



**AMERICAN INSTITUTE
OF CHEMICAL ENGINEERS**

**THE RESEARCH AND EXPERIMENTATION
TAX CREDIT:
Restructuring and Extension**

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Washington Internships for Students of Engineering
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CONTENTS

ABOUT THE AUTHOR.....	II
WISE	II
ACKNOWLEDGMENTS.....	II
EXECUTIVE SUMMARY	III
BACKGROUND.....	1
THE RESEARCH AND EXPERIMENTATION TAX CREDIT.....	1
BENEFITS OF RESEARCH AND DEVELOPMENT.....	1
MARKET FAILURE.....	2
DIRECT SPENDING VERSUS TAX INCENTIVES.....	2
TARGETED TAX CREDITS.....	3
<i>Basic and Applied Research</i>	3
<i>Corporation Size</i>	4
HISTORY OF THE R&E TAX CREDIT.....	4
ORIGINAL WORDING.....	4
AMENDMENTS TO THE CREDIT.....	5
CURRENT STATUS OF THE R&E TAX CREDIT	7
EFFECTIVENESS	7
LEGISLATION.....	7
THE PLAYERS	8
KEY CONFLICTS AND POLICY ALTERNATIVES.....	9
CORPORATE WELFARE	ERROR! BOOKMARK NOT DEFINED
TEMPORARY STATUS OF CREDIT.....	10
REDUCED RATE OF CREDIT.....	11
FORMULATION OF THE BASE PERIOD.....	12
ADDITIONAL ALTERNATIVES.....	13
<i>Elimination</i>	14
<i>State-Based Credits</i>	14
RECOMMENDATIONS AND CONCLUSION	15
APPENDIX A: SAMPLE CALCULATION GIVEN ORIGINAL WORDING.....	A
APPENDIX B: SAMPLE CALCULATION GIVEN STANDARD CREDIT RATE.....	B
APPENDIX C: SAMPLE CALCULATION GIVEN 3% STARTUP RATE.....	C
APPENDIX D: SAMPLE CALCULATION USING ALTERNATIVE INCREMENTAL RESEARCH CREDIT (AIRC).....	D

ABOUT THE AUTHOR

Shawn Davis is a senior in the chemical engineering department of the Florida Institute of Technology. This paper is the result of his research conducted during the Washington Internships for Students of Engineering (WISE) program of 1997. His internship was sponsored by the American Institute of Chemical Engineers (AIChE).

WISE

The Washington Internships for Students of Engineering is a ten-week program for outstanding engineering students who have completed their junior year and display evidence of leadership skills and interest in public policy. The students spend the summer in Washington, DC learning how engineers contribute to public policy decisions on complex technological matters. Through frequent meetings and discussions with government officials and other policy-makers, students examine a variety of public policy issues. Each student completes a paper that analyzes specific engineering public policy issues of concern to the sponsoring society. For information about the WISE program, contact WISE, Attn: Anne Hickox, 400 Commonwealth Dr., Warrendale, PA 15096-0001.

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EXECUTIVE SUMMARY

The Research and Experimentation (R&E) Tax Credit is an incentive program to induce private sector research through government subsidization. The R&E credit was first introduced in 1981 by former Representative, and then Chairman of the House Ways and Means Committee, Dan Rostenkowski (D-IL). It currently provides a credit equal to 20 percent of the company's qualified research expenditures (QRE) over a base amount toward federal taxes owed by the corporation. The intention of the tax credit is to encourage corporations to conduct more research than is economically optimal. This program was justified by the premise that society derives a substantial amount of the benefit stemming from private sector research and experimentation.

In the past 16 years many amendments to the credit have been introduced with the goal of reducing revenue lost by the federal government and making the credit more equitable for industry. Unfortunately, these revisions have instead lowered the overall effectiveness of the credit and made it less attractive as a research incentive to corporations. These changes included: the lowering of the statutory rate, the introduction of the expensing adjustment, and the restructuring of the base period.^{*} In addition, the "50 percent rule," an original part of the credit, has continued to act as a barrier for some companies to conduct additional research, contrary to the intent of the tax credit.

The amendments to the credit have effectively lowered the credit's rate to six-and-a-half percent. This is significantly lower than both the initial rate of 25 percent and the optimum rate of 30 percent estimated by the Congressional Research Service.

An important issue concerning the R&E tax credit is its temporary status. Originally, the credit was made temporary to allow a trial period in which its effectiveness could be determined. Sixteen years later, despite its proven effectiveness, the credit has remained a temporary part of the Internal Revenue Code. Since its initial period of four-and-a-half years, the credit has been extended eight times. The extensions have always been shorter than the original period and have contributed to a growing feeling of disenchantment with the credit by industry. The recently enacted tax bill and budget agreement perpetuated this temporary status by extending the credit for only 13 months, through June 30, 1998. The short life span of the credit has precluded many companies from factoring this incentive into their long-term research budgeting, which tends to run in five or ten year cycles.

Although the R&E tax credit is supported by most members of Congress and the Administration, concerns of corporate welfare and budget balancing are constant hindrances to the extension of the credit. Congress' search to replace the tax credit's

^{*} The statutory rate of the credit was reduced from 25 to 20 percent by P.L. 99-514. Tax credited items can no longer be expensed or deducted from taxable income due to the passing of P.L. 101-239. The same law also changed the base period calculation from a moving average to a fixed percentage.

revenue loss continues to be the key issue when a decision concerning expansion or extension is considered.

In order to rectify the problems associated with the R&E tax credit it is recommended the following changes be enacted:

- Make the credit a permanent part of the Internal Revenue Code.
- Redesign the base amount calculation to an offset moving average technique.
- Restructure the credit to increase the effective rate to at least its original level of 25 percent.

These changes will help to return the R&E credit's intended level of incentive by eliminating the amendments that have lowered the effective rate to an unacceptable level, reducing the administration costs, and making the credit neutral in the distribution of its benefits.

Above all else, the R&E tax credit must be made permanent in order for its full potential to be realized. The inclusion of the credit in companies' long-term research budgets will increase the number of companies taking advantage of the credit. This will benefit both society and industry by increasing the total amount of research and experimentation being conducted.

BACKGROUND

The Research and Experimentation Tax Credit

The Research and Experimentation (R&E) tax credit is a temporary provision of the Internal Revenue Code that allows a 20 percent credit towards a corporation's federal income taxes for qualified research expenditures above a base limit. This base limit is calculated using a "fixed-base percentage" of research intensity (research to sales ratio) for the period of 1984 to 1988. The ratio when multiplied by a firm's average gross income for the past four years yields a base amount that must be exceeded for a credit to be applicable. The incremental nature of the credit is intended to encourage companies to conduct additional research while minimizing federal revenue losses.

Benefits of Research and Development

The benefits of research and development have been well documented. "In the United States, half of our economic productivity in the last half century is attributable to technological innovation and the science that supported this innovation."¹ Through advances in research and development (R&D) of new products and processes, a corporation may see remarkable gains in both their profits and their position in the economy. However, because corporations that conduct R&D do not see the entirety of benefits from their research, they invest less than the optimum level for the maximization of benefits to society.

Through information transferal, imitation, and patent expiration, society often experiences greater benefits from industrial R&D than the corporation that actually conducts the research. This overflow of benefits to society is referred to as "spillover" by economists and is estimated to be as much as twice as great as the benefits received by the corporation.² The estimated private and social rates of return of research spending by various industries may be seen in Table 1.³

Table 1: Estimated Rates of Return to R&D Investments, 1981

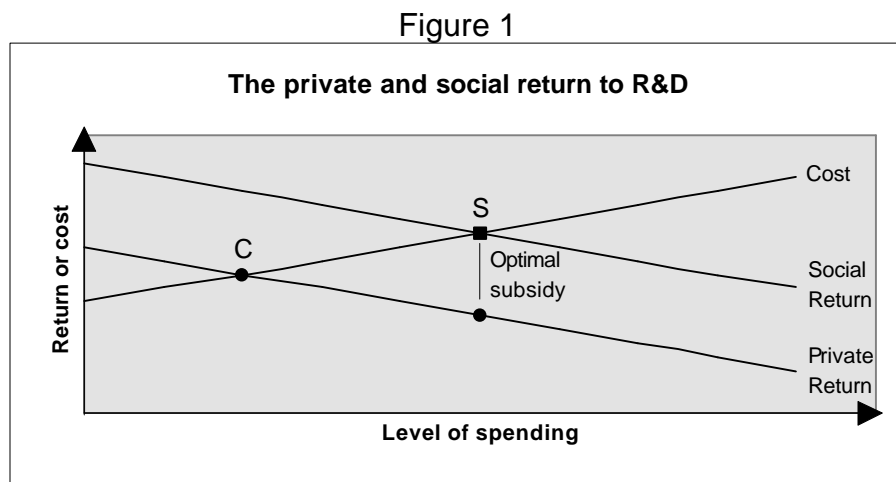
Industry	Private Rate of Return	Social Rate of Return
Chemicals	13.3%	29.1%
Non-electrical machinery	24.0%	45.0%
Electrical products	22.4%	30.2%
Transportation equipment	11.9%	16.3%
Scientific instruments	16.1%	128.9%

Society receives considerable benefits from private sector research. Therefore, policies that efficiently encourage private industry to conduct research are beneficial to both the company and the nation as a whole.

Market Failure

The spillover effect results in industry undertaking less R&D than they would were they the sole beneficiaries of this spending. This process is what economists refer to as a "market failure."

The market failure concept is well illustrated by Figure 1.⁴ This diagram indicates that the optimum level of spending by either the private sector or society is the point at which the returns from the investment intersect the level of cost (points C and S respectively). This is the point at which the greatest benefit is achieved for the lowest cost. Apparently, the optimum investment for industry is well below that of society. This is indicative of the fact that private industry will choose to fund less research than society's optimum level. The difference between what private industry invests and the amount of money that needs to be invested to fully benefit society is the amount of subsidy required.



Since it is society as a whole that is detrimentally affected by this market failure, government has an obligation to attempt to rectify the situation. Government has the option of using direct spending in order to solve the failure or resort to indirect means, such as a tax incentive. These two techniques for resolving the market failures are often thought of as mutually exclusive. In reality, each policy has its own benefits and drawbacks.

Direct Spending Versus Tax Incentives

Direct spending is a powerful and precise tool for increasing research in a particular area. If a government agency decides a particular area of research is not being well represented, it may supplement this area through a direct influx of funds. Direct spending is the older and more prevalent of the tools used to stimulate economic factors.

Tax incentives, on the other hand, are a newer idea that have begun to see greater exploitation both in the United States and other developed nations. Rather than simply giving money to a specific type of research, a federal tax credit has a more marginal effect. A percentage of the company's qualified research is refunded by deducting the amount from the firm's federal taxes. By reducing the overall cost of conducting research, but still allowing the corporation to decide the specific nature of the research, a tax credit provides a stronger research incentive than direct spending. The Peat Marwick Policy Economics Group cites several studies that indicate "company-funded industrial R&D investments yield a rate of return of about 35 percent, on average, in terms of increased productivity" of the company while "direct government spending on R&D yields less than 5 percent, on average."⁵ This implies that tax credits, which allow a company to decide which research projects it pursues, yield better private (and corresponding social) rates of return.

Targeted Tax Credits

The incentive gained from tax credits tends to be general in nature, not specific to one type or area of research, and equally available to companies of all sizes. This, however, is not always the case. Either intentionally or not, tax credits may sometimes be skewed to favor specific types of research or particular industries.

Basic and Applied Research

While tax credits usually do not directly favor one type of research over another, they traditionally serve as an incentive for applied research and development. While the distinctions between "basic" and "applied" research can be arbitrary and not particularly illuminating, basic research focuses on uncovering the intrinsic workings of the sciences and engineering. Applied research is conducted to further the development of products or processes and accomplish specific goals. Basic research tends to be conducted by academia and government labs. Industry, meanwhile, focuses almost exclusively on applied research and development. This makes intuitive sense since industry is in the business of making money through their inventions or by solving problems that exist in their product lines.

Two thoughts have led to a general consensus that basic research tends to yield greater benefits to society as a whole. Economic studies have shown that basic research tends to yield greater industrial productivity increases than applied R&D.⁶ Also, the uncovering of the mysteries of science and engineering tends to be viewed as more altruistic than the solving of existing problems to further production. This has led some countries to focus tax credits on basic research. Japan and Denmark have both attempted to target basic research with their credits by granting a higher credit rate for basic research expenses.⁷ The indistinct line between applied and basic research makes this type of tax credit focusing difficult.

In addition, what is not often recognized is the innate linkage between the two types of research. The development of new technologies through applied research often provides the tools required to further investigate basic science's questions. Thus, in order to justify subsidizing industrial research, one must recognize the link between industry's applied research and basic research and also the direct benefits to society from the products and processes developed.

Corporation Size

The size of a corporation can be another determining factor in the equitable application of tax credits. Tax credits favor larger corporations due to their very nature. The benefit of a credit toward a corporation's taxes serves little purpose if the corporation has little if any taxes owed. This is often the case for very small firms, just beginning their corporate life. In the case of the R&E tax credit, firms with total assets of \$10 million or less only claim approximately 11 percent of the total credits distributed, while 70 percent is received by firms with \$250 million or greater total assets.⁸

To help balance this innate inequality other countries have intentionally targeted certain segments of industry, such as small business. This is accomplished by simply giving a higher credit percentage to business with sales below a particular level. Canada, for example, has a base credit of 20 percent, but the credit increases to 35 percent for small companies.⁹ This type of focused credit is intended to encourage small business to conduct research that they may not be able to normally afford. In return, not only does the population of the country benefit from spillover effects, but the country possibly adds another productive corporation to their economy.

HISTORY OF THE R&E TAX CREDIT

Original Wording

With a firm understanding of both the importance of research to the U.S. economy and the existence of market failure, the Research and Experimentation (R&E) tax credit was enacted in 1981 as Section 41 of the IRC. The original wording provided a 25 percent tax credit for approved research and experimentation spending above a base limit. The base limit was calculated as the average of the previous three years qualified research expenditures. An example of this calculation may be seen in Appendix A. These expenditures consist primarily of wages paid to researchers and their staff and supervisors. Of course, the equipment and supplies required for the research are also included. On the other hand, research infrastructure such as buildings are not included. Also, any research conducted by outside sources such as colleges, universities, and tax-exempt scientific research institutes is credited at a reduced rate. Only 65 percent of the total off-site research was creditable. All of these expenses must be incurred within the United States in order for them to qualify.

It is important to realize that the R&E tax credit has always been a temporary provision to the IRC. Thus, it must be continually renewed after each expiration. Initially, the period of the credit was four-and-a-half years. The original intent of this provision was to allow a trial period in order to determine the effectiveness of a tax incentive to inspire additional research from the private sector.

A relatively minor provision of the tax credit that has major implications for some companies is referred to as the “50 percent rule.” This rule states that the base amount of the credit can not be less than 50 percent of a firm’s total R&D spending for the year. This has many interesting effects on the level of incentive for firms in different R&D spending situations. In particular, the 50 percent rule tends to unbalance the effective rate of the credit for some firms. Companies that increase their research spending to more than twice their base amount receive only half the incentive effect of other companies. The problems that may arise from this rule are further discussed in the Key Conflicts section of this paper.

Amendments to the Credit

In the past 16 years many amendments have been introduced with the goal of making the credit more equitable for industry and a better fit for the federal budget’s constraints. Unfortunately, these revisions have instead lowered the overall effectiveness of the credit and made it a less effective research incentive. The three most significant changes all lowered the effective rate and the incentive of the credit. These changes included: the lowering of the statutory rate, the introduction of the expensing adjustment, and the restructuring of the base period. The problems that have arisen due to these amendments may be seen in the Key Conflicts and Concerns section.

The first change to the credit was among the simplest. The statutory rate of 25 percent was lowered to 20 percent to reduce the credit’s cost as part of the Tax Reform Act of 1986 (P.L. 99-514). In addition, a separate credit was created to cover research contracted out to universities. Expenditures beyond a set limit to qualified organizations (e.g., institutions of higher learning, scientific tax-exempt organizations) are credited 20 percent in addition to the incremental credit. This credit is colloquially referred to as the University Credit.

The next change was enacted in 1988 by the Technical and Miscellaneous Revenue Act (P.L. 100-647). The primary change was actually to a separate part of the IRC (Sec. 174) that details the general business items that may be expensed (or deducted) during a tax season. Originally, a research item could be expensed as well as be the subject of the tax credit. The 1988 change reduced the amount of the items that could be expensed to 50 percent of the tax credit claimed.

In 1989 the greatest changes were made to the credit. The Omnibus Budget Reconciliation Act (P.L. 101-239) changed both the expensing adjustment and the

structure of the base period. The expensing adjustment was increased to a full 100 percent, which eliminates the possibility of expensing an item on which the tax credit has been claimed. In addition, the base period was modified to allay some fears that the corporations were committing “gaming.” Since the status of the tax credit depended so heavily on the previous three years research spending, some policy analysts felt that companies may attempt to manipulate their spending to more fully take advantage of the credit. In response to this concern, the base period was changed to a “fixed base percentage.” The base percentage is the ratio of the corporations QRE from 1984-1988 to their average gross income for this same period. This fixed base percentage is then multiplied by the previous four years average gross income to determine the base amount the corporation must exceed in order to receive the tax credit. To accommodate companies that did not exist during the 1984-1988 span (startup firms) a fixed three percent was chosen as their fixed base. Appendices B and C are example calculations of the standard and fixed three percent credits for further illustration.

The most recent changes to the credit came in the Small Business Job Protection Act of 1996 (P.L. 104-188). The definition of startup firms was redefined as a company for which their first year of QRE and gross receipts occurred after 1983. Also, the percentage of contract research expenses qualifying for the tax credit was increased from 65 to 75 percent. The introduction of the Alternative Incremental Research Credit (AIRC) was the most notable addition. The AIRC provides another calculation technique for companies that experience difficulties qualifying for the standard credit and its 1984-1988 basis. The AIRC assigns varying levels of credit to expenditures in an incremental fashion. These increments are percentages of the previous four years average gross receipts. The AIRC yields the following rates:

Table 2: Credit Rates of Alternative Incremental Research Credit

Percentage of base amount	Credit Rate
1.0% to 1.5%	1.65%
1.5% to 2.0%	2.20%
Greater than 2.0%	2.75%

The AIRC, while a viable option for many companies, does yield lower credit values than the original R&E tax credit. An example calculation using the AIRC structure may be seen in Appendix D. Despite the lower rate associated with the AIRC, it is seeing increased application by many companies, particularly in the chemical and pharmaceutical industries. This is due in part to the assurance that the AIRC will always be there and can be relied upon for long-term budgeting.¹⁰

CURRENT STATUS OF THE R&E TAX CREDIT

Effectiveness

It is difficult to determine the true effectiveness of tax credits as incentives. Despite figures or data collected showing the amount of credits being taken, it is impossible to know exactly how much additional research is due directly to the R&E credit. The studies that have been conducted, however, indicate that the credit is having a positive effect on the total amount of research conducted by private companies.

In 1993, the credit accounted for approximately two percent of the industries' total R&D funding.¹¹ The resources provided by the R&E credit do appear to be making a difference in the companies taking advantage of the tax credit. As previously mentioned, tax credits have been shown to be more effective than direct spending in increasing the productivity of industry. Also, it has been found by Bronwyn H. Hall that "the tax revenue cost by the late 1980's was about a billion dollars a year, approximately equal to half the incremental industrial R&D induced by the credit (about \$2 billion a year)".¹² Thus, for every dollar spent by the government, industry spent an additional two dollars on research.

Although it is difficult to determine the exact amount of additional research conducted, general trends can be established. The credit has been encouraging additional research, and the research undertaken has yielded greater rates of social and private return (increased productivity) than the results of research funded by direct spending. Despite these encouraging studies, it is important to note that they do not include the detrimental effects of the 1989 expensing adjustment. Therefore, caution must be taken not to draw conclusions prematurely that the structural modifications have not reduced the effectiveness of the credit.

Legislation

As mentioned earlier, due to the temporary nature of the R&E tax credit, its status is in a constant state of flux. This is particularly true in today's climate of constant cutbacks in spending by the government in order to reach a balanced budget. It has been estimated that the total government funding for R&D will decrease 14 percent by 2002.¹³ While the U.S. struggles to maintain the same level of spending in research and development, countries such as Germany and Japan have continued their steady increase of R&D spending.¹⁴ Despite the stagnancy of U.S. R&D spending it has become a constant battle for advocates of the R&E tax credit to persuade Congress to renew the credit.

The extensions have usually been made retroactive in order to fill any gaps between expiration and extension. This was not the case when the R&E credit expired on June 30, 1995. The Small Business Job Protection Act (P.L. 104-188) enacted in August of 1995, extended the credit for eleven months, but the extension was not made retroactive. This left a 12-month gap for which the credit was not available, which left

many companies with unexpected funding short-falls. It is this type of action on Congress' part that have made many industrial sources hesitant to include the credit in their budgets, and effectively reduced the incentive effect of the credit.

The last expiration of the credit occurred on June 1, 1997. During passage of the tax bill that was part of the recently enacted balanced budget agreement (P.L.) the House of Representatives proposed an 18-month extension. The Senate, on the other hand, approved a two-year extension. The credit's extension was eventually cut to thirteen-months during a final three-way negotiation between the House, Senate, and the White House.

The Players

The final results of the tax bill negotiations are indicative of the shallow support for the credit. What must be considered, however, is the larger picture of revenue balancing. Since its inception, the extensions to the R&E tax credit have always been "pay as you go" financing. In other words, if the Congress was able to find the required \$1.8 billion per year, they extended the credit. According to a spokesperson for the R&D Tax Credit Coalition, few members of Congress are actually opposed the credit itself. The most prominent is Senator Don Nickles (R) of Oklahoma. He is philosophically opposed to the idea of tax credits in general and does not believe it is in the government's interest to create them. Also, some members of Congress suspect the credit of being a form of "corporate welfare".

The leading Congressional proponents of the R&E tax credit include: Representative Robert T. Matsui (D-CA), Representative Nancy L. Johnson (R-CT), Senator Orrin G. Hatch (R-UT), and Senator Max Baucus (D-MT). Senator Baucus in particular is in fundamental agreement with the issue of research credits.¹⁵

The Clinton administration has also supported the credit. The explicit inclusion of the R&E tax credit in President Clinton's FY1998 budget proposal was viewed as a strong show of support. This support, however, has wavered in the past when the credit competes with other administration priorities, such as education and welfare tax credits. In addition, the administration is apparently conflicted about having both the standard credit and the Alternative Incremental Research Credit. They feel that having two credits becomes increasing difficult to manage.¹⁶

Industrial support for the R&E tax credit remains strong, led by the R&D Tax Credit Coalition. The coalition is made up of companies and the trade associations representing them, such as: the National Association of Manufacturers, Chemical Manufacturers Association, Pharmaceutical Research & Manufacturers of America, American Electronics Association, and the U.S. Chamber of Commerce.

In addition, many engineering societies such as the American Institute of Chemical Engineers, the American Association of Engineering Societies, and the Institute of Electrical and Electronic Engineers have approved positions in support of the

permanent R&E tax credit, and have engaged in advocacy efforts on behalf of the credit.

KEY CONFLICTS AND POLICY ALTERNATIVES

With the end of the Cold War and the struggle to maintain its position in the global market, the U.S. needs a general incentive for industry to overcome the market failure of research spending--thus the introduction of the R&E tax credit. Since its creation there has been much debate concerning the credit's effectiveness and the very idea of supporting private investments. Some of the greatest concerns include:

- The credit as “corporate welfare”
- The temporary status of the credit
- The reduced rate of the credit
- The formulation of the base period

Corporate Welfare

An initial concern during the enactment of the R&E tax credit was that the government might be paying for research that would be conducted without additional incentive. If this were the case, government would not be inspiring any additional research to alleviate the market failure and benefit society, but giving companies unnecessary subsidies, or “corporate welfare”. This is often the argument used against extensions or expansions of the credit. However, this argument is largely addressed by the very structure of the credit.

In order to help avoid corporate welfare, the structure of the credit is incremental. In other words, only by increasing their R&E spending beyond the base period could a company receive the credit. The incremental nature of the tax credit does bring to mind the question of whether research conducted by companies whose research levels are either decreasing, or not increasing as fast as sales, is any less valuable than research eligible for the credit. Although this is a concern, the corporate welfare issue has been judged more pressing.

As additional assurance that the government would not be paying for research only intended to benefit the company, restrictions were placed on the type of research conducted. The Tax Reform Act of 1986 limited acceptable research to work of a technical nature. The credit also specifies that the research conducted must be an attempt to create or improve a product in some significant manner. Cosmetic improvements such as taste, color, or smell are not considered qualified research.

Finally, the primary purpose of the R&E tax credit is to induce additional research spending. Given the high rate of return on research spending, it is a safe assumption that companies conducting more research will eventually see higher sales and increased profitability. Increased sales and profits generate additional tax revenue.

Therefore, the credit helps to pay for itself by creating more research and more tax revenue.

Temporary Status of Credit

Of greatest concern to industry is the temporary status of the R&E tax credit. The constant expiration and renewal of the credit have caused both high administrative costs and a reduced incentive effect.

Since the tax credit must be continually renewed, the administrative costs of the companies wishing to take advantage of the credit are much higher than if it were made permanent. "OTA [Office of Technology Assessment] interviews indicate that these costs can be substantial for some firms: some firms indicated that they frequently question the net worth of using the tax credit, given the costs of administering it."¹⁷ It is these types of costs that make the credit less of an incentive than was originally intended.

In addition to the higher administrative costs, the short time frame of the credit limits its inclusion in long-term research budgets.¹⁸ With an average research project taking approximately five to ten years, a six-month, one-year, or even three-year extension of the credit hardly creates an optimal incentive. In particular, the last extension of the credit that allowed the one-year gap in coverage has made many companies hesitant to even consider the credit part of their long-term plans. The lack of inclusion in research budgets is exactly the opposite of the intended incentive effect.

The obvious solution to both the increased administration costs and poor budget planning is the permanent extension of the R&E tax credit. The credit could then be easily incorporated into long-term budget plans by corporations. This will allow companies to actively plan around the credit and will increase the number of companies utilizing the credit. With the assurance that the credit will remain in effect, a company would be more likely to plan additional research expenditures. In addition to easier long-term planning, permanence would decrease the administrative cost associated with the credit, again increasing the incentive effect of the credit.

As always, money is the driving concern with this policy alternative. A permanent extension is estimated to cost the federal government approximately \$2.5 billion a year in lost tax revenues.¹⁹ This revenue cost is the highest hurdle that must be overcome in order for the credit to become a much more effective incentive for corporate research and development. Although its revenue implication is a major concern, the benefits far outweigh the cost associated with permanent extension. This alternative is considered the most important and most immediate relief to the R&E tax credit ailments.

Reduced Rate of Credit

Since the R&E credit's inception, its effective rate has been continually decreased. The aforementioned amendments have all lowered the rate to varying degrees. It has been estimated by the Congressional Research Service that the most effective rate of government subsidies is approximately 130 percent of a company's research expenses. This is based on the assumption that in order to increase a company's spending, one must increase their before-tax gains from the research. Tax policy can only affect after-tax gains; therefore, one must calculate the rate of credit including the corporate taxation rate of 35 percent. Also, since the benefit to society is roughly twice that of the company conducting the research, the calculation must be doubled. This calculation, $2X(1-0.35)=130\%$, is heavily dependent on the rate of social return. Variations in this rate (e.g., 1.75 or 2.25) change the optimal rate considerably. Since the data collected (see Table 1) supports a societal rate of return at least twice as large as corporate return, 130 percent may be considered the lower bound on the optimal rate.²⁰ Thus, the credit should be maintained at as close to 30 percent as possible in order to make the most effective use of the taxpayer money.

The most obvious reduction in the credit's rate was the initial reduction in the statutory rate made by the Tax Reform Act of 1986. Yet, this reduction of only five percent actually has one of the least disruptive effects of the amendments. While five percent is a significant portion of the ideal 30 percent, it does not compare with the deleterious effects of the other amendments.

The expensing adjustment has had a major impact on the incentive effect of the R&E tax credit. Expensing is the deduction of an expenditure from a company's tax calculation. This gives an effective tax rate of zero to items that may be expensed. Since the amount of the credit being taken must be subtracted from the amount that can be expensed each year, the credit's amount is essentially added to the company's taxable income. Thus, the tax credit is effectively being taxed! The current corporate tax rate of 35 percent significantly reduces the benefit from the tax credited items not being expensed. Therefore, the expensing adjustment has seriously reduced the incentive effect of the R&E tax credit.

Finally, the "50 percent rule" has a serious effect on the overall rate of credit for some companies. Since the base amount (1984-1988 ratio multiplied by the last four years' average receipts) must be at least half of the total qualified research, a company that invests more than double the base amount receives a lower rate of credit than a company that has increased but not doubled their spending. This is because "when qualified research expenses reached double the base amount, any further increase raised the base amount by half of that increase, and only half of the increase generated tax credits."²¹ This has the effect of giving twice as large an incentive to companies investing less than twice their base amount. Although doubling one's base amount seems like an unlikely event, start up companies with an assigned base rate of three percent are the most commonly affected companies. The Congressional Research

Service estimates that 31.8 percent of start-up firms double their base amount, while an additional 12 percent of companies that use the 1984-1988 base period are affected.²²

These three factors (reduced statutory rate, expensing adjustment, and “50 percent rule”) have dramatically decreased the effective rate of the tax credit. It has been estimated that the average company taking advantage of the R&E tax credit is only receiving a six-and-a-half percent credit.²³ The range of credits taken varies from three to thirteen percent after these factors have been included. Clearly, an effective rate of six-and-a-half percent cannot compare to the optimum rate of 30 percent. If the goal of the credit is to motivate companies to perform the optimum level of research for the benefit of society, the effective rate should be increased.

A decision must be made about how much incentive is required to address market failure, while avoiding corporate welfare. Some analysts strongly disagree with the Congressional Research Service’s estimate of the optimal rate and feel a credit of that level would be giving industry money to conduct research they would have regardless of the credit.²⁴ Regardless of the exact rate that will prove most beneficial, the current six-and-a-half percent is much lower than was originally intended. To return the credit’s rate to an effective level the expensing adjustment and the “50 percent rule” could be simply eliminated. In conjunction with this elimination, the statutory rate of the credit could be returned to its original value of 25. These simple revisions would raise the effective rate to an approximate average of 30 percent.²⁵

As with most tax policies, the greatest concern is revenue. The aforementioned revisions will certainly increase the overall cost of the tax credit since more credits will be allotted. At this point, no estimate has been made by the Congressional Joint Committee on Taxation concerning the increased cost of a revised credit structure.²⁶

Formulation of the Base Period

The initial calculation of the base period was relatively simple. The average of the previous three year’s research expenditures was used as the base amount. The Omnibus Reconciliation Act of 1989 made the calculation both more complicated and somewhat more random. The revised method of calculation found a base ratio of the QRE to the company’s gross income for the time-frame of 1984-1988. This ratio, when multiplied by the current year’s gross income, yields the new base amount. The revised base period calculation is exemplified in Appendix B.

The decision to change the base calculation was based on two conclusions. First, the original base increased with increasing research expenditures. In other words, the more a company increased their research spending, the harder it becomes to earn the tax credit. This reduced incentive was the key consideration in the decision to change the base calculation. A lesser concern was the possibility of conscious manipulation of research expenditures to exploit the tax credit’s calculation formula.

Two issues come to light when considering the existing base period calculation: the varying effect of the 1984-1988 period on different industries due to market fluctuations and the effect on start-up companies that do not have the necessary base period data for the chosen years.

Normal business fluctuations may either favor or prove disadvantageous to companies claiming the credit, depending on their economic situation during 1984-1988. This characteristic of the new base period lends credence to the theory that the new calculation is more random than the original method.

Another problem associated with the chosen structure is that many companies have been started after the 1984-1988 period. Companies in this situation are referred to as “start-up companies” and have become subject to some debate. Companies that do not have gross receipts for 1984-1988 are assigned a base of three percent for the first five years. After this period, their base percentage is to be calculated and phased in over the next five years. This can lead to a substantial advantage for start up firms in research intensive industries.²⁷ They are able to take advantage of this low percentage for as much as nine years before their actual expenditures become part of the calculation.

Since any change in the base period will favor some companies, one can only attempt to minimize the magnitude of the bias. In order to avoid future problems that will arise if the time period is simply moved up, the base period should be returned to the simpler moving average calculation. The modification that should be made is the distancing of the averaged period from the credit calculation year. If the most recent year in the period from which the base amount is calculated is two or three years prior to the actual credit calculation, the process of gaming would be much more difficult, and in all likelihood almost eliminated. This calculation will still have the effect of making the credit more difficult to achieve when spending is increased, but that is part of the intended effect. The credit is a reward for companies that continue to increase their spending, not simply maintain the same level.

In addition to balancing some of the favoritism of the current calculation, the moving average will unlink the credit from current sales by the company. The current calculation reduces the amount of credit if the company's sales increase faster than research spending, or if they do not decline as fast as research spending. The proposed revision will allow companies to still receive a benefit from the credit despite any current success of previous research.

Additional Alternatives

In addition to the issues and their corresponding policy alternatives, two other possibilities should be considered: elimination of the credit, and the further use of state-based credits.

Elimination

This simplest answer to many problems is often total elimination. Of course, the simplest answer often results in the most dire consequences. Each year the R&E tax credit incurs an estimated cost of \$1.96 billion (1993 data).²⁸ This is money that can easily be credited to other valuable but under-funded programs.

The clear drawback of the elimination of the credit is the lack of R&D stimulation in the private sector. With or without public policy, a market failure will continue to exist. Although private industry will continue to conduct research, they will reduce their spending to the optimal level at which they gain the greatest benefits for the minimum cost. Industry will continue to prosper; it is society that would bear the brunt of this alternative. The spillover from industry would continue, but at significantly reduced rates. It is this reduced societal benefit that makes elimination a relatively unattractive alternative.

State-Based Credits

An alternative that may be considered is the use of state-based credits. In these cases, the individual states create their own credit programs to supplement the federal credit. Thirty-five states currently have tax incentive programs of one kind or another. Some of these programs have been based on the federal R&E tax credit, while others offer unique benefits such as exemption from sales or property taxes. There are 15 states without any form of research tax incentive.²⁹

A state-based credit's primary advantage over a national credit is the ability to create region-specific incentives. Thus, if California feels that the cost is justified and they wish to encourage additional industrial research, they may enact a tax credit. On the other hand, a state that does not have a great deal of research-conducting industry may decide not to implement a credit and save the revenue that would be lost in taxes by giving a credit. Each state may also decide the amount and duration of the credit individually. For example, California has recently made its research tax credit permanent.³⁰ This act sent a clear message to the private sector in support of their research efforts and may help entice companies from other states to California. California's tax credit is an eight percent credit on qualified research conducted in the state, and six percent credit for "qualified tangible personal property used for R&D."³¹ California, with approximately \$120 million in annual tax expenditures for R&D, leads the rest of the states in the search for a research-friendly environment.

The primary drawback of the state-based credit system is the possibility of few states actually using the credit. Since many states already have credits, there is little fear that state-based tax credits for research will completely disappear. However, if no additional states decided to take up the credit program, the possibility of a significantly

reduced incentive environment would exist. This should be avoided at all costs, as mentioned in the elimination alternative.

An additional drawback of the state-based credit is the money and time that must be spent by each state to determine if a credit system is right for them. This process would be wasteful since a great deal of research has already been conducted by states, non-government organizations, and the federal government. Also, the cost of implementing state-based credits large enough to be effective is often beyond the means of the state governments.³²

The use of state-based credits as a tool complimenting the federal R&E credit is a very attractive option. This would maintain the credit throughout the country, while still allowing individual states to supplement the credit for additional control. This alternative will not solve the problems that have arisen around the credit, but it will provide some additional incentive to industry in an attempt to remedy the market failure.

RECOMMENDATIONS AND CONCLUSION

The R&E tax credit in its current state is no longer as effective an incentive for industrial research and experimentation as it once was or could be. The effectiveness of the credit has been repeatedly reduced by various amendments. The statutory rate reduction, the expensing adjustment, and the 50 percent rule have worked together to reduce the effective rate of the credit to only six-and-a-half percent. Additionally, the calculation of the base amount favors some industries or size companies over others. Thus, not only is the credit less effective than intended but also less neutral.

In order to solve these problems three recommendations are made:

- Institute the credit a permanent part of the Internal Revenue Code
- Redesign the base amount calculation
- Restructure the credit to increase the effective rate

Most importantly, the R&E tax credit must be made a permanent part of the Internal Revenue Code to achieve the intended effect of the program. Even with the current structure the credit is proving somewhat effective. The limiting factor is the short time frame of the credit. This is the primary hindrance in the adoption of the credit by more companies. The permanent extension allows both long-term planning and reduced administration fees. The security provided by the permanent extension will provide the impetus for more and more companies to include the credit as a consideration in research funding decisions. Logically, the more companies taking advantage of the credit, the greater the research and experimentation spending, and the greater the benefit to society.

Additionally, the calculation of the base amount is sorely in need of updating. The 1984-1988 period is not only unrealistic in terms of corporation longevity, but also unfair

to some industries due to business cycle fluctuations in sales and spending. The calculation should be returned to the moving average system to help balance some of the current inequities. The distancing of the averaging period will limit gaming while providing a more accurate indication of the research and development spending of the company.

The optimal rate of subsidization is estimated to be 30 percent. This optimal rate may be approached by removing the 50 percent rule and the expensing adjustment. This will allow the R&E tax credit to more effectively alleviate the market failure and better serve society as a whole.

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- ¹ “Science and Technology: Shaping the Twenty-First Century.” Washington DC: Executive Office of the President, Office of Science and Technology Policy. April 1997. 1.
- ² “The Effectiveness of Research and Experimentation Tax Credits.” Washington DC: Office of Technology Assessment, September 1995. 4-5.
- ³ Bernstein, Jeffrey I. and Nadiri, M. Ishaq, “Interindustry R&D Spillovers, Rates of Return, and Production in High-Tech Industries,” *American Economic Review Papers and Proceedings* Vol. 78 No. 2, May 1988, 429-434
- ⁴ Hall, Bronwyn H. “Fiscal Policy Towards R&D in the United States: Recent Experience.” Paris, France: Presentation to the OECD Working Group on Fiscal Measures to Promote R&D, January 19, 1995.
- ⁵ “Extending the R&E Tax Credit: The Importance of Permanence.” KPMG Peat Marwick LLP Policy Economics Group. November 1994. 8.
- ⁶ “Extending the R&E Tax Credit: The Importance of Permanence.” 8.
- ⁷ “Fiscal Measures to Promote R&D and Innovation.” OECD: Directorate for Science, Technology and Industry. January 19, 1995.
- ⁸ “The Effectiveness of Research and Experimentation Tax Credits.” 19.
- ⁹ “Fiscal Measures to Promote R&D and Innovation.” 15.
- ¹⁰ Conversation with Kristin Paulson on July 29, 1997.
- ¹¹ “Economic Perspectives of the Research Tax Credit.” Research Credit Briefing for Congressional Staff prepared by: Price Waterhouse LLP. 6.
- ¹² Hall, Bronwyn H. “Fiscal Policy Towards R&D in the United States: Recent Experience.”
- ¹³ American Association for the Advancement of Science homepage.
www.aaas.org/spp/dspp/rd/outyr.htm
- ¹⁴ Conversation with U.S. Representative F. James Sensenbrenner, June 26 1997.
- ¹⁵ Conversation with Kristin Paulson on July 29.
- ¹⁶ Conversation with Kristin Paulson on July 29.
- ¹⁷ “The Effectiveness of Research and Experimentation Tax Credits.” 26.
- ¹⁸ “The Effectiveness of Research and Experimentation Tax Credits.” 53.
- ¹⁹ “The Effectiveness of Research and Experimentation Tax Credits.”

²⁰ Cox, William A., "Tax Preferences for Research and Experimentation: Are Changes Needed?" Washington DC: CRS Report for Congress. August 4, 1995. 8.

²¹ Cox. "Who Got How Much?" 7.

²² Cox. "Who Got How Much?" 7.

²³ Cox. "Who Got How Much?" 4.

²⁴ Conversation with Paul Doremus on June 23, 1997.

²⁵ Cox. "Who Got How Much?" 17.

²⁶ Cox. "Who Got How Much?" 17.

²⁷ Cox. "Who Got How Much?" 4.

²⁸ "Economic Perspectives of the Research Tax Credit."

²⁹ "State Research and Development Tax Incentives." State Science & Technology Institute. May 1997.

³⁰ "The R&D Credit Workbook: Your source of information on the R&D tax credit" R&D Credit Coalition. 1997: 11.

³¹ "State Research and Development Tax Incentives." 9.

³² Conversation with Paul Doremus on June 23, 1997.

APPENDIX A: SAMPLE CALCULATION GIVEN ORIGINAL WORDING

Previous Years' Information (millions of dollars)

Year	Gross Receipts	QRE
1994	\$1,350	\$130
1995	\$1,400	\$135
1996	\$1,450	\$140
Average (1994-1996):	\$1,050	\$133
1997	\$1,550	\$150

1997's Base Amount (millions of dollars)

Average of previous three years' QRE= \$133

1997's Calculation (millions of dollars)

1997's Research Expenditures	\$150
Less Base amount	\$133
Results in QRE	\$17

Credit is 25% of QRE \$4

APPENDIX B: SAMPLE CALCULATION GIVEN STANDARD CREDIT RATE

Base Period Information (millions of dollars)

Year	Gross Receipts	Qualified Research Expenditures (QRE)
1984	\$500	\$45
1985	\$600	\$55
1986	\$700	\$65
1987	\$800	\$75
1988	\$900	\$85
Total:	\$3,500	\$325

Fixed Base Percentage

QRE	equals	\$325	equals	9.93%
Gross Receipts		\$3,500		

Previous Years' Information (millions of dollars)

Year	Gross Receipts	QRE
1993	\$1,300	\$125
1994	\$1,350	\$130
1995	\$1,400	\$135
1996	\$1,450	\$140
Average (1993-1996):	\$1,375	\$133
1997	\$1,550	\$150

1997's Base Amount (millions of dollars)

Fixed Base X Average of Gross Receipts	
0.0993 X \$1,375=	\$128

1997's Calculation (millions of dollars)

1997's Research Expenditures	\$150
Less Base amount	\$128
Results in QRE	\$22

Credit is 20% of QRE	\$4
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However, if the effective rate of 6.5% rather than the statutory 20% rate is used the credit is

	\$1
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APPENDIX C: SAMPLE CALCULATION GIVEN 3% STARTUP RATE

Fixed Base Percentage

Set at 3.0%

Previous Years' Information (millions of dollars)

Year	Gross Receipts	QRE
1993	\$1,300	\$125
1994	\$1,350	\$130
1995	\$1,400	\$135
1996	\$1,450	\$140
Average (1993-1996):	\$1,375	\$133
1997	\$1,550	\$150

1997's Base Amount (millions of dollars)

Fixed Base X Average of Gross Receipts	
0.03 X \$1375=	\$41

1997's Calculation (millions of dollars)

1997's Research Expenditures	\$150
Less Base amount	\$41
Results in QRE	\$109

Credit is 20% of QRE \$22

However, if the effective rate of 6.5%
rather than the statutory 20% rate is used
the credit is

\$3

It is important to note that the same values of gross receipts have been used in all appendices. This is in order to convey the magnitude of difference among the three calculation methods. However, this consistent basis is unrealistic since a startup company utilizing either the 3% assigned basis or AIRC would most likely not generate the same sales or expenditure values as an established corporation using the standard rate.

APPENDIX D: SAMPLE CALCULATION USING ALTERNATIVE INCREMENTAL RESEARCH CREDIT (AIRC)

Previous Years' Information (millions of dollars)

Year	Gross Receipts	QRE
1993	\$1,300	\$125
1994	\$1,350	\$130
1995	\$1,400	\$135
1996	\$1,450	\$140
Average (1993-1996):	\$1,375	\$133
1997	\$1,550	\$150

1997's Base Amount (millions of dollars)

Incremental percentage X	Average of Gross Receipts	=	Range
1.0%-1.5% X	\$1,375		\$13.75-20.63
1.5%-2.0% X	\$1,375		\$20.63-\$27.50
Greater than 2.0% X	\$1,375		>\$27.50

1997's Calculation (millions of dollars)

1997's Research Expenditures \$150

Expense range	Expense amount	Credit rate	Credit
0-\$13,750	\$14	0.00%	\$0.0
\$13,750-\$20,630	\$7	1.65%	\$0.1
\$20,630-\$27,500	\$7	2.20%	\$0.2
\$27,500-\$150,000	\$123	2.75%	\$3.4

Total Credit: \$4