
All Intangible Assets ^c	0.6	0.6	0.8
Purchased software	3.3	1.3	1.9
Research and development with the R&E tax credit	-0.6	0.6	0.6
Research and development without the R&E tax credit	0.4	1.6	1.6
Entertainment, literary, and artistic originals	3.0	0.7	1.8
Mineral exploration and development	0.6	0.5	0.5
Brand identity arising from advertising	0.4	0.4	0.4
All Tangible Assets	2.6	1.3	1.5

Source: Congressional Budget Office.

The effective tax rate is the tax wedge divided by the before-tax rate of return that must be achieved to justify an investment. The tax wedge is the difference between the before-tax rate of return and the after-tax rate of return; the standard measure represents circumstances in which an investment's development period is less than one year and there is no risk of failure.

Reported values apply only to equity-financed investments by C corporations.

R&E = research and experimentation.

- a. CBO's computations account for only the permanent features of tax law in effect during 2017. They exclude provisions that were scheduled to expire.
- b. The permanent provisions of the 2017 tax act apply in 2027 and beyond.
- c. Includes the effects of the R&E tax credit.

bonus depreciation to 100 percent applies to prepackaged software (although not to custom software). The bonus depreciation percentage is gradually scaled back from 2023 to 2026 and is zero in all subsequent years. Without bonus depreciation, the ETR is 28 percent under post-2026 law—still lower than under pre-2018 law because of the lower statutory tax rates and the permanent expansion of section 179 expensing.³⁶

Research and Development. For investments in R&D, the 2017 tax act has a very different effect. The ETR for R&D significantly increases from -14 percent to 11 percent under both 2022 law and post-2026 law because five-year amortization replaces expensing as the cost-recovery method for this category of assets. Excluding the R&E credit, the increase would be from 8 percent to 25 percent. That increase in the ETR would have been larger had the statutory tax rates not been lowered.

36. The permanent extension of section 179 expensing has a much greater impact on pass-through entities than on C corporations because pass-through entities tend to be smaller businesses whose

investment levels are more likely to fall below the threshold for section 179 eligibility.

Entertainment, Literary, and Artistic Originals. The pattern for ELA originals is similar to that for purchased software: The ETR declines from 38 percent to 13 percent under 2022 law but rises to 27 percent under post-2026 law. In each case, the permanent changes to the statutory tax rates contribute to the reduction in the ETR. As with purchased software, the greater decline under 2022 law reflects the temporary expansion of bonus depreciation (in this case, to motion picture and television program development and production). The expansion of section 179 expensing, however, does not apply to ELA originals.

Mineral Exploration and Development and Brand Identity Arising From Advertising. The 2017 tax act has little or no effect on investments in assets for which expensing is allowed under both past and current law. Mineral exploration and development is mostly expensed and thus is affected only minimally by the 2017 tax act. The ETR decreases from 11 percent to 10 percent, however, because some of the costs of investments in those types of intangible assets (most importantly, 30 percent of the development costs of integrated oil and gas companies) cannot be fully expensed and thus are sensitive to the change in the statutory tax rate. All investment in advertising is expensed under both pre-2018 law and the 2017 tax act, which eliminates any effect of the changes in the statutory tax rates on the ETRs for equity-financed investment.

Limitations of the Analysis. The above results cannot be generalized to pass-through entities or to debt-financed investment. The temporary reductions in statutory tax rates for pass-through entities are smaller than for C corporations under 2022 law (even when accounting for the 20 percent deduction of net income) and disappear altogether at the end of 2025. Thus, the ETR on income from equity-financed intangible assets is higher, on average, for pass-through entities than for C corporations

under both 2022 law and post-2026 law (which was not the case under pre-2018 law). The limits on interest deductions under the 2017 tax act and the lower statutory tax rates (which reduce the value of the remaining interest deductions) combine to generate higher ETRs, on average, on income from debt-financed intangible assets for both C corporations and pass-through entities than under pre-2018 law.

Implications for Assets With Multiyear Development Periods and Failure Risks

The effects of multiyear development periods and potential for failure on tax wedges differ among asset types. Just as the 2017 tax act has little impact on the ETR for ME&D, it has little impact on how multiyear development periods and failure risks affect the tax wedge and hurdle rate for oil well development (see Table 8). With respect to R&D in new drugs, however, the effect is somewhat different. Under pre-2018 law, the standard tax wedge was negative, and multiyear development periods and failure risks made the success-state tax wedge slightly positive (0.4 percentage points). The shift to five-year amortization under the 2017 tax act, however, results in a standard tax wedge of roughly zero; accounting for a multiyear development period and failure risk, the success-state tax wedge rises to over 5 percentage points—higher than that for either the development of oil wells or the development and production of motion pictures under both 2022 and post-2026 law.

The effect of the multiyear development period and failure risk on motion picture development and production follows the same pattern under the 2017 tax act as it did under pre-2018 law but with much lower tax wedges under 2022 law than under post-2026 law. Ultimately, the success-state hurdle rate for that type of assets is 10.9 percent under 2022 law and 13.0 percent under post-2026 law (in contrast to 14.7 percent under pre-2018 law).

Table 8.

Tax Wedges and Hurdle Rates for Three Types of Investments in Intangible Assets Under Pre-2018 Law and the 2017 Tax Act

	Pre-2018 Law ^a	Provisions of the 2017 Tax Act in Effect in 2022	Permanent Provisions of the 2017 Tax Act ^b
		Standard Tax Wedge (Percentage points)	
Oil Well Development ^c	0.7	0.6	0.6
New Drug Research and Development ^d	-0.9	*	0.1
Motion Picture Development and Production ^e	3.1	0.4	1.9
		Success-State Tax Wedge (Percentage points)	
Oil Well Development ^c	0.9	0.7	0.8
New Drug Research and Development ^d	0.4	5.0	5.1
Motion Picture Development and Production ^e	4.7	0.9	3.0
		Success-State Hurdle Rate (Percent)	
Oil Well Development ^c	6.9	6.7	6.7
New Drug Research and Development ^d	62.2	66.9	66.9
Motion Picture Development and Production ^e	14.7	10.9	13.0

Source: Congressional Budget Office.

The tax wedge is the difference between the before-tax rate of return that must be achieved to justify an investment (referred to here as the “hurdle rate”) and the after-tax rate of return. The standard measure represents circumstances in which an investment’s development period is less than one year and there is no risk of failure; the success-state measures represent circumstances in which an investment undertaken with a risk of failure is successful after a multiyear development period.

Reported values apply only to equity-financed investments by C corporations.

* = between zero and 0.05 percentage points.

a. CBO’s computations account for only the permanent features of tax law in effect during 2017. They exclude provisions that were scheduled to expire.

b. The permanent provisions of the 2017 tax act apply in 2027 and beyond.

c. Results in this category apply to integrated oil and gas companies (that is, those that also own refineries or retail outlets) and reflect a 6-year development period and 10 percent failure rate.

d. Results in this category reflect a 12-year development period and 90 percent failure rate.

e. Results in this category reflect a 3-year development period and 50 percent failure rate.

Defining Intangible Assets and Estimating Their Value

The term “intangible assets” means different things in different contexts. The Financial Accounting Standards Board—the entity that determines the rules that publicly traded corporations must follow when reporting profits to their shareholders—defines intangible assets (other than financial assets) as those “that lack physical substance.”¹ Assets were included in this report if they fell under that definition and met three additional criteria:

1. They were the result of a deliberate choice by the business to invest, rather than the by-product of the normal course of business (as occurs, for example, when a business develops relationships with suppliers or when employees acquire on-the-job experience);
2. The assets were new, which excludes assets purchased from other firms (except for prepackaged and custom software) or acquired as part of the purchase of an entire firm; and
3. Sufficient reliable data on the asset type’s value and economic depreciation (that is, the rate at which it declines in value because of obsolescence) were available to calculate an effective marginal tax rate (ETR).

Under those criteria, the set of intangible assets considered in this report bears little resemblance to that described in the tax code or reported by businesses to the Internal Revenue Service, even though those also meet

the Financial Accounting Standards Board’s definition (see Box A-1).

The Congressional Budget Office used information from a variety of sources to estimate the value of each type of intangible asset that meets the above criteria. Those values were used as weights when calculating an all-inclusive ETR for intangible assets. The exclusion of assets whose value could not be estimated because of insufficient data creates some bias in that calculation. The direction of that bias can be determined, but its precise magnitude cannot be.

Estimating the Value of Asset Types Covered in the Main Text

It is necessary to estimate the value of each type of asset, disaggregated by form of organization and industry, in order to weight the before- and after-tax rates of return used to calculate ETRs or tax wedges for aggregate categories. The calculation of ETRs in this report follows the formulas and specifications contained in Appendix A of CBO’s December 2014 report titled *Taxing Capital Income: Effective Marginal Tax Rates Under 2014 Law and Selected Policy Options* (hereafter referred to as *Taxing Capital Income*). As in that report, ETRs were first calculated for each combination of asset type, industry, and form of organization (referred to as “cells”). Then, the all-inclusive ETR and ETRs for aggregate categories were calculated using weighted averages of the components of the ETR formula (that is, the before- and after-tax rates of return), with the weights corresponding to each cell’s share of the total value of assets.

1. The fact that intangible assets are frequently rendered in physical form (such as films, books, compact discs, and product prototypes) does not make those assets tangible. Software, for example, is intangible whether it resides on a compact disc or has been loaded into a computer’s memory. The tangible assets, in those cases, are the compact disc and the computer, not the software. Similarly, the presence of software on a compact disc or computer does not render either asset intangible.

The values of tangible assets in this report were drawn from the same sources used in the earlier report, except that 2012 values were used instead of 2007 values wherever possible. In particular, values for equipment and structures by asset type and industry were taken from data published by the Bureau of Economic Analysis

Box A-1.

How Intangible Assets in This Report Differ From Those Referenced in Federal Tax Publications

Federal tax publications use the term “intangible assets” in two distinct ways. First, within the tax code, the term is reserved for assets listed in section 197. Second, most corporations and partnerships are required to report a value for intangible assets on the balance sheets they file with their tax returns. Although much of the value reported on the balance sheet is derived from the assets listed in section 197, a portion also comes from assets that are not. For example, other sections of the tax code address the tax treatment of investments in purchased software; investments in entertainment, literary, and artistic (ELA) originals; research and development (R&D); and mineral exploration and development (ME&D). The corresponding assets are never identified as “intangible” in the tax code, but purchased software, ELA originals, and certain assets arising from ME&D are nevertheless reflected on the balance sheets.

In several respects, the intangible assets listed in section 197 or reflected in the total value reported on balance sheets differ from those examined in this report. Some of the assets identified in section 197 (for example, goodwill, business books and records, and relationships with suppliers) are developed in the normal course of business rather than through deliberate investment and could be excluded from this report on that basis alone. Other section 197 assets may arise from deliberate investments that were excluded from this report because of insufficient data (for example, the value of a “workforce in place” may arise from deliberate investments in employee training). Some section 197 assets, however, including patents, copyrights, and brand names, are the direct result of deliberate investments that are covered in this report. Nevertheless, their values (if such detail were reported on balance sheets) would still not correspond to those presented in Table 2 for the following reasons:

- Section 197 assets do not appear on balance sheets until they are acquired by another firm. Intangible assets in this report, by contrast, are recognized when they are developed.
- In the first year a section 197 asset appears on a balance sheet, its value reflects the full acquisition cost. In this report, however, assets’ values are estimated solely from the amount invested and the estimated economic depreciation since the investment was made.
- In subsequent years, the values on the balance sheet (for both section 197 assets and those addressed in other

sections) reflect the cost-recovery deductions allowed under the tax code. Those deductions do not reliably correspond to the economic depreciation rates used in this report.

The Timing of Asset Recognition. In 2013, \$6.4 trillion in assets was reported on the balance sheets attached to tax returns, but \$1.2 trillion of that amount had already been amortized, leaving a net value of \$5.2 trillion. Assets covered in this report—specifically, purchased software, ELA originals, and the portion of ME&D subject to amortization—account for roughly 20 percent of that \$5.2 trillion. Most of the rest of the assets on the balance sheets were purchased (for example, patents that were transferred from one company to another) or obtained through mergers and acquisitions.¹ Such acquired assets are not explicitly identified in this report because they are not “new.”

Their exclusion, however, is mostly a matter of timing. Assets first recognized by the tax system when they are acquired by another firm were recognized for purposes of this report when they were developed by the original firm. For example, the value of patents that are transferred from one firm to another (which become assets on the balance sheet) should roughly reflect the cumulative R&D costs leading to the patented products (which are assets covered in this report). In this report, effective tax rates are calculated as if the firm making the original investment retains ownership of the asset for its entire useful life. Different values would be obtained if the tax consequences of asset transfers were included in the analysis.

Atypical Changes in Value. There are instances in which intangible assets have value that is captured on balance sheets but not in this report, even after adjusting for timing—namely, when an asset recognized upon acquisition per section 197 is more valuable than the economic depreciation rates used in this report would imply. An example would be brand names that have more value than would be estimated from the associated advertising and other marketing expenses. In such a case, this report would consider only the value of the brand identity arising from advertising and its typical depreciation. For tax purposes, however, the entire value of the brand name would be included on the balance sheet as an intangible asset

1. Section 197 mandates that when one firm acquires another, the difference between the purchase price and the value of assets on the acquired firm’s balance sheet be recorded as an intangible asset by the acquiring firm.

Box A-1.

Continued

How Intangible Assets in This Report Differ From Those Referenced in Federal Tax Publications

when either the brand name itself or the firm that developed it is acquired by another firm.

The Application of Cost-Recovery Rules. Most intangible assets are not recognized on balance sheets when they are originally created because the tax system allows firms to expense their costs. One purpose of the balance sheet is to keep track of assets that must be amortized in future years. Assets that have been expensed cannot also be amortized in the future, and hence their inclusion on the balance sheet would be inconsistent with its purpose.

Thus, balance sheets would typically omit assets arising from R&D and advertising, as well as ME&D assets derived from expensed “intangible drilling costs.” Over two-thirds of intangible assets included in this analysis fall into those three categories. Furthermore, the values of purchased software and ELA originals that are reflected in balance sheets are derived using tax rules for cost recovery, not the economic depreciation rates used to derive the values found in Table 2.

(BEA), and the value of land was taken from data published by the Bureau of Labor Statistics.² The value of inventories and the shares of equipment, structures, and land owned by C corporations and pass-through entities were based on data published by the Statistics of Income (SOI) division of the IRS.³

Intangible assets were not considered in *Taxing Capital Income*. In this report, their values were estimated using

2. Values for equipment and structures were drawn from the spreadsheet for “Residential Detailed Estimates” and those for the current cost of net stocks and investment under “Nonresidential Detailed Estimates,” Bureau of Economic Analysis, “Detailed Data for Fixed Assets and Consumer Durable Goods” (accessed August 10, 2015), <https://tinyurl.com/ybm7xg2y>. Values for land were drawn from the spreadsheet for capital by asset type for major sectors under “Capital Tables: 1987–2016 Detailed Capital Measures,” Bureau of Labor Statistics, “Download Tables of Multifactor Productivity Measures for Major Sectors and Manufacturing” (March 26, 2015), www.bls.gov/mfp/mprdownload.htm.
3. For C corporations, see Internal Revenue Service, “SOI Tax Stats—Corporation Complete Report” (February 16, 2018), Table 12, <https://go.usa.gov/xPdCC>. For S corporations, see Table 14 of the same document. For partnerships, see the spreadsheets under “Balance Sheet Items,” Internal Revenue Service, “SOI Tax Stats—Partnership Statistics by Sector or Industry” (June 20, 2018), <https://go.usa.gov/xPdCr>. For sole proprietorship inventories, see the spreadsheets under “Income Statements,” Internal Revenue Service, “SOI Tax Stats—Nonfarm Sole Proprietorship Statistics” (January 3, 2018), <https://go.usa.gov/xPdCj>. SOI does not report any other asset values for sole proprietorships. Those were imputed by applying, by industry, the ratio of depreciation deductions to depreciable assets (net of accumulated depreciation) for S corporations to the depreciation deductions of sole proprietors.

many of the same sources as for tangible assets. In some cases, however, those values had to be disaggregated to a greater extent than did the values for tangible assets because different types of cost-recovery methods apply to specific types of intangible assets within broader categories.

Purchased Software. BEA identifies three types of software: prepackaged, custom, and own-account (which is developed in-house). In this report, CBO grouped prepackaged and custom software together as purchased software because they are treated similarly by the tax code. Both are typically amortized over three years, although prepackaged software is eligible for expensing under section 179 and for bonus depreciation. Own-account software is treated by the IRS in the same manner as research and experimental expenses as defined in section 174 and is included in the research and development (R&D) asset type.⁴ Software that is preloaded onto a new computer is treated by both BEA and the IRS as part of the computer and is not considered an intangible asset.

Research and Development (Including Developed Software). BEA’s “Research and Development” category comprises 17 types of assets, most of which are defined by the industry in which they are found. For purposes of applying cost-recovery rules, the distinctions among those types of assets are largely unimportant—the full costs of all investments by taxable businesses are recovered in the same manner. Therefore, CBO combined the

4. See Rev. Proc. 2000-50, 2000-52 I.R.B. 601.

15 asset types that were owned by taxable businesses into a single R&D category. (Assets owned by private universities and other nontaxable entities were excluded from the analysis.)

Despite its name, the research and experimentation (R&E) credit covers a portion of investment in own-account software but does not cover all investment in R&D. Therefore, CBO divided both categories between the portion benefiting from the credit and the portion not benefiting from the credit. The splits were accomplished primarily by using SOI data on use of the R&E credit.

Although aggregate SOI data were available for both C corporations and pass-through entities, information on use of the R&E credit by industry was available only for C corporations (and was less detailed than the BEA data). SOI data on the credit-eligible expenses of S corporations and partnerships (for which no industry breakdown was available) indicated that those forms of organization accounted for approximately 10 percent of the total qualifying expenses in 2012. That figure could not be applied across all industries, however, because firms in different industries differ in their selection of organizational forms. For that reason, CBO identified two proxy measures from the SOI data to estimate credit-eligible R&E expenses by industry and by form of organization: depreciable assets (net of accumulated depreciation) and intangible assets (net of accumulated amortization).⁵ In aggregate, those measures imply that pass-through entities would be expected to account for 5 percent and 15 percent of credit-eligible expenses, respectively. Therefore, to approximate the aggregate target of 10 percent, CBO calculated, for each industry, an average of the shares of depreciable and intangible assets reported by pass-through entities, with the two shares given roughly equal weight in the computation.

After using that approach to split the expenses reported by BEA between the two forms of organization, CBO found that for some industries, its estimates of credit-eligible expenditures by C corporations for R&D and own-account software exceeded BEA's estimate

of C corporations' total investment in those assets. To ensure that the estimates of credit-eligible expenditures were less than total investment in R&D and own-account software, CBO categorized the industries listed in the SOI data into nine groups such that no group's eligible expenses exceeded the total investment in R&D and own-account software reported by BEA.⁶ The following SOI industries (which accounted for 68 percent of credit-eligible expenses) were considered independently because their estimated credit-eligible expenses were less than their total investment in R&D and own-account software:

- Computer and electronic products manufacturing;
- Transportation equipment manufacturing;
- Chemical products manufacturing;
- Information; and
- Professional, scientific, and technical services.

The remaining industries listed in the SOI data were assigned to the following broader categories:

- Agriculture, mining, utilities, construction, and transportation;
- All other manufacturing;
- Finance, real estate, and management of companies; and
- Wholesale and retail trade and all other services.

For each of the nine industry groups, the credit-eligible expenses of C corporations were divided by the sum of C corporations' investment in R&D and own-account software. For each group, the resulting percentage was then applied to the R&D and own-account software assets of both C corporations and pass-through entities in each of that group's BEA-defined industries.

Entertainment, Literary, and Artistic Originals. BEA divides this category of intellectual property products

5. To the extent that assets arising from R&D are reflected in the intangible asset values published by SOI, it is mostly because they were purchased from another firm. Thus, the distribution of intangible assets by industry published by SOI is, at best, an indirect proxy for the distribution of investment eligible for the R&E credit.

6. Complete mappings of industries recognized by BEA and by SOI into the nine categories are presented in the supplemental material posted online with this report.

into theatrical movies, long-lived television programs, books, music, and “other.”⁷ For films and television programs, cost-recovery methods (in the absence of bonus depreciation) differ depending on whether or not a project makes it into production—the income forecast method applies if it is produced, and 15-year amortization applies if it is not. However, asset values in the BEA data account only for produced works. Therefore, CBO did not use the 15-year recovery schedule to estimate ETRs or tax wedges for entertainment, literary, and artistic (ELA) originals except when demonstrating the effect of success rates less than 100 percent.

Mineral Exploration and Development. Intangible assets classified as mineral exploration and development (ME&D) in this report are counted as structures in BEA’s Fixed Asset Tables. CBO estimated the split between physical structures and intangible assets associated with exploration and development using the 2007 Economic Census.⁸ According to that source, 70 percent of capital expenditures by the oil and gas industry were for exploration and development, and the rest were for depreciable tangible assets. For other types of mining, the share attributable to exploration and development was 35 percent.

Cost-recovery methods differ by form of organization. To accommodate those differences, CBO further disaggregated ME&D assets as follows:

- For oil and gas, the tax code distinguishes between integrated companies (those that also own refineries and retail outlets, virtually all of which are C corporations) and independent companies that engage only in extraction (which include both C corporations and pass-through entities). CBO assigned 32 percent of capital expenditures to integrated companies and 68 percent to independent companies on the basis of data published by the Independent Petroleum Association of America (IPAA) for 2012.⁹ Having already estimated C corporations’ and pass-through entities’ shares of capital expenditures in the oil and gas extraction industry on the basis of SOI data, CBO assigned the entire amount for pass-through entities to independent companies and then subtracted the amount assigned to integrated companies from the total for C corporations to derive the portion of C corporations’ capital expenditures that was attributable to independent companies.
- For other types of mining, the tax code treats C corporations and pass-through entities differently. As with every other industry, CBO divided assets between those forms of organization on the basis of balance-sheet data reported on tax returns.

The tax code also applies different cost-recovery methods to exploration and to development. In those instances, CBO adopted the following approaches:

- For the oil and gas industry, shares of spending on exploration, development, and dry holes (that is, unsuccessful projects—see Table A-1) were based on 2009 data published by the Energy Information Administration.¹⁰ To update those shares to 2012, CBO used data reported by IPAA on the change in capital spending and the number of exploratory wells, developmental wells, and dry holes between 2007 and 2012.¹¹ The dry hole data were used in the

7. The term “long-lived television programs” does not refer to the number of years a television series runs. Essentially all scripted television programs are intended to be rerun over a multiyear period, and spending on such programs therefore qualifies as investment even if a show is canceled in its first year. By contrast, spending on news, sports, and game shows does not qualify as investment because such programs are generally intended to be shown once, not to generate revenues over a multiyear period. The “other” category consists of theatrical play scripts, greeting card designs, and commercial stock photography. It does not include fine art originals such as paintings and sculptures, which are considered tangible assets.

8. U.S. Census Bureau, *2007 Economic Census of the United States*, Mining: Subject Series: General Summary: Detailed Statistics: 2007, <https://tinyurl.com/y9hqzkr6>. Those figures were not updated in the 2012 Economic Census until after the analysis was complete. (The 2012 exploration and development shares for oil and gas were similar to those for 2007; for other types of mining, the exploration and development share dropped to 17 percent.) CBO applied the same economic depreciation rates to ME&D that BEA applies to mining structures.

9. Independent Petroleum Association of America, *United States Petroleum Statistics*, Table 16, <https://tinyurl.com/yabx9t5r> (PDF, 806 KB).

10. U.S. Energy Information Administration, “Performance Profiles of Major Energy Producers 2009,” Table 15, <https://tinyurl.com/ybkjxzx>.

11. Independent Petroleum Association of America, *United States Petroleum Statistics*, Tables 1, 2, and 16, <https://tinyurl.com/yabx9t5r> (PDF, 806 KB).

Table A-1.

Distribution of Exploration and Development Expenses of Oil and Gas Companies, 2012

Percent	
Exploration	
Integrated companies ^a	1
Independent companies	2
Development	
Integrated companies ^a	27
Independent companies	56
Dry Holes (Unsuccessful projects)	15
Total	100

Source: Congressional Budget Office, using data from the U.S. Energy Information Administration and the Independent Petroleum Association of America.

a. Integrated companies are those that also own refineries or retail outlets.

calculation of success-state tax wedges for oil well development by integrated companies—specifically, to derive the 10 percent failure rate.

- For other types of mining, the split between exploration and development—roughly 50/50—was based on mineral-specific data reported by the Canadian government and reweighted to reflect the distribution of mineral production in the United States.¹²

Brand Identity Arising From Advertising. BEA does not include brand identity in its Fixed Asset Tables. To estimate asset values for brand identity, CBO used SOI data on advertising expenses.¹³ However, not all advertising

expenses are properly characterized as investment because some are focused primarily on moving inventory rather than developing the brand. Some researchers have found that 60 percent of advertising expenses are for brand development, so CBO adopted that as a target for its imputation.¹⁴ Still, there is broad variation among industries in the use of advertising. Advertising by retailers, for example, is much more focused on moving inventory than is advertising by manufacturers, which is more focused on brand development.

To reflect those differences among industries, CBO assessed each industry's propensity to use advertising for brand development and assigned it a score of 1, 2, or 3. Scores of 1 (the lowest propensity) were assigned to industries that are most likely to advertise in order to sell off inventory: wholesale trade, retail trade, publishing, motion picture and sound recording, real estate, and rental and leasing. Scores of 2 were assigned to construction; computer and electronic products manufacturing; transportation equipment manufacturing; air transportation; transit and ground passenger transportation; broadcasting and telecommunications; educational services; arts, entertainment, and recreation services; accommodation and food services; and other services (such as automobile repair). The remaining industries were assigned a score of 3. Reported advertising expenses were then scaled by a factor of 0.2809 times the score so that 60 percent of advertising expenses would count as investment, in line with CBO's target.

To convert investment into asset values, CBO used a depreciation rate of 60 percent per year and investment growth equal to gross domestic product (GDP) growth (3.9 percent).¹⁵ Those rates imply that after a few years, the ratio of asset values to investment levels off at 1.14, so that ratio was applied to investment in 2012 to get an estimate of asset values in that year.

12. For exploration/development splits by mineral, see Natural Resources Canada, *Mineral Exploration, Deposit Appraisal, and Mine Complex Development Activity in Canada, 2010 and 2011*, data underlying Figure 2a, <https://tinyurl.com/yblv2vwr>. For nonfuel mineral production in the United States, see U.S. Geological Survey, *2012 Minerals Yearbook: Statistical Summary*, Table 1, <https://tinyurl.com/yaxu4627> (PDF, 420 KB). For coal production in the United States, see National Mining Association, "Most Requested Statistics—U.S. Coal Industry," <https://tinyurl.com/ybt6uz3q> (PDF, 233 KB).

13. For C corporations, S corporations, and sole proprietorships, see the sources cited in footnote 3 in this appendix. The advertising expenses of partnerships are not reported in the SOI data. Those were imputed by applying, by industry, the ratio of advertising expenses to business receipts for S corporations to the business receipts of partnerships.

14. Carol Corrado, Charles Hulten, and Daniel Sichel, "Intangible Capital and U.S. Economic Growth," *Review of Income and Wealth*, vol. 55, no. 3 (September 2009), p. 670, <https://tinyurl.com/y79cgvnp>.

15. The 60 percent depreciation rate follows Corrado, Hulten, and Sichel, p. 674. The 3.9 percent rate of growth represents the average annual growth in GDP between 2000 and 2012 according to BEA; see Bureau of Economic Analysis, *National Income and Product Accounts*, Table 1.1.5, <https://tinyurl.com/yyc3ehyg>.

Estimating Effective Tax Rates for Firm-Specific Resources

Some researchers have attempted to measure deliberate investment not only in the asset types accounted for by CBO but also in “firm-specific resources,” which include employee training and management consulting services. Doing so generates estimates of investment in intangible assets and the value of intangible capital stock that are substantially larger than estimates that account only for the asset types included in this report—by over 50 percent in the case of investment and by over 40 percent in the case of the value of the capital stock, according to one study.¹⁶ CBO did not include investment in firm-specific resources in its analysis because estimates of its magnitude vary greatly. In 2012, for example, one organization reported that U.S. companies spent \$164 billion on employee training, whereas another estimated those expenses to be about \$56 billion.¹⁷ Another reason for excluding firm-specific resources is that information on those expenses is not available by industry, which makes it impossible to infer sources of financing and forms of organization among the different categories of assets with sufficient precision.

To gauge the potential impact of firm-specific resources on the ETR for all intangible assets, CBO constructed a hypothetical scenario. Assuming that such investments depreciate at a rate of 40 percent per year and that all such investment can be expensed, CBO calculated ETRs for income from investment in firm-specific resources for each combination of form of organization and

16. Carol Corrado, Charles Hulten, and Daniel Sichel, “Intangible Capital and U.S. Economic Growth,” *Review of Income and Wealth*, vol. 55, no. 3 (September 2009), Tables 1 and 2, <https://tinyurl.com/y79cgvnp>. The value for investment is reported for 2000 through 2003; that for capital stock is reported for 2003.

17. The \$164 billion figure was reported by the American Society for Training and Development, “\$164.2 Billion Spent on Training and Development by U.S. Companies” (press release, December 12, 2013), <https://tinyurl.com/yd4sv8dq>. The \$56 billion figure was reported in “2013 Training Industry Report,” *Training* (November/December 2013), <https://tinyurl.com/y7239kb7>.

Table A-2.

Effective Tax Rates on Capital Income From Firm-Specific Resources, by Form of Organization and Source of Financing

Percent	Equity Financing	Debt Financing	Typical Financing ^a
C Corporations	8	-30	-2
Pass-Through Entities	0	-58	-12
All Businesses ^b	8	-31	-2

Source: Congressional Budget Office.

The effective tax rate is the tax wedge divided by the before-tax rate of return that must be achieved to justify an investment.

- In this hypothetical scenario, CBO attributed 67 percent of financing to equity and 33 percent to debt, which approximates the split for all asset types.
- In this hypothetical scenario, CBO attributed 90 percent of firm-specific resources to C corporations and 10 percent to pass-through entities, which approximates the split for other types of intangible assets.

source of financing (see Table A-2).¹⁸ Because of the lack of industry-level detail, estimates of an ETR for all firm-specific resources are less precise, on average, than the estimates provided elsewhere in this report. Nevertheless, if 90 percent of investment was made by C corporations and the remainder by pass-through entities (typical of other intangible assets), and if two-thirds of investment was financed through equity and the remainder through debt (typical of all industries), the ETR on income from all firm-specific resources would have been -2 percent, on average, under pre-2018 law. Regardless of how firm-specific resources are weighted relative to the other intangible assets in this report, it implies that the ETR for all intangible assets would be closer to zero if firm-specific resources were accounted for, rather than the 3 percent rate reported in the main text.

18. As with advertising, the tax code makes no specific mention of employee training expenses or any other investments in firm-specific resources. All such expenses are treated as “ordinary and necessary” in the tax code, meaning that they can be deducted in the year they are incurred.

Uniformity of the Tax System

Imposing a lower tax burden on one type of asset than another encourages investors to buy more of the lower-taxed asset solely to take advantage of the tax benefit. That incentive can divert investment from its most productive use and hinder economic growth. For that reason, economists generally regard the uniformity of tax burdens as conducive to promoting the efficient allocation of resources. However, uniformity of taxation will not always result in efficiency if an investment in an asset generates benefits or costs to individuals and entities other than the investor.

The body of this report contains measures of the tax burden that vary by form of organization, source of financing, and type of asset. However, those measures reflect nontax factors as well as features of the tax code, so a comparison of effective tax rates (ETRs) across categories does not measure tax uniformity in isolation. (By contrast, the ETRs that the Congressional Budget Office reported in *Taxing Capital Income: Effective Marginal Tax Rates Under 2014 Law and Selected Policy Options*—hereafter referred to as *Taxing Capital Income*—controlled for variations along those dimensions, so differences among those ETRs represented only the effects of the tax system.) CBO therefore constructed a measure of tax uniformity that is independent of nontax factors and applied it to the permanent provisions of the tax law in place during 2017 (pre-2018 law) and to the provisions of Public Law 115-97, hereafter referred to as the 2017 tax act, in effect in 2022 (the only year in which all of the provisions directly targeted at intangible assets are in effect) and in 2027 (the first year in which only the permanent provisions of the act are in effect).¹

Measuring the Uniformity of Taxation

To analyze uniformity, CBO uses the tax wedge (that is, the difference between the before-tax and after-tax rates of return) to measure how much taxes affect the decision to make a particular investment. A larger tax wedge implies a greater influence on the decision, whereas a

smaller tax wedge implies a lesser influence. The dispersion of tax wedges offers a better assessment of the uniformity of taxation than does the dispersion of ETRs because the ETR can take on extreme values when the required before-tax rate of return is close to zero. For example, that rate is near zero for debt-financed research and development (R&D) because of the combination of the interest deduction and the research and experimentation (R&E) tax credit. As a result, the absolute value of the ETR—which is the ratio of the tax wedge to the before-tax rate of return—is very high in that case. Using the tax wedge to assess uniformity ensures that measures of dispersion are not unduly influenced by situations like those that apply to debt-financed R&D.²

Differences in taxation between forms of organization are identified by calculating the difference between the tax wedges of C corporations and pass-through entities. Similarly, the measure of uniformity between the two sources of financing is the difference between the tax wedges of debt-financed and equity-financed investments. Measuring uniformity among 79 different types of assets is more complex. A measure that is consistent with the simple measure applied to the other categories is the mean difference between pairs (hereafter, simply “mean difference”)—that is, the average difference between the tax wedges of every pair of asset types, with each pair weighted by the relative size of the paired types. A value of zero indicates complete uniformity; higher values reflect a greater degree of nonuniformity.

Solely for purposes of measuring tax uniformity, CBO employs the weighting method that was used in *Taxing Capital Income*, applying the average distribution of industries and sources of financing for all types of assets to each individual type. If the weighting method used

1. The permanent provisions of pre-2018 law do not include bonus depreciation because it had been scheduled to phase out by 2020.

2. In *Taxing Capital Income*, CBO used ETRs to assess the uniformity of taxation. When applied to tangible assets under post-1986 law, the dispersion of ETRs is as informative as the dispersion of tax wedges because the absence of tax credits that apply to investment in tangible assets prevents ETRs from taking on extreme values.

elsewhere in this report were utilized, differences among asset types that are treated identically by the tax code could nevertheless emerge if, for example, investment in one asset type was more likely to be financed by debt or was more common among certain industries than investment in another type. An ideal measure of tax uniformity would exclude nontax influences.

Among the nontax influences that are excluded from the analysis are multiyear development periods and failure risks. (To exclude those nontax factors, the weighting scheme disregards any variation they might introduce, just as it does the variation in source of financing by industry and other nontax factors.) Thus, the success-state tax wedge described in the main text, which depends on those two factors, does not apply to this analysis. Instead, the standard tax wedge is the relevant measure of the tax burden.

How Nonuniform Taxation Affects the Efficient Allocation of Resources

Simply comparing tax wedges is not sufficient for judging whether the tax code promotes economic efficiency. Many investments, particularly in intangible assets, generate externalities—that is, benefits accruing to an individual or entity other than the investor. A high tax on assets that generate negative externalities and a low tax on assets that generate positive externalities might promote efficiency to a greater extent than would full tax uniformity.

Externalities associated with each type of intangible asset differ:

- The externalities associated with purchased software are probably negligible because the benefits of the software are generally limited to the businesses that purchase it.
- Research and development generates positive externalities by, for example, expanding the body of scientific knowledge that can be accessed by anybody—not just the party undertaking the original research. The existence of those externalities has been cited as a rationale for the R&E credit. However, R&D can also generate negative externalities. For example, new prescription drugs, even when they deliver their intended benefits, may increase addiction.
- The externalities created by entertainment, literary, and artistic originals are more subjective—the same book, movie, or recording may be viewed by some observers as enhancing a country’s culture and by others as debasing it.
- Mineral exploration and development creates the external benefit of facilitating an uninterrupted supply of energy, but it also generates greenhouse gases and other pollutants.
- Advertising makes markets more efficient to the extent that it provides consumers with information they would not otherwise have, even if the information is nothing more than that a certain product exists. But it makes markets less efficient to the extent that the information it provides to consumers is misleading.

Identifying all of the positive and negative externalities associated with an investment is difficult, and because researchers disagree on how to measure the magnitude of those externalities, their net effect is uncertain. For this report, CBO did not consider externalities in its computations of tax wedges.

Differences in Tax Wedges Under Pre-2018 Law

CBO estimates that under the permanent features of pre-2018 law, the mean difference for all asset types (both tangible and intangible) was 0.95 percentage points for equity-financed investments by C corporations (see Table B-1). The nonuniformity was much greater among intangible asset types than among tangible asset types. For C corporations, the mean difference for intangible asset types was 1.60 percentage points; for tangible asset types, it was 0.57 percentage points. Much of the difference between those two figures is explained by the R&E credit—without it, the mean difference for intangible asset types would have been 0.95 percentage points, and the mean difference for all asset types would have been 0.83 percentage points.

Compared with the differences in tax wedges for equity-financed C corporations, the differences for pass-through entities were smaller across all assets and across all tangible assets. That is because more than half of the tangible assets of pass-through entities are concentrated in two types: land and residential buildings. However, the nonuniformity of tax wedges among

Table B-1.

Mean Differences in Average Standard Tax Wedges Between Pairs of Asset Types Under Pre-2018 Law and the 2017 Tax Act, by Presence or Absence of the R&E Tax Credit and Form of Organization

Percentage Points

	With R&E Tax Credit		Without R&E Tax Credit	
	C Corporations	Pass-Through Entities	C Corporations	Pass-Through Entities
All Asset Types				
Pre-2018 Law ^a	0.95	0.50	0.83	0.47
Provisions of the 2017 Tax Act in Effect in 2022	0.65	n.a.	0.62	n.a.
Permanent Provisions of the 2017 Tax Act ^b	0.46	n.a.	0.38	n.a.
Intangible Assets				
Pre-2018 Law ^a	1.60	1.70	0.95	0.98
Provisions of the 2017 Tax Act in Effect in 2022	0.69	n.a.	0.64	n.a.
Permanent Provisions of the 2017 Tax Act ^b	0.86	n.a.	0.66	n.a.
Tangible Assets				
Pre-2018 Law ^a	0.57	0.41	0.57	0.41
Provisions of the 2017 Tax Act in Effect in 2022	0.62	n.a.	0.62	n.a.
Permanent Provisions of the 2017 Tax Act ^b	0.31	n.a.	0.31	n.a.

Source: Congressional Budget Office.

The tax wedge is the difference between the before-tax rate of return and the after-tax rate of return; the standard measure represents circumstances in which an investment's development period is less than one year and there is no risk of failure.

Reported values apply only to equity-financed investments.

R&E = research and experimentation; n.a. = not available.

a. CBO's computations account for only the permanent features of tax law in effect during 2017. They exclude provisions that were scheduled to expire.

b. The permanent provisions of the 2017 tax act apply in 2027 and beyond.

intangible assets is greater for pass-through entities than for C corporations.

The difference between forms of organization was smaller than the differences among asset types. For intangible assets (and with the R&E credit in place), the tax-wedge difference between C corporations and pass-through entities was 0.21 percentage points.³ By contrast, the difference in tax wedges for debt- and equity-financed assets was greater than the differences in tax wedges among asset types—1.78 percentage points.

Differences in Tax Wedges Under Certain Provisions of the 2017 Tax Act

CBO limited its analysis of tax wedges under the 2017 tax act to equity-financed investments of C corporations. Under the 2022 provisions of the act, CBO estimates, the mean difference among all asset types is 0.65 percentage points—0.30 percentage points lower than under pre-2018 law. Under the 2027 provisions of the act, the mean difference is even smaller—0.46 percentage points.

That pattern does not hold, however, when tangible and intangible assets are considered separately. The mean difference among intangible asset types is smaller under both the 2022 provisions and the 2027 provisions than under pre-2018 law, but it is smallest under the 2022 provisions. By contrast, although the mean difference among tangible asset types is also smaller under the

3. Calculating the difference from tax wedges reported in Table 5 does not yield a value of 0.21 because those tax wedges were calculated using a different weighting method.

2027 provisions than under pre-2018 law, it is largest under the 2022 provisions.

Those results are driven by two features of the 2017 tax act: the lower statutory tax rate and the temporary expansion of bonus depreciation. The lower statutory tax rate reduces the mean difference among both tangible and intangible assets because, all else equal, it drives the tax wedges closer to zero and thus closer to one another. The effect of bonus depreciation, however, is different for intangible assets than for tangible assets. In the case of tangible assets, it generally reduces the tax wedge for equipment but not for structures (to which it generally does not apply). That increases the mean difference among asset types and more than offsets the effect of the lower statutory tax rate, rendering the mean difference under the 2022 provisions of the tax act larger than that

under pre-2018 law. The expansion of bonus depreciation, however, is not a permanent provision, so only the effect of the lower statutory tax rate applies under the 2027 provisions, resulting in a smaller mean difference.

Among intangible assets, bonus depreciation has the effect of shrinking the tax wedge for purchased software and entertainment, literary, and artistic originals—the intangible assets with the highest tax wedges under pre-2018 law. As a result, the mean difference under the 2022 provisions of the tax act is smaller than under pre-2018 law. Under the 2027 provisions of the tax act (that is, after bonus depreciation is phased out), the mean difference is larger than under the 2022 provisions, but it is still smaller than under pre-2018 law because of the effect of the lower statutory tax rate.



Tax Wedges for Investments in Intangible Assets by Start-Up Companies

The effective tax rates and success-state tax wedges in the body of this report do not apply to investments made by start-up companies—only to investments made by profitable established businesses, which account for the vast majority of economic activity in the United States. However, start-up companies also play an important role in the economy. One study found that although companies less than five years old account for only 3 percent of jobs, they are responsible for 20 percent of job growth.¹

In some respects, tax law favors start-up companies. For example, new small businesses can expense, rather than amortize, up to \$5,000 in start-up costs (such as expenditures on market research and employee training) and up to \$5,000 in organizational costs (such as incorporation fees).² In other respects, however, the tax code places start-up companies at a disadvantage. Most importantly, the tax law's treatment of losses (that is, deductions in excess of receipts) favors established businesses over start-up businesses.

The disparity is most noticeable under the corporate income tax. When a C corporation's deductions exceed its receipts, the resulting net operating loss (NOL) must be carried over to a future year in which there are profits to offset. Prior to the enactment of Public Law 115-97, hereafter referred to as the 2017 tax act, NOLs could offset 100 percent of profits from the prior two years (requiring taxpayers to file amended returns for those years to receive a refund) and the following 20 years. Under the 2017 tax act, NOLs can offset only 80 percent of those profits, but there is no longer a time limit on when NOLs can be used to offset profits.

Generally, an established business is less likely than a start-up company to generate NOLs because it can use losses from an unsuccessful project or a project in development to offset income from its profitable investments. When a start-up company carries NOLs forward, it is effectively deferring its cost-recovery and interest deductions until it has sufficient receipts to be offset by those deductions. The deferral of deductions reduces their present value and increases the tax wedge and effective tax rate on new investments.³ In one study, researchers estimated that because firms that were less than 5 years old required an average of 1.4 more years to use their NOLs than did older firms, the present value of their deductions (at the time of the study) was only 60 percent that of the older firms.⁴ The phenomenon is especially pronounced for investments in assets that require long periods of development before they can generate any income—a condition common to many types of intangible assets. Thus, the tax code favors investment in those types of intangible assets by established businesses over start-up companies.⁵

1. John Haltiwanger, Ron S. Jarmin, and Javier Miranda, "Who Creates Jobs? Small Versus Large Versus Young," *Review of Economics and Statistics*, vol. 95, no. 2 (May 2013), pp. 347–361, <https://tinyurl.com/y8fwow93>.

2. For every dollar by which start-up or organizational costs exceed \$50,000, the corresponding allowable deduction declines by \$1, reaching zero at \$55,000.

3. A present value is a single number that expresses a flow of current and future income, or payments, in terms of a lump sum received, or paid, today; the present value depends on the interest rate (known as the discount rate) that is used to translate future cash flows into current dollars. For example, applying a discount rate of 5 percent to a nominal value of \$1,050 available one year from now results in a present discounted value of \$1,000. There is no corresponding change in the value of the income received when the good or service is finally developed and sold because that income is taxed in the year it is received. By contrast, there is a time lag for start-ups between the realization of expenses and the tax consequences thereof. It is that time lag that causes the change in present value.

4. See Michael G. Cooper and Matthew J. Knittel, "The Implications of Tax Asymmetry for U.S. Corporations," *National Tax Journal*, vol. 63, no. 1 (March 2010), Table 4, <https://tinyurl.com/yegchatr> (PDF, 366 KB).

5. Not all established businesses are profitable. The analysis in this appendix applies to established businesses operating at a loss as well as to start-up companies.

The amount by which the value of the deductions is reduced depends on what the investor could have earned on that money in the meantime. Investors will demand an after-tax rate of return that is at least what they could earn on an index fund in which the ratio of corporate bonds to equities is the same as the ratio of debt to equity financing anticipated for the investment in question. For that hypothetical scenario, that rate of return (including inflation) is 7.2 percent for equity-financed investments. With that rate of return, deferring a deduction by a specified number of years (t) reduces its value by $(1 - 1 \div [1 + 0.072]^t)$.⁶ If the deduction is deferred by one year, the value of the deduction is reduced by about 6.7 percent. If the deduction is deferred by 5 or 10 years, the reductions in its value are 29.4 percent and 50.1 percent, respectively. If the unused deductions are spread out evenly over the development period, the cumulative reductions in value would be 13.0 percent over a 5-year period and 26.9 percent over a 10-year period.⁷

In its treatment of losses, the tax code also differentiates between pass-through entities and C corporations. The owners of a pass-through entity—whether an established business or a start-up—can use its losses to offset profits from other pass-through entities they own and any other types of income subject to the individual income tax, including wages, in the same year. The losses of a C corporation, by contrast, can be used only to offset the income of the same corporation (or a successor corporation, if the original is sold) in a different year. As a consequence, C corporations generate NOLs and carry them forward far more frequently than pass-through entities do. Because there is more flexibility in how the losses of pass-through entities can be used, both in the year of the loss and in future years, new businesses may also be more likely to organize as pass-through entities.

In this appendix, the amount invested in any given asset is assumed to be spread out evenly over the length of the development period, with the firm accumulating additional NOLs in each year. To illustrate the effect of

deferring deductions under tax law before the enactment of the 2017 tax act (hereafter, pre-2018 law) and after it, CBO constructed a special case in which profits in the first year of the postdevelopment period exactly equal the accumulated NOLs.⁸ Under that scenario, all NOLs carried forward would have been allowed in the first year of profitability (that is, immediately after the end of the development period) under pre-2018 law. Under the 2017 tax act, 80 percent of the NOLs would be allowed in the first year of profitability and 20 percent in the second year.

The effects are estimated for the same three types of assets (oil well development by integrated companies, new drug development, and movie development and production) used in the main text to illustrate the effects of longer development periods and failure rates on investments by established businesses. However, failure rates have been set to zero so that only the effect of deferring deductions, not the effect of permanently disallowing them (as would occur in the case of failure), is reflected in the results. The resulting tax wedge is referred to as the “postdevelopment tax wedge” to distinguish it from the success-state tax wedge, which incorporates the possibility of failure.

Postdevelopment Tax Wedges Under Pre-2018 Law

For equity-financed investments, the difference between the postdevelopment tax wedges of established businesses and start-up companies is a function of two things:

- The relationship between potential cost-recovery deductions and the asset’s rate of economic depreciation (that is, the rate of its decline in value due to obsolescence), and
- Whether the investment qualifies for the research and experimentation (R&E) tax credit.

Two of the three types of investments discussed here—oil well development and movie development and production—do not qualify for the R&E tax credit. In the absence of that credit, deferral of losses by either a new or an unprofitable C corporation affects only cost-recovery deductions. The relationship between potential cost-recovery deductions and economic

6. See Joseph Rosenberg and Donald Marron, *Tax Policy and Investment by Startups and Innovative Firms* (February 9, 2015), p. 20, <https://tinyurl.com/jundk3f>.

7. See Michael G. Cooper and Matthew J. Knittel, “The Implications of Tax Asymmetry for U.S. Corporations,” *National Tax Journal*, vol. 63, no. 1 (March 2010), Table 7, <https://tinyurl.com/ycgchatr> (PDF, 366 KB). Those authors estimate that 33 percent of new firms can begin using their deductions after 5 years and 55 percent can begin using them after 10 years.

8. In fact, first-year profits are unlikely to be that high, meaning that the illustration probably understates the effect of carrying NOLs forward on postdevelopment tax wedges.

depreciation is very different for those two asset types. For oil well development, cost-recovery deductions under the permanent provisions of pre-2018 law were accelerated (that is, more rapid than economic depreciation). For movie development and production, however, cost-recovery deductions closely approximated economic depreciation. In both cases, deferring the cost-recovery deductions until the end of the development period reduced their value and increased the postdevelopment tax wedge. But the cost was greater for oil well development because it encompassed the loss of accelerated deductions, which never applied to movie development and production. Under pre-2018 law, the postdevelopment tax wedge for start-up oil companies was 2.0 percentage points—1.1 percentage points higher than for established oil companies (see Table C-1). By contrast, the postdevelopment tax wedge for start-up movie production companies was 3.4 percentage points—only 0.4 percentage points higher than for established movie production companies.

The R&E credit for investments in new drugs must also be deferred by start-up corporations with no immediately taxable profits, which reduces its value. That further widens the gap between start-up companies and established businesses. The postdevelopment tax wedge for the research and development (R&D) of new drugs by start-up companies was 2.7 percentage points—3.5 percentage points higher than for established businesses, for which the postdevelopment tax wedge under pre-2018 law was negative.

Start-up businesses do not have access to much debt financing, but to the extent that they do, the deferral of interest deductions makes the postdevelopment tax wedge even higher for debt-financed investment than equity-financed investment. However, under the permanent provisions of pre-2018 law, that effect would have been uniform among asset types (in contrast to the effect on cost-recovery deductions, which varied by asset type).

Postdevelopment Tax Wedges Under Certain Provisions of the 2017 Tax Act

Under the 2017 tax act, the lower statutory tax rate reduces the postdevelopment tax wedges for equity-financed investment in all types of assets, regardless of the investing company's age, and thus narrows the tax-wedge gap between start-ups and established C corporations. That tax-rate reduction is the only major provision of the 2017 tax act that affects equity-financed investments in oil well development. Thus, the difference between the postdevelopment tax wedge for start-up and established oil companies under the 2017 tax act is 0.6 percentage points (1.3 percentage points for start-ups and 0.7 percentage points for established businesses), in contrast to a difference of 1.1 percentage points under pre-2018 law (see Table C-1).

The temporary extension of expensing to movie development and production costs means that the 2022 provisions of the tax act have different effects than the permanent provisions. The postdevelopment tax wedges for movie development and production under the 2022 provisions are 0.7 percentage points for start-up companies and 0.5 percentage points for established businesses. Under the 2027 provisions, cost-recovery deductions of movie development and production expenses revert to those under pre-2018 law while the statutory tax rate remains lower. The postdevelopment tax wedge for start-up movie companies in that case is 2.1 percentage points, compared with 1.9 percentage points for established movie companies. Under either set of provisions, the difference between the postdevelopment tax wedges for start-up and established businesses is smaller than it was under pre-2018 law.

For new drug R&D, the switch in cost-recovery methods in 2022 from expensing to five-year amortization reduces the cost to start-up companies of deferring cost-recovery deductions. That effect, combined with the effect of the lower tax rate, further reduces the gap between start-up companies and established businesses. Under the 2017 tax act, the difference between the postdevelopment tax wedges of start-up and established businesses is 1.7 percentage points (2.0 percentage points for start-up companies and 0.3 for established businesses), in contrast to a 3.5-percentage-point difference under pre-2018 law.

Table C-1.

Tax Wedges for Three Types of Investment in Intangible Assets Under Pre-2018 Law and the 2017 Tax Act, by Length of Development Period and Maturity of Business

Percentage Points

	No Development Period (Standard tax wedges)	Typical Development Period (Postdevelopment tax wedges) ^a	
		Profitable Established Business	Start-Up Business
Pre-2018 Law^b			
Oil Well Development ^c	0.8	0.9	2.0
New Drug Research and Development ^d	-0.9	-0.8	2.7
Motion Picture Development and Production ^e	2.9	3.0	3.4
Provisions of the 2017 Tax Act in Effect in 2022			
Oil Well Development ^c	0.6	0.7	1.3
New Drug Research and Development ^d	*	0.3	2.0
Motion Picture Development and Production ^e	0.4	0.5	0.7
Permanent Provisions of the 2017 Tax Act^f			
Oil Well Development ^c	0.6	0.7	1.3
New Drug Research and Development ^d	0.1	0.3	2.0
Motion Picture Development and Production ^e	1.8	1.9	2.1

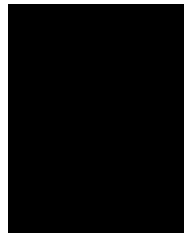
Source: Congressional Budget Office

The tax wedge is the difference between the before-tax rate of return and the after-tax rate of return. The standard measure represents circumstances in which an investment's development period is less than one year and there is no risk of failure; the postdevelopment measure represents circumstances in which an investment undertaken with no risk of failure has completed a multiyear development period.

Reported values apply only to equity-financed investments by C corporations.

* = between 0 and 0.05 percentage points.

- Postdevelopment tax wedges differ from success-state tax wedges in that the failure rates have been set to zero. Thus, the results shown here do not match those in Table 6 or Table 8, which reflect failure rates greater than zero.
- CBO's computations account for only the permanent features of tax law in effect during 2017. They exclude provisions that were scheduled to expire.
- Results in this category apply to integrated oil and gas companies (that is, those that also own refineries or retail outlets) and reflect a 6-year development period, during which deductions of start-up businesses are deferred.
- Results in this category reflect a 12-year development period, during which deductions and credits of start-up businesses are deferred.
- Results in this category reflect a 3-year development period, during which deductions of start-up businesses are deferred.
- The permanent provisions of the 2017 tax act apply in 2027 and beyond.



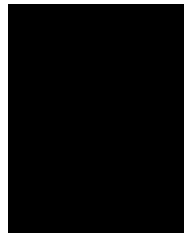
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About This Document

This study was prepared at the request of the Ranking Member of the Senate Finance Committee. In keeping with the Congressional Budget Office's mandate to provide objective, impartial analysis, the report makes no recommendations.

Paul Burnham wrote the report with guidance from Janet Holtzblatt and John McClelland. Useful comments were provided by Nathan Musick, Sebastian Gay, and Mark Lasky of CBO; Charles Hulten of the University of Maryland; and Jason DeBacker of the University of South Carolina. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

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CBO continually seeks feedback to make its work as useful as possible. Please send any feedback to communications@cbo.gov.

A handwritten signature in black ink, appearing to read "Keith Hall".

Keith Hall
Director
November 2018