Statement of

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NOTICE

This document is not available for public release until it is delivered on Thursday, 2 August 1984.

Mr. Chairman, I am pleased to participate in these hearings on the extension of the Research and Development (R&D) Tax Credit (Internal Revenue Code Section 44F). In my testimony today, I will consider the role of the R&D tax credit in federal and private research efforts in the United States and focus on several specific questions about the credit:

- How does it fit into the overall pattern of federal support of research and innovation?
- How has it influenced private research efforts?
- Should it be renewed, either permanently or temporarily, and if renewed, in what form?

FEDERAL SUPPORT FOR R&D

The federal role in funding both military and civilian R&D has been sizable for four decades. Until the late 1970s, the federal government spent more money on R&D than did the entire private sector. Federal R&D spending accounted for $40 billion of the $88 billion spent nationwide on R&D in 1983. Private industry accounted for $44 billion and not-for-profit research institutions, including universities, accounted for the rest.

The Aim of Federal Support for R&D

The rationale for federal support for civilian R&D is that imperfections in private markets may dissuade companies from investing adequate sums of money in socially valuable products and processes. Specifically, government aid is conceived to overcome the disincentive of a firm's developing a valuable product or process, then losing part of the resulting benefits to imitators, who can apply this innovation to their own ends without undertaking the cost of producing it. Thus, federal R&D policies--a mix of direct spending, tax benefits, and patent laws--are designed to overcome what economists term the "nonappropriability" of private R&D efforts. At present, the main thrust of current federal efforts in support of civilian innovation is to provide a supportive framework and some incentives. But the central technological decisions remain private. (This is a significant change from the 1970s, when the federal commercialization effort was large--especially in the area of energy research.)

The distinctions between basic research, applied research, and development are essential to any discussion of federal R&D policy, tax related or other. In simple terms, basic research is an inquiry into the causes and effects of physical phenomena, done for its own sake; the potential practical and marketable applications of its results are strictly incidental. Applied research, in contrast, is undertaken to solve practical problems, rather than

to expand the frontiers of knowledge; it is not directed toward a specific product or process. Development--accounting for more than two-thirds of private R&D spending--is undertaken to solve the technical problems involved in bringing new products or processes to market. Firms spend between one-fifth and one-quarter of their funds in applied research; they spend only a small portion of their research funds on basic research.

The Recent Record on Direct Federal Spending for R&D. Direct federal spending on civilian R&D recently has declined both in constant-dollar terms and as a percent of total federal R&D efforts. In fiscal year 1980, direct federal spending for civilian R&D totaled $19.5 billion (in 1982 dollars), or 52.7 percent of all federal R&D spending. By fiscal year 1984, civilian R&D had decreased to $15.2 billion (in 1982 dollars), or 34.2 percent of the total. The main losers have been development programs. Support for civilian basic research has grown in constant-dollar terms, while funding of applied research has declined slightly. The R&D tax credit belongs in this category, in that it supports civilian science and technology.

The Tax Treatment of R&D

To complement direct support, the Congress has traditionally given R&D efforts favorable tax treatment. Before 1981, while the tax code

allowed other business investments to be depreciated over time, it permitted many corporate investments in R&D to be deducted from taxable income in the year they were incurred. But tax changes made in 1981 and 1982 have permitted most short-term investments to receive the present value equivalent of expensing because of the investment tax credit (ITC) and the accelerated cost recovery system (ACRS).

The R&D Tax Credit. To maintain R&D's preferential tax treatment, the Congress passed the "incremental" R&D tax credit as part of the Economic Recovery Tax Act of 1981 (ERTA). The provision grants a credit equal to 25 percent of the increment of "qualified" R&D expenditures (primarily direct wage and material costs) any firm makes over and above its average R&D spending for the three years prior to claiming the credit. In covering primarily the direct wage and material costs associated with R&D, the credit takes account of only two-thirds of total research costs.

In the first year of the credit's implementation, a revenue loss of more than $600 million resulted. The Joint Committee on Taxation (JCT) projects a loss of $1.5 billion in 1985. According to the JCT, even if the credit expires on schedule, it will incur tax losses after 1985 because ERTA allows unused credits to be carried forward to future tax years. If the credit is renewed without change, losses attributable to it could continue at the 1985 level or higher.

The R&D tax credit is most likely to support the development component of R&D. Of the $44 billion private industry spent for R&D in 1983, almost three-fourths, or $32 billion, went for development.

HOW HAS THE CREDIT INFLUENCED PRIVATE INDUSTRIAL R&D

The design of the R&D tax credit makes it less effective than it would seem at first. A firm with R&D expenditures higher than its base in any year receives a credit, but at the same time raises its base in future years and therefore, lowers its opportunities to qualify for future credits. Thus, an extra dollar of R&D investment receives the 25 percent credit, but it also raises the base by 33 cents in each of the ensuing three years. This "feedback" effect reduces by 8.3 cents (25 percent times 33 cents) the opportunity to earn credits in each of those coming years. Thus, for a firm in this situation, the R&D credit does not lower taxes; rather, it postpones them, providing interest on the value of the credit in the interim (or, "the time value of money").

The incentive provided by the credit can vary greatly from firm to firm. To one that steadily increases its R&D spending above its qualifying three-year average, the credit's value will be much reduced: at a nominal

15 percent discount rate, the credit would be worth 6 percent to the firm, or less than one-fourth the statutory level. The full credit will be available only to a firm that increases research expenditures in one year and then returns to its base R&D spending level. In other circumstances, the credit can actually be negative. If, for instance, a firm's R&D spending is well below its qualifying base for the current year, incremental R&D expenditures would only serve to increase the firm's future tax liabilities. In this instance, the incremental expenditures would not qualify for the credit, but they would be counted in the firm's base for future credits. Of all firms in 1981, 15 percent fit into this category. (The credit is, of course, irrelevant for a firm expecting no tax liability.)

Thus, the credit is haphazard in its effects, and its value often depends on a firm's past actions and tax status. Moreover, much uncertainty surrounds the value of the credit to individual firms because of their inability to forecast accurately future output, income, and tax liabilities.

The Credit's Effects on the Costs of Doing Research

The R&D tax credit can only be effective if it reduces the after-tax cost of doing research. Obviously, tax provisions are not the only variables that can influence research costs. The state of the economy also plays a

role, as do an individual firm's prospects and its available technological choices. Besides reducing costs, the R&D credit can also improve the cash flow of firms that pursue research.

R&D costs can be gauged by the "user cost of capital." This will be determined by the expected economic life of the research results, prevailing interest and inflation rates, and the tax treatment of various assets and of debt.

The cost of pursuing R&D must be measured over the economic life of research results--that is, the length of time a project's results yield economic benefits to the originating firm. Because of the difficulties in estimating a research project's economic life, the Congressional Budget Office has chosen to analyze possible lifespans of five, ten, 15, and 20 years. CBO's estimates assume a nominal discount rate equal to a before-tax interest rate of 15 percent and an inflation rate of 4 percent. A higher interest rate would increase the present value of the credit, but it would also increase the cost of capital. (The text box on page 8 summarizes CBO's analytic cases and assumptions.)

The credit can also be assessed in terms of its effect on tax liabilities resulting from investment in R&D. As shown in Table 1, the credit turns tax rates negative--that is, makes the after-tax rate of return greater than the

CBO'S ANALYTIC CASES AND ASSUMPTIONS

To analyze the effects of the R&D tax credit in its present or possibly modified form, CBO examined three typical cases. In analyzing all three cases, CBO assumed an annual **interest rate of 15 percent** and an annual **inflation rate of 4 percent.** The cases otherwise differed in the following respects.

In the base case, Case 1, the firms were considered to be profitable, with **R&D expenditures increasing steadily** in nominal terms. All firms were assumed to take full advantage of **all tax benefits** available and for which they qualified, including the R&D tax credit.

In Case 2, CBO assumed that firms were **ineligible for the credit in the first year,** but would become **eligible in subsequent years.** Otherwise, assumptions resembled those underlying Case 1. Case 2 would be relevant for firms with **R&D spending below average for one year and** then increasing spending above average levels, and for existing firms undertaking new R&D efforts to enter a new market. **New entrants** are ineligible for the credit. In either case, firms increasing R&D spending would receive no credit, but would face a higher base average in future years.

In Case 3, firms do not have tax liabilities sufficient to qualify for the credit. They do, however, fully exploit other available tax advantages, such as the **investment tax credit and expensing** of wages and material costs.

before-tax rate of return--for most R&D projects, although its absolute value is small. Without the credit, the before-tax and after-tax rates of return would be roughly the same, since the bulk of R&D costs would be deducted from profits as they were incurred. In other words, the credit subsidizes R&D investments for most firms. The credit's subsidy value

TABLE 1. EFFECTIVE TAX RATES OF INDUSTRIAL R&D RESULTING FROM R&D TAX TREATMENT--THREE CASE STUDIES (In percents per year)

Tax Policy	Economic Life of R&D Investment: Five Years	Ten Years	15 Years	20 Years
	CASE 1 (BASE CASE)			
No Credit	1.2	1.1	1.1	1.1
Current Credit	-29.8	-17.2	-13.5	-11.7
Full Credit	N/A	-184.6	-113.6	-89.9
Two-Year Lag in Base Period	-71.6	-36.8	-28.1	-24.2
Including Equipment Depreciation	-30.6	-17.6	-13.8	-12.0
Expensing R&D Capital Costs	-27.4	-16.5	-13.2	-11.7
	CASE 2			
Current Credit on a Current-Year Base	43.8	33.9	29.8	27.5
	CASE 3			
Current Credit on a Current-Year Base	-10.9	-6.4	-5.0	-4.4
Current Credit on a Three-Year Base or Longer	1.2	1.1	1.1	1.1

SOURCE: Congressional Budget Office.

NOTES: Analytic cases assumptions outlined on page 8. Minus sign indicates that after-tax returns exceed before-tax returns, resulting in federal subsidization.

N/A = Not applicable. With the full credit and short-lived investments, the effective tax rates become arbitrarily large and negative.

varies with economic life, and long-term investments receive less subsidy than short-term investments--not a very desirable result. Finally, although some of the tax rates are positive, they all still fall below the marginal corporate tax rate.

But the credit reduces the cost of doing research by less than tax-rate estimates suggest. Table 2 displays the effects of the credit on the after-tax cost of doing research under the same assumptions used for the results reported in Table 1. For a typical ten-year project in a firm that plans steadily increasing R&D expenditures (see Table 2, Case 1), the tax credit lowers the cost of capital from 18.8 percent to 17.4 percent. By contrast, the full 25 percent value of the credit would have further lowered the research cost to 13.0 percent. But for a firm that is not eligible, such as a new firm in an industry, the credit provides disincentives by raising the cost of R&D from 18.8 percent to 23.2 percent.

(It should also be noted that the government already provided benefits to R&D expenditures before the 1981 tax credit by allowing them to be expensed. If R&D costs were capitalized, not expensed, the cost of doing research would rise to 21.3 percent for a ten-year project.)

Industry R&D Spending Since the Credit

Though total industry R&D has grown both in nominal and constant-dollar terms since the credit was passed, it has grown at a decreasing rate. Since 1978, industry R&D has risen at an annual rate of 14 percent in nominal terms. After the credit was passed, however, the annual growth

TABLE 2. USER CAPITAL COSTS OF INDUSTRIAL R&D RESULTING FROM R&D TAX TREATMENT--THREE CASE STUDIES (In percents per year)

Tax Policy	Economic Life of R&D Investment: Five Years	Ten Years	15 Years	20 Years
	CASE 1 (BASE CASE)			
No Credit	28.6	18.8	15.5	13.8
Current Credit	26.5	17.4	14.3	12.8
Full Credit	19.7	13.0	10.7	9.6
Two-Year Lag in Base Period	24.8	16.3	13.5	12.0
Including Equipment Depreciation	26.4	17.3	14.3	12.8
Expensing R&D Capital Costs	25.5	17.0	14.1	12.7
	CASE 2			
Current Credit on a Current-Year Base	35.4	23.2	19.1	17.1
	CASE 3			
Current Credit on a Current-Year Base	27.6	18.1	15.0	13.4
Current Credit on a Three-Year Base or Longer	28.6	18.8	15.5	13.8

SOURCE: Congressional Budget Office.

NOTE: Analytic cases and assumptions outlined on page 8.

rate has slowed to 11 percent. The recession, which depressed company profits, might have reduced R&D growth rates even further had there been no credit. But no definitive assessment of the credit's effect on R&D activity during that time is possible.

POLICY OPTIONS

With the R&D tax credit's expiration date approaching, the Congress must now decide whether to let it lapse or to extend it, and if the latter, whether in its present form or modified. If the Congress allowed the credit to expire, expensing would still provide a considerable tax advantage for R&D, but the relative advantage would be less than before 1981 and 1982 tax legislation, which greatly reduced tax burdens on other investments. If the Congress wished to change and extent the credit, it could consider three possible changes and one quite different approach:

- **Refocus the credit** toward basic and applied research,
- **Eliminate or reduce disincentives** to R&D,
- **Expand the benefits** into new areas, and
- **Support R&D with direct grants** instead of tax preferences, shifting the source from the revenue to the spending side of the federal budget.

The arguments for expiration are as follows. The prospect of a large budget deficit suggests extreme caution about any revenue-losing measure, especially one of unknown effectiveness. Since most industrial research is for product development, not for basic or applied research, the usual economic arguments for favorable tax treatment are not entirely appropriate. The main argument for renewal in some form is that technological change is a major contributor to economic growth, and without some

encouragement for R&D, the marketplace will not devote enough resources to innovation.

Refocusing the Credit

The R&D tax credit now is available for both the development work connected with getting current products to the market and for research on potential future products. Yet it is in basic and applied research that societal and market benefits from R&D are most likely to diverge. Accordingly, one option is to refocus the credit toward basic and applied research. This would help those projects now least likely to receive adequate private support. Such a refocusing would also reduce the cost of the credit while encouraging firms to do the research likeliest to yield the greatest reward to society. By limiting support to a narrower category of R&D, the Congress could increase aid to that category and maintain current, or even reduce, tax revenues losses. It would, however, complicate the problem of policing the credit. It is extremely difficult conceptually to distinguish basic and applied research from development. Attempting to administer such a distinction in tax law would be extremely difficult.

Eliminating the Disincentives

As noted earlier, the effective credit rate is often far below the statutory rate, and in some cases, it may actually discourage R&D. These effects result from the interactions between the credit and the base from which incremental R&D is defined. Aside from eliminating the incremental feature (a 4 percent to 6 percent credit applied to all qualified research would be roughly revenue neutral), the most direct ways of reducing this disincentive would be to retarget the qualifying base, "lag" (delay) the base period, or make the credit refundable.

Retarget the Base. The Congress could limit the credit to firms with R&D expenditures--controlled for firm size--greater than an economy-wide or industry-wide average, rather than a firm-specific average as under current law. This modification would eliminate the "feedback" of the base on the credit and increase the credit to its statutory value. For qualifying firms, the cost of doing research would drop by the full amount of the credit--from 18.8 percent to 13.0 percent for a typical ten-year project (see Table 2, Case 1). But amending the credit in this manner would target incentives toward firms that already do more research than do others in their industry, and it would eliminate any incentive for firms doing little research. Defining the relevant industry might also pose problems. And perhaps most important, there would be no guarantee that the R&D

undertakings receiving the most encouragement from this approach would be those yielding the greatest benefit for the nation as a whole.

Lag the Base. The firm-specific base could be retained while the credit's disincentives to R&D were reduced by redefining the base as the average of three years ending two years before the current year--that is, by lagging the base period by two years. A lagged base (possibly indexed for inflation) would raise the credit's present value. As noted earlier, the value of the credit to the firm comes through the time value of money. By introducing a lag, the Congress would be increasing the number of years over which the firm could discount the negative aspects of the tax. If the base were lagged two years for the "typical" firm, the cost of doing research for a ten-year project would drop from the current 17.4 percent to 16.3 percent (see Table 2, Case 1). An extreme form of the lag would be to fix the base permanently for each firm at a given three-year average and adjust this permanent base for inflation. In this situtation, the credit would increase to its full value. After a few years, however, the credit would cease to be incremental.

In general, though, these changes in the treatment of the base would lessen the credit's negative incentives, which would increase the cost of the credit to the government. They would also expand the windfall element of

the credit by rewarding some firms for actions they intended to take regardless of the credit's being available.

Making the Credit Refundable. Making the credit refundable would ensure that the firm receives some value from the credit. For a firm with growing R&D expenses, the credit loses half its value if carried forward one year (see Table 2, Case 3), and it has no value if carried forward three years. In 1981, one-fourth of the potential credits went unused. Largely because of limited tax liabilities, research-intensive industries received less of the credit than their shares of R&D would suggest. Alternatively, the base calculation could be modified to ensure that the base was increased only if a credit were actually received. The latter approach would be less costly to the government but not so valuable to firms.

Expanding the Benefits into New Areas

Proposals have been made that would expand the credit into two new areas: first, to new entrants and second, for equipment depreciation (see Cases 1 and 2, text box on page 8).

New Entrants. At present, only expenditures incurred in carrying on an existing product line are eligible for the credit. Thus, existing firms

moving into new business lines and new firms just starting up are not eligible. For these firms, the credit is in fact negative: the expenditures they make count in their future base period calculations but do not earn the credit when they are making the investment. To them, the costs of research will therefore increase from 18.8 percent without the credit to 23.2 percent with the now-negative credit (see Table 2, Case 2). Existing firms entering a new line of business could be made eligible for the credit, and they would then benefit as other firms do. But making start-up firms eligible might not provide them with comparable benefits, since they are not typically profitable in their initial period and have few if any tax liabilities to offset. On the other hand, allowing all R&D spending to qualify for the credit would increase the cost of the credit further and increase the difficulty of policing it.

Equipment Depreciation. As noted earlier, the ITC and ACRS allow equipment investments to receive the present value of expensing. Because depreciation expenses represent a small portion of the R&D effort, their inclusion in the credit would only slightly lower the cost of doing research, albeit only from 17.4 percent to 17.3 percent (see Table 2, Case 1).

Alternatively, capital purchases could be expensed or granted the same treatment as R&D labor and material costs before enactment of the

tax credit. Expensing equipment and structures would reduce R&D costs to 17.0 percent for a typical ten-year project (see Table 2, Case 1).

Support R&D with a Direct Grant Program

Given the complexity of the tax credit, a grant program targeted to industry might be more efficient in accomplishing the goal of promoting innovation. The Congress might be better able to target funds directly to R&D projects offering particular social value and to include such spending in the normal budgetary process, as it now does through the National Science Foundation. Removing the credit from the tax system would also somewhat reduce the complexity of the tax code. It should be noted, however, that a system of direct grants for innovation would once again place federal agencies in a position of having to evaluate the technological and commercial prospects of individual research projects. There is no guarantee that they would do a better job of it than firms responding to a tax incentive. A grant program might also have the tendency to reward grantsmanship more than scientific originality and skill.

TEMPORARY VS. PERMANENT EXTENTION

The Administration has proposed extending the incremental R&D tax credit for another three years. They argue that experience with the credit has been very short and because of the intricacies involved in such definitions of "qualified research," another Congressional examination is warranted three years after renewal. On the other hand, permanent extension would facilitate firms' developing long-term financial plans. As a result, current and future research might rise more than under a temporary extension.

CONCLUSION

Thus far, Mr. Chairman, my comments have not considered how the R&D tax credit has complicated the tax code. In general, the more the tax system is burdened with credits and special exemptions, the less effective each credit or incentive becomes. This is certainly so when companies have so many credits and deductions available that they can completely cancel out their current and future tax liabilities. At that point, tax incentives are no longer effective. In 1981, half of all corporations had no tax liabilities. We have reached the point that our tax system is asked to do so much that it

does nothing very well. That includes its fundamental purpose: raising revenues.

The economic incentive of each new credit (or special deduction) is also reduced as other economic activities are offered preferred tax treatment. For example, the availability of the ITC tends to dilute the effect of the R&D credit by making investment in capital equipment comparatively more attractive than if no credit were allowed. As more economic activities are given special treatment, each activity loses its comparative advantage, thereby negating the effects of any one incentive. Furthermore, the proliferation of tax credits, as well as uncertainty about their status, makes the tax code more cumbersome, complicates the investment planning of firms, and can raise the public's perception that the tax system is unfair.