FISCAL RESEARCH CENTER

STATE TAX INCENTIVES FOR RESEARCH AND DEVELOPMENT ACTIVITIES: A REVIEW OF STATE PRACTICES

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Executive Summary

In hopes of inducing economic development, states are seeking to encourage research and development activities. The technology and information sectors of the economy are seen as the engines that are expected to drive strong economies in the 21st century. State economies that are well positioned to attract and create high-tech firms and jobs are expected to do well in the economy of the future. One tool states have at their disposal to aid in this effort is economic incentives to attract and encourage research and development activities within the state.

The focus of this study is on industrial R&D and the tax incentives used by state governments to promote this activity. The purpose of this report is to review the tax incentives offered by the states most heavily involved in industrial research and development activity. The report begins with a discussion of the federal R&D credit and the state R&D credits as implemented in Georgia. It then continues with a description of the R&D credits offered in other states. Special attention is paid to the specific components of the R&D credit as implemented by the various states. In general, the states follow the model of the federal Research and Experimentation (R&E) credit but each one has its own variations. These variations can greatly alter the attractiveness and effectiveness of the credit. The implications of these variations are discussed in the body of the report. The report also includes a list of other tax incentives used by the states, such as sales tax exemptions and exclusion of income from royalties. The review contains a brief sampling of grant programs used in other states that may be successful in encouraging additional industrial R&D activity. The final section of the report contains several simulations which attempt to isolate the monetary effects of credit characteristics and determine which credit formulas offer the most generous incentives.

Comparison of Research and Development Tax Credits at the State Level

Most states offer some version of an R&D tax credit but they vary greatly in their design. In most cases the state credit is generally patterned after the Federal R&E tax credit in that it is uses the same definition of qualified expenses and is

incremental in nature. Credit rates at the state level vary from a low of zero percent to a high of 20 percent. While many policy makers tend to focus on the rate of a state credit as an indication of how valuable the credit is, there are many factors that determine the attractiveness and effectiveness of an R&D tax credit. For example, while most states follow the federal definition of qualified expenses, a few states allow other expenses to be eligible for the credit such as purchases of land or capital equipment. In addition, some states use a nonincremental base of qualified expenditures so that all R&D expenditures are eligible for the credit. Refundable or transferable credits are also available in several states. These can be particularly valuable to firms in need of financial capital. To offset the cost of the R&D credit to the state government, limitations are many times imposed on the credits. Examples of such limitations include restricting the application of the credit to 50 percent of a firm's tax liability or by imposing a ceiling on the aggregate value of the credits awarded each year. Other factors include the application of the credit to noncorporate entities, the transference of a subsidiary's credit to a parent, and the general decoupling of the state credit from the federal credit.

Other Incentives

Both Rhode Island and West Virginia offer a 10 percent tax credit for the construction or acquisition of property used in research and development activities. Our informal survey found that the use of sales tax exemptions is fairly common among the states. Two advantages of a sales tax exemption are that it provides a way to subsidize the cost of depreciable property used in R&D activities and its value does not diminish for those firms with little or no income tax liability. Less common is the use of property tax incentives. More commonly associated with manufacturing processes, only Michigan and Florida were found to offer a property tax incentive targeted to research activities. Also found in our survey was an exclusion (against the state personal income tax) for royalty income associated with patent ownership offered by Hawaii. Hawaii also allows high-tech businesses to sell up of $500,000 of certain unused net operating losses (NOLs).

To increase the amount of capital available to small businesses, Arizona passed legislation creating the Small Business Capital Investment Tax Incentive program. The Arizona legislation provides a 30 percent tax credit equal to the amount of the investment. Many states also offer grant programs designed to foster innovation and high-tech startups in their states and Ohio offers a low-interest loan program designed to promote R&D spending.

Simulation of the R&D Credit under Four Alternative Credit Structures

In this section of the report we design a simulation to determine the value of the state R&D tax credit under several alternative forms. Two experiments are run on three hypothetical firms, A – low income/small size firm, B – middle income/medium size firm, C – high income/large firm. The first experiment consists of the following question: Which form of the tax credit provides the greatest benefit per dollar of R&D expenditures? In this simulation, the state tax rates and the R&D credit rates are held constant across all models so that the effect of the credit structure is isolated. The results of this simulation highlight the benefit of a refundable credit structure and also disadvantages of placing limits on the use of the credit.

The second experiment asks, Which state offers the most attractive R&D tax credit package? In this simulation, the form of the credit, the state income tax rate, and the credit rate are all allowed to vary according to what is found in each state. This experiment provides a combined illustration of all of the components of the credit that affect its value. The results indicate that the largest tax benefit is associated with Hawaii because this credit combines a high tax rate of 20 percent, a nonincremental base, and a refundable credit.

Lastly, we compute the amount of additional R&D expenditures that would be stimulated under the various credit structures. To answer this question we convert the credit structures compared above into changes in tax prices faced by each firm. The incremental and refundable characteristics of the credits translate into changes in tax liabilities for each firm. These differences in tax liabilities affect the net cost of a dollar of R&D expenditure. We use the existing incremental and nonrefundable Georgia R&D credit structure as our base model to which each alternative is

compared. To compute the impact of a change in structure, we assume an elasticity of -1. The simulation results indicate that switching from a traditional incremental/ nonrefundable credit to an incremental/refundable credit produces an additional $41,000 to $100,000 in R&D activity per firm depending on the firm's tax liability. This is due to the refundable nature of the credit but its impact is reduced by the effect of the incremental base which allows less R&D expenditures to be eligible for the credit as taxable income increases. The greatest gains in additional R&D activity come from the move to the nonincremental/refundable credit structure. In this case, the simulation leads to a per firm increase in R&D activity of between $72,165 and $99,997 over what would have been performed under the existing incremental/ nonrefundable credit. This gain reflects the impact of the nonincremental base and the refundable nature of the credit.

Summary

We provide a sampling of the R&D tax incentives offered by states around the country. Most states provide some type of incentive for technology-based economic development. The most popular incentive is a research and development tax credit. In general, the tax credit found in most states resembles the federal credit but the specifics of the credit vary significantly from state to state. Some states have added provisions to allow for refundable or transferable credits, adjusted the credit rates, and in some cases decoupled from the federal credit so that the state credit is a permanent provision at the state level. Ranking the attractiveness of the state tax credit is difficult since there are many components to consider. Comparing states based solely on the tax credit rate can be misleading as states usually impose limitations on the use of the credits such as statewide caps or limits on the amount of tax liability that can be applied to the credit. Based on simulations of hypothetical firms, it appears that the most attractive credit structure is one that combines a nonincremental base calculation and refundable credits.

In addition to the R&D tax credit, several states offer sales tax exemptions and more states are beginning to offer tax incentives designed to attract investment

capital to the state. Many states also have grant programs earmarked for faculty and research talent acquisition and small business high-tech startups.

While we document many examples of the use of R&D tax incentives, we do not explore the effectiveness of these incentives. Indeed, very little research has been done on the effectiveness of the state credit in stimulating R&D activity within the state. Research on the effectiveness of the federal R&D credit finds that decreasing the cost of R&D by $1 leads in the long run to an increase in R&D expenditures of about $1. Whether the effect is the same for state credits is not known. Nor has the effectiveness of the various versions of the state credit been studied. Even less research has been done on the effectiveness of sales or property tax relief for high-tech firms. Finally, the effect on state employment and investment from the use of targeted tax incentives remains largely unexplored. More research is needed to determine if increasing the value of tax incentives, whether against income or sales or property, designed to stimulate a small set of industries is justified when compared to the employment and investment effects of lowering the tax rate for all business in a state.

State Tax Incentives for Research and Development Activities: A Review of State Practices

1. Introduction

In hopes of inducing economic development, states are seeking to encourage research and development activities. This type of economic development is often referred to as Technology Based Economic Development. The technology and information sectors of the economy are seen as the engines that are expected to drive strong economies in the 21st century. State economies that are well positioned to attract and create high-tech firms and jobs are expected to do well in the economy of the future. One tool states have at their disposal to aid in this effort is economic incentives to attract and encourage research and development activities within the state.

Most states offer economic incentives designed to encourage firms to engage in research and development activities. These incentives range from R&D tax credits to sales tax exemptions for R&D equipment. While there has been some research conducted on the impact of the federal R&D tax credit in encouraging research and development activities, there has been less focus on state level incentives. In general, academic research has shown that the federal R&D tax credit has been successful in increasing R&D expenditures.[1] The general consensus from the literature is that a dollar of federal tax credit stimulates at least one dollar of additional private spending on R&D in the long run. There is little reason to believe that a state R&D tax credit would not be as effective as the federal credit if both operate in tandem as many do.

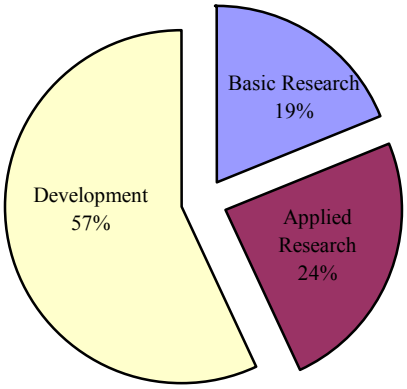
Total R&D activity can be broken down into three main types as shown in Figure 1. Applied research and development activities are usually undertaken by industry, while basic research is conducted by university and government labs. Private industry is the largest source of R&D funding in the US. In 2003, industry funded 63 percent of total R&D activity while the Federal Government funded 30 percent and universities and colleges and other non-profits funded the remaining 6 percent.[2] Of the total amount spent on development and applied research in 2003,

[1] See Office of Technology Assessment (1995) and Hall and Van Reenen (2000) for a review of studies on the effectiveness of the R&E tax credit.
[2] National Science Foundation National Patterns of Research and Development Resources: 2003.

those areas of most interest to industry, industry funded 74 percent and performed 81 percent of the research.[3]

The focus of this study is on industrial R&D and the tax incentives used by state governments to promote this activity. Industrial research and development is defined by the National Science Foundation (NSF) in their Industrial Research and Development survey. According to this survey, industrial "R&D includes basic and applied research in the sciences and engineering. It also includes design and development of new products and processes and enhancement of existing products and processes." Industrial research and development activities specifically exclude such activities as routine product testing, sales promotion, market research, and other nontechnical activities as well as research in the social sciences or psychology.[4]

Figure 1:
Types of U.S. R&D Activity:
2003



Source: National Science Foundation National Patterns of Research and Development Resources: 2003.

The purpose of this report is to review the tax incentives offered by the states most heavily involved in industrial research and development activity. The report begins with a discussion of the federal R&D credit and the state R&D credits as

[3] Ibid.
[4] See *Research and Development in Industry: 2000* (National Science Foundation) for additional information on the definition of basic and applied research and development activities.

implemented in Georgia. It then continues with a description of the R&D credits offered in other states. Special attention is paid to the specific components of the R&D credit as implemented by the various states. In general, the states follow the model of the federal Research and Experimentation (R&E) credit but each has its own variations. These variations can greatly alter the attractiveness and effectiveness of the credit. The implications of these variations are discussed in the body of the report. The report also includes a list of other tax incentives used by the states, such as sales tax exemptions and exclusion of income from royalties. The review contains a brief sampling of grant programs used in other states that may be successful in encouraging additional industrial R&D activity in Georgia. The final section of the report contains two simulations that attempt to isolate the monetary effects of credit characteristics and determine which credit formulas offer the most generous incentives.

2. States Included in the Study

While this report does not attempt to measure the effectiveness of R&D incentives, we begin our informal survey with a look at the practices of the tax incentives used by those states with the largest amount of industrial R&D expenditures. It is only an assumption that these particular economic incentives, working in combination with other characteristics of the state, have a positive influence on the total amount of R&D activity within that state.

According to information provided by the National Science Foundation, research and development expenditures are concentrated in a relatively few number of states.[5] Based on data from 2001, 10 states account for 65 percent of the industrial R&D expenditures in the US. California alone represents almost 21 percent of industrial R&D in the country. These states are listed in Table 1. In addition, Table 1 also notes the top 10 states for total R&D activity, which is very similar to the list for industrial R&D states but with Maryland replacing Ohio in the top 10 states for overall R&D activity. Lastly, Table 1 ranks the states according to industrial research expenditures per gross state product for each state. This list contains several smaller states with inordinately high levels of industrial research expenditures.

To complete the list of states considered in this review, North Carolina and Florida are added to the set of 10 states listed in Table 1. These states are contiguous neighbors of Georgia with substantial R&D activity and as such can be viewed as direct competitors. Since one purpose of this report is to determine the relative attractiveness of Georgia to its neighbors in the region, it is believed valuable to include these states in the review. Other states can also be viewed as alternative locations but because of their proximity and similarity to Georgia, Florida and North Carolina may be considered stronger options. In addition, incentives used in other states may be mentioned as their practices come to our notice. Reliance solely on the practices of these 12 states may be misleading as they may not offer the most attractive high-tech incentive packages. Other states that are not so competitive in their R&D activities may compensate by offering more generous and possibly more

[5] National Science Foundation DataBrief, March 23, 2001; NSF 01-320.

effective incentives. Therefore, this review, while focusing mainly on practices of the 12 states, will at times include note-worthy practices of other states.

TABLE 1. STATE RANKINGS OF R&D EXPENDITURES FOR 2001

Total R&D -------Expenditures------		Total Industrial R&D ----------Expenditures----------		Total Industrial R&D ---Expenditures per GSP--	
Rank	**State**	**Rank**	**State (% of US total)**	**Rank**	**State**
1	California	1	California (20.7%)	1	Michigan
2	Michigan	2	Michigan (7.2%)	2	Oregon
3	Massachusetts	3	Massachusetts (5.7%)	3	Massachusetts
4	New York	4	New York (5.5%)	4	Washington
5	Texas	5	New Jersey (5.1%)	5	Rhode Island
6	New Jersey	6	Texas (5.0%)	6	Delaware
7	Maryland	7	Pennsylvania (4.5%)	7	California
8	Pennsylvania	8	Washington (4.4%)	8	New Hampshire
9	Illinois	9	Illinois (4.2%)	9	Connecticut
10	Washington	10	Ohio (3.4%)	10	New Jersey
22	*Georgia*	*22*	*Georgia (1.0%)*	*36*	*Georgia*
12	*North Carolina*	*14*	*North Carolina (2.1%)*	*22*	*North Carolina*
13	*Florida*	*15*	*Florida (1.9%)*	*33*	*Florida*

3. Calculation of the Federal Credit[6]

Since most states pattern their R&D credit after the federal version, an explanation of that credit is a good starting point for a discussion of the state R&D credits. In general, the federal credit, known as the Research and Experimentation (R&E) tax credit, provides a reduction in tax liability for qualified research expenses, where qualified expenses are defined to include such items as wages of employees, supplies (other than land, improvements to land, or depreciable property), 65 percent of any amount paid for qualified research done on a contract basis or 75 percent of any amount paid for qualified research done by a research consortium.[7] The legislation defines qualified research as that "which is undertaken for the purpose of discovering information which is technical in nature, the application of which is intended to be useful in the development of a new or improved business component of the taxpayer."[8] The legislation specifically prohibits application of the credit to expenses associated with research conducted after commercial production, adapting existing technology for a specific need or customer, duplication of any existing business component, surveys, studies, marketing research, routine data collection or testing for quality control, computer software, internal use computer software, research conducted outside the United States, social science research, and funded research.[9]

For any given firm, the federal credit is equal to 20 percent of the qualified research expenses for the year in excess of the base amount of research expenditures. The credits can be used when earned only if a positive tax liability exists. Unused credits can be carried back 3 years and forward 15. The base amount of research expenditures is defined as the product of the fixed-base percentage and the average annual gross receipts of the taxpayer for the 4 years prior to the tax year for which the credit is being determined. By law the base amount cannot be less than 50 percent of the qualified research expenses for that year. The fixed-base percentage is defined as

[6] Excerpt from Wheeler (2005).
[7] For purposes of this legislation a research consortium is defined to include organizations which are either 501(c)(3) or 501(c)(6) and tax exempt, is organized and operated primarily to do scientific research and is not a private foundation.
[8] Internal Revenue Code section 41(d)(1)(B).
[9] Internal Revenue Code section 41(d)(4).

the ratio between the taxpayers qualified research expenditures and their gross receipts during 1984-1988. Calculation of the federal tax credit is illustrated in Example 1.

EXAMPLE 1. – CALCULATION OF THE FEDERAL R&E TAX CREDIT

	1984	1985	1986	1987	1988
Gross Receipts (a)	$1,000,000	$1,200,000	$1,400,000	$1,600,000	$1,800,000
Qualified Expenditures (b)	$50,000	$75,000	$100,000	$150,000	$175,000
Qualified Expenses to Gross Receipts ratio (b/a=c)	0.05	0.0625	0.071	0.09375	0.09722
Fixed Base percentage (∑c/5=d)	0.075				
Average Gross Receipts for 2001-2004 (e)	$2,300,000				
Qualified expenses for 2005 (f)	$200,000				
Base amount of expenses for 2005 (d × e = g)			0.075 × $2,300,000 = $172,500		
2005 expenses subject to tax credit (f - g = h)			$200,000 - $172,500 = $27,500		
Value of 2005 tax credit (20% × h)			0.2 × $27,500 = $5,500		

Based on calculations provided by the Joint Committee on Taxation, about $3 billion in R&E credits were earned in 2000 by corporations. Additional credits were earned by noncorporate entities. An Ernst and Young (Koch 2004) report estimates the total R&E credit earned in 2000 to be $7.2 billion.

The basic credit calculation is structured so that firms are only rewarded for expenditures in excess of a base amount. Thus, the provision is designed to stimulate new research expenditures. Second, the amount of the tax credit is dependent on the base level of expenditures taken during the 1984-1988 time period. Originally, the time period was a moving one consisting of the four years prior to the tax year in question. Companies complained that this rule created a system of an ever increasing standard for the base level of expenditures. For instance, substantially increasing research expenditures one year would raise the base of research expenditures for future years. Only research expenditures in excess of the new, higher base would be subject to the credit. Because of this design, firms with high expenditures one year

end up with a reduced value of the tax credit in future years because not all future expenditures are in excess of the new base. By tying the base of expenditures to those expenditures taken in the past, a one time standard was set for each company. The legislation contains a special formula for computing the base amount of expenditures for firms organizing after 1988.[10]

As an alternative to the standard federal tax credit, firms may elect to take the Alternative Incremental Credit. Under this option, the value of the federal credit is based on a progressive scale of expenditures. For example, a firm can receive a credit equal to 2.65 percent of qualified expenses in excess of 1 percent of the average annual gross receipts for the past 4 years but not to exceed 1.5 percent of receipts. The value of the credit increases to 3.2 percent for qualified expenses between 1.5 and 2 percent of average gross receipts. For expenditures in excess of 2 percent of the average annual gross receipts, firms can receive a credit worth 3.75 percent of expenditures.

In addition to the Research and Experimentation tax credit, the federal tax code offers two other provisions targeted to research activities. IRS §174 allows for expensing of tangible property used in research and development activities, but the value of this deduction must be reduced by the amount of the R&E credit.[11] The Orphan tax credit, IRS §45C, is available to firms engaged in the clinical testing of drugs designed to combat rare diseases and conditions. The orphan drug credit allows a maximum 50 percent credit for certain clinical testing expenses.

[10] In the case of firms not in existence during the 1984-1988 time period, special rules apply to the formulation of their eligible credits. In this case, the fixed-base percentage is 3 percent for each of the taxpayer's first five years after 1993 for which the taxpayer has qualified research expenses. Additional rules apply for expenses incurred in later years.

[11] An election can be made to instead reduce the value of the credit and claim the full value of the Sec. 174 deduction.

4. Structure of Georgia's R&D Tax Credit[12]

Georgia's R&D tax credit (Georgia Code 48-7-40.12) is a 10 percent credit on expenditures in excess of the base amount. In this way it is an incremental credit similar in design to the federal credit. In the case of the state though, the base amount is defined to be the product of the firm's taxable net income in the current year and the average ratio of its qualified research expenses to its taxable income for the past three years. That is, the state base amount of expenditures is not tied to a fixed period of time as it is at the federal level. The calculation of the state credit is illustrated in Example 2.

EXAMPLE 2. – CALCULATION OF THE STATE R&D TAX CREDIT

	2002	2003	2004
Taxable Income(a)	$1,000,000	$1,200,000	$1,400,000
Qualified Expenditures (b)	$50,000	$75,000	$100,000
Expense to Taxable Income ratio (b/a=c)	0.05	0.0625	0.071
Average ratio over the 2002-2004 period (∑c/3=d)	0.061		
Taxable Income for 2005 (e)	$2,300,000		
Qualified expenses for 2005 (f)	$500,000		
Base amount of expenses for 2005	0.061 × $2,300,000 = $140,300		
2005 expenses eligible for the tax credit	$500,000 - $140,300 = $359,700		
Value of 2005 tax credit	0.1 × $359,700 = $35,970		

Firms are eligible for the Georgia credit only if they claim and are allowed the credit on the federal level. In this way, the state is dependant on federal regulations pertaining to the classification of qualified research and development expenditures. It also means that the Georgia officials do not have to spend additional resources to audit R&D returns for state specific qualified research expenditures. On the state level, the credit is specifically targeted to manufacturing, warehousing and distribution, processing, telecommunications, tourism, and research and development industries, and specifically excludes retail businesses. According to data from the

[12] Excerpt from Wheeler (2005).

Georgia Department of Revenue, 27 firms claimed $13.7 million in R&D tax credits in 2001 and 30 firms claimed $17.6 million in credits in 2002.[13]

In Georgia the state credit has a general limitation that the R&D tax credit used in any one year cannot exceed 50 percent of the state income tax liability remaining after all other business credits have been applied. It is common practice in Georgia to limit the ability of a tax credit to reduce a taxpayer's tax liability to zero.[14] The effect of this limitation is to reduce the value of the credit especially for those firms with low tax liabilities or a high level of eligible expenses, which is typical of startup firms and R&D intensive firms. As illustrated in Example 3, a firm with a tax credit of $5,000 and a tax liability of $3,000 can only use $1,500 or 30 percent of its tax credits. In the case of this example, this is equivalent to a tax credit rate of 3 percent as opposed to the statutory rate of 10 percent. The remaining credits may be carried forward for 10 years but future tax credits have less value than current ones since their value is not indexed for inflation. In fact, any credits in excess of 50 percent of the existing tax liability will be significantly less valuable in encouraging additional R&D expenditures because these additional credits cannot be used in the current tax year.

EXAMPLE 3. LIMIT ON USE OF TAX CREDIT AGAINST TAX LIABILITY

R&D Tax Credits Generated in 2005 = $5,000
Georgia Tax Liability in 2005 = $3,000

Value of Tax Credit Without 50% Limitation = $5,000
Value of Tax Credit with 50% Limitation = $1,500 (i.e., 0.5 × $3,000)

[13] This represents the total amount claimed by the corporations only. In 2001, $6.7 million of the $13.7 million was applied to tax liabilities and the remainder was carried forward. In 2002, about $11.8 million of the $17.6 million earned was carried forward. Credits may also be claimed by S-corps and partnerships but data on the value of credits earned by noncorporate entities is not available from the Department of Revenue.

[14] Several other Georgia credits have this provision such as the Income Growth Credit, the Water Conservation credit, and the Manufacturing and Telecommunications credit, though there are exceptions such as the Basic Skills Education credit and the Jobs tax credit which do allow firms to reduce their tax liability to zero.

5. Comparison of Research and Development Tax Credits at the State Level

Most states offer some version of an R&D tax credit but they vary greatly in their design. In most cases the state credit is generally patterned after the Federal R&E tax credit in that it is uses the same definition of qualified expenses and is incremental in nature. While many policy makers tend to focus on the rate of a state credit as an indication of how valuable the credit is, there are many factors that determine the attractiveness and effectiveness of an R&D tax credit. These other factors include the ability to sell credits, the presence of refundable credits, and definitions of qualified expenses that include items not allowed at the federal level. Focusing solely on the credit rate is misleading because many states offer high credit rates but have clauses that limit the ability to use the credit to offset the firm's tax liability or impose other limiting features. The different factors that comprise an R&D credit are discussed below, with examples from various state credits included.

Specifics of the credits from the 12 states surveyed are shown in Table 2 and when available the latest estimates on the cost of the credit to the state are included. The information for each state was gathered from state websites, from phone conversations with state officials, and in a few cases, references made in other reports. A list of the state websites can be found in the Appendix. The information provided is believed to reflect the current practice of each state at the time of this report. The list is not intended to be comprehensive. In addition, attempts were made to verify the information for each state, but since so many of the specific components of the tax incentive programs change from year to year it is difficult to keep an accurate account of all the particulars of the state incentives.

TABLE 2. STATE R&D INCOME TAX CREDITS

State	Amount of R&D Credit Offered if Any	Relationship of State Credit to Federal credit	Special Features or Related Credits
California	15 percent of the excess of current year qualified research expenditures over a base amount; 24 percent of the excess of current basic research expenditures over a base amount for corporations; Also offers a state Alternative Incremental credit patterned after the federal alternative credit; Aggregate value of credit in FY 2005-06 = $24 million against the personal income tax; $459 million against the corporate income tax.	Uses federal definitions of qualified expenses but is a permanent state tax credit.	
Florida	Offers no standard R&D credit against corporate income but does offer a sales tax exemption for the purchase of industrial machinery and equipment.		Qualified Target Industry tax credit for certain firms that create high-wage jobs. Funds for the credit are provided by state and local governments. Capital Investment tax credit against corporate income tax.
Georgia	Offers a 10 percent credit for qualified expenses over a base amount.	Follows the federal guidelines on qualified expenses; provision expires with the federal provision.	
Illinois	6.5 percent of total qualified expenses and basic research expenses over a base amount.	Follows the federal definition of qualified expenses but is not an expiring provision at the state level.	
Massachusetts	10 percent credit for qualified excess expenses and 15 percent for basic research payments.	Use federal definitions of R&D but state credit is a permanent tax credit.	Can be combined with the state investment tax credit of 3 to 5 percent.

Table 2 continues next page…

TABLE 2 (CONTINUED). STATE R&D INCOME TAX CREDITS

State	Amount of R&D Credit Offered if Any	Relationship of State Credit to Federal credit	Special Features or Related Credits
Michigan	Does not provide a tax credit but has initiated the 21st Century Jobs Fund designed to invest in high-tech research activities in universities and stimulate capital investment in high-tech ventures.		
New Jersey	10 percent of total of qualified research expenses and basic research expenses over a base amount.	Follows the definition and administration of the federal credit but does not expire with the federal credit.	Unused NOLs and R&D tax credits can be sold if the firm has 225 or fewer employees and is engaged in a targeted high-tech industry.
New York	9 percent corporate nonincremental tax credit for the purchase of tangible property including buildings, machinery, and land used in R&D activities; Allows a similar credit for noncorporate firms; Aggregate value of tax credit earned in 2003 = $62.3 million.		Also offers the Qualified Emerging Industry credits for certain firms engaged in R&D activities.
North Carolina	5 percent of excess qualified R&D expenditures or 25 percent of the federal alternative R&D credit amount// Effective after 5/1/2005 a nonincremental tax credit of 1-3 percent of qualified research expenses and 15 percent of research expenses for research conducted at a NC university; Aggregate value of tax credit applied against tax liability = $12.5 million for 2005.	Follows the federal statute.	State also offers a credit for investment in machinery and equipment related to production of technology developed from a research university, min. investment is $10 million each year.

Table 2 continues next page…

TABLE 2 (CONTINUED). STATE R&D INCOME TAX CREDITS

State	Amount of R&D Credit Offered if Any	Relationship of State Credit to Federal credit	Special Features or Related Credits
Ohio	7 percent of qualified research expenses over a base amount; Estimated aggregate value of tax credit applied against tax in FY 2006 = $27 million, FY 2007 = $36 million.		State also offers a Technology Investment tax credit (25 percent of investment) for investments in small technology companies.
Pennsylvania	10 percent of firm's excess R&D expenses over the base amount; credit can be applied against the corporate or personal income tax; Value of aggregate tax credit applied against tax is capped at $30 million in 2004.		Firms are able to sell all or part of their unused tax credits to other firms with positive tax liabilities.
Texas	5 percent of qualified excess expenses; amount of credit can be doubled for activities in Strategic Investment areas (specially designated geographic areas).	Patterned after the federal credit; is not currently state law due to state tax reform.	Also offers a 25 percent credit for certain wages and salaries in R&D and 7.5 percent credit for certain capital investments in R&D property used in special state designated geographic regions.
Washington	Prior to June 2004, 1.5 percent nonincremental credit for qualified expenditures.	Does not expire with the federal credit.	

5.1 Credit Rate

In addition to the 12 states listed above, several other states offer unique R&D tax credits. While the Federal R&E credit rate is 20 percent, many states have other credit rates. The state of Maine offers a Super R&D tax credit for those firms that increase their state research expenditures by at least 50 percent over the previous year's expenditures. Hawaii and Arizona offer a 20 percent credit. In Arizona, the credit rate for qualified expenses less than $2.5 million is 20 percent; for qualified expenses greater than $2.5 million, the credit rate is $500,000 plus 11 percent of the excess expenditures over $2.5 million. Rhode Island offers a credit rate of 22.5 percent for excess qualified R&D expenditures if the total amount of expenditures is less than $111,111. For expenditures in excess of $111,111 the credit equals 16.9 percent.

5.2 Qualified Expenses

In general, the definition of qualified expenses used by the states conforms to the federal definition. Connecticut uses a broader definition, which includes not only expenses allowable under the federal credit but also expenses allowable under Sec 174 of the Internal Revenue Code (IRC). The West Virginia credit includes as qualified expenses the expense associated with the purchase of land, structures, and equipment. These do not constitute qualified expenditures under the federal credit. The amount of the investment eligible for the credit increases with the life of the asset from 33.3 percent to 100 percent for assets with a life of at least 8 years. North Carolina allows all expenses paid or incurred to a research university for qualified research to be eligible for the credit. Most states conform to the federal rule which limits eligibility of these payments to 65 percent.[15]

5.3 Calculation of the Base of Expenses

As discussed earlier, in the case of the federal credit the base of expenditures is determined by the average expenditures of a firm during the past 4 years multiplied

[15] In cases in which the research is conducted through a consortium, the percentage increases to 75.

by the ratio of its research expenditures to its gross receipts during the 1984-88 period. Special rules apply for firms that were not in existence during that time period. Originally many states applied this same formula. But the formula has not been updated at the federal level and some states have since altered their calculation.

One modification employed by the states is to use a moving average of qualified expenses over the last 2 to 4 years, depending on the state. Some states which incorporate this moving average base include Pennsylvania, Illinois, Georgia, and Maine. Originally the federal credit was based on a moving average of the prior three years. This design was replaced at the federal level with a fixed base because a moving average base was less generous for firms with an uneven pattern of expenses. If the firm's R&D expenditures increases substantially in any one year, the firm's base level of R&D expenditures rises. Since only expenditures in excess of the base qualify for the credit, the higher base means fewer credits are generated from future R&D expenditures than would be generated under a fixed base computation.

Washington State uses a unique fixed base. In order to qualify for the R&D tax credit, firms must have R&D expenditures in excess of 0.92 percent of their state tax base (the Business and Occupation tax). If the firm's expenditures are greater than 0.92 percent of their tax base then prior to June 2004 all expenses qualify for the state credit. The credit rate is 1.5 percent of the qualified expenditures. For expenses incurred after June 2004, only expenditures in excess of the base are eligible for the credit. In addition, the credit rate is set equal to the firm's tax rate which is in most cases considerably less that 1.5 percent. The rate is scheduled to return to 1.5 percent by 2010.

5.4 Refundable and Nonincremental Bases

At the federal level, the R&D credit is not refundable or transferable but unused credits can be carried forward for 20 years or carried back 1. In several states, the R&D credit is either refundable or can be sold to other firms. While making the credit more expensive to the state government, this feature makes the credit more valuable to firms. In many cases, firms with significant R&D expenses have little or no tax liability to apply against the credit. In most cases the state credit can be

carried forward for several years, but since the carryforwards are not indexed for inflation their real value declines for each year they remain unused. This reduces the effectiveness of the credit in stimulating research activities. In an effort to make the credit more attractive to startup firms, some states allow the unused credits to be sold. This feature creates an incentive for firms with a zero or negative tax liability to engage in R&D activities and file for the credit. The funds from the sale or refund of the credit provide much needed capital for the startup firm. Hawaii offers a refundable credit. Several other states, such as New Jersey, Connecticut, and Pennsylvania, allow unused credits to be sold or transferred to other firms. In Pennsylvania unused credits were sold for 99 percent of their aggregate value in 2005.[16]

In addition to the ability to transfer the credit, some states, such as Hawaii, Connecticut, and West Virginia, have a nonincremental credit. This means that every dollar of the research expenditure qualifies for the credit. Most states' R&D credit is patterned after the federal incremental credit in which only expenditures above a base amount qualify for the credit. West Virginia offers a hybrid credit that allows firms to take the greater of 3 percent of qualified research expenditures or 10 percent of the excess of qualified expenses over a base amount. Connecticut offers three R&D credits, one of which is nonincremental and allows a 6 percent credit for research expenditures of certain qualifying small businesses.

5.5 General Limitations of the Credit

Looking at only one part of a credit is misleading when trying to determine how generous a credit is. For instance, most states offer an R&D credit but it is common to limit the extent to which a firm can use the credit to offset its tax liability. In many states including Georgia, firms can only use the credit to offset 50 percent of their tax liability. The remaining credits can be carried forward for various years, usually 3 to 5 years, though Pennsylvania and North Carolina allow a 15 year carryforward. California allows an indefinite carryforward period. West Virginia

[16] Report to the Pennsylvania General Assembly on the Research and Development (R&D) Tax Credit, 2005. The credit can only be used to offset a maximum of 75 percent of a firm's tax liability.

allows a 10 percent credit but it must be taken over ten years at a rate of 10 percent per year. Kansas allows only 25 percent of the credit to be taken in a year with the remaining credits carried forward. Many states also specify that expenditures eligible for the R&D credit may not be eligible for other credits such as credits for job creation or manufacturing activities.[17]

Another limitation found among the states is the use of an absolute cap. Some states impose a statewide limit on the aggregate annual R&D credits awarded to firms. These caps are administered on a pro-rated basis or on a first-come first-served basis. Pennsylvania imposes a $30 million annual cap and Delaware a $15 million annual cap. Missouri imposes a $10 million annual cap.

Lastly, several of the states have sunset provisions on their R&D tax credit, for example Hawaii and Pennsylvania. While in some cases the states have decoupled their credit provision so that it is not tied to the existence of the federal provision, they have imposed their own sunset provision instead.

5.6 Application of Credit to Noncorporate Entities

In most cases the credit can be applied against personal income tax liabilities as well as corporate income liabilities. Offering tax credits to firms regardless of their organizational form increases the overall effectiveness of the tax credit, as it is unlikely that R&D activities undertaken by noncorporate firms are any less valuable than R&D activities undertaken by corporate firms.

Examples of states that allow R&D tax credits against their personal income tax include California, New York, Georgia, and Pennsylvania. Based on the experience of Pennsylvania and New York, the value of credits claimed against the personal income tax for R&D expenditures are much smaller than those claimed against the corporate income tax. This is not unexpected as large corporate firms are more likely to have the resources and be able to absorb the risk associated with R&D activities. In 2004, Pennsylvania put aside $6 million to award as R&D tax credits to small firms.[18] Only $1.4 million was claimed by 94 firms. In only 1 year between

[17] On the other hand, some states encourage R&D firms to locate in depressed areas and receive both an R&D credit and a credit for job creation.
[18] Small firms are those firms with assets of less than $5 million.

1997 and 2003 did small firms in Pennsylvania claim all the credit set aside for them.[19] In 2004, about 5 percent of the $30 million awarded in tax credits to all firms in Pennsylvania awarded to small firms.

5.7 Apportionment of the State Credit

A related issue to the R&D tax credit at the state level is the conditions under which a parent company can use the credits generated by a subsidiary. In a recent case, *General Motors v. Franchise Tax Board*, the California Supreme court prohibited the parent company from using the state R&D tax credits generated by the subsidiary. Not all states conform to this rule in which the credits generated by a firm subsidiary must stay specifically with that subsidiary. Allowing parent companies to claim apportioned state R&D tax credits generated by their subsidiaries increases the use and attractiveness of the tax credit. For example, Idaho explicitly states a member of a unitary business group may transfer unused portions of its state credit to other members of the same unitary group.

5.8 Decoupling from the Federal Credit

A major weakness of the federal credit is its temporary existence. This credit first came into existence in 1981, and at that time was set to expire in 1985. It has been extended 11 times over the last 25 years. In all but one case, the provision was extended retroactively so that the credit was always available. Given the long-run nature of R&D operations, it is possible that the on-again off-again pattern of the federal R&D credit has reduced its effectiveness in stimulating R&D activity.

In response, several states have decoupled their state R&D credit from the federal version. There are various degrees of decoupling. In most cases, the state credit is still patterned after the federal credit in that it is usually incremental and nonrefundable. The difference is that the states have made their credit a permanent provision in their code. In most cases, the provision relies on the federal definition of qualified expenses when specifying the state credit. For example, California, Hawaii, and Illinois are among several states that have decoupled their state credit from the

[19] While not true in all cases, small firms are more likely to be noncorporate firms.

federal so that their credit is not dependent on the status of the federal credit. These states still base their definition of qualified expenses on the federal definition as specified in IRC Sec. 174. By maintaining the same definition of qualified expenses, the states are able to rely on the federal government to audit returns and establish regulations on new issues. These administrative tasks are very costly to the state government and significant resources can be saved by avoiding them to the extent possible. Conversations with state revenue officials and auditors confirm that state R&D credit audits are extremely complex. The more states stray from the federal guidelines, the more the states must become responsible for the administration of their own credit. In addition, significant differences in qualified expenses between the states and the federal government, while providing a means by which states can compete against one another, increase the accounting cost associated with the credit and may reduce its effectiveness in stimulating R&D activity.

6. Depreciation Credits and Deductions for Capital Equipment

Both Rhode Island and West Virginia offer a 10 percent tax credit for the construction or acquisition of property used in research and development activities. In the case of Rhode Island, the property must have a life in excess of 3 years. The credit can be carried forward for 3 years. As an alternative, the state offers an elective deduction of a 1-year write-off of expenses associated with the construction or acquisition of property used in research and development activities.

7. Sales and Property Tax Exemptions

Our informal survey found that the use of sales tax exemptions is fairly common among the states. The advantage of a sales tax exemption is that it provides a way to reduce the cost of depreciable property used in R&D activities because the expenses related to the purchase of depreciable property are not usually eligible for the R&D tax credit. Furthermore, the value of sales tax exemptions does not diminish for those firms with little or no income tax liability.

Of the 12 states in our focus group, Massachusetts, Washington, Ohio, and Florida offer some kind of sales tax exemption for purchases of tangible property used in research activities conducted in the state. Washington State offers the Machinery and Equipment exemption for purchases of equipment used in research and development activities. The cost of the equipment must exceed $1,000 and be used at least 50 percent of the time in research activities. Washington also offers a sales tax deferral program aimed specifically at high-tech startups. Under this program sales and use taxes are deferred on purchases of equipment and construction costs if used in certain high-tech areas. The taxes are deferred and a portion is forgiven for each year that the equipment and facilities are used in the high-tech activity. Deferrals are completely forgiven after 8 years. In addition to the 12 states surveyed, other states offering a sales tax exemption for research and development equipment include Utah, Iowa, Arizona, Idaho, Rhode Island, and Indiana.

Less common is the use of property tax incentives. More commonly associated with manufacturing processes, only Michigan and Florida were found to offer a property tax incentive targeted to research activities. In Michigan, the localities are able to offer a 50 percent abatement of local property taxes for up 12 years for certain high-tech firms. The state can also offer abatements. Both are offered on a case by case basis and the value of the abatement is negotiable.

8. Other Incentives

Also found in our survey was an exclusion for royalty income associated with patent ownership offered by Hawaii against the state personal income tax. Hawaii also allows high-tech businesses to sell up of $500,000 of certain unused net operating losses (NOLs). Furthermore, Hawaii offers a 100 percent investment tax credit for firms that have at least 50 percent of their operations devoted to qualified research and that conduct at least 75 percent of their research in Hawaii. Under this program, firms are allowed a 100 percent credit for their investments. Credits are paid out by the state over a 5-year period.[20] The maximum annual investment per business is $2 million. The credit is available to individuals, corporations, insurance, and financial companies.

[20] The credit payment in the first year is 35 percent, 25 percent in the second year, 20 percent in the third year, and 10 percent in the fourth and fifth year.

9. Financing Incentives

A key ingredient to a successful startup firm is the availability of financial capital. States can encourage the availability of capital in several ways. A previously mentioned method is through the use of tax incentives offered to investors of high-tech startup firms. These investors may be individuals, venture capitalist firms, angel investors, and in some cases insurance firms or pension funds with excess cash to invest.

To increase the amount of capital available to small businesses, Arizona passed legislation creating the Small Business Capital Investment Tax Incentive program. The Arizona legislation provides a 30 percent tax credit equal to the amount of the investment. The value of the credit increases to 35 percent if the investment is in a bioscience firm. The credits are not refundable but can be carried forward for three years. A minimum investment of $25,000 is required.[21] Ohio offers a 25 percent credit for high-tech investors. The maximum credit allowed per investor is $62,500 per investment. To receive the credit, companies must have their principal location in Ohio and have annual revenue of less than $2.5 million or less than $2.5 million in net assets. More generous credits are available for investments in distressed areas. This tax credit program is backed by a pool of $20 million in state funds and will expire when all funds are depleted. Wisconsin is contemplating a 25 percent credit specifically for angel investors. Kansas offers a 50 percent credit for such investors.

[21] The state-wide value of the credits is capped at $20 million and is administered on a first-come first-served basis.

10. Grants

Grants are another tool states can use to stimulate R&D activity. A refundable or transferable tax credit is equivalent to providing a matching grant. The match rate is determined by the tax credit rate. For instance, a completely refundable or transferable 10 percent tax credit is equivalent to a grant for research activities with a required match of 90 percent. The more limitations imposed on the use of the tax credits, such as limiting the use the credits to a maximum of 50 percent of its tax liability, the greater the distinction becomes between grants and tax credits. Another difference between the grants and credits lies with the use of the funds. Since most states tie their credit to the federal code, only expenses that qualify at the federal level qualify at the state level. On the other hand, grants are administered by the states and may be used in any fashion the state deems appropriate.

Many states offer grant programs designed to foster innovation and high-tech startups in their states. Four are mentioned here but many others are in operation around the country. Texas has established the Emerging Technology Fund which consists of three grant making programs. The Research Superiority Acquisition of Talent grants are to be used by public universities to attract new or enhance existing research talent for the state. The Research Grant program provides matching grants to companies that partner with state universities on emerging technology projects. The state grants are designed to be used in conjunction with non-state funds obtained by the partnership. For FY 2006-07 Texas allocated $25 million for the Emerging Technology Research matching grant program and $25 million for the Acquisition of Research Superiority grant program. In addition, the state will make available $50 million for the Regional Centers of Innovation and Commercialization project designed to aid in the commercialization of technology created within the state.

Pennsylvania has a similar program called Keystone Innovation Starter Kits. This is a $3 million annual grant program offered to certain research and medical facilities in the state. The funds are to be used to attract research faculty and outfit laboratories. A 50 percent match by the research institution is required.

The Florida High Tech Corridor (FHTC) Council has two basic grant programs designed to stimulate industrial R&D activities conducted as joint projects

between university faculty and industry partners. The first program consists of awarding grants between $20,000 and $100,000 in value. The grant takes a slightly different form depending on the university through which it is administered. In one version, small business industry partners, those with fewer than 100 employees, are expected to match $1 for every grant dollar awarded. Large business partners must match $2 for each grant dollar. The second grant program uses state grant dollars to match federal grants from the Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR) Programs. SBIR or STTR phase 1 recipients are eligible for additional grant dollars from the FHTC of up to $150,000 when partnering with university faculty to undertake the research activity. Similar grant programs are offered in other states.

Ohio offers a low-interest loan program designed to promote R&D spending. Under the loan program, businesses can receive 10 to 15 year loans at rates which are typically half of the current prime rate. The loans can be used to fund up to 50 percent of the purchase of land, buildings, or machinery and equipment used in R&D activities within the state, expenditures not usually eligible for the state or federal credit. Loans range in amount from $1 million to $25 million. In addition, businesses can receive a tax credit for the principle and interest payment of the loan. The maximum annual nonrefundable credit available to a business is $150,000 and unused credits can be carried forward.

11. Simulation of the R&D Credit under Four Alternative Credit Structures

As explained earlier, the value of the state tax credit depends on several factors such as the credit rate, the state tax rate on business income, the limitations on the use of the credit, and any minimum or maximum values imposed on the intermediate calculation of the credit. These factors interact in several ways to determine the final value of the tax credit for a firm. In this section, we design a simulation to determine the value of the state R&D tax credit under several alternative forms. Four credit formulas are chosen for the simulation. Each of these formulas is used by at least one state and represents an increasing level of generosity of the credit structure. The forms chosen for comparison are the Georgia credit, an incremental form mimicking the federal tax credit, the nonincremental and nonrefundable form used by North Carolina, the incremental but refundable model employed by Pennsylvania, and the nonincremental, refundable model found in Hawaii.

Two experiments are run on three hypothetical firms: A – low income/small size firm; B – middle income/medium size firm; C – high income/large firm. The first experiment addresses the following question: Which form of the tax credit provides the greatest benefit per dollar of R&D expenditures? In this experiment, the state tax rates and the R&D credit rates are held constant across all models so that the effect of the credit structure is isolated. The second experiment asks, Which state offers the most attractive R&D tax credit package? In this simulation, the form of the credit, the state income tax rate, and the credit rate are all allowed to vary according to what is found in each state. This experiment provides a combined illustration of all of the components of the credit that affect its value.

11.1 Results of Simulation 1

In the first simulation, each firm is specified to spend $1,000,000 on R&D and face a state tax rate of 6 percent and an R&D credit rate of 10 percent. The results of the simulation are shown in Table 3. Taxable income for Firm A is set at $100 and gross receipts at $10,000. Taxable income for Firm B is set at $100,000

TABLE 3. RESULTS FROM SIMULATION 1

Credit Structure	Incremental/ Nonrefundable	Nonincremental/ Nonrefundable	Incremental/ Refundable	Nonincremental/ Refundable
----------A. Value of Credit before Limitations----------				
	Georgia	**North Carolina**	**Pennsylvania (atl. Form)[1]**	**Hawaii**
Firm A	$99,997	$100,000	$0 ($99,997)	$100,000
Firm B	$97,000	$100,000	$0 ($97,000)	$100,000
Firm C	$70,000	$100,000	$0 ($70,000)	$100,000
----------B. Value of Credit after Limitations----------				
	Georgia	**North Carolina**	**Pennsylvania (alt. form)[1]**	**Hawaii**
Firm A	$3	$3	$0 ($99,997)	$100,000
Firm B	$3,000	$3,000	$0 ($97,000)	$100,000
Firm C	$30,000	$30,000	$0 ($70,000)	$100,000
----------C. Value of Credit after Limitation as a % of Qualified R&D expenditures----------				
	Georgia	**North Carolina**	**Pennsylvania (alt. form)[1]**	**Hawaii**
Firm A	0.0003%	0.0003%	0.0% (10.0%)	10.0%
Firm B	0.3%	0.3%	0.0% (9.7%)	10.0%
Firm C	3.0%	3.0%	0.0% (7.0%)	10.0%

[1]Numbers in parentheses refer to a variation of the Pennsylvania credit.

and gross receipts at $10,000,000. Taxable income for Firm C is set at $1,000,000 and gross receipts at $100,000,000. The state tax rate in this simulation is 6 percent and the credit rate is 10 percent for all firms and all credit forms.

Georgia, North Carolina and Hawaii offer a large initial credit under these circumstances as shown in Panel A of Table 3. Because the North Carolina and Hawaii structures are nonincremental, 100 percent of R&D expenditures are eligible for the credit. The nonincremental feature also ensures that each firm receives the same initial credit regardless of tax liability. The Georgia credit is incremental so that only expenses above the base are eligible for the credit. Furthermore, the base increases with the firm's taxable income so the initial value of the credit declines as we move from Firm A to Firm C.

Panel B of Table 3 shows the credit value after limitations are imposed. Georgia only allows the credit to be used to offset a maximum of 50 percent of the taxpayer's liability. This is also the case in North Carolina. Unused credits earned by firms in North Carolina and Georgia can be carried forward. Pennsylvania and

Hawaii impose no limitation on the use of the credits and allow unused credits to be sold or refunded to the taxpayer.

Tying the value of the credit to some portion of the firm's tax liability has a significant effect on the value of the credit. This constraint has a greater impact on smaller firms or firms with lower tax liabilities than those firms with larger tax liabilities. As shown in Panel C of Table 3, because of this limitation on the use of the credit, the value of the credit after the limitation is only 0.0003 percent of qualified R&D expenditures for the small firm in our simulation in Georgia and North Carolina. This figure represents the reduction in the firm's tax liability from a dollar of R&D expenditure. Thus, in the case of Firm A in Georgia and North Carolina each $1 of qualified expenditure reduces the tax liability by $0.000003. In the case of Firm C though, each $1 of qualified expenditure reduces the tax liability by $0.03. This is because Firm C in our example has a larger tax liability against which the credit can be applied. As can also be seen from Panel C of Table 3, the initial benefit from the nonincremental form of the tax credit used by North Carolina is eliminated due to the strict limitation on the use of the credit. Thus, firms have more credits to carryforward in North Carolina than in Georgia but because these lose value over time, the benefit over the incremental system is greatly reduced.

Neither Pennsylvania nor Hawaii limits the use of the credit. Any credits in excess of the firm's tax liability can be refunded or transferred to other companies and hence are sources of financial capital to the R&D firm. Because the Hawaii credit is nonincremental, all research expenditures are applied to the credit. Because the credit is refundable, all credit dollars are available to the firm in the current year. Thus, the nonincremental/refundable credit structure represents the most generous credit structure considered in this simulation. Because of these characteristics the full 10 percent of research expenses are used to offset the tax liability of each firm.

A special feature of the Georgia structure comes into play when determining the value of the Georgia credit. The base amount of R&D expenditures is by law equal to the minimum of the average ratio of R&D expenditures to taxable income over the past four years or 30 percent of taxable income in the current year. In our simulation, this provision has the effect of lowering the base amount of qualifying

R&D expenses for firms in Georgia and allowing more current R&D expenditures to qualify for the credit. In this simulation taxable income and R&D expenditures are set to grow at a constant 5 percent per year over 2001-2005 for all firms in each state. Since the pattern of R&D expenditures is constant over this time period, in the absence of this minimum base rule the Georgia structure yields no credit because the level of 2005 expenditures do not exceed the base amount. In fact, this is the reason no credits are generated in the case of the Pennsylvania credit.

The computation of the Pennsylvania credit in this simulation is such that a constant rate of annual growth in the ratio of R&D expenditures to taxable income over the 2001-2004 period does not produce any R&D spending in excess of the base in 2005. This is a common problem with the incremental design and provides an incentive for firms to manipulate the timing of their R&D expenditures so as to maximize the credit value over the life of a project.[22] As an alternative, we simulate an alternative Pennsylvania structure that contains the same minimum 30 percent base provision found with the Georgia credit. The results of this alternative Pennsylvania structure are shown in Table 3 in parentheses. The initial value of the alternative credit, shown in Panel A of Table 3, is equal to that from the Georgia form. The size of the credit is negatively associated with firm profitability so that firms with less taxable income have a lower base amount and received a larger credit per dollar of R&D expenditure. Unlike the Georgia form, the Pennsylvania credit is refundable. This results in a larger benefit for firms as indicated in Panel B of Table 3. The final credit value in the case of small firms is the full 10 percent of the R&D expenditures in excess of the base. This percentage falls to 7 percent for Firm C shown in Panel C of Table 3 since the credit is incremental in nature and the base of expenditures rise with a firm's taxable income.

11.2 Results of Simulation 2

In this experiment we ask the question, What is the overall value of the credit generated from $1,000,000 of R&D expenditure in each of these four states? The values for taxable income and gross receipts for each of the firms are the same as in

[22] See Billings and Schoeder (1991).

Simulation 1. The tax rate and credit rate are allowed to vary according to the laws in each state. For instance, the credit rate for Georgia is 10 percent and the tax rate is 6 percent. The credit rate for North Carolina is 1 percent and its corporate tax rate is 6.9 percent. In Pennsylvania the credit rate is 10 percent and the credit rate in Hawaii is 20 percent. The results are presented in Table 4.

TABLE 4. RESULTS FROM EXPERIMENT 2

Credit Structure	Incremental/ Nonrefundable	Nonincremental/ Nonrefundable	Incremental/ Refundable	Nonincremental/ Refundable
----------A. Value of Credit before Limitations----------				
	Georgia	**North Carolina**	**Pennsylvania (alt. form)[1]**	**Hawaii**
Firm A	$99,997	$10,000	$0 ($99,997)	$200,000
Firm B	$97,000	$10,000	$0 ($97,000)	$200,000
Firm C	$70,000	$10,000	$0 ($70,000)	$200,000
----------B. Value of Credit after Limitations----------				
	Georgia	**North Carolina**	**Pennsylvania (alt. form) [1]**	**Hawaii**
Firm A	$3	$3	$0 ($99,997)	$200,000
Firm B	$3,000	$3,450	$0 ($97,000)	$200,000
Firm C	$30,000	$10,000	$0 ($70,000)	$200,000
----------C. Value of Credit after Limitation as a % of Qualified R&D Expenditures----------				
	Georgia	**North Carolina**	**Pennsylvania (alt. form) [1]**	**Hawaii**
Firm A	0.0003%	0.0003%	0.0% (10.0%)	20.0%
Firm B	0.3%	0.3450%	0.0% (9.7%)	20.0%
Firm C	3.0%	1.0%	0.0% (7.0%)	20.0%

[1]Numbers in parentheses refer to a variation of the Pennsylvania credit.

Based on these results, the Hawaii credit again appears to be the most generous of the four structures presented here due to its high credit rate of 20 percent, its nonincremental base structure, and refundable nature. These features of the Hawaii credit work together to establish a large credit for the firm and also allow the firm to take immediate and full advantage of the credit. The potentially generous nonincremental structure of the North Carolina credit is offset by its low credit rate of 1 percent but even more so by limiting the value of the credit by the firm's tax liability.

Just as in the previous experiment no credits are generated under a constant growth in R&D expenditures in the Pennsylvania example. If we again impose the

30 percent maximum base rule, the Pennsylvania credit generates the results shown in the parentheses of Table 4. This alternative credit structure represents a combination of the current Georgia credit and Pennsylvania credit. Comparing the impact of the Georgia credit and alternative Pennsylvania credit highlights the marginal effect of the ability to sell the unused credits on the value of the existing Georgia credit.

Another desirable characteristic of the Pennsylvania credit is that it provides a greater benefit to smaller, less profitable firms relative to more profitable firms. There is no reason to think that a dollar of R&D performed by a small firm is any less valuable to society than a dollar performed by large firms. Thus, to the extent that the purpose of the credit is to stimulate R&D, all firms and all R&D dollars should be treated equally. An argument can be made though, for giving preference to small firms over large firms since they may need more of an incentive to absorb the risk associated with R&D activities.

11.3 Choice of Credit Structure on Level of R&D Activity

As a final exercise, we ask the question, How much more R&D activity would be performed by our hypothetical firms under these different credit structures? To answer this question we convert the credit structures compared above into changes in tax prices faced by each firm. The incremental and refundable characteristics of the credits translate into changes in tax liabilities to each firm. These differences in tax liabilities affect the net cost of a dollar of R&D expenditure. Therefore, we compute the net cost of a dollar of R&D under each credit structure and simulate the effect of a change in the credit structure on the level of R&D expenditures produced by our hypothetical firms. We use the existing incremental and nonrefundable Georgia R&D credit structure as our base model to which each alternative is compared. To compute the impact of a change in structure, we assume an elasticity of -1. That is, we assume, based on the existing literature, that a reduction of 1 percent in the price of R&D activity results in an increase of 1 percent in R&D spending by each firm. We also apply a common credit rate of 10 percent and a common tax rate of 6 percent to each credit structure. The results of this simulation are presented in Table 5.

TABLE 5. INCREASE IN R&D ACTIVITY OVER EXISTING LEVEL DUE TO CHANGE IN CREDIT STRUCTURE

	Nonincremental/ Nonrefundable	Incremental/ Refundable	Nonincremental/ Refundable
Firm A	$0.00	$99,994.30	$99,997.30
Firm B	$0.00	$94,282.85	$97,291.88
Firm C	$0.00	$41,237.11	$72,164.95

As can be seen there is no additional R&D activity stimulated by the nonincremental/nonrefundable credit form. Although the nonincremental credit structure allows more credit dollars to be generated, the limitation on use of the credit to no more than 50 percent of the firm's tax liability causes the final value of this credit to equal the value associated with the existing Georgia credit.[23] If this credit were limited to 100 percent of the firm's tax liability, the final value of the credit would exceed the existing Georgia credit and some additional R&D activity could be anticipated. The incremental/refundable credit produces an additional $99,994 in R&D activity for Firm A or an additional 10 percent in R&D activity.[24] This is due to the refundable nature of the credit and the low base that exists for lower-income firms. Moving from the existing Georgia credit to the incremental/refundable credit produces an additional $41,237 in R&D activity for Firm C. This is due to the refundable nature of the credit but its impact is reduced by the effect of the incremental base, which allows less R&D expenditures to be eligible for the credit as taxable income increases. The greatest gains in additional R&D activity appear to be associated with the move to the nonincremental/refundable credit structure. In this case, $99,997 additional dollars in R&D activity is stimulated by Firm A compared to what would have been performed under the existing incremental/nonrefundable credit. This gain reflects the impact of the nonincremental base and the refundable nature of the credit. The increase in R&D expenditures for Firm C is $72,165. Under the comparison incremental/nonrefundable credit the tax benefit increases as taxable

[23] The nonincremental credit will produce more carryforwards than the incremental credit but these are not indexed for inflation and lose value over time.

[24] The incremental/nonrefundable credit structure used here is the alternative structure introduced in Simulation #1 and #2.

income increases. Therefore, the marginal benefit of the nonincremental/refundable credit is lower for a high-income firm compared to a low-income firm.

12. Summary

This report provides a sampling of the R&D tax incentives offered by states around the country. Most states provide some type of incentive for technology-based economic development. The most popular incentive is a research and development tax credit. In general, the tax credit found in most states resembles the federal credit but the specifics of the credit vary significantly from state to state. Some states have added provisions to allow for refundable or transferable credits, adjusted the credit rates, and in some cases decoupled from the federal credit so that the state credit is a permanent provision at the state level. Comparing states based solely on the tax credit rate can be misleading as states usually impose limitations on the use of the credits such as statewide caps or limits on the amount of tax liability that can be applied to the credit. Based on simulations of hypothetical firms presented in the paper, it appears that the most attractive credit structure is a nonincremental/ refundable model currently used by Hawaii. This structure uses a nonincremental base so that all R&D expenditures are applied to the credit and is refundable so that all credit dollars are of immediate value to the firm.

In addition to the R&D tax credit, several states offer sales tax exemptions and more states are beginning to offer tax incentives designed to attract investment capital to the state. Many states also have grant programs earmarked for faculty and research talent acquisition and small business high-tech startups.

While this report documents many examples of the use of R&D tax incentives, it does not explore the effectiveness of these incentives. Indeed, very little research has been done on the effectiveness of the state credit in stimulating R&D activity within the state. Research on the effectiveness of the federal R&D credit finds that in general, decreasing the cost of R&D by $1 leads in the long run to an increase in R&D expenditures of about $1. Whether the effect is the same for state credits is not known. Nor has the effectiveness of the various versions of the state credit been studied. Even less research has been done on the effectiveness of sales or property tax relief for high-tech firms. Finally, the effect on state employment and investment from the use of targeted tax incentives remains largely unexplored. More research is needed to determine if increasing the value of tax incentives, whether

against income or sales or property, designed to stimulate a small set of industries is justified when compared to the employment and investment effects of lowering the corporate tax rate for all industries in a state.

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Appendix

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California: www.ftb.ca.gov

Connecticut: www.ct.gov and www.cga.ct.gov

Florida: www.floridahightech.com

Hawaii: www.mauialohafund.com, www.state.hi.us, and www.capitol.hawaii.gov

Idaho: www.idahoworks.com and www.tax.idaho.gov

Illinois: www.revenue.state.il.us

Maine: www.maine.gov

Massachusetts: www.mass.gov

Michigan: www.michigan.org and www.michigan.gov

North Carolina: www.ncse.org and www.dor.state.nc.us

New Jersey: www.technium.org and www.state.nj.us.gov

New York: www.empire.state.ny.us and www.tax.state.ny.us

Ohio: www.odod.state.oh.us

Pennsylvania: www.newpa.com

Rhode Island: www.riedc.com and www.tax.state.ri.us

Texas: www.window.state.tax.us and www.governor.state.tx.us

Washington: http://dor.wa.gov and http://cted.wa.gov

West Virginia: www.state.wv.us/taxrev

Wisconsin: www.dor.state.wi.us

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