EFFECTIVENESS OF THE CALIFORNIA R&D TAX CREDIT

A REPORT PREPARED FOR

THE CALIFORNIA COUNCIL ON SCIENCE AND TECHNOLOGY

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1. Introduction

Since 1988, the state of California has allowed a credit against corporation or individual Schedule C tax for incremental expenditures devoted to Research and Development within the state of California, as well as a special credit for monies paid to universities or other research organizations for the performance of basic research.[1] These provisions of the tax code are designed both to encourage California firms to undertake research and innovation and to encourage them to do so within the state of California. In general, the California provisions are modeled on those of the federal tax system, although with somewhat lower credit rates, and with some important differences that result from the desire to focus the benefits on research done in California.

Although the R&D tax credit represents a fairly minor portion of the entire corporate and business tax system in the state, the tax revenue foregone is a significant fraction of the money spent directly on R&D by the state government (that is, excluding the funding for higher education). In 1996, the latest year for which we have a complete set of figures, the R&D credit claimed on California tax returns totaled 290 million dollars, whereas the direct funding in the state budget for R&D was 317 million dollars.[2] So although these numbers pale in comparison with total R&D spending in the state (36 billion dollars in 1995), as a fraction of the state subsidy, the R&D tax credit is quite important.

This report provides a review of the nature and effect of the California R&D tax credit, including the rationale for the credit, its history, how it works, how it has changed, and whether it has played a role in encouraging more private R&D in the state. The report concludes with a few recommendations for policy.

2. The Rationale for an R&D Tax Credit

At the outset, it is natural to ask why the state of California feels that it is necessary to have such a feature in the tax system. The usual argument for subsidizing and encouraging research and development is the positive externality innovation creates for other firms and consumers in a society. There is a large economic literature, both theoretical and empirical, that emphasizes the likelihood of positive spillovers and externalities from industrial R&D, especially that oriented toward basic research (Nelson (1959), Arrow (1962), Griliches (1992), Hall (1996), Mohnen (1996)). These spillovers take the form of reducing the cost of other firms' innovative activity (by creating technological knowledge on which they can build, or by showing them where the dead ends and dry holes are) as well as simply creating new and improved goods that are sold at prices well below the prices that consumers or other firms might be willing to pay. However, in an economy like that of the United States, where the barriers to the free flow of information across state borders are essentially nonexistent, it would seem that encouraging firms to locate their R&D facilities in the state of California might not yield benefits that are easily confined to the state; in fact, most of the spillovers might flow to those outside the state.

For this reason, the argument usually used for the federal version of the R&D tax credit is probably not appropriate for the state of California. The argument for a state-level tax credit takes two forms: first, there is considerable evidence for localization of some of the spillovers (see, for example, Jaffe, Trajtenberg, and Henderson (1993)). The fact that California is well-known for its clusters of high technology industries (Silicon Valley, biotechnology in the East Bay and San Diego, and so forth) does suggest that there are reasons that high technology firms in the same industry like to locate next to each other, and one of those reasons presumably is the fact that they learn from each other. Therefore, encouraging firms to move to your state early in the development of a new industry will probably mean that other firms will be attracted in the future, and that other firms in the state are more likely to benefit from knowledge spillovers from the new industry because of their geographical proximity.

Second, and this appears to be a major political motivation for the credit, California is perceived as a high-tax business environment by firms contemplating setting up business or expanding. For this reason, and because other states have similar policies, a variety of tax incentives and "industrial policy" measures have been adopted to overcome the reluctance of fairly footloose national or international companies to open establishments in California.[3] An R&D-related tax measure targets the particular types of firms that California desires to attract in spite of its relatively high position in the "tax" league tables.[4] For example, the state

[1] The definition of qualified research expense is quite complex in fact, but it generally includes the wages and salaries, leasing expenses, supplies, and 65% of the contract research expense that is incurred in performing research undertaken to discover technological information for a new or improved business purpose and to exclude capital expense and post-production development. See sections 174 and 41 of the U.S. Internal Revenue Code, which are followed by California in its law.

[2] From Chapman, "The Role of the State in Research and Development Funding", June 11, 1999.

[3] Survey evidence collected by Professor Annette Nellen, San Jose State University confirms that this feature of the tax law is viewed by firms as improving the perception of the business climate in California.

[4] It is beyond the scope of this report to survey all the features of the California corporation tax law, but in general we can point to fairly high

includes the credit in its list of tax features designed to attract new investment and describes it in this way on its website:

> Designed to encourage companies to increase their basic research and development activities in California, the research tax credit allows companies to receive a credit of 11 percent for qualifying research expenses (research done in-house) and 24 percent for basic research payments (payments to an outside company), making it the highest in the nation. To qualify, research must be conducted within California and must not include research for the purpose of improving a commercial product for style, taste, cosmetic, or seasonal design factors.[5]

Other reasons occasionally given for a state-level R&D tax credit are the following: 1) R&D jobs are high-paying, which generates a multiplier effect for the rest of the state economy, to the extent that consumption is also localized within the state. 2) R&D encourages and aids quality education systems. It is not clear that this is an outcome from or an input to R&D effort; presumably the idea is that there is some kind of synergy between educational systems that train high quality workers and the presence of R&D efforts in the state. 3) Having such a tax credit conforms California tax law to federal tax law, which is the normal goal of tax legislation in California.

3. The Mechanics and History of the R&D Tax Credit

Like so many others, this feature of the state tax law is modeled on the federal law, although it was not introduced until January 1988, seven years after the federal law took effect. The latter was introduced early in the Reagan administration (1981) and has been continuously renewed and extended since that date, with the exception of a one year lapse between July 1995 and June 1996. Hall (1993) and Hall (1995) summarize the features of the federal law and how they have changed through 1995. The following brief discussion is drawn from the later paper, updated to reflect changes in the law since then. The features of the federal law are also summarized in Table 1.

3.1 Federal R&D Tax Credit - Description

As of July 1996, the R&D tax credit is generally computed based on the following formula:

20% x (Qualified Research Expenses less Base Amount) + 20% x (Basic Research Payments)

The Base Amount equals the Fixed Base Percentage multiplied by the taxpayer's average annual gross receipts for the preceding four tax years. The Base Amount cannot be less than 50% of the taxpayer's Qualified Research Expenses for the current tax year. The Fixed Base Percentage represents the ratio of the taxpayer's Qualified Research Expenses for the base period of 1984 through 1988 to gross receipts for the same period. The Fixed Base Percentage may not exceed 16%. For start-up companies (as specially defined for the credit), the Fixed Base Percentage is generally 3%.

Alternatively, taxpayers may elect to use the alternative incremental credit (AIC) that was added to the federal tax law in 1996. The AIC is also computed based on a taxpayer's Qualified Research Expenses. Both methods for computing the research tax credit involve a multitude of somewhat complex definitions and the need to determine whether a taxpayer's research is "qualified research" and if so, to identify the "qualified research expenses" incurred in such research. Certain research activities, such as those conducted outside the U.S., do not qualify for the credit.

3.2 Federal R&D Tax Credit – History

The federal Research and Experimentation (R&E) tax credit was introduced in the Economic Recovery Tax Act of 1981; it was originally scheduled to be effective from July 1, 1981, to December 31, 1985. The credit was renewed for two years (January 1, 1986, to December 31, 1988) in a somewhat reduced form by the Tax Reform Act of 1986, and extended for one year through 1989 by the Technical and Miscellaneous Revenue Act of 1988.[6]

corporate, income, and sales tax rates relative to many other states, although not perhaps relative to the chief competitors in attracting industry. For example, California ranks 11th out of 50 in state tax revenue per capita and 19th in state tax revenue as a share of personal income in 1997 (U.S. Bureau of the Census, reported at http://www.taxadmin.org/fta/rate/97taxbur.html).

[5]http://commerce.ca.gov/business/investgd/investgd04.html

[6]At the federal level, a feature of the Tax Reform Act of 1986 that affected R&D incentives was the strengthening of the alternative minimum tax (AMT) system for corporations. If a firm is subject to AMT, it cannot claim the R&D tax credit in the current year, but must carry it forward (for up to fifteen years) until it is subject to regular corporate tax. Also, the rate of taxation under AMT is 20% rather than the statutory corporate rate of 34%. As Lyon (1991) has discussed, this means that firms that are temporarily subject to the AMT will face tax incentives that are slightly tilted away from investment in intangibles toward tangibles, relative to what they would face under ordinary corporate taxation. In practice, only a small number of large manufacturing firms in 1988 filed AMT returns, accounting for only 3 percent of the total tax bill paid by manufacturing firms (Statistics on Income 1988), so this is unlikely to be important. However, the reduction in the implicit subsidy to R&D that the AMT creates is likely to be more important in recession years, when corporate profits are down.

The Omnibus Budget Reconciliation Act of 1989 effectively extended the credit through 1990, and The Omnibus Budget Reconciliation Act of 1990 did the same for 1991. The Tax Extension Act of 1991 extended the credit through June 30, 1992. The Omnibus Budget Reconciliation Act of 1993 extended the research tax credit for three years to June 30, 1995. Most of these pieces of legislation also made changes to the terms of the credit.

The credit was allowed to expire in June 1995, and was reinstated in July 1996 for one year. Since then it has been renewed each year for one year, and it is currently set to expire on June 30, 1999, having been renewed in the Omnibus Consolidated and Emergency Supplemental Appropriations of October 1998 (H.R. 4328; S. 2622; P. L. 105-227). It should be noted that the one point on which there is little controversy among analysts is that if the government wants to have an R&D tax credit, such a credit should be quasi-permanent in order to obtain the full benefit of the incentive. The rationale behind this argument is that many firms will respond differently to short and long term changes in the cost of R&D, owing to the costs of adjustment of R&D effort.[7] In spite of this, the Congress has repeatedly failed to renew for longer than one or two years, for reasons related to the balanced budget amendment and the way in which such tax credits are scored against the budget.[8]

In all cases (except for firms subject to the alternative incremental credit), the federal R&E tax credit is computed by taking qualified R&D expenditures that exceed a certain base level, multiplying by the statutory credit rate, and deducting this amount from corporate income taxes. There is a three-year carryback and fifteen-year carryforward in the case of no taxable income in the current year.

The most contentious feature of the original federal law (a feature that applied through 1989) was the definition of the base level of R&E spending for each firm. The intention of the legislature was to reduce the budgetary cost of the credit by making it available only for marginal R&D investment, above and beyond what the firms would spent anyway. Given the smoothness of R&D spending within firms, and the high costs of adjusting R&D budgets, this was a reasonable and sensible idea, but it foundered on the difficulty of determining a base level that was appropriate for an individual firm (given their heterogeneity) without leaving that level subject to the firm's manipulation. As one of us, as well as other researchers, have written extensively elsewhere (see Eisner, Albert, and Sullivan 1986 and Altshuler 1989 as well as Hall (1993)), the method adopted at first, which defined the base level to be a moving average of previous years' spending by the firm, had the effect of greatly reducing the incentive effect, to the extent that a statutory rate of credit equal to 25 percent became approximately 5 percent in practice. This occurred because firms deciding to increase their spending this year benefit from the credit this year, but increase their base level of spending in subsequent years, which reduces the benefit.

Responding to the vocal critiques by several economists and others, the 1989 legislation changed the definition of the base level of R&D spending to a fixed quantity defined as the average R&D intensity for the five years between 1984 and 1989 times the current year sales. In the case of startups, a special statutory R&D intensity is used, equal to 3 percent. Also in 1989, the effective credit rate was reduced from 20% to about 13.5% by a provision which required the recapture of the expense deduction for R&D expense allowed under section 174 of the Internal Revenue Code.

In 1996, the Small Business Jobs Protection Act added an alternative incremental credit (AIC) for R&D, which was designed to compensate firms with high R&D spending that were denied the credit due to rapidly growing sales; this profile is typical of a high technology startup. Firms with high fixed-base percentage in 1984-89 relative to current R&D spending intensity, such as aerospace firms, can also greatly benefit from this alternative credit. According to Price-Waterhouse estimates, three industries will account for 96% of the benefit of the AIC: chemicals (including pharmaceuticals), industrial machining (including computer manufacturers), and electrical and electronic machinery manufacturers.[9] The alternative credit has a lower base (the initial tier starts at 1.0 percent of the average revenue for the past four years, with higher rates available after 1.5 percent and 2.0 percent), and also a lower rate of credit:

[7] See, e.g., Hall (1993) and Penner, Smith, and Skanderson (1994). Senator Bingaman (D., New Mexico) has also made this point forcefully on the Senate floor (U.S. Congressional Record of the 105th Congress, September 28, 1998).

[8] A particularly cynical view holds that keeping the credit temporary can be used repeatedly as a carrot for business, and it encourages corporations to make financial contributions to and lobby their representatives every year in order to preserve this feature of the tax law (New York Times, October 28, 1998).

[9] See Shanahan and Fox (1997).

Ratio of Qualified R&D expenditure (QRE) to four-year average sales	*Federal alternative credit rate (1996-1999)*	*California alternative credit rate (1998)*
1.0-1.5 percent	1.65 %	1.32 %
1.5-2.0 percent	2.20 %	1.76 %
More than 2.0 percent	2.75 %	2.20 %

Firms could elect this credit for up to 24 months after July 1996 (the dates have been extended at each renewal of the law); election is only revocable with IRS consent. Appendix A shows a sample computation for a firm with rapidly growing revenue post-1988 and high R&D spending.[10]

3.3 California R&D Tax Credit

The tax credit rate in California is fairly high (relative to the corporate tax rate of 8.84 percent): 8 percent until 1997, and 11 percent after 1997.[11] For comparison, the current federal credit rate is 20 percent, whereas the corporate tax rate is 35 percent.

The California law uses the federal definition of the base level but with the important feature that although the R&D intensity used to determine the "Base Amount" is the same number used in the federal calculation, the sales figure by which it is multiplied is the California share of total sales. This has the strange, but possibly intended, effect that a firm with sales throughout the United States but which does all of its R&D in California can have a rather low base level of R&D spending relative to its current level, year after year, even though it is not increasing its R&D. Thus it is not unusual to have the California credit amount be larger than the federal credit largely because of the way that R&D intensity is calculated (see Scenario 3, Cases C and D in Appendix B for an example). The effect of this provision is to give firms a strong incentive to locate their R&D laboratories in California, even if the rest of the firm is nationwide. It is likely that this is one of the goals of the legislation.

Since 1997, California has also offered an alternative incremental tax credit (the AIC) to firms that are unable to take the ordinary incremental R&D credit because they have not been increasing their R&D as quickly as their sales revenue. In 1997, the credit rates were the same as the federal, although the computation was done with California revenue and California R&D. In 1998, these rates were reduced to 80% of the federal rates (see the table above).

In both cases (regular and alternative), the entire credit amount is then multiplied by 91.16% (which is equal to one minus the corporate tax rate), so that the deductible portion of the credit is recaptured.

Table 2 shows some sample computations of the tax price faced by R&D on the margin relative to nondeductible expenditure and the average credit rate. The first two columns show the share of revenue and R&D that is in California. The next two columns are the tax price and credit as a percent of R&D spending for the federal tax system only. The final two columns show the full tax price for firms facing both federal and state taxes and considering spending another dollar of R&D in California along with the ratio of the federal and state tax credits to the total R&D dollars spent in the state (the average state plus federal credit rate).

It is clear from the table that not only is the California credit potentially of the same importance as the federal in an average sense, but it continues to benefit even firms that are not increasing their R&D, due to the effects that arise from having R&D more concentrated in the state of California than sales. Thus, although superficially the same as the federal, in fact the state credit looks more like a lump sum transfer designed to induce firms to locate R&D in the state of California.

3.4 State/Federal Interaction

An extra complication that occurs at the state level is the interaction between federal and state tax. Briefly, state taxes are deductible against federal taxes, so that any benefit that accrues at the state level is smaller by the amount of the marginal federal tax rate faced by the firm. It seems appropriate to analyze the full state tax effect, taking into account the impact on federal taxes, since presumably the marginal decision from the perspective of the firm is which state to locate an activity in; conditional on being in the United States, they do not have a choice over paying federal tax.

Here are a set of sample computations of the full marginal tax cost of investing an additional dollar in R&D. We define the following tax parameters:

Parameter	*Meaning*	*Typical value*
t_f	federal marginal tax rate	34%
t_s	state marginal tax rate	8.8%
c_f	federal marginal tax credit	20%
c_s	state marginal tax credit	11%

Then, denoting by pR the total effective marginal tax price faced by a firm considering spending one dollar on R&D, we have the following computations for a representative firm:

- **For a firm subject to both federal and state taxation but ineligible for the tax credit**: this firm can deduct the cost of doing R&D against both state

[10] These computations are drawn from notes by Annette Nellen.

[11] As this report was being finalized, the California legislature changed the tax credit law by raising the credit rate to 12 percent from 11 percent.

and federal taxes. However, the deduction reduces their state taxes, which are deductible against federal income. So an amount equal to the state tax rate times the R&D deduction is added back in to federal income. The total tax price is therefore:

$$p^R = 1 - t_f - t_s + t_s t_f = (1 - t_s)(1 - t_f) = .912 \times .66 = 0.602$$

- **For a firm subject to taxation and eligible for the federal but not the California tax credit**: the same type of computation applies and the federal credit is added. However, the federal credit is reduced by the amount of deduction that is taken under section 174 of the Internal Revenue Code (the standard expensing provision).

$$p^R = 1 - t_f - t_s + t_s t_f - c_f (1-t_f) = .602 - .20 (.66) = 0.470$$

- **For a firm subject only to federal taxation and with only the federal credit allowed:** in this case, the state R&D expense deduction is not recaptured and there is no state credit computation. This the normal computation done for analysis at the federal level.

$$p^R = 1 - t_f - c_f (1-t_f) = (1 - t_f)(1 - c_f) = .66 \times .8 = 0.528$$

- **For a firm subject to federal and state tax and eligible for both tax credits:** in this case, the state credit (net of its effect on the state section 174 tax deduction) is added onto the computation. The same amount reduces the deduction for state taxes against the federal tax, reducing, but not eliminating, the impact of the state R&D credit.

$$p^R = 1 - t_f - t_s + t_s t_f - c_f (1-t_f) - c_s (1-t_s) + t_f c_s (1-t_s) = .602 - .132 - .100 + .034 = .404$$

To isolate the effects of the tax credit, it may be more appropriate to compare these tax prices to the prices faced by the firm for R&D in the absence of the credits. Table 3 shows the ratio of the tax price with the credit to the tax price arising solely from the section 174 deductibility of R&D. This table assumes that the firm is permanently a tax payer or permanently tax-exhausted (that is, there is no allowance for carryback or carry forward of tax deductions).

From the table it is clear that the effective marginal rate of credit if we compare two firms in the same tax position is about 0.13 for the federal credit (0.60-0.47 or 0.66-0.53) and an additional 0.07 for the state credit (0.53-0.46 or 0.47-0.40). If we isolate the credit effect by taking the ratio of the tax price to the after-tax price of output (that is, we compute the price of R&D relative to the after-tax revenue it will presumably generate), we can see the full statutory effect of the credit, plus or minus some rounding error due to recapture.

These computations point to two dominant effects on the margin: first, the credit rates themselves; second, the accounting requirement that the firm recapture the R&D portion of the Credit (i.e., the portion that is expensed against taxes). The interaction of the state corporate tax with the federal corporate tax is a negligible effect on the margin.

3.5 Record-keeping and Audits

We spoke informally with a Silicon Valley tax accountant (a CPA and owner of a tax accounting services firm in Palo Alto). It was clear that he was barely aware of this provision of the tax law, and had difficulty even tracking down the relevant reference in the tax accounting guides. We think this reflects the experience of small high technology firms in some cases. A small software firm with which we are familiar first heard of this provision of the law when it was surveyed by Professor Annette Nellen of San Jose State University to see whether they were using it.

We also spoke to the tax lawyers at a large publicly traded software firm in Silicon Valley. They were well aware of the provision and in fact, were the first ones to explain to us how to compute it, something that was difficult to figure out from the state tax forms and instructions. In particular, we found it unclear whether the California sales should be used in the calculation of the fixed-base.[12]

The records necessary to support the use of the research tax credit are of two types: the first is the usual accounting data that would be needed to determine the amount of revenue and qualified R&D in the firm, and its location (in or out of state). The second is the supporting documentation necessary to demonstrate that the expenditure is indeed on qualified R&D.

For the accounting data, if a firm is keeping records for federal tax purposes, it should be straightforward to adapt them to the California law, which parallels the federal. However, neither §174 nor §41 provide specific rules for record keeping that the IRS may want to access during an audit. Given this lack of mandated procedures and the fact that for smaller firms most R&D spending can be expensed anyway, so it is not normally accounted for

[12] The instructions for Form FTB 3523 for year 1997 state: "[f]or purposes of determining the base amount, gross receipts are the receipts from the sale of property that is held primarily for sale to customers (…) in California." The instructions (for line 10) call for using aggregate gross receipts without specifying that in this case the federal receipts should be used.

separately,[13] record-keeping that separates out R&D spending from the ordinary cost of goods sold an extra burden for these firms.

For large or small firms, the central difference from the records required for federal returns is that both sales and R&D must be tracked within California. Unless the firm files tax returns in other jurisdictions, it may not track California revenue separately from other revenue. It is quite possible to have sales that are not in California for sales tax purposes and yet to receive all of a firm's revenues in California for corporate tax purposes. For example, a mail order firm entirely located within California but shipping to the rest of the country: they will receive all their revenue in California and pay corporate tax there, but much of their sales will be outside of California. Such a firm must identify sales delivered or shipped to California customers in the same way that they do for sales tax purposes. However the numbers will not be the same as those maintained for sales tax purposes because of sales made to firms holding sales tax exemption certificates.

The second type of data, data that justifies the expenditure as qualified research, is more difficult to gather. The IRS has been known to ask for job descriptions, employee performance review files, organizational charts, accounting manuals, copyright and patent applications, minutes of various meetings where R&D projects were discussed, and progress reports.[14] For some firms, much of this data may not exist in organized form and it would require diverting scientific and management personnel to generate it. Given ambiguities of the written record in these areas, such data also have the potential to fail to satisfy the requirements of the IRS for qualified research spending unless they are rather carefully maintained.

Does the cost of an audit outweigh the benefit of the tax incentive? Large firms are audited every year anyway, although the record-keeping requirements for this particular credit seem onerous. For small firms, audit costs are high (they generally take fairly high-level manager time), and this provision looks like one that would trigger an audit (especially in California, given its relatively generous nature). Because R&D expense is already fully deductible, it may not be worth the credit for a small firm to keep track of this expense separately and to keep the records that would survive an audit, given the risk of having to pay the cost of an audit.

4. R&D Tax Policy in Other States

How does this compare to what other states have done? Most states now offer a package of business development tax incentives in order to induce businesses to locate within their state and credits for R&D spending are often a key component of these packages. The primary goal of state legislatures in this respect appears to be job creation, especially the creation of jobs requiring skills, and the encouragement of industries that are likely to grow in the future. Both of these goals are served by encouraging R&D-intensive firms to locate within a state.

The Texas legislature conducted a study of these special business development tax incentives in 1998 and produced the following summary table:

Tax incentive provision	*Number of states*
Investment tax credit	33
Job creation credit	33
Education credit	8
R&D credit	23
Enterprise zone programs	33
Sales tax machinery exemption	48
Sales tax R&D exemption	33
ITC and R&D tax credit	18

Source: Texas House of Representatives Select Committee on Revenue and Public Education Funding.

Frequency of Special Business Development Tax Incentives

Clearly at least three of these instruments are specifically targeted to R&D, and in many cases both the job creation and the enterprise zone provisions also have an R&D component. According to the State Science and Technology Institute, 35 states offered some type of incentive for research and development activity in 1996. Many of these programs (approximately 15, including Massachusetts and New York) are modeled after the federal R&D tax credit, as is the case in California. However, other types of incentive programs are in place and often one state offers more than one program. A number of these programs is targeted towards job creation within the state, and some are targeted toward specific industries that are perceived to be important for future growth.

[13] R&D expense is R&D labor, R&D materials, and R&D capital equipment. The first two are expensable anyway (except for capital costs associated with stock options, future compensation, etc., which may be a feature of employment contracts in high technology firms). The latter category can often be expenses for very small firms too, because of the provision that the first $18,500 of capital investment can be expensed.

[14] Annette Nellen, course notes, 1998. Some of this information is drawn from a presentation by David W. Bernard, IRS, "IRS Specialist's Paper on Audit Plan for Research Tax Credit," *Tax Notes Today*, 95 TNT 225-40 (Nov. 17, 1995).

Here is a short list, drawn mainly from a study conducted by the State Science and Technology Institute (SSTI), to give some idea of the variety:

- New Jersey offers R&D tax credits up to 10% (but not exceeding 50% of the tax liability). In addition, the laws authorize the New Jersey Economic Development Authority to establish the Corporation Business Tax Benefit Certificate Transfer Program (CBTBCT), which would allow new or expanding emerging technology and biotechnology companies in New Jersey with unused amounts of R&D tax credits or unused loss carryovers to transfer those tax benefits to another corporation business taxpayer in NJ in exchange for private financial assistance.[15]
- Vermont offers an income tax credit of $1,500 per job for new jobs in R&D created between 1/1/92 and 7/1/96.
- South Carolina has a ceiling of $300 on the sales and use tax applied to R&D machinery.
- in Arkansas, businesses engaged in qualified R&D performed within the state are eligible for an income tax credit equal to 33% of qualified research expenditures (the credit is limited to 50% of the total net tax due).
- in Florida, research and development labor is not subject to tax; it is not clear from the source what this means, since in general R&D labor costs are deductible against taxable revenue in all states.
- companies in Delaware's targeted industries that invest at least $200,000 in new or expanded facilities and hire at least 5 new employees qualify for an income tax credit of $250 for each new qualified employee and $250 for each $100,000 (credits may not exceed 50% of the tax liability, but the credit can be carried forward).
- in Kentucky, state income tax credits of up to 50% startup costs and up to 50% of annual rentals for 10 years for new and expanding service or technology business that employs 25 or more Kentuckians and provide more than 75% of their services to out-of-state customers.

Table 4 gives a very approximate impression of the tax cost of these provisions for selected states including California. The numbers in this table are drawn from a table provided by SSTI that provides estimates of the foregone tax revenue due to the credit (or other) provisions in 1996, augmented by some data on total tax revenues in the same year from the U.S. Bureau of the Census.[16] The foregone tax revenue for California is approximately 2 percent of corporate tax revenue in that year; only Ohio, Virginia, and Wisconsin are higher, although the table is notable for the absence of the important R&D-performing states (New York, Texas, Michigan, and Massachusetts). Only New Jersey, which ranks fifth among the states (California is first) is included. The conclusion is that California is relatively high up in the league tables in the generosity of its credit provisions.

Consideration of the incentives offered by other states raises a slightly worrisome issue. If all states were to follow policies similar to that pursued by the state of California, then we end up with a zero-sum game in which the allocation of R&D-intensive firms across states is unchanged, but each state has effectively subsidized the firms within its borders. Presumably all firms would be doing more R&D because of the subsidy, but the relocation argument for state incentives would disappear in equilibrium. This fact will inevitably weaken the effectiveness of industrial policy at the state level.

5. Future Policy Issues

In this section we discuss a couple of issues that come up when considering possible changes to the current law on R&D tax credits: the potential for change in the federal credit and the introduction of sales tax exemption provisions for R&D equipment.

5.1 Likely Changes in the Federal Law

In the past, the state of California has typically followed the lead taken by the federal government in tax legislation. Thus it is reasonable to ask about the likely changes to federal legislation in the future. As was discussed earlier, there is something of a consensus among policy makers in and out of government that the features of the tax code targeted toward R&D spending should be made (quasi-) permanent, but there has been and continues to be a lack of congressional will for implementation. In this respect, the law in California is ahead of the federal law, since the California credit is permanent.

In the 106th Congress, no fewer than 6 bills were introduced that proposed to make the R&D tax credit permanent. These bills are summarized in the table on top of the next page:

[15] Information about the CBTBCT program can be found at http://www.gibbonslaw.com/noframe/40680.htm

[16] Note the discrepancy between the figure given for California in 1996 in Table 4 ($120 million) and that given in Table 5 by the Franchise Tax Board ($278 million). It is not clear which number is correct.

Bill	*Sponsor*	*Date*	*Status*
S. 195	Barbara Boxer (D, Calif.)	1/12/99	Referred to Committee on Finance
H.R. 760	James Sensenbrenner, Jr. (R, Wisc.)	2/12/99	Referred to Ways and Means Committee
H.R. 835	Nancy L. Johnson (R, Conn.)	2/24/99	Referred to Ways and Means Committee
S. 680	Orin Hatch (R, Utah)	3/23/99	Referred to Committee on Finance
H.R. 1682	Heather Wilson (R, New Mexico)	5/4/99	Referred to Ways and Means Committee
S. 951	Peter Domenici (R, New Mexico)	5/4/99	Referred to Committee on Finance

Thus all of these bills currently languish in committee in the U.S. Congress. However, analysts expect that the credit will at least be extended this year and that any extension will be retroactive to June 30, 1999, when the current legislation expired.

5.2 Sales R&D Exemption versus R&D Credits

An alternative tax instrument designed to encourage R&D spending within a state is the widely used sales tax exemption for purchases of inputs to R&D. For example, the state of Washington exempts machinery and equipment that is used directly in manufacturing or in an R&D "for hire" operation from sales tax. They also exempt materials that are incorporated into the development of new aircraft parts, equipment, and modifications; this latter provision would seem to reflect the industrial composition of the state (Washington State Department of Revenue website, 1999).

Exempting machinery and equipment used in R&D seems to conform to a view of the sales tax that it is only used to tax end consumption, and not intermediate goods. Comparing a provision like this to the R&D tax credit is difficult for the following reasons:

- Machinery and equipment is a variable fraction of R&D spending, probably substantially less than half the total budget. Therefore the sales tax exemption would cover *fewer* expenditures than the R&D credit. Note also that these are precisely the expenditures not currently qualified for the credit.
- This provision would make equipment relatively cheaper and personnel relatively more expensive. It is not clear why that is a good idea.
- The R&D tax credit is a credit on incremental R&D spending; the sales tax exemption would only be on new capital and possibly on repairs and maintenance to existing capital. To the extent that new capital is replacement capital, the sales tax exemption would cover *more* expenditures than the R&D credit, unless R&D capital is written off very quickly for tax purposes (as it often is).
- Firms must make a profit to benefit from the R&D credit immediately (otherwise, they can carry the credit forward for up to 15 years until they do have profits). In contrast, the benefits from the R&D sales tax exemption accrue immediately and are not dependent on the firm's profitability.

Given a sales tax rate of approximately 8.25 percent and an R&D credit rate of 8 or 11 percent (i.e., roughly the same), the differences between the two tax instruments center on two factors: 1) the basis to which the rate applies, and 2) the timing of when the benefit is received. In the case of the sales tax exemption, the basis is capital equipment and repairs to that equipment, whereas for the credit, the basis is incremental R&D, whether it is labor or capital. Thus the sales tax exemption may be more generous for some firms (those with lots of equipment that depreciates quickly) and less for others (those whose R&D is mostly skilled R&D workers, or whose equipment is fairly long lived). An exact comparison depends also on the precise provision of the law (e.g., the treatment of repairs and maintenance, the definition of R&D, whether contract R&D expense is included, etc.).

The difference in timing may be important to a firm just starting up, since they receive the benefit of the sales tax exemption at the time that they purchase capital equipment. With the R&D tax credit, even if it is available for that equipment purchase, the firms will receive the benefit only as fast as they are able to depreciate the equipment expenditure. In addition, the benefit of the credit may be delayed or never realized if the firm does not have taxable earnings for several years.

However, given that there is no particular reason why it is appropriate to subsidize one form of R&D spending (labor and materials) over another form (capital), or vice versa, it does seem that addressing the startup problem with another policy might be preferred. Alternatively, if the sales tax exemption is provided, perhaps the basis for the R&D tax credit should exclude capital expenditure.

6. Performance of the R&D Tax Credit: Success or Failure?

There are at least two analytic approaches to evaluating the effectiveness of any tax policy designed to correct the insufficient supply of a good like industrial R&D and innovation that has some externality characteristics. The first asks whether the level of the

good supplied after the implementation of the policy is such that the social return is equal to the social cost. In this situation, that would involve comparing the marginal return to industrial R&D dollars at the level of the state of California to the opportunity cost of using the extra tax dollars in another way, for example, in deficit reduction. This is a very tall order, and policy evaluation of this tax credit (or any other) usually falls back on the second method, which is to compare the amount of incremental industrial R&D to the loss in tax revenue. The implicit assumption in this method is that the size of the subsidy has been determined and that the only question to be answered is whether it is best administered as a tax credit or a direct subsidy.

Obviously, this kind of benefit-cost ratio is only very loosely connected with the magnitude of the gap between the social and private returns to R&D, if at all. It might be that the social return from additional industrial research is very high. If it is very, very high one may be willing to give up more tax dollars than the actual research induced by the tax subsidy. On the contrary, if the social return is only slightly higher than the private return, lowering the cost of research might cause the firm to do too much. In this case, even though the tax credit induces more industrial R&D than the lost tax revenue, it would not be good policy to have such a credit, because one could have spent that tax revenue on some other activity which had a higher social return. Fortunately, the available evidence on the social return to R&D suggests that the first case is more likely than the second.[17]

In the case of analyzing a state-level response to tax incentives, even the second method founders on lack of data. The most reliable and justifiable estimates of an impact of the federal R&E tax credit come from an approach that focuses on the cross-sectional response of individual firms to a change in the price of the R&D that they face. That is, we use the fact that the tax position of different firms means that they face a different tax price for R&D on the margin (due to the presence or absence of loss carryforwards in different years, requirements to use AMT, Alternative Minimum Tax, and so forth) to measure their response to this tax price. Performing this type of analysis requires data on the R&D spending and tax histories of the firms, and such data is simply unobtainable at the state level unless one has access to the individual tax records of firms, something that is normally prevented for confidentiality reasons.

Given the variability of incentives across states both in magnitude and design, one possible mode of analysis would be a comparative study that examined R&D spending at the individual state level as a function of changes in the relevant tax legislation. Such a study could be of considerable interest (and would be similar in spirit to studies of the effects of infrastructure generally on economic growth), but would be time-consuming due to the necessity of collecting the relevant data, which does not come conveniently in one dataset. In particular, collecting the individual tax legislation histories for 50 (or even 35) states is a daunting task. Policy-makers may wish to consider such a project.

6.1 Some Facts about the Magnitude of R&D Credit Take-up

Table 5 gives some statistics on the total credit claimed in California since the law was introduced in 1988, together with some figures for the total income tax collections by the state between 1992 and 1997. Obviously the R&D tax credit represents only a negligible reduction in personal income tax collections (about 0.05 percent in most years), but the tax revenue foregone is a significant reduction in corporate tax collections, nearly 5 percent in 1996, the latest year for which we have figures.

It is also noteworthy in this table how much the amount claimed as grown since its inception in 1988, even though the rules have not changed very much. To a certain extent, this reflects the process of learning about the credit (note that the number of returns doubles over the period), but it also reflects substantial increases in R&D, especially in the latter half of the period, where the number of filers does not grow that much but the amount of credit claimed does.

6.2 Evidence from State Agencies

We were asked to quantify and analyze the state claims to success. The Governor's Office, the Trade and Commerce Agency, the Franchise Tax Board and the Regional Technical Alliances were contacted by CCST staff to see what the state had to say about these programs. Only Cliff Numark, (JD Cal, LARTA Program Director for California Technology Investment Partnership (CalTIP) program, which provides seed money to early stage technology companies, http://www.LARTA.org/) responded. His comments were "what tax incentives?" In his experience, the founder's home location is a more important factor in determining if a high-tech company will set up shop or expand in California than any tax incentive.

Clearly this provision of the tax law has not been studied and evaluated by the state legislature, although there appear to be plans to do so in the future. One of the provisions of the proposed 1999 bill that changed the provisions of the California R&D tax credit is that the Legislative Research Bureau report on its economic

[17]See, for example, Griliches (1992), Mansfield (1965), and Bernstein and Nadiri (1988, 1989).

impact by January 1, 2000.[18] However, there is no mention of this requirement in the final legislation that became law on July 7, 1999.

California's R&E tax credit appears to have been initially motivated by desire to conform to the federal statutes: bills instituting the credit, SB 572 and AB 53, are part of the 1987 Federal Tax Conformity. Current references to the credit stress the potential to create high paying manufacturing jobs. For example, when the rate went up from 8% to 11% in 1996, Jim Cunneen (R-San Jose) commented:

> "the governor's action in signing the legislation I authored sends a powerful message that not only do we care about job creation in California, but that we care about creating manufacturing jobs. It is proven that R&D expenditures by any given company expands employment in related small businesses that act as suppliers of those organizations. That multiplier effect is very powerful"[19]

Job creation has also been emphasized by Kirk West, California Chamber President:

> "The bipartisan effort that went into this package of tax incentives will benefit all Californians. We will see an almost immediate increase in jobs because of these tax incentives"[20]

On signing SB 705 into law along with a number of other tax measures on July 7, 1999, Governor Gray Davis had the following to say:

> "These tax relief measures will ensure sound, targeted tax relief for California's business, families and investors. These measures will also invigorate the economy and ensure Californians keep more of what they earn."

Although these are laudable goals, they probably should be supported by some analytic evidence.

7. Conclusions and Policy Recommendations

It would be premature to make very specific policy recommendations at this point. There is no doubt that this tax credit is potentially quite a benefit for certain firms, especially those with a large R&D presence in the state relative to their revenues. If one believes strongly in the benefits of localized R&D spillovers and externalities of all kinds, then inducing firms to concentrate their R&D in the state of California may be a good thing for the state's economy. One may well ask, however, why other states don't simply reply with tax credits of their own (see Table 4), and whether in the long run, this type of tax policy competition isn't a zero sum game.

Thus a central question emerging from this kind of analysis is whether policies to encourage R&D activity at the firm level may operate best at the national rather than at the state level. And, if that is true, is it still to an individual state's advantage to try to influence the location decision of technology firms, even though or because other states are engaged in the same activity? Or is it the case that tax incentives like this have little influence on the decision, as some seem to be suggesting?

In addition to the overall conclusion, we have found that the incremental design of the credit has meant that the benefits are highly variable across different types of R&D-intensive firms in rather artificial ways. The rules seem excessively complex and hard to follow and plan for, although this may be unavoidable given the desire to target incremental R&D and minimize the tax revenue losses associated with the credit while keeping a large incentive effect.

One obvious recommendation is that the study of the effectiveness of the credit suggested by the legislature in A.B. 68 be carried out some time in the future, possibly using a comparative approach as suggested in the text. Such a study may wish to also look more closely at the claims of high technology job formation arising from such a policy.

8. References

Altshuler, Rosanne. 1989. "A Dynamic Analysis of the Research and Experimentation Credit." *National Tax Journal* XLI (1989): 453-66.

Arrow, Kenneth J. 1962. "Economic Welfare and the Allocation of Resources for Invention," *in The Rate and Direction of Inventive Activity*, Nelson, Richard R. (ed.), Princeton University Press, pp.609-625.

Battelle Research Institute and State Science and Technology Institute. 1998. "Survey of State Research and Development Expenditures: Fiscal Year 1995."

Bernstein, Jeffrey I., and M. Ishaq Nadiri. 1989. "Rates of Return on Physical and R&D Capital and Structure of the Production Process: Cross Section and Time Series Evidence." In *Advances in Econometrics and Modeling*, edited by B. Raj, 170-87. Amsterdam: Kluwer Academic Publishers, 1989.

[18] See AB 68 (Assembly Bill) and SB 705 (Senate Bill) – Status on http://www.leginfo.ca.gov/pub/bill.

[19] http://republican.assembly.ca.gov/members/24/PressRelease1125.html

[20] http://www.calchamber.com/news/kwsb38.html

Bernstein, Jeffrey I., and M. Ishaq Nadiri. 1988. "Interindustry R&D Spillovers, Rates of Return, and Production in High-Tech Industries." *American Economic Review* 78 (1988): 429-34.

Bloom, Nicholas, Lucy Chennells, Rachel Griffith, and John Van Reenen. 1998. "How Has Tax Affected the Changing Cost of R&D? Evidence from Eight Countries." London: Institute for Fiscal Studies (March).

Bloom, Nicholas, Rachel Griffith, and John Van Reenen. 1999. "Do R&D Tax Credits Work? Evidence from an International Panel of Countries 1979-94." London: Institute for Fiscal Studies (March).

Eisner, Robert, Steven H. Albert, and Martin A. Sullivan. 1986. "The New Incremental Tax Credit for R&D: Incentive or Disincentive." *National Tax Journal* XXXVII (1986): 171-83.

Griliches, Z. 1995. "R&D and Productivity: Econometric Results and Measurement Issues", in *Handbook of the Economics of Innovation and Technical Change*, P. Stoneman (ed.). Basil Blackwell: Oxford.

Griliches, Z. 1992. "The Search for R&D Spillovers," *Scandinavian Journal of Economics* 94(3, Supplement): 529-547.

Hall, B. H. 1996. "The Private and Social Returns to Research and Development: What Have We Learned?," in Smith, Bruce L. R., and Claude E. Barfield (eds.), *Technology, R&D, and the Economy*, Washington, DC: The Brookings Institution and the American Enterprise Institute.

Hall, B. H. 1995 "Effectiveness of Research and Experimentation Tax Credits: Critical Literature Review and Research Design," Report written for the Office of Technology Assessment, U.S. Congress, Washington, DC (June).

Hall, B. H. 1993. "R&D Tax Policy During the Eighties: Success or Failure?" *Tax Policy and the Economy* 7: 1-36.

Hall, B. H. 1992. "R&D Investment at the Firm Level: Does the Source of Financing Matter?" Cambridge, Mass.: NBER Working Paper No. 4095 (June).

Hall, B.H. and F. Hayashi 1989. "Research and Development as an Investment," Cambridge, Mass.: NBER Working Paper No. 2973.

Hall, B. H., and J. van Reenen, "How Effective are Fiscal Incentives for R&D? A New Review of the Evidence," Invited paper for a special issue of *Research Policy*, January 2000.

Himmelberg, C. P. and B. C. Petersen 1994. "R&D and Internal Finance: A Panel Study of Small Firms in High-Tech Industries, *Review of Economics and Statistics*, 76: 38-51.

http://www.wa.gov/dor/pub/notic/mgrepair.html

http://www.taxadmin.org/fta/rate/97taxbur.html

http://www.leginfo.ca.gov/pub/

http://commerce.ca.gov/business/investgd/investgd04.html

Jaffe, A. 1986. "Technological Opportunity and Spillover of R&D: Evidence from Firms' Patents, Profits, and Market Value", *American Economic Review* 76: 984-1001.

Jaffe, A. B., M. Trajtenberg, and R. Henderson 1993. "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations," *Quarterly Journal of Economics* 108: 577-98.

Mairesse, J. and M. Sassenou 1991. "Research and Development and Productivity: a Survey of Econometric Studies at the Firm Level", *Science-Technology Industry Review*, Paris, OECD, 8: 9-43].

Mansfield, Edwin. 1965. "Rates of Return from Industrial Research and Development." *American Economic Review* 55 (1965): 310-22.

Mohnen, P. 1996. "R&D Externalities and Productivity Growth", *Science-Technology Industry Review*, Paris, OECD, 13: 39-66.

National Science Foundation. 1999. *National Patterns of R&D Resources: 1998*, Arlington, VA: NSF 99-335, by Steven Payson.

Nelson, Richard R. 1959. "The Simple Economics of Basic Research," *Journal of Political Economy* 67: 297-306.

Penner, Rudolph G., Linden C. Smith, and David M. Skanderson. 1994. "Extending the R&D Tax Credit: The Importance of Permanence." Washington, DC: KPMG Peat Marwick LLP (November).

Shanahan, James R. Jr., and Kendall B. Fox. 1997. "Changes to the Research Tax Credit." Price-Waterhouse High Tech Industry Report (September/October).

State Science and Technology Institute. 1997. "State Research and Development Tax Incentives," Columbus, Ohio (May).

Texas Legislature, Select Committee Issues (1999). "Interim Report on Tax System."

Table 1. History of R&D Tax Treatment in the United States 1981-1999

Period	Credit Rate	Corporate Tax Rate	Definition of Base	Qualified Expenditures	Sect. 174 Deduction?	Foreign Allocation Rules
July 1981 to Dec 1985	25%	46% (48% in 81)	Max of previous 3-yr average or 50% of current yr.	Excluded: Res. Done outside U.S.; Humanities and Soc. Sci.; Research funded by others	None	100% deduction against domestic income
July 1986 to Dec 1986	20%	34%	Same	Narrowed def. To "tech-nological" research. Excluded leasing.	None	Same
Jan 1987 to Dec 1987	20%	34%	Same	Same	None	50% deduction against domestic income; 50% allocation
Jan 1988 to Apr 1988	20%	34%	Same	Same	None	64% deduction against domestic income; 36% allocation
May 1988 to Dec 1988	20%	34%	Same	Same	None	30% deduction against domestic income; 70% allocation
Jan 1989 to Dec 1989	20%	34%	Same	Same	-50% credit	64% deduction against domestic income; 36% allocation
Jan 1990 to Dec 1991	20%	24%	1984-88 R&D to sales ratio times current sales (max ratio of .16); .03 for startups.	Same	-100% credit	Same
Jan 1992 to Dec 1993	20%	34%	Same; startup rules modified	Same	-100% credit	Same
Jan 1994 to June 1995	20%	35%	Same	Same	-100% credit	50% deduction against domestic income; 50% alloc.
July 1995 to June 1996	0%	35%	None	NA	NA	Same
July 1996 to June 1999	20%	35%	1984-88 R&D to sales ratio times current sales (max ratio of .16) (or AIC for 24 mos.)	Same definition	-100% credit	Same

Table 2. R&D Tax Credit under Different Scenarios

The following table summarizes the findings from hypothetical tax scenarios in Appendix B. It assumes a 1993 tax year situation: California R&D credit level of 8% (instead of current 12%) and no possibility of electing AIC. Formulas for marginal tax prices used here are derived in section 3.4. Credit per R&D dollar is equal to the credit amount divided by the actual amount of R&D dollars in that year.

Description		California		Federal		California + Federal	
		Sales share	R&D share	Marginal tax price	Credit per R&D $	Marginal tax price	Credit per R&D $
Firm paying federal and state taxes; R&D growing 15% per year	Case A	100%	100%	0.528	5.6%	0.422	7.9%
	Case B	50%	50%	0.528	5.6%	0.446	7.9%
	Case C	50%	50%	0.528	5.6%	0.446	9.6%
	Case D	25%	100%	0.528	5.6%	0.446	9.6%
Firm paying federal and state taxes; R&D and sales flat	Case A	100%	100%	0.528	0.0%	0.422	0.0%
	Case B	50%	50%	0.528	0.0%	0.446	0.0%
	Case C	50%	100%	0.528	0.0%	0.446	4.0%
	Case D	25%	100%	0.528	0.0%	0.446	4.0%
Firm paying federal and state taxes; R&D falls below previous year R&D	Case A	100%	100%	0.528	1.1%	0.422	1.5%
	Case B	50%	50%	0.528	1.1%	0.446	1.5%
	Case C	50%	100%	0.528	1.1%	0.446	5.1%
	Case D	25%	100%	0.528	1.1%	0.446	5.1%

Table 3. Comparing the Effective Credit Rates across Eligibility and Tax Paying Status (Using Credit Rates as of 1998)

Tax situation	Statutory Credit Rate	Full tax price	Tax price without credit	Full tax price relative to tax price without credit
Federal, state, no credits	0.0	0.602	0.602	1.0
Federal, no state, no credits	0.0	0.660	0.660	1.0
Federal, state, fed. credit only	0.20	0.470	0.602	0.781
Federal, no state, fed. credit only	0.20	0.528	0.660	0.800
Federal, state, both credits	0.2+0.11=0.31	0.404	0.602	0.671
Federal, no state, both credits	0.2+0.11=0.31	0.455	0.660	0.689

Table 4. Comparison of R&D Tax Credit Take-up Across Selected States

State	Incentive Type	Approx. Number of Firms Using the Incentive	Approx. Annual Tax Expenditure ($M)	Annual Sales Tax Revenue ($M)	Annual Corporate Tax Revenue ($M)	Relative to Sales Tax	Relative to Corporate Tax
Arkansas	Income	1.5	0.0	1940	230	0.00%	0.01%
California	Income (8% at time of survey)	3500	120.0	24100	5800	0.50%	2.07%
Illinois	Income (6.5%)	Not available	16.5	8490	1620	0.19%	1.02%
Iowa	Income (6.5%)	100	2.0	2150	200	0.09%	1.00%
Louisiana	Research park exemptions	0	0.0	2560	330	0.00%	0.00%
Minnesota	Income (5% for first $2M of R&E, 2.5% for R&E beyond ($2M)	300	11.0	4410	700	0.25%	1.57%
Missouri	Income (6.5%)	18	1.2	3350	380	0.04%	0.33%
New Jersey	Income (10%)	100	3.1	7360	1160	0.04%	0.27%
Ohio	Sales and Use	Not available	19.2	7600	810	0.25%	2.37%
Oregon	Income (5%)	45	1.3	590	300	0.22%	0.43%
Virginia	Sales and Use	Not available	11.8	3590	360	0.33%	3.28%
Washington	Business and occupations/Sales and Use	140	30.6	7870	NA	0.39%	NA
Wisconsin	Income (5%)	400	20.0	4010	580	0.50%	3.45%

Sources: State Research and Development Tax Incentives, SSTI, May 1997; U.S. Bureau of the Census Website.

Table 5. Total R&D Credit Claimed in California

	Personal Income Tax				Bank and Corporation Tax			
Year	Number of Returns	Amount Claimed ($1000)	Total Tax Revenue ($M)	R&D Credit Claimed per Tax Revenue	Number of Returns	Amount Claimed ($1000)	Total Tax Revenue ($M)	R&D Credit Claimed per Tax Revenue
1988	1,091	$1,460			806	$38,642		
1989	1,271	$2,861			1,022	$54,352		
1990	2,078	$3,492			1,363	$85,651		
1991	1,556	$5,552			1,582	$94,409		
1992	1,302	$5,389	$17,030	0.03%	1,461	$100,759	$4,518	2.23%
1993	1,621	$7,739	$17,200	0.04%	1,285	$109,684	$4,728	2.32%
1994	1,551	$9,588	$17,548	0.05%	1,437	$182,582	$4,633	3.94%
1995	1,554	$10,305	$18,344	0.06%	1,268	$245,950	$5,748	4.28%
1996	1,546	$11,596	$24,100	0.05%	1,669	$278,280	$5,810	4.79%
1997	1,769	$12,558	$23,729	0.05%	NA	NA	$5,814	NA

Source: Research Bureau, Franchise Tax Board, State of California, personal communication: U.S. Census Bureau Website, state government finance statistics for 1992-1997.

9. Appendix A: Research Credit Data for T Corporation[21]

This example illustrates the advantages of the Alternative Incremental Credit for firms with rapidly growing revenues and high R&D intensities in the earlier (1984-88) period.

Year	Gross Receipts (GR) ($M)	Qualified Research Expense (QRE) ($M)
1984	28.0	4.4
1985	30.0	6.3
1986	31.0	6.4
1987	31.0	7.2
1988	32.0	7.6
1989	42.0	8.8
1990	56.0	8.9
1991	68.0	9.0
1992	81.0	10.0
1993	99.0	11.0
1994	117.0	12.0
1995	122.0	13.0
1996	134.0	14.0
1997	156.0	16.0

Regular credit computation: The total QRE to total gross revenue ratio for 1984-88 for this firm is 21%, above the maximum fixed base percentage of 16%, so it is reduced to that level. The base R&D amount in 1997 is 16% of the average of the prior 4 years (1993-1996) revenue ($118M), which is $18.9M. Therefore this firm receives no research credit, because its base amount exceeds its current year QRE.

Alternative credit computation: 1% of $118M=$1.18M; 1.5%=$1.77M; 2.0%=$2.36M.
The credit is the sum of 1.65% (1.77M-1.18M) + 2.2% (2.36M-1.77M) + 2.75% (16M-2.36M) = $397,815. To obtain this level of credit under the regular computation, the firm would have had to increase its R&D to a level of about $20.9M in 1997.

[21] We are indebted to Annette Nellen's course notes for this example.

10. Appendix B: Calculation of R&D Tax Credit under Scenarios in Table 2

Scenario 1: R&D and sales flat

	Case A		Case B		Case C		Case D	
% in California →	100%	100%	50%	50%	50%	100%	25%	100%
↓tax year	Revenue	QRE	CA rev	CA QRE	CA rev	CA QRE	CA rev	CA QRE
1984	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1985	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1986	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1987	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1988	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1989	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1990	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1991	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1992	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1993	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000

Step by step calculation	Case A		Case B		Case C		Case D	
of the R&D tax credit	Federal	California	Federal	California	Federal	California	Federal	California
fixed base=(QRE 84-88)/(fedrev 84-88)	11%	11%	11%	11%	11%	11%	11%	11%
max fixed base	16%	16%	16%	16%	16%	16%	16%	16%
min(fixed, max fixed base)	11%	11%	11%	11%	11%	11%	11%	11%
base = mfb * avgrev(last 4 yrs)	3,000,000	3,000,000	3,000,000	1,500,000	3,000,000	1,500,000	3,000,000	750,000
min allowable base = 0.5 QRE	1,500,000	1,500,000	1,500,000	750,000	1,500,000	1,500,000	1,500,000	1,500,000
Maxb=max(base, min allowable base)	3,000,000	3,000,000	3,000,000	1,500,000	3,000,000	1,500,000	3,000,000	1,500,000
Federal credit = 0.2(QRE-maxb) +0.2(basic research)	$0		$0		$0		$0	
California credit =0.08(QRE-maxb) +0.12(basic research)		$0		$0		$120,000		$120,000
Credit per R&D dollar= R&D amount / credit amount	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	4.0%

Scenario 2: R&D growing at 15% per year

	Case A		Case B		Case C		Case D	
% in California →	100%	100%	50%	50%	50%	100%	25%	100%
↓tax year	Revenue	QRE	CA rev	CA QRE	CA rev	CA QRE	CA rev	CA QRE
1984	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1985	32,000,000	3,450,000	16,000,000	1,725,000	16,000,000	3,450,000	8,000,000	3,450,000
1986	31,000,000	3,967,500	15,500,000	1,983,750	15,500,000	3,967,500	7,750,000	3,967,500
1987	34,000,000	4,562,625	17,000,000	2,281,313	17,000,000	4,562,625	8,500,000	4,562,625
1988	43,000,000	5,247,019	21,500,000	2,623,509	21,500,000	5,247,019	10,750,000	5,247,019
1989	48,000,000	6,034,072	24,000,000	3,017,036	24,000,000	6,034,072	12,000,000	6,034,072
1990	60,000,000	6,939,182	30,000,000	3,469,591	30,000,000	6,939,182	15,000,000	6,939,182
1991	68,000,000	7,980,060	34,000,000	3,990,030	34,000,000	7,980,060	17,000,000	7,980,060
1992	76,000,000	9,177,069	38,000,000	4,588,534	38,000,000	9,177,069	19,000,000	9,177,069
1993	80,000,000	10,553,629	40,000,000	5,276,814	40,000,000	10,553,629	20,000,000	10,553,629

Step by step calculation of the R&D tax credit	Case A		Case B		Case C		Case D	
	Federal	California	Federal	California	Federal	California	Federal	California
fixed base=(QRE 84-88)/(fedrev 84-88)	12%	12%	12%	12%	12%	12%	12%	12%
max fixed base	16%	16%	16%	16%	16%	16%	16%	16%
min(fixed, max fixed base)	12%	12%	12%	12%	12%	12%	12%	12%
base = mfb * avgrev(last 4 yrs)	7,585,179	7,585,179	7,585,179	3,792,589	7,585,179	3,792,589	7,585,179	1,896,295
min allowable base = 0.5 QRE	5,276,814	5,276,814	5,276,814	2,638,407	5,276,814	5,276,814	5,276,814	5,276,814
maxb=max(base, min allowable base)	7,585,179	7,585,179	7,585,179	3,792,589	7,585,179	5,276,814	7,585,179	5,276,814
Federal credit = 0.2(QRE-maxb) +0.2(basic research)	$593,690		$593,690		$593,690		$593,690	
California credit =0.08(QRE-maxb) +0.12(basic research)		$237,476		$118,738		$422,145		$422,145
credit per R&D dollar= R&D amount / credit amount	5.6%	2.3%	5.6%	2.3%	5.6%	4.0%	5.6%	4.0%

Scenario 3: R&D falls below previous year R&D in current tax year

	Case A		Case B		Case C		Case D	
% in California →	100%	100%	50%	50%	50%	100%	25%	100%
↓tax year	Revenue	QRE	CA rev	CA QRE	CA rev	CA QRE	CA rev	CA QRE
1984	28,000,000	3,000,000	14,000,000	1,500,000	14,000,000	3,000,000	7,000,000	3,000,000
1985	32,000,000	4,200,000	16,000,000	2,100,000	16,000,000	4,200,000	8,000,000	4,200,000
1986	31,000,000	5,000,000	15,500,000	2,500,000	15,500,000	5,000,000	7,750,000	5,000,000
1987	34,000,000	6,200,000	17,000,000	3,100,000	17,000,000	6,200,000	8,500,000	6,200,000
1988	43,000,000	6,800,000	21,500,000	3,400,000	21,500,000	6,800,000	10,750,000	6,800,000
1989	48,000,000	8,400,000	24,000,000	4,200,000	24,000,000	8,400,000	12,000,000	8,400,000
1990	60,000,000	10,200,000	30,000,000	5,100,000	30,000,000	10,200,000	15,000,000	10,200,000
1991	68,000,000	11,000,000	34,000,000	5,500,000	34,000,000	11,000,000	17,000,000	11,000,000
1992	76,000,000	12,000,000	38,000,000	6,000,000	38,000,000	12,000,000	19,000,000	12,000,000
1993	80,000,000	10,000,000	40,000,000	5,000,000	40,000,000	10,000,000	20,000,000	10,000,000

Step by step calculation	**Case A**		**Case B**		**Case C**		**Case D**	
of the R&D tax credit	Federal	California	Federal	California	Federal	California	Federal	California
fixed base=(QRE 84-88)/(fedrev 84-88)	15%	15%	15%	15%	15%	15%	15%	15%
max fixed base	16%	16%	16%	16%	16%	16%	16%	16%
min(fixed, max fixed base)	15%	15%	15%	15%	15%	15%	15%	15%
base = mfb * avgrev(last 4 yrs)	9,450,000	9,450,000	9,450,000	4,725,000	9,450,000	4,725,000	9,450,000	2,362,500
min allowable base = 0.5 QRE	5,000,000	5,000,000	5,000,000	2,500,000	5,000,000	5,000,000	5,000,000	5,000,000
maxb=max(base, min allowable base)	9,450,000	9,450,000	9,450,000	4,725,000	9,450,000	5,000,000	9,450,000	5,000,000
Federal credit = 0.2(QRE-maxb) +0.2(basic research)	$110,000		$110,000		$110,000		$110,000	
California credit =0.08(QRE-maxb) +0.12(basic research)		$44,000		$22,000		$400,000		$400,000
credit per R&D dollar= R&D amount / credit amount	1.1%	0.44%	1.1%	0.44%	1.1%	4.0%	1.1%	4.0%

11. Appendix C: Analysis of Changing Minimum Base

On July 7, 1999, Governor Davis signed tax relief legislation, which included an increase in the R&D tax credit from 11% to 12%. The original legislation (AB68) proposed two changes: (1) an increase in the credit rate to 15% and (2) a decrease in the minimum base amount from 50% to 20%. The summary of AB68 (date of hearing: April 5, 1999) correctly noted that "[i]ncreasing the credit rate from 11 to 15% provides greater tax relief to taxpayers that already qualify for the research and development credit." However, it mistakenly stated that "[d]ecreasing the minimum base amount from 50% to 20% would allow more taxpayers to qualify for the research and development credit."[22] The following is an explanation of the impact of changing the minimum base amount.

Recall one of the final steps in the calculation of the credit:

*maxb = max(MFB*AR4, 50%QRE)*

where

MFB= min fixed base = minimum of (16%, research intensity in 84-88)

AR4= average revenue in last 4 years.

Then the credit is equal to

0.11(QRE-maxb) + 0.20(basic research).

Therefore, a firm is eligible for credit only if maxb>QRE (assuming no basic research). For the reform to increase the pool of firms eligible for the credit, it must result in maxb falling below QRE. Consider the case where

*MFB*AR4 > 50%QRE*

before the reform. In this scenario it is now possible that MFB*AR4 is also greater than QRE, so the firm will not be eligible for the credit so a reform could increase the pool of eligible firms. But if the above inequality holds, then it must also be true that

*MFB*AR4 > 20%QRE.*

Therefore MFB*AR4 is used for calculating the credit so for those firms there will be no change in eligibility.

If 50%QRE > MFB*AR4 before the reform then the credit is always positive and the firm is already eligible for the credit.

[22] The error was realized after the hearing and corrected in subsequent hearings.