

Federal Tax Policy and Drug Research and Development

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The taxes paid by pharmaceutical companies alter both the net cost of pharmaceutical research and development (R&D) and the ultimate returns on R&D investments. This chapter examines U.S. tax code provisions that directly affect R&D or are of particular relevance to the pharmaceutical industry. It describes the incentives for taxpaying companies to alter their R&D behavior, and it estimates the actual impact of these provisions on the Federal Treasury and on drug companies.

ANALYZING TAX POLICY

Federal corporate income tax policy comprises laws and regulations that define income subject to taxation, adjustments to taxable income (deductions), tax rates, and adjustments to tax payments (tax credits and minimum tax payments). Tax code provisions are not just intended to raise revenue; they are also structured to provide taxpayers with incentives to spend or invest in desirable ways. Most of these incentives are either deductions from taxable income or credits against tax liability. For example, the tax code contains tax credits to encourage firms to perform more R&D and to make the United States competitive with other nations as a place to locate business. Similar tax deductions exist for some R&D expenses not eligible for these tax credits. Because each of these provisions reduces the taxes that the Federal Government collects from firms, they are sometimes referred to as ‘tax expenditures’ (241). While any taxpayer theoretically could take advantage of any of these incentives, in reality many provisions have requirements that preclude their use except by certain types of taxpayers. This review focuses on components of the tax code that either directly affect industrial



¹This chapter is based in part on two papers prepared under contract for the Office of Technology Assessment (7,245).

R&D expenditures or are used by the pharmaceutical industry more (in terms of Federal tax expenditures) than by other industries.

A common measure of the impact of tax policy on a firm's or industry's operation is the *average effective tax rate*, the ratio of actual income tax paid to the pretax income of a taxpayer or a group of taxpayers (such as the whole pharmaceutical industry). This measure: of tax burden assesses the equity of taxes paid across different kinds of taxpayers or in examinations of corporate profits and profit rates.

Because the average effective tax rate combines the effects of all provisions of the tax code, it obscures differences in the tax rate that apply to different kinds of assets or across different firms within an industry (7). This chapter does not contain estimates of average effective tax rates in the pharmaceutical industry, but it does contain estimates of each tax credit in the U.S. Federal Tax Code as a percent of the pharmaceutical industry's taxable income. This measure is the difference between two average effective tax rates: the average rate without a credit minus the average rate with the credit.

To examine the effects of particular tax credits on pharmaceutical R&D investment, a more useful measure is the *marginal incentive effect* or *marginal credit rate* (5). This rate is the number of cents that a tax credit reduces the "cost" of an additional dollar that the taxpayer decides to spend on R&D. The "credit rate" is a negative tax rate. Because of limitations on particular tax credits, the effective marginal credit rate can be different from the "statutory rate." This chapter reviews what is known about the marginal credit rate associated with each of the several tax credit provisions affecting pharmaceutical operations.

The aggregate impact of a tax credit is the extent to which it achieves its policy goal. For example, the goal of a tax credit is to increase corporate investment in R&D. The Office of Technology Assessment (OTA) did not measure policy impacts of the tax provisions affecting the pharmaceutical industry.³

Finally, a measure of the Federal Treasury's cost is the *net subsidy of a tax credit or deduction*. The value of tax credits claimed by taxpayers represents a dollar-for-dollar cost to the Federal Treasury. OTA estimated Federal tax subsidies associated with tax credits claimed by the pharmaceutical industry.

TAX DEDUCTIONS AND TAXABLE INCOME

■ Deductions of R&D Expenses From Taxable Income

Section 174 of the Internal Revenue Code permits businesses to fully deduct R&D expenditures in the year incurred—a practice referred to as "expensing." In contrast, Federal income tax law does not permit expensing of outlays made on other kinds of investments such as machinery, equipment, or facilities that remain useful for a number of years.⁵ The immediate expensing of R&D creates an incentive for a taxpaying firm to conduct R&D, because a tax deduction taken today is worth more than one that must be taken in the future. Firms do have the option to deduct R&D expenditures made in a particular year over a period of at least 5 years beginning with the month in which revenues first flow into the firm from the R&D. The deferral option is meant to benefit small or newer firms with little or no taxable income during their early years.

When it was written in 1954, section 174 gave little indication of what activities qualified as

² The statutory rate is the rate written into the internal revenue code.

³ Analyses of the impact of the R&D tax credit on aggregate R&D investment, see (33,437).

⁴ R&D is referred to in the tax code as research and experimentation (R&E). In this chapter OTA uses the term R&D to refer to R&E expenses covered under five tax code provisions.

⁵ The cost of other investments is recognized overtime through "depreciation allowances." The term 'depreciation' refers to the allocation of the cost of a long-lived asset over its useful life.

R&D. Subsequent regulations, first adopted in 1957, provided more detailed guidelines (26 CFR 1.174). According to these regulations, the deduction is for ‘research and development costs in the experimental or laboratory sense,’ including all expenditures incident to the development of an experimental or pilot model, a plant process, a product, a formula, an invention or similar property, and improvements to existing property similar to these types. It also includes the cost of obtaining a patent.

Specifically excluded from the definition of qualifying R&D expenditures are those for testing quality control, management studies, advertising and promotion, market research, sales promotion, sales service, research in the social sciences or psychology, and other nontechnological activities or routine technical services. In interviews with executives at eight research-intensive pharmaceutical firms and with Internal Revenue Service (IRS) examiners responsible for auditing R&D deductions, OTA found that the IRS interprets these regulations to exclude the cost of developing software used in the R&D process as well as all management functions except the direct supervision of scientists and technicians. The regulations do permit firms to deduct the expense of qualifying R&D that the firm has commissioned and paid another organization to perform on its behalf.

In regulations proposed in 1989 (54 FR 21224), the IRS specifically discussed the application of section 174 to pharmaceutical R&D. The proposed regulations included the following very specific example:

Example (9): C, a biotechnology firm developed a new drug that substantially lowers blood pressure. Prior to marketing the drug, C incurs costs to test the product and obtain U.S. Food and Drug Administration (FDA) approval of the drug.

The costs incurred by C to develop, test, and receive government approval of the drug are research and experimental expenditures within the meaning of section 174.

Although this interpretation has not yet been adopted as a final regulation, the IRS is currently interpreting the rules in this way.

If expenditures are disallowed by the IRS as qualifying R&D expenses under section 174, they can still be deducted as ordinary business expenses. However, the definition of R&D is the basis for allowing research expenses to count for a Federal R&D tax credit, which is discussed later in this chapter.

FOREIGN SALES AND DEDUCTION OF US. R&D EXPENSES

One provision of the tax code, currently suspended by congressional action,⁶ could serve as a *disincentive* for multinational firms to locate R&D in the United States. A 1977 Treasury Department regulation (CFR 1.861-8) would limit the extent to which multinational firms could deduct expenses for qualified R&D conducted in the United States (CFR 1.861-8). The rationale for the regulation is that if a firm spends money for R&D in the United States and the resulting products or processes are sold abroad, then a portion of these R&D costs should be allocated against foreign sales. As discussed later in the section on foreign tax credits, foreign sales are subject to special U.S. tax provisions designed to provide some allowances for income taxes paid abroad. Because the U.S. tax rules governing income from foreign sources lead to higher effective tax rates on foreign income than on domestic income,⁷ this regulation may provide an incentive for multinational firms to export a portion of R&D overseas (245). Because the research-intensive segment of the pharmaceutical industry is multinational, the incentive to locate

⁶ In 1981, Congress passed a 2-year moratorium of U.S. Treasury regulation 1.861-8 (Public Law 97-34). Although Congress has never made the moratorium **permanent**, it has renewed the moratorium for a temporary period at each expiration. Most recently, the Omnibus Budget Reconciliation Act of 1990 extended the moratorium through the 1991 tax year (Public Law 101-508).

⁷ Most other **nations** with provisions permitting the deduction of R&D expenses from taxable income do not disallow part of this deduction for foreign sales.

R&D outside the United States is especially important for the pharmaceutical industry.

■ Deduction for Contributions to Scientific Organizations

The internal revenue code allows corporations to deduct up to 5 percent of their taxable income for contributions to educational and scientific organizations held to be operating in the public interest (section 170a.). The income of these scientific and educational organizations operated in the public interest is exempt from Federal income tax (section 501a-c). The operating standard for research in the public interest is that the work must result in information ‘‘published in a treatise, thesis, trade publication, or in any other form that is available to the interested public.’’ If met, the research-performing institution qualifies for the tax exemption, even if the research is performed under ‘‘a contract or agreement under which the sponsor or sponsors of the research have the right to obtain ownership or control of any patents, copyrights, processes, or formulae resulting from such research.’’ Under this provision, pharmaceutical firms that contract with academic institutions or donate R&D resources to such institutions can reap the commercial benefits of sponsored research at a cost that is net of taxes.

■ Depreciation of Capital Assets Used for R&D

In addition to resources that qualify for the section 174 deduction discussed earlier (such as salaries and depletable supplies), pharmaceutical R&D also requires the use of capital assets such as machinery, equipment, and facilities. The tax

code requires companies to depreciate these costs instead of deducting the total investment in the year it was made.

Prior to 1981, firms were required to depreciate equal portions of a capital expenditure used in R&D (as well as assets used in other activities) each year over its whole useful life (which could be 10 or more years). The Economic Recovery Tax Act of 1981, or ERTA (Public Law 97-34), altered this practice by establishing an ‘‘accelerated cost recovery system’’ (ACRS). Under ACRS, firms can depreciate all capital expenditures for R&D over a 3-year period regardless of their useful lives.⁹ Congress further enhanced this provision by giving companies a 6-percent tax credit for all new capital investment for tax years 1982 through 1986.¹⁰ The Tax Reform Act of 1986 (Public Law 99-514) required firms to depreciate such investments over 5 years instead of 3.

Because tax savings realized sooner are worth more to pharmaceutical companies than those realized later, ACRS represents a net decrease in the cost of R&D-related capital investment and therefore an incentive for firms to expand their U.S. R&D efforts.

TAX CREDITS

■ R&D-Related Tax Credits

TAX CREDIT FOR INCREASING RESEARCH EXPENSES

A significant change in the tax treatment of R&D occurred with the enactment of ERTA in 1981. Among four major provisions related to

⁸As noted earlier, the section 174 deduction for qualifying R&D also permits **firms** to deduct the cost of **R&D** conducted by another **organization**. How then does the section 170(a) deduction differ from section 174 deduction? While it is possible that for a **firm** in the position of providing funds to another **organization** for **research**, the two deductions are, in practice, indistinguishable, it is also possible that the particular provisions of each deduction noted in the text may limit its usefulness to the **firm**. To use the section 174 **deduction**, the research performed must meet the **definition** of **qualifying** R&D discussed earlier in this chapter, whereas section 170(1) is less restrictive. Hence, the **R&D** expenses deductible under 170(a) may be greater than under 174. To use the section 170(a) deduction, however, the results of the research must be openly published, thus eliminating the possibility of trade secrets. Furthermore, for corporations the total amount of **all** 170(a) deductions must be less than 5 percent of taxable income.

⁹Capital expenditures for non-R&D assets are depreciated over 3 years or longer periods under **ACRS** (335). Hence R&D assets were advantaged by the system put in place in 1981 when compared with all non-R&D assets as a group.

¹⁰This **investment tax credit** was not renewed when it expired **in 1986**.



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The Economic Recovery Tax Act of 1981 allowed pharmaceutical companies to depreciate all expenditures for R&D facilities and equipment over a 3-year period. The Tax Reform Act of 1986 lengthened this depreciation period to 5 years.

R&D in ERTA was a new tax credit for increases in R&D expenditures.¹⁰ The credit was originally equal to 25 percent of the difference between qualified R&D expenses in the current tax year and the average amount spent during the previous 3 taxable years, or 50 percent of current year expenditures, whichever is greater. Qualifying expenditures include company-financed expenditures for R&D wages and supplies, 65 percent of the amount paid for contracted research, and 65 percent of corporate grants to universities and scientific research organizations for basic research. Expenses must be paid by the taxable year and must pertain to the carrying on of a trade or business. Thus, the credit was originally not available to startup companies, certain joint ventures, or existing firms entering into a new line of business,

The credit has several important limitations. The requirement for ‘‘carrying on a trade or business’’ means that expenses incurred in connection with trade or business but not pertaining to the development of potentially marketable goods and services failed to qualify. For example,

development of new business accounting software would not qualify. Perhaps as important, the courts have interpreted this limitation to exclude research expenditures paid or incurred prior to commencing a trade or business (29). Only wages paid for doing actual research work qualified for the credit. Thus, wages for laboratory scientists and engineers and their immediate supervisors qualified, but wages for general administrative personnel or other auxiliary personnel (such as computer technicians working in a multipurpose computer and information-processing department) did not. Research done outside of the United States was also excluded.

Companies with insufficient tax liabilities to use credits in the year they are earned may ‘‘carry back’’ these credits for up to 3 years to offset past tax liabilities, or they may ‘‘carry forward’’ for up to 15 years to offset future tax obligations (26 CFR 38-39). Credits carried forward in time do not earn interest, making them less valuable than those that can be used in the year they are earned.

Since its enactment in 1981, the provisions of the R&D tax credit have changed several times. The Tax Reform Act of 1986 (Public Law 99-514) reduced the statutory credit rate from 25 to 20 percent. The law also narrowed the definition of qualified research to emphasize the discovery and experimentation stages of the innovation process, thus eliminating expenditures for product modifications after they reach their functional specifications (441). The legislative history of the Tax Reform Act clearly states that all R&D necessary to obtain approval from the FDA to market a pharmaceutical in the United States for one or more indications qualifies for the tax credit (Public Law 99-514, L.H. II-75).

Further changes in the tax credit enacted in the 1988 Technical and Miscellaneous Revenue Act (TAMRA) (Public Law 100-647) reduced the

¹⁰ The other three provisions were: 1) an allowance for faster depreciation of R&D assets (discussed earlier in the text), 2) an increase in the deduction for newly manufactured research equipment donated to universities, and 3) a 2-year suspension of a 1977 Treasury Department regulation (FR 1.861-8) requiring a portion of R&D expenses for products or processes sold abroad to be allocated against foreign sales, thus reducing the value of the R&D deduction for U.S. taxes (also discussed earlier in the chapter) (357).

effective credit rate from 20 percent before TAMRA to 16.6 percent (233). The Omnibus Budget Reconciliation Act of 1989 (Public Law 101-239) extended the tax credit through September 1990 but also made changes that had important effects on its value to firms (33,233). In addition, as a company's rate of R&D growth (i.e., the annual percentage increase in R&D from one year to the next) goes up, so too does the probability **that the** credit will be subject to limitations. Baily and Lawrence (33) showed that a company first faces the limitations in the credit at growth rates above 36 percent. This provision of the law limited the ability of fast growing but small research intensive R&D firms (such as many biotechnology firms) to claim high credits.

Congress twice extended the version of the R&D tax credit as adopted in 1989 (Public Law 101-508; Public Law 102-227), although it expired in June 1992. Congress passed another extension as part of the Revenue Act of 1992 (H.R. 102-11) which President Bush vetoed November 1992.

A number of researchers have estimated the effective marginal credit rate (the percent reduction in the cost of R&D) implicit in the several incarnations of this tax credit using a variety of methods and assumptions; they have found effective credit rates that are substantially less than the statutory rates of 20 or 25 percent. The divergence between the effective and statutory rates stems from the way in which the credit is calculated, the interaction of the credit with other provisions of the internal revenue code,¹¹ the rate at which future savings are discounted to their present value, and the fact that not all firms have sufficient tax liability to use credits in the year they are earned.

Baily and Lawrence (33) estimated marginal effective credit rates for the R&D tax credit as it changed over the course of the 1980s. Assuming that a firm could take full advantage of the credit beginning in the first year it was available and

assuming a (before-tax) interest rate of 12 percent, they calculated that the 1981 credit reduced the cost of qualified R&D by 9.3 percent. The 1986 changes in the credit and in corporate tax rates reduced this effective rate to 6.1 percent by 1988; alterations made in 1988 further reduced the marginal effective credit rate to 4 percent.

These calculations do not take into account the fact that not all firms could use the credit. Some were not expanding their R&D, making them ineligible for the credit since it was based on increases in research spending, while others did not have sufficient tax liability to use the credits. Other firms may have increased R&D spending so rapidly that they were subject to upper limits on the credit. To correct for these instances, Baily and Lawrence reduced the calculated rate by 30 percent, based on estimates that 30 percent of company-financed research expenditures across all industries from 1981 to 1985 did not qualify for the credit (437). After this correction, the marginal effective credit rate declined from 6.5 to 2.8 percent between 1981 and 1989. This marginal effective rate is an average across all firms in all industries. The pharmaceutical industry might have a higher effective credit because pharmaceutical R&D expenditures increased faster than R&D in most other industries in the 1980s (290). Individual pharmaceutical companies probably vary greatly in their marginal effective credit rate depending on their R&D expenditures.

Altshuler used a different approach to estimate marginal credit rates (5). Using data from the IRS, she modeled the extent to which any particular type of firm was able to use the R&D tax credit between 1981 and 1984. This model accounted for the carryforward and carrybacks of unused credits. Altshuler estimated the marginal effective credit rate for firms with different levels of R&D and different tax liabilities. Assuming an (after-tax) interest rate of 7 percent, she found a marginal credit rate of 1.3 percent for 1981 across all industries. When weighted by qualified re-

¹¹ For example, even without a tax credit, when the corporate tax rate was 46 percent, an additional dollar of R&D cost the firm only \$0.54 because these expenses are deductible.

search expenditures,¹² this rate increases to 2.3 percent, a figure that is less than 10 percent of the statutory 25 percent credit rate in effect in 1981. For some types of firms that expand their R&D quickly and move from a nontaxable to taxable state, she found a negative credit rate, which suggests that the credit may create a counter-intuitive disincentive to expand R&D. (An earlier study by Eisner, Albert and Sullivan (119) that also used IRS data for the 1981-84 period but did not correct for carry forwards and carrybacks also found instances in which the incentive created by the credit to increase R&D is zero or negative.) A third study by Wozny (525) that uses similar data for the period and also accounts for the inability of some firms to claim credits in the year they are earned found marginal effective credit rates consistently below 6 percent. Taken together, these studies suggest that during the 1980s, this tax credit lowered the price of each extra dollar spent on R&D to a much smaller degree than the 25- and 20-percent statutory rates. However, none of these studies provide estimates of effective rates particular to pharmaceutical companies.

To date, only Baily and Lawrence have attempted to estimate the marginal effective credit rates of the 1989 version of the R&D tax credit, although this work also lacks any industry-specific estimates. Baily and Lawrence estimated that the marginal effective credit rate for firms able to fully utilize the credit is the statutory 20 percent, but for firms limited in using the credit, it may be as low as 10 percent. Assuming that 70 percent of company -financed R&D qualifies for the credit and no more than 10 to 20 percent of

R&D is in firms that face limitation, Bailey and Lawrence estimated that, on average, the marginal effective credit rate of the latest version of the credit is 12 to 13.5 percent. Regardless of the exact marginal rate, their calculations indicate that the 1989 version of the R&D credit provides incentives to increase R&D spending substantially greater than those of earlier versions.

THE BASIC RESEARCH TAX CREDIT

The Tax Reform Act of 1986 established a tax credit for support of university-based and nonprofit-based basic research. Like the R&D tax credit, its statutory rate is 20 percent, and it is given for increases in corporate cash payments to universities or nonprofit organizations for basic research over a base amount.¹³ Basic research is defined as “original investigation” (in any area except the social sciences, arts, or humanities) undertaken “for scientific advance without commercial objective” (26 U.S.C. 41(e)).

OTA found no attempts to analyze the marginal effective credit rate of the basic research tax credit. Because of the complex structure of this credit, the marginal effective rate faced by any particular firm is lower than the statutory 20 percent and depends on the firm’s overall qualified R&D expenditures during the tax year and previous years, its qualified basic research payments during the tax year, and its undesignated university contributions during both the base period and the tax year.

The IRS does not prohibit universities that perform basic research under this credit from assigning intellectual property rights (such as

¹² Because the marginal credit varies with the rate at which a firm is increasing its R&D over time, Altshuler (unlike Baily and Lawrence) weights research expenditures at the level of individual firms according to whether they were taxable in each of the 4 years she examined and according to whether their qualified R&D expenditures were growing at a low, normal or high rate. Baily and Lawrence weight at the level of all firms together, using the estimate that 70 percent of all R&D expenditures in the whole economy from 1981 to 1989 qualified for the credit. Using her method, Altshuler estimated that for the period 1981-84, 62 percent of all R&D expenditures qualified.

¹³ The base amount is specific to each corporation and is the sum of two components. The first component is the greatest of three calculated amounts: 1) 1 percent of the average annual total qualified research expenses (as calculated for the R&D tax credit) during a 3-year base period; 2) all contract research payments made by the taxpayer during the base period; 3) 50 percent of the qualified basic research payments to universities and nonprofit organizations during the tax year. The second component is defined as the excess of the average annual nondesignated contribution to universities during the base period (updated for inflation) over nondesignated university contributions during the tax year. This second component is designed to reflect any decrease in nonresearch giving to universities during the tax year as compared with the base period. If this amount turns out to be negative, it is assumed to be zero in calculating the base amount.

patent ownership) resulting from such research to other parties, including the corporation that pays for the research. Because the pharmaceutical company may realize exclusive benefits from basic research it supports in universities, the basic research tax credit has created a new economic incentive for pharmaceutical companies to support research conducted in universities. However, such a decision is likely to depend on other factors in addition to the after-tax cost of such research, including where the scientific expertise resides, whether it is desirable to maintain secrecy of ongoing research, and what the firm's philanthropic policy is.

THE ORPHAN DRUG TAX CREDIT

The third tax credit designed to promote R&D is specific to the pharmaceutical industry. It is one of several incentives included in the 1983 Orphan Drug Act (Public Law 97-414) to encourage firms to develop new treatments for commercially unviable therapies in the United States.¹⁴ Firms are entitled to a tax credit equal to 50 percent of qualified R&D expenditures for human clinical trials on therapies that have received official orphan drug status by the FDA. Firms can receive such status for drugs that treat diseases or conditions affecting less than 200,000 people in the United States.¹⁵

Clinical research expenditures for designated orphan drugs qualify for the orphan tax credit only if they otherwise meet the test for qualifying R&D expenditures under the R&D tax credit (26 U.S.C. 41(a-d)). This test excludes several types of expenses, including software development and management of R&D activities (except for direct supervision of R&D).

Is this tax credit an important incentive for pharmaceutical firms to engage in additional orphan drug R&D? Because it depends only on the amount of qualified clinical testing that a company does on a drug with orphan drug status, not on increases in R&D,¹⁶ the cost of an additional dollar of qualifying orphan R&D is \$0.50 for the company, a 24 percent reduction from the cost of the qualifying R&D without the tax credit.¹⁷ However, not all firms can take advantage of this credit. To benefit, companies must have taxable income in the same year they make these clinical research expenditures, because there is no carryforward or carryback provision in the orphan drug tax credit. In addition, since some expenses associated with additional clinical orphan drug R&D do not qualify for the credit, the actual cost of additional clinical R&D for qualifying drugs is somewhat more than \$0.50 on the dollar (but less than \$0.66).¹⁸ Even so, this analysis suggests that for

¹⁴ See chapter 9 for a review of other incentives in the orphan drug law.

¹⁵ Firms may also receive orphan drug status for therapies whose expected costs are high enough that no single firm would otherwise develop the pharmaceutical. However, since 1985 no firm has yet applied for orphan status under this provision. See chapter 9 for more information about how drugs receive designation as orphan drugs.

¹⁶ There is one exception to this generalization. The orphan drug credit cannot reduce the taxes a firm owes below a calculated minimum amount (referred to as the "alternative minimum tax").

¹⁷ Because taxpayers cannot deduct expenses eligible for the orphan drug credit from taxable income, one can figure the effective marginal rate as follows: Without the credit, the after-tax cost of a dollar of research is $(\$1.00 - 0.34) = \0.66 when the marginal tax rate is 34 percent. With the tax credit, the cost is $(\$1.00 - \$0.50) = \$0.50$. Hence, the tax credit lowers the cost of the extra dollar of clinical orphan research from \$0.66 to \$0.50, a drop of 24.2 percent.

¹⁸ OTA found no data on the percentage of pharmaceutical R&D spending that actually qualifies for the various tax credits. However, One study by the U.S. General Accounting Office (GAO) suggested that across all industries, qualifying R&D represented 70 percent of all R&D spending (437). If this figure applied to clinical orphan drug R&D as well, then the tax credit would reduce the cost of an additional dollar of such research (for a firm in the position to expand its clinical orphan R&D) by 17 percent. This figure is arrived at as follows:

Assuming a 34-percent tax rate, the cost of an additional dollar of clinical orphan R&D without the tax credit would be $(\$1.00 - \$0.34) = \$0.66$. With the 50-percent tax credit and assuming that 70 percent of R&D expenses qualify for the credit, the cost would be $0.7(\$1.00 - \$0.50) + 0.3(\$1.00 - \$0.34) = \$0.55$. Hence, the tax credit would lower net cost per dollar of research from \$0.66 to \$0.55, a reduction of 17 percent. However, there is no evidence other than the single GAO study mentioned to indicate that 70 percent of clinical orphan R&D qualify for the credit.

a firm with a high percentage of its clinical orphan R&D qualifying for the credit, the potential tax savings may be substantial and potentially pivotal in the decision about whether to begin or continue clinical testing of an orphan drug.

■ Other Tax Credits

Among other tax credits of the Federal Tax Code, two provisions are of particular relevance to the pharmaceutical industry: the foreign tax credit system and the possessions tax credit. While these credits do not represent direct subsidies to the firm's R&D costs, there are at least two reasons to consider their importance for pharmaceutical R&D. First, they indirectly affect the location and amount of R&D. These credits affect the after-tax cost of doing business in political jurisdictions outside the United States. Second, they affect pharmaceutical firms' returns to R&D.

FOREIGN TAX CREDITS

All major U.S. pharmaceutical firms are multinational and are taxed under the U.S. tax code on the basis of their worldwide income.¹⁹ This creates the potential for double taxation of foreign source income. Because most other nations have mechanisms to prevent double taxation, the United States would bear a competitive disadvantage without a similar policy here as well. For this reason, the United States has adopted a foreign tax credit system allowing multinational corporations to credit tax payments they make to foreign treasuries against their domestic income tax obligations (26 U.S.C. 861). Because the credit is

limited to the amount of U.S. taxes a firm would owe on income derived from foreign sources, multinational firms would not receive the full credit if the taxes paid abroad are greater than the U.S. tax owed.²⁰

Revenues from foreign sales (perhaps of a product resulting from foreign R&D) may be subject to both foreign and U.S. taxes. When the revenues are repatriated to the U.S. parent corporation, they are subject to U.S. taxes. Parent firms that already have excess foreign tax credits generate no additional U.S. tax liability, and parent firms without such an excess pay the difference between the rates at home and abroad. In the final analysis, both the former and latter parent corporations pay at least the U.S. tax on foreign income. However, for a firm that cannot use all of the credits earned on foreign income from a country whose effective tax rate is higher than the U.S. tax rate, the after-tax cost of business in the foreign country is higher than the cost of business in the United States. To the extent that firms are sensitive to such discrepancies between locations in the net price of investing, firms may be less likely to invest in the country with a higher effective tax rate. As suggested above, such considerations may influence the location, level, and financing of a firm's R&D investments. However, OTA's interviews with corporate and financial managers at eight U.S. research-based pharmaceutical firms indicated that tax considerations are much less important in determining where they locate R&D than are regulatory, marketing, and scientific considera-

¹⁹ This system is called a 'residence approach' to taxation and is not found in all countries. For example, many European countries use a 'territorial' approach under which taxes are owed only on income earned within national borders. Mixtures of the two systems are also common.

In the United States, a multinational firm may organize an overseas operation as a branch or a subsidiary. The choice of legal form determines when it must pay U.S. taxes on income from foreign sources. Branches, which are not separately incorporated in foreign countries, are taxed when income (positive or negative) is earned. Subsidiaries, which are separately incorporated, pay taxes only when income is repatriated. This feature of the U.S. international tax system, called "deferral," creates a strong incentive to delay repatriations of subsidiary earnings indefinitely. In 1962, Congress enacted the Subpart F provisions that restrict deferral of certain types of unrepatriated income (Public Law 87-834). The Tax Reform Act of 1986 (Public Law 99-514) extended the classes of income subject to the Subpart F provisions. Within these limitations, a subsidiary may repatriate income from foreign sources in a variety of forms, each of which have different tax consequences. Although multinational firms are largely free to choose repatriation strategies that minimize their global tax liabilities, both the United States and foreign countries have passed laws that limit the scope of this activity.

²⁰ A firm's excess foreign tax credits may be carried back to offset tax obligations for up to 2 prior years or carried forward to offset future tax obligations for up to 5 years. However, unused credits do not earn interest over time.

tions. Like other multinational firms, pharmaceutical companies have an incentive to allocate their expenses among their international subsidiaries and divisions to the extent allowable by law to minimize their global tax liability.

THE POSSESSIONS TAX CREDIT (SECTION 936)

In an effort to encourage firms to locate operations in Puerto Rico, the United States altered the tax code to exempt qualifying income generated in Puerto Rico from U.S. taxation (7). In addition, Puerto Rico has designed its tax code to benefit U.S. firms that locate in the Commonwealth.²¹ Section 936 of the U.S. tax code contains provisions that exempt qualifying corporations from U.S. taxes on Puerto Rico income. Corporations qualifying for this credit are called possessions corporations. U.S. companies are considered possessions corporations if they derive at least 80 percent of gross income from U.S. possessions such as Puerto Rico. Possessions corporations must earn at least 75 percent of their income from active business operations (such as manufacturing), and thus no more than 25 percent of income may be derived from financial mechanisms such as interest on bank investments.²² The “possessions tax credit” is equal to 100 percent of the U.S. tax on income from Puerto Rico for subsidiaries or branches that meet the definition of a possessions corporation (6).

The pharmaceutical industry is a prime beneficiary of the possessions credit because of both the extent of its taxable revenues and its “intangible assets.” Intangible assets include patents, licenses, trademarks, and corporate or brand names. Unlike tangible assets including buildings and machinery, intangible assets are not tied to any particular physical location. Hence, ownership of intangible assets such as patents may be transferred to subsidiaries or branches that qualify as possessions corporations according to guidelines established by the Federal Government.²³

County NatWest’s Washington Analysis Corporation (WAC) estimated the net tax savings from the possessions credit in 1989 for several companies using data from annual reports (248).²⁴ Table 8-1 summarizes the results of this analysis for eight research-based U.S. pharmaceutical firms. These are only rough estimates of net tax savings from the possessions tax credit, because the net income in that study was defined according to standard accounting practice and differs from taxable income as defined by the internal revenue code.

Because effective corporate tax rates in Puerto Rico are substantially lower than in the United States, this tax credit represents a major form of Federal tax expenditure for pharmaceutical firms. Although little actual pharmaceutical R&D is done in Puerto Rican locations (245), the credit may lead to more manufacturing jobs in the

²¹ Puerto Rico has primary taxing jurisdiction over income earned within its borders. Although Puerto Rico has statutory corporate tax rates that range from 22 to 44 percent (and will drop to a maximum rate of 35 percent by 1993), the effective tax rates faced by most firms are much lower due to extremely generous tax exemptions. Corporations that engage in manufacturing or export services in Puerto Rico receive an exemption of current income of up to 90 percent. These exemptions take the form of grants and gradually expire over a 10- to 25-year period depending on the location of the plant. The Commonwealth usually grants extensions before expiration.

Structures and equipment located in Puerto Rico are also treated preferentially. Depreciation deductions are “flexible” which means that as long as the deduction does not make taxable income negative and the total amount depreciated does not exceed the value of the asset, any amount of depreciation may be claimed in any year.

Income repatriated to parent corporations in the form of dividends are subject to a Puerto Rican tax of 10 percent. However, if half the earnings from Puerto Rican investment are held in Puerto Rico for at least 5 years, the tax is reduced by one-half. In addition, interest generated from Puerto Rican financial instruments such as from bonds or banks is not subject to Puerto Rican taxes.

²² For financial income to qualify for the credit it must be obtained from investments made in Puerto Rico.

²³ Possessions corporations must use one of several methods to allocate income derived from products protected by such patents between the U.S. possession and the U.S. mainland business. The most common method, called “profit splitting,” allocates to Puerto Rico half the revenues generated from transferred intangibles (7,243).

²⁴ Statehood for Puerto Rico would lead to the repeal of the Possessions Tax Credit because the U.S. Constitution requires that Federal law apply uniformly across all States (430).

Table 8-1—Tax Savings for Selected Pharmaceutical Firms Attributable to U.S. Possessions Credit for Businesses in Puerto Rico, 1989^a

Firm	Estimated tax savings attributable to possessions credit (\$ millions)	Net income (\$ millions)	Tax savings as a percent of net income
American Home Products.....	\$81	\$1,102	7.3%
Bristol-Myers.....	64	747	8.6
Eli Lilly.....	54	940	5.7
Merck.....	105	1,430	7.4
Pfizer Inc.....	106	681	15.6
Schering-Plough.....	49	399	12.3
Upjohn.....	46	176	25.9
Warner-Lambert.....	40	413	9.6

^a Data for Schering-Plough are for 1988.

SOURCE: Office of Technology Assessment, 1993. Based on data from I.S. Loss and A.D. Morgenstern, *Pharmaceuticals/Tax Policy: A Successful Puerto Rican Statehood Initiative Will Result in Higher Corporate Tax Rates for Many Companies* (Washington, DC: The NatWest Investment Banking Group, 1990).

commonwealth (430). In addition, the net tax savings improves pharmaceutical companies' after-tax returns.

■ Estimates of Federal Tax Credit Expenditures

At OTA's request the congressional Joint Committee on Taxation (JCT) estimated the size of all tax credits affecting the pharmaceutical industry in tax year 1987. These estimates come from the Statistics of Income (SOI) Database compiled by the IRS.²⁵

The results of the analysis are presented in tables 8-2 and 8-3.

Table 8-2 shows the tax credits actually claimed by the pharmaceutical industry in 1987. In addition to the total dollar value of each credit, the estimated number of firms claiming them, and the pharmaceutical industry's credit as a percent of the credit's total dollar value for all industries, the table also estimates the credit as a percent of the industry's tax liability in the absence of any credits²⁶ as well as the credit as a percent of the industry's taxable income (a "negative tax rate"

on taxable income). As noted earlier, foreign tax credits differ somewhat from the other tax credits examined in this chapter in that they are a means to prevent double taxation of foreign source income rather than a provision to encourage certain types of taxpayer behavior. However, we include estimates of this credit here to underscore the multinational nature of the pharmaceutical industry and to show the size of foreign tax credits relative to the credits.

For the pharmaceutical industry, however, the possessions tax credit may be more important than the foreign tax credit.²⁷ More than half of the total credit was claimed by firms in the pharmaceutical industry, and, on average, it reduced each firm's tax liability by more than a third. The percentage deduction in tax liability was greater for smaller companies (those with assets \$250 million) than for larger companies, which suggests size may not be a barrier to establishing a subsidiary in Puerto Rico.

The orphan drug credit had relatively little impact on either the Federal Treasury or the industry's tax obligations in 1987. As one would

²⁵ Appendix J describes how OTA and the JCT identified research-based pharmaceutical firms in the SOI.

²⁶ This statistic measures the extent to which the credit reduces the industry's tax obligations.

²⁷ Estimates of the possessions credit here represent tax expenditures for the Federal Treasury only and do not count taxes that firms must pay to the Commonwealth of Puerto Rico. Hence, the actual total tax savings to the industry is smaller than the subsidy provided by the Federal Government. As indicated earlier, however, effective tax rates in Puerto Rico are much lower than on the U.S. mainland.

Table 8-2—Tax Credits Claimed by the Pharmaceutical Industry in 1987a

	Aggregate credit claimed by pharmaceutical industry (\$ thousands)	Number of firms claiming credit	Aggregate credit claimed as a percent of aggregate claimed by all industries	Aggregate credit claimed as a percent of taxes pharmaceutical industry would pay with no credits	Aggregate credit claimed as a percent of aggregate pharmaceutical industry income subject to taxes
Foreign tax credit					
Firms with assets less than \$50 million	\$469	2	0.1%	0.4%	0.2%
Firms with assets between \$50 million and \$250 million.	287	6	0.1	0.1	0.0
Firms with assets of \$250 million or more.	928,089	20	4.6	26.6	10.7
All firms.	928,843	28	4.5	23.4	9.4
Possessions tax credits					
Firms with assets less than \$50 million.	66,947	22	14.5	64.1	24.8
Firms with assets between \$50 million and \$250 million	313,536	20	40.3	81.9	33.0
Firms with assets of \$250 million or more.	958,100	11	67.8	27.5	11.1
All firms.	1,338,800	53	50.4	33.7	13.6
Orphan drug tax credits					
Firms with assets less than \$50 million.	0	0	0.0	—	—
Firms with assets between \$50 million and \$250 million	0	0	0.0	—	—
Firms with assets of \$250 million or more.	4,665	6	90.5	0.1	0.1
All firms.	4,665	6	90.5	0.1	0.0
General business tax credits					
Firms with assets less than \$50 million.	4,053	221	0.5	3.9	1.5
firms with assets between \$50 million and \$250 million.	2,355	7	0.7	0.6	0.2
Firms with assets of \$250 million or more.	79,240	20	1.2	2.3	0.9
All firms.	85,648	248	1.1	2.2	0.9

^aEstimates are for tax year 1987 from the U.S. Treasury's Statistics of Income (SOI) sample weighted to reflect relevant populations. Pharmaceutical industry is defined as SOI industry group 2830 minus firms with assets of \$250 million or more and known not to be involved in pharmaceuticals.

SOURCE: Office of Technology Assessment, 1993. Estimates provided by U.S. Congress, Joint Committee on Taxation.

Table 8-3—Research Tax Credits Earned by the Pharmaceutical Industry in 1987^a

	Aggregate credit claimed (\$ thousands)	Number of firms claiming credit	Aggregate credit earned as a percent of aggregate earned by all industries
Research and experimentation tax credit^b			
Firms with assets <\$50million.	\$6,455	147	3.10/0
Firms with assets > \$50 million and < \$250 million. . .	2,042	9	2.0
Firms with assets of \$250 million or more.	88,878	28	12.6
All firms.	97,375	184	9.6
University-based basic research tax credits			
Firms with assets < \$50 million.	3	90	17.3
Firms with assets > \$50 million and <\$250 million. . .	0	39	0.0
Firms with assets of \$250 million or more.	2,257	43	10.7
All firms.	2,260	990	6.4
Orphan drug tax credits			
Firms with assets <\$50 million.	0	0	—
Firms with assets > \$50 million and < \$250 million. . .	0	0	—
Firms with assets of \$250 million or more.	5,358	8	84.3
All firms.	5,358	8	84.3

^a Estimates for tax year 1987 are from the U.S. Treasury's Statistics of Income (SOI) sample weighted to reflect relevant populations. Pharmaceutical industry is defined as SOI industry group 2830 minus firms with assets of \$250 million or more and known not to be involved in pharmaceuticals. Tax credits *earned* are not equivalent to tax credits *claimed* because the former does not reflect insufficient tax liability in current year, or carry-forwards from previous years.

^b Research and experimentation credit estimates are net of university-based basic research credit.

SOURCE: Office of Technology Assessment, 1993. Estimates provided by U.S. Congress, Joint Committee on Taxation.

expect, virtually all (91 percent) of this credit was claimed by firms whose primary activity is pharmaceuticals.

Estimates of the R&D and university basic research credits claimed by the pharmaceutical industry are included in the "general business credit." In addition to these two research-related credits, the general business credit includes other tax credits potentially available to corporations: a credit for newly created jobs, one for certain types of special investment, one for the use of alcohol as a fuel, and a credit for the provision of low-income housing. Because carrybacks and carry forwards are calculated on the general business credit *as a whole*, it is not possible to produce separate estimates of the R&D and university basic research credits actually claimed.

General business credits were claimed by firms of all sizes in this industry and reduced the taxes owed by the smallest companies (those with assets under \$50 million) by almost 4 percent more than for larger firms. Although general business credits for drug companies cost the Treasury 17 times more than the orphan drug credit in 1987, it still totaled less than 10 percent of the foreign tax credit and only 6 percent of the possessions credit claimed by this industry.

Estimates of the R&D tax credit, the basic research credits and orphan drug tax credits *earned* by the pharmaceutical industry in 1987, are shown in table 8-3.²⁸

Only eight companies, all large firms, earned an orphan drug credit in 1987.²⁹ Two-thirds of all orphan drug designations granted by the FDA

²⁸ For the R&D and basic research credits, the amount of each credit *earned* by a particular company is defined as 20 percent of the difference between qualifying expenses in the current year and the base amount. The amount of credit actually *claimed*, however, adds in credits earned in earlier years that are carried forward to the current year or subtracts credits earned in the current year but unused due to insufficient tax liability.

²⁹ The fact that only six firms claimed this credit (see table 8-2) indicates that two of the firms that *actually* had qualifying expenses in 1987 were unable to use it due to insufficient tax liabilities.

went to firms that are not members of the Pharmaceutical Manufacturers Association (generally the smallest companies in the pharmaceutical industry). Thus, the developers of most orphan drugs may not have been in a position to claim a tax credit or may not yet have reached the clinical stage of the R&D process.

The fluidity of tax laws during the latter half of the 1980s may make these 1987 estimates unrepresentative of the late 1980s. The Tax Reform Act of 1986 lowered the maximum corporate tax rate from 46 to 34 percent over a period of several years beginning in 1987. And, the structure of the R&D tax credit also changed substantially over time. Although the resources necessary to conduct the analysis presented in tables 8-2 and 8-3 limited OTA to examining a single tax year, the IRS publishes some summary statistics from the SOI database for Principal Activity Classification (PAC) codes, groups of firms organized according to the activity earning them the **greatest** proportion of their total receipts.

Table 8-4 presents estimates of tax credits claimed by firms in pharmaceutical firms (PAC 2830) in the 1984-87 period.³⁰ Whereas all of the credits increased in the 1984-86 period, the possessions, orphan drug, and general business credits dropped between 1986 and 1987, the first year after tax reform. Of these three, only the general business credit registered a major decline (48 percent). It is likely that the dramatic decline between 1986 and 1987 in this set of credits is attributable to the elimination of the Investment Tax Credit in the 1986 Tax Reform Act (297). The foreign tax credit actually increased between 1986 and 1987. Despite the evident trends, the numbers indicate that the relative magnitude of these credits remained roughly steady between 1984 and 1987.

In sum, the estimates in tables 8-2,8-3, and 8-4 indicate that, in an effort to achieve a variety of

Table 8-4-Tax Credits Claimed by Firms in Statistics of Income Industry Group 2830,1984-87 (\$ millions)

	1984	1985	1986	1987
Foreign tax credit.	\$621	\$632	\$747	\$929
Possessions credit.	839	903	1,463	1,399
Orphan drug credit.	0	0	6	5
Research & experimentation tax credit*.	86	88	—	—
General business credits ^a	135	125	180	86 ^a

^a Beginning in 1986, statistics of income (SOI) data subsumed the research and experimental tax credit within "general business credits" which also includes low-income housing, investment, jobs, alcohol fuel, and employee stock ownership credits.

SOURCE: Office of Technology Assessment, 1983. Based on Statistics of Income Division, Internal Revenue Service, U.S. Department of Treasury, *Source Books, Statistics of Income, 1984-1987, Corporate Tax Returns* (Washington, DC: U.S. Government Printing Office, 1984-87).

public policy objectives, the Federal Government makes substantial tax expenditures through credits claimed by the pharmaceutical industry. In 1987, not including over \$900,000 for foreign tax credits, the Federal Treasury spent a total of \$1.4 billion in tax credits for these firms (table 8-4). Taken together, they reduced the Federal taxes the pharmaceutical industry would have otherwise owed by over 36 percent.³¹ The largest of these tax code provisions, the possessions credit, is also significant because the pharmaceutical industry makes more use of it than does any other industry, accounting for half of all the dollars claimed in 1987. Although this credit along with the foreign tax credit was designed to enhance the economic development of a U.S. possession and to avoid double taxation of foreign income, respectively, rather than to subsidize pharmaceutical R&D, they nevertheless do effectively reduce the tax liability of pharmaceutical firms. Hence, they raise net after-tax income achievable from pharmaceutical operations, including those arising from the development of new products.

³⁰ The data for PAC 2830 contain some large firms with multiple lines of business (and, hence, overestimate the industry's true assets and tax credits). Nevertheless, the summary statistics are useful for examining trends in the use of tax credits over time.

³¹ Adding foreign tax credits raises this to 59 percent.

■ Firm Characteristics and the Use of Tax Credits

The tax credits available to businesses engaging in pharmaceutical R&D are of greater or less value to firms, depending on their specific financial and operating characteristics. The following stylized examples show how companies in various situations would stand to benefit from the various tax credits. Consider three types of research-based pharmaceutical companies:³²

- . A startup firm with no products or processes on the market, and hence, no income, but with a growing R&D budget financed by investment from sources outside the firm.
- . An emerging firm with a few products on the market (either in the U.S. or abroad), some income, a growing R&D budget, and a very high ratio of R&D expenses to sales.
- An established, large, multinational firm with multiple products on the market and R&D expenditures that equal between 12 and 16 percent of sales (the same as that found among almost all existing large pharmaceutical firms).

For the startup firm, tax credits are not particularly useful since it usually does not pay income taxes. Such a firm is intent on identifying or moving a product or process to the point that investors may realize a return. To the extent that it can anticipate taxable income in the future, it can carry forward R&D tax credits to subsequent years, but the value of these potential future credits is diminished because of the time value of money. While the possessions and foreign tax credits can also theoretically be carried forward, a firm can earn these credits only by generating income (either abroad or in a U.S. possession).

The orphan drug credit has no carryforward or carryback provision at all. In practical terms, then, these credits are not useful to the startup firm.

The established firm cares most about the tax provisions having the greatest impact on its tax liability—the possessions and foreign tax credits. Although the established company will claim any R&D or orphan drug credit to which it is due, these have a smaller impact on taxes it pays: the total general business and orphan drug credits claimed by the largest pharmaceutical firms represented only 4 percent of the amounts claimed for possessions and foreign tax credits. In addition, the fact that the R&D credit is limited to expenses for research done in the United States diminishes its appeal for an established firm with multinational R&D facilities.

For the emerging firm, the R&D tax credit can be particularly important. Because the credit is for increases in R&D expenditures, its dollar value is higher for firms with relatively high annual rates of growth of qualifying research expenses. The higher the company's R&D-to-sales ratio, the more likely that tax subsidies from the R&D credit will reduce the company's Federal tax liabilities.³³

OTHER NATIONS' R&D TAX INCENTIVES

To the extent pharmaceutical firms earn income in other countries, they are subject to the tax laws of the foreign countries in which they conduct business. While a full review of all foreign tax laws of relevance to the pharmaceutical industry and their implicit incentives is beyond the scope of this report, this section provides a brief examination of how other nations treat corporate R&D.

³² The pharmaceutical firms visited by OTA staff over the course of this assessment included companies that resemble each of the three types described above. The perspectives of relevant corporate managers interviewed at these firms about the value of various tax subsidies closely fit these three generalizations.

³³ Although not considered in this chapter, OTA's interviews at pharmaceutical companies indicated that startup and emerging firms may care as much or more about the tax treatment of income generated for their investors as they do about taxes on their own income. Because such companies are likely to finance their R&D with funds from outside sources using novel mechanisms such as the R&D limited partnership, favorable tax treatment of investment income (particularly from high risk/high return financial instruments) may make it easier for firms to attract needed capital.

In a review of national tax policies in 23 developed or emerging high-technology countries,³⁴ OTA found that most nations permit R&D spending to be deducted from taxable income in the year incurred (245). In addition, most tax codes provide some mechanism to carry unused deductions forward into future years. Countries vary a great deal in the provision of tax credits tied to R&D spending. Currently, Brazil, China, Denmark, Hong Kong, Italy, South Africa, and Switzerland lack any R&D tax credits or other special allowances for R&D beyond the deduction of current expenses. Among other countries examined, Canada, France, Japan, Spain, Sweden, and Taiwan all provide a tax credit on increases in R&D spending similar to the United States. As shown in table 8-5, the statutory credit varies considerably but does not exceed 50 percent in any country. Remaining nations provide other incentives for R&D, including more specific types of tax subsidies as well as direct grants. These policies are also briefly summarized in table 8-5.

Although a complete understanding of particular tax subsidies and incentives faced by the pharmaceutical industry in other countries would require a more detailed analysis, this review suggests that most countries use some mechanism to subsidize private spending for R&D. In many cases, these mechanisms are similar to those employed by the U.S. Government. This general comparability of U.S. and international tax codes is reinforced by the recent trend in other countries to reduce corporate tax rates to levels near the maximum 34 percent rate adopted by the United States in its Tax Reform Act of 1986 (303). Corporate managers at the research-based pharmaceutical firms interviewed by OTA said that marketing and scientific considerations were much more important in deciding the location and

level of R&D investment than were tax incentives. While specific research projects and programs may differ considerably in their tax implications, this perspective is consistent with an overall general comparability of national taxes across different countries.

CONCLUSIONS

Taxes paid by corporations are determined by numerous provisions of the tax code, each designed to achieve particular policy goals. Whether or not such provisions achieve their public policy goals, many lead to lower taxes for firms and to lower after-tax costs of R&D and higher after-tax returns to R&D.

In actual Federal dollars spent, Federal tax credits constitute one of the most substantial forms of government involvement in the operations of the pharmaceutical industry. In 1987, not including over \$900,000 in foreign tax credits, the Federal Treasury made \$1.4 billion in tax expenditures through credits to drug companies. Of this, only about \$90 million was for credits whose specific policy purpose is to stimulate R&D. The major part, \$1.3 billion, of the lost tax revenue was due to the foreign and possessions tax credits.

Overall, tax credits reduced the amount of taxes pharmaceutical firms would have otherwise owed the U.S. Government by 36 percent and equaled 15 percent of the industry's taxable U.S. income. Adding foreign tax credits raises these figures to 59 percent and 24 percent, respectively.

The relative importance of each credit varies among firms according to their financial characteristics. The incentives in the R&D tax credit may be stronger for emerging biotechnology companies who have some income on which to pay taxes but whose R&D budgets are growing more rapidly than they are for larger, more established firms. For the largest, most estab-

³⁴ The countries are Australia, Belgium, Brazil, Canada, China, Denmark, Germany, France, Hong Kong, Ireland, Italy, Japan, Netherlands, Norway, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, and United States. The information gathered in this review does not capture tax policies at the regional or local level, which can be as important or more important than those at the national level. For example, in Switzerland, the individual cantons into which the country is divided have primary responsibility for collecting government revenue (334,335). Some countries, like Italy, may also have special incentives in their national tax codes that apply only to particular geographic regions where they wish to stimulate economic development.

**Table 8-5-Research and Development Tax Incentives in Other Nations:
Summary of Policies**

Country	R&D tax credits	Other subsidies ^a
Australia		<ul style="list-style-type: none"> ● 150% expensing of R&D ● R&D tax “grants”
Belgium		<ul style="list-style-type: none"> ● Special deductions for R&D personnel ● Exemptions from tax of distributed profits
Canada	● 20% incremental	
France	● 50% incremental	● R&D grants in selected industries ^b
Germany	• Tax credits on R&D equipment	● Tax grants on capital investment
Ireland		● Tax exemption for royalty income from patent R&D done in Ireland
Japan	● 20% incremental	<ul style="list-style-type: none"> ● Trade policies beneficial to R&D equipment^c ● R&D grants for selected technologies
Netherlands		● Special allowances for R&D capital and labor
Norway		● Deductions for future R&D
Singapore		● 200% expensing of R&D
South Korea		● Deductions for future R&D
Spain	<ul style="list-style-type: none"> ● 15% of R&D ● 30% of R&D equipment 	
Sweden	● 30% incremental	● Special allowances for R&D salaries
Taiwan	● 20% incremental	
United States	<ul style="list-style-type: none"> ● 20% incremental on R&D ● 20% incremental on university-based basic R&D ● 50 percent of clinical orphan drug R&D 	
United Kingdom		● Deduction of R&D facilities and machinery

^a Beyond expensing of current R&D expenditures.

^b These subsidies are provided directly to the qualifying firms; they are not administered through the tax code.

SOURCE: office of Technology Assessment, 1993.

lished companies, the possessions and foreign tax credits are most likely more important. For the very newest startup firms, corporate tax credits may be of negligible value.

Quite apart from tax credits, the immediate deductibility of R&D expenditures reduces the cost of a dollar worth of research performed today from \$1.00 to about \$0.66.

To summarize, the tax code includes numerous credits and deductions tied to firms' expenditures for R&D as well as several other tax code

provisions that are especially important for drug companies and their profits. These tax policies are major avenues of U.S. Federal assistance to the research activities of the pharmaceutical industry. Although they were designed to achieve a variety of policy goals (most of which are not specific to the pharmaceutical industry), the tax policies reviewed here result in a substantial Federal investment in the industry in terms of foregone tax revenues.