

FISCAL RESEARCH CENTER

THE RESEARCH AND DEVELOPMENT TAX CREDIT FOR GEORGIA

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Executive Summary

The state of Georgia and approximately 29 other states offer a Research and Development (R&D) tax credit, allowing firms engaged in R&D activities in the state to reduce their state tax liability. The Georgia credit is patterned after the federal version of the research and development credit, referred to as the Research and Experimentation (R&E) credit. The credit is designed to stimulate further investment in R&D by the private sector that will in turn create high wage, high-tech jobs in the state.

Since the introduction of the federal level R&E credit, many studies have been conducted on the effectiveness of the federal credit in increasing research and development efforts. Early studies of the federal R&E tax credit found a very small effect on the level of research and development undertaken as a result of the credit. This may be because these studies were capturing only the short-run effect of the credit since many were conducted shortly after the credit's introduction in 1981. As time passed, firms were in a better position to use the credit and it was expected that utilization of the credit would increase. Studies conducted later seem to suggest just such a larger effect. In general, these later studies found that a dollar of tax credit stimulated at least one dollar of additional spending on R&D. This implies that reducing the cost of R&D through the use of a tax credit by 10 percent will increase national R&D expenditures 10 percent in the long run.

Only a few studies have been done on the effectiveness of the credit granted at the state level. The major justification of a state level R&D tax credit is because the spillovers from R&D are believed to have local benefits.^a Therefore, the state would be in a position to build an agglomeration economy around a high tech core. It is assumed that these jobs would be high-wage jobs and would stimulate further growth in the state economy. The only nationwide study attempting to estimate the effect of state R&D tax credits is by Wilson (2005). The author assumes that R&D

^a See Jaffe, Trajtenberg, and Henderson (1993) and Anselin, Varga, and Acs (1997) for evidence supporting localized spillovers.

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funds are completely mobile between states so that it is the incremental difference between the cost of conducting R&D activities in one state versus another that is the deciding factor on where to locate and not the overall cost in any one state. The research shows the responsiveness of state R&D spending to be almost zero. This implies that R&D activities are very mobile and suggests that increasing the state R&D tax credit may attract R&D activities from other states but not create new R&D expenditures nationally. One potential weakness of this study is that the author does not control for public spending in the model. In other studies of the effectiveness of general tax incentives, public spending was found to have a strong influence on the location decisions of a firm. Omission of this variable from this study may influence these findings as well.

The effectiveness of the tax credit in stimulating additional R&D however, is only part of the story. The end goal of granting an R&D tax credit is to increase economic activity and raise the standard of living. Therefore, a second question must be posed. To what extent do increases in R&D activity result in increases in employment and investment for a state? To date, there exist no economic study linking increased expenditures on research and development at the state level to higher employment rates and standards of living. There have been many studies though, that consider the effect of taxes on economic growth. In general, these studies have shown only a very weak and sporadic relationship between tax incentives and increased economic activity. Most of these studies find that instead of tax cuts, firms value public expenditures on non-transfer items such as education, roads, and health.^b

Georgia policy makers have as of late considered modifications to the state R&D tax credit. The purpose of these would be to make the state more attractive to firms specializing in R&D activities. Several modifications to the credit are discussed below. Each is considered on the basis of its administrative feasibility and its potential success in achieving the goal of increased employment and investment to the state of Georgia.

^b See Bartik (1991) for a review of the literature concerning the effect of economic development tax incentives.

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- *Option 1.* Make the state credit permanent. As it is currently written, the state R&D tax credit would expire on 12/31/2005.
- *Option 2.* Expand the tax credit to include applied research activities in addition to basic research activities. This would be administratively difficult for the state. At this time, the state relies on the federal interpretation of the federal definition of qualified research and development activities. Qualified activities on the federal level are limited to basic research activities. Allowing a broader definition of qualified research activities to be eligible for the state credit would require state resources focused on interpretation and auditing of state applications for the credit. This could be costly as interpretation of this provision on the federal level is quite complex.^c
- *Option 3.* Allow a whole or partially refundable tax credit, or allow firms to sell unused credits. Currently, unused credits can be carried forward 10 years. Because many firms have negative tax liabilities, they cannot immediately use the credits earned by their R&D activities.^d In these cases, the credit has very little influence on the firm's level of R&D. To expand its impact, the credit could be made refundable. Many European countries do this, as does Hawaii and Iowa.^e Another approach would be to allow the unused credits to be sold. Both New Jersey and Louisiana allow firms to sell their excess credits under certain conditions.^f
- *Option 4.* Adjust the calculation of the base of R&D. The current calculation for the base amount creates a disincentive for undertaking a large amount of R&D in any one year.^g Since the base is dependant on past R&D expenditures, increasing R&D expenditures substantially in one year or even increasing R&D expenditures steadily over time creates a higher and higher base for the firm. Only expenditures in excess of the base are eligible for the credit. By increasing the base one year, the firm will cause some qualified R&D expenditures to be ineligible for the credit in future years since they no longer exceed the base of qualified expenditures.
- *Option 5.* Exempt purchases of tangible property used in the production of research and development from state and local sales tax.

^c Response to this option comes from informal discussions with state tax officials at the Georgia Department of Revenue.

^d According to data on Georgia corporate returns only about 40 percent of returns have a positive tax liability.

^e Iowa will double the value of the tax refund under certain conditions.

^f New legislation passed in 2005 by the Georgia Assembly provides a tax credit to certain Georgia firms in the film industry. The legislation allows any unused credits generated by the tax provision to be sold.

^g See Eisner, et. al. (1984) and Altshuler (1988) for a thorough discussion of how the base computation affects the value of the federal credit.

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Without any guidance from academic studies, it is difficult to determine the size of the effect on R&D expenditures from any of the changes discussed above. In theory, adoption of any provision that expands the scope of the R&D tax credit will result in an increase in R&D activity in the state. But, the size of the increase in activity is not expected to be large. The academic literature has found, in general, the impact of economic development incentives to be weak and fairly small.

As a first step it may be beneficial to take a state inventory of existing high-tech and R&D firms, other government sponsored R&D programs, and university sponsored research programs in order to understand the players and resources already active in the state. Discussions with these organizations may help identify the most useful type of support for this industry and a particular niche for the state of Georgia. If modifications to the tax credit are found to be warranted, the more prudent approach would be to consider the exemption of purchases of tangible property, modifications to the base calculation, and the possibility of refundable credits. Attempting to decouple the state definition of qualified expenses from the federal definition may encourage more R&D activity in the state but at a large administrative cost to the state in terms of audits and regulations.

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I. Introduction

The state of Georgia and approximately 29 other states offer a Research and Development (R&D) tax credit, allowing firms engaged in R&D in the state to reduce their state tax liability.¹ The Georgia credit is patterned after the federal version of the research and development credit, which is referred to as the Research and Experimentation (R&E) credit. The credit is designed to stimulate further investment in R&D by the private sector that will in turn create high wage, high-tech jobs in the state.

The purpose of this report is to provide a discussion of the issues associated with the R&D tax credit at both the state and national level. These include a brief history of the credit, examples of the computation of the credit, the revenue loss associated with the credit at the state and federal level, a review of the studies of its effectiveness, and several suggestions of modifications of the state level credit.

¹ An alternative dataset provided by the Georgia Department of Revenue lists 40 states that already offer or will offer a tax incentive for R&D in the near future.

II. History of the Tax Credit

The federal credit for increasing research activities (IRC §41) was first introduced in 1981 as a temporary provision. Since that time it has been extended 11 times, lapsing only once in 1994. More recently, the provision was scheduled to expire in 2004 but was granted an 18 month extension and is now scheduled to expire December 31, 2005. Several bills have been introduced in both the House and Senate proposing to extend the provision again. In addition to being repeatedly extended, the federal provision has also been amended. For instance, the original provision provided a 25 percent credit for qualified expenses. This was lowered to 20 percent when the corporate rate was lowered to 34 percent in 1986. The definition of qualifying research was also narrowed to focus on “technological” research. Later, the computation of the base was altered with special rules for new companies and an alternative incremental credit computation was added.

Firms qualifying for the federal tax credit also qualify for the Georgia state tax credit (Georgia Code § 48-7-40.12). The Georgia credit provides a 10 percent credit for qualified expenses exceeding a base amount of expenditures. The definition of qualified expenses is tied to the federal credit in that the same definition is used at both levels of government. Because of this, the state provision as it is currently written is also temporary in nature. If the federal R&E credit is not renewed, the state provision would not remain in effect without some action taken by the state legislature.²

² Brief discussions with legislative counsel suggests that having a state R&D credit independent of a federal credit would be extremely difficult due to the lack of a clear cut definition of R&D activities. Currently, the state relies on federal interpretation of the law to determine which expenses constitute qualified expenses for the purpose of this provision.

III. Purpose of the Credit

The purpose of the credit is to provide an incentive for investment in basic research that acts as a stimulus for future economic growth. Towards this end, the intended use of the credit is to offset the expenses of basic research and not research focused on the commercialization of a specific product. According to the National Science Foundation (2005, p.7), basic research has as its objective “to gain more comprehensive knowledge or understanding of the subject under study without specific applications in mind. In industry, basic research is defined as research that advances scientific knowledge but does not have specific immediate commercial objectives, although it may be preformed in fields of present or potential commercial interest.” The objective of applied research is to gain the knowledge or understanding to meet a specific, recognized need. In industry, applied research includes investigations to discover new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.”

The distinction between basic and applied research is not clear cut and there is continued controversy as to the application of the credit. For example, the IRS is currently in the process of deciding whether certain clinical trial expenses constitute basic research and are therefore classified as qualified expenses for the purposes of the federal tax credit. Although the provision was made law in 1981, the IRS did not issue regulations until 1989 and those regulations did not apply to the amendments to the provision which were passed in 1986. It was not until 2001, after several attempts to achieve the correct balance between providing an economic incentive for industry and allowing an excessive amount of expenditures on product development to be eligible for the credit, that the IRS was finally successful in issuing regulations for the current version of the R&E credit.

Economic theory has long supported the idea of subsidizing research and development efforts. Based on the economic theory of externalities, basic research activities are seen as producing positive effects for society beyond that obtained by the firm undertaking the research. Because this is an external benefit to society and not to the firm, left to their own profit maximizing behavior, the private sector would

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produce too little research and development. Therefore, by subsidizing the private sector the cost (in terms of expenses and risk) are lowered and firms are willing to undertake more research and development activities.

There are several ways to fund R&D. The appropriate funding mechanism for subsidizing R&D efforts so as to maximize the amount of basic research available to society is not completely obvious and not all approaches have equal outcomes. First, the federal government could fund research directly by either awarding grants for research done by another group or by conducting the research itself in government laboratories. The research conducted through these direct approaches tends to focus on basic research as opposed to applied research. It is not clear whether the positive externalities associated with R&D stem from basic R&D activities or applied R&D. For instance, Levy and Terleckyj (1983) found that government-funded private research had a larger effect on US productivity than direct government R&D. Even larger still was the effect of privately funded R&D on US productivity. On the other hand, Archibald and Pereira (2003) found that public R&D had a greater effect on private sector productivity than private R&D expenditures. Unfortunately, the issue remains unresolved.

In addition to direct funding of research activities, the government could encourage private industry to undertake more research and development through the use of tax incentives. The R&E tax credit is designed to do just that. The downside of the tax credit is that it has fewer restrictions on the type of research undertaken than direct funding by the government. While the provision is meant to apply to basic research, the private sector's natural tendency is to undertake applied, not basic, research. This gives rise to a continual tension between the desire of government officials to use the tax credit to promote more basic research and industry's desire to broaden the definition of qualified research expenditures to include applied research expenses.

IV. Structure of the Federal R&E Tax Credit

In general, the 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.³ 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.”⁴ 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.⁵

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

³ 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.

⁴ Internal Revenue Code section 41(d)(1)(B).

⁵ Internal Revenue Code section 41(d)(4).

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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
Expense to Gross Receipts ratio					$\frac{\$550,000}{\$7,000,000}$
$\left(\frac{\sum (b_{84} \dots b_{88})}{\sum (a_{84} \dots a_{88})} = c \right)$					
Fixed Base percentage (d)	0.079				
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)	0.079 * \$2,300,000 = \$181,700				
2005 expenses subject to tax credit (f - g = h)	\$200,000 - \$181,700 = \$18,300				
Value of 2005 tax credit (20% * h)	0.2 * \$18,300 = \$3,660				

The basic 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 dependant 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 would end up with a reduced value of the tax credit in future years because not all future expenditures would be 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 1988.⁶

⁶ 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.

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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.⁷ 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.

⁷ An election can be made to instead reduce the value of the credit and claim the full value of the Sec. 174 deduction.

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V. Structure of Georgia's R&D Tax Credit

The state of 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 ($\sum c/3=d$)	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.

The state credit has two special provisions. First is the 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

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liability to zero.⁸ 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. 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.

In addition to the 50 percent limit discussed above, the Georgia legislation contains an oddity pertaining to the calculation of the base level of R&D expenditures for a firm. The base is defined to be the product of the firm's taxable income and the ratio of its aggregate qualified expenses to its Georgia taxable net income for the past three years. By law, though, this ratio of expenses to taxable income cannot exceed 30 percent. This provision has the effect of lowering the base of expenditures for a firm and increasing the amount of qualified expenses eligible for the tax credit. Thus, firms receive a larger tax credit because of this provision than they would in its absence. This is illustrated in Example 4. In this example, the firm's ratio of qualified expenses to taxable income over the previous three years is computed to be 52 percent. By Georgia law, this ratio may not exceed 30 percent. In this example, limiting the ratio to 30 percent has the same effect as increasing the tax credit rate from 10 percent to almost 24 percent and allows the taxpayer to receive an additional \$3,907 in tax credits that would not have been available without this 30 percent restriction. This provision favors research intensive firms that have a high ratio of expenses to taxable income. Without this provision their base of qualified research expenses would increase and fewer expenses would be eligible for the tax credit.

⁸Several 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.

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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)

EXAMPLE 4. RESTRICTION THAT THE RATIO OF QUALIFIED EXPENSES TO TAXABLE INCOME MAY NOT EXCEED 30 PERCENT

Year	2002	2003	2004	Sum 02-04
Qualified Expenses	\$120,000	\$150,000	\$160,000	\$430,000
Taxable Income	\$75,000	\$75,000	\$75,000	\$225,000
Ratio of Qualified Expenses to Taxable Income = 52%				
Maximum Allowable Ratio = 30%				
2005 Taxable Income = \$175,000				
2005 Qualified Expenses = \$120,000				
	With no limit on ratio	With 30% limit on ratio		
Base Amount of Expenses	\$91,570	\$52,500		
Expenses in Excess of the Base	\$28,430	\$67,500		
Value of the Tax Credit	\$2,843	\$6,750		

VI. Value of the Tax Credits Taken

For the federal tax credit, the most recent data available on the value of the R&E tax credit taken comes from a report by Ernst and Young (Koch 2004) employing data from Statistics of Income (SOI). According to this report, the total value of the federal tax credit in 2000 was \$7.2 billion, claimed by more than 15,000 firms. Approximately 80 percent of the credits were taken by firms with assets in excess of \$250,000. The majority of the credits were taken by the manufacturing, information, and service sectors. Together this group accounted for about 95 percent, or \$6.8 billion, of the \$7.2 billion claimed in 2000.⁹ While manufacturing firms only accounted for about 7 percent of all firms claiming the credit, these firms claimed 69 percent of the total value in 2000. By state, California had the largest number of firms taking the federal credit. Georgia ranked 19th with 855 firms taking the federal tax credit.

Data for 2001 from the Georgia Department of Revenue shows 27 firms took the state R&D credit for a total of \$13.7 million.¹⁰ In 2002, 30 firms took the state credit for a total value of \$17.6 million. It is important to note that the state figures only include the credits taken by corporations. Pass through entities such as S-corps and partnerships are also eligible for the credit but no information is available at the state level on the extent to which the credits are claimed by these other groups.

⁹ Tax expenditure estimates from the Joint Committee on Taxation estimate the value of the R&E tax credit at about \$3 billion. This estimate includes the credit taken by corporations but not the value taken by S-corps and partnerships which are included in the E&Y figure of \$7.2 billion.

¹⁰ This represents the amount which was claimed by the firms but not necessarily used in that year. In 2001 of the \$13.7 million claimed, \$6.7 was applied to the 2001 tax liability and the remainder was carryforward. In 2002, \$5.8 million was used of the \$17.6 million claimed.

VII. Effect of R&D Tax Credit

Since the introduction of the R&E credit, many studies have been conducted on the effectiveness of the federal credit in increasing research and development efforts. Early studies of the R&E tax credit found a very small effect on the level of research and development undertaken as a result of the credit. This may be because these studies were capturing only the short-run effect of the credit since many of the studies were conducted shortly after the credit's introduction. For instance, a 1996 GAO study reported an elasticity of R&D with respect to its price of -0.2 to -0.5. This indicates that a 1 percent decrease in the price of R&D due to the tax credit would only result in a 0.2 percent to 0.5 percent increase in R&D spending. Similar findings are reported by Mansfield (1984). His research indicated that R&D expenditures increased by only about 1 percent due to the presence of the tax credit.

As time passed firms were in a better position to use the credit and it was expected that utilization of the credit would increase. Studies conducted later seem to suggest just such a larger effect. Reviews of these studies are found in the Office of Technology Assessment (OTA) report (1995) and Hall and Van Reenen (2000). In general these later studies found that a dollar of tax credit stimulated at least one dollar of additional spending on R&D. A recent work by Bloom, et. al. (2002) using a panel of nine OECD countries also found a short run elasticity of about -0.1 and a long run elasticity of -1.0. This implies that reducing the cost of R&D through the use of a tax credit by 10 percent will increase R&D expenditures by 1 percent in the short run and by about 10 percent in the long run.

Only a few studies have been done on the effectiveness of the credit granted at the state level. The major justification of a state level R&D tax credit is due to the spillovers from the R&D that are believed to have local benefits.¹¹ Therefore, the state would be in a position to build an agglomeration economy around this high tech core. It is assumed that these jobs are high-wage jobs that will stimulate further

¹¹ See Jaffe, Trajtenberg, and Henderson (1993) and Anselin, Varga, and Acs (1997) for evidence supporting localized spillovers.

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growth in the state economy. The only nationwide study which attempts to estimate the effect of state R&D tax credits is by Wilson (2005). In this work the author considers not only the cost of undertaking R&D in a given state but also the cost of undertaking R&D in other states. The author assumes that R&D funds are completely mobile between states so that it is the incremental difference between the cost of R&D in one state versus another that is the deciding factor on where to locate, not the overall cost in any one state. When the author estimated the effect of the state tax credit ignoring the indirect effects from other states, he found results similar to those found for the federal credit. That is, his results indicated that a 10 percent increase in the value of the R&D tax credit would stimulate an additional 8 percent of R&D expenditures at the state level, a result close to the elasticity of -1.0 found in several other studies. When the author controlled for the effect of the cost of R&D in other states, the responsiveness of R&D spending fell to almost zero. This implies that R&D activities are very mobile and suggests that increasing the R&D tax credit in a state will attract R&D activities from other states but not create new R&D expenditures nationally. One potential weakness of this study is that the author does not control for public spending in the model. In other studies of the effectiveness of general tax incentives, public spending was found to have a strong influence on the location decisions of a firm. Omission of this variable from this study may influence these findings as well.

Both early and more recent studies suffer from two common flaws. First, the presence of the tax credit creates an incentive for firms to increase reporting of R&D activities in order to maximize the value of the tax credit.¹² Either previous activities were actual R&D activities and were misreported as some other activity or subsequent activities were reinterpreted to be R&D activities when they were in fact not. In either case, R&D expenditures will be shown to rise after the credit but neither case represents a true increase in R&D activity. This will result in an upward bias in the estimated effects of the credit.¹³ Second, the value of the tax credit is

¹² This flaw is believed to be a larger problem for the early studies of the R&D tax credit but may be present in both early and late studies.

¹³ Eisner, et. al (1984).

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dependant on the tax liability of each specific firm.¹⁴ Knowledge of this liability status requires very detailed micro data which is usually not available for a large number of firms over a long time frame. Most studies must rely on aggregate data that will not contain the necessary level of detail to estimate the true value of the tax credit for each firm.

The effectiveness of the tax credit in stimulating additional R&D however, is only part of the story. The end goal of granting an R&D tax credit is to increase economic activity and raise the standard of living. Therefore, a second question must be posed. To what extent do increases in R&D activity result in increases in employment and investment for a state? To date there exist no economic study linking increased expenditures on research and development at the state level to higher employment rates and standards of living. There have been many studies though, that consider the effect of taxes on economic growth. In general these studies have shown only a very weak and sporadic relationship between tax incentives and increased economic activity. Most of these studies find that instead of tax cuts, firms value public expenditures on non-transfer items such as education, roads, and health.¹⁵

¹⁴ See Eisner, et. al (1984) and Altshuler (1988) for a thorough discussion of the various conditions which prohibit firms from benefiting from the tax credit.

¹⁵ See Bartik (1991) for a review of the literature concerning the effect of economic development tax incentives.

VIII. Summary of Other State R&D Provisions

In general, most states follow the federal tax credit. They adhere to the federal definition of qualified expenditures but usually offer the credit only for R&D conducted in their state. The value of the credit varies among the states. There are some modifications to the federal guidelines, though. For instance, Arkansas targets its tax credit to the field of biotechnology. Florida offers no credit but does not tax R&D labor. Vermont, Ohio, and Virginia exempt tangible property used in R&D from the sales tax. The state of Maryland offers a 3 percent nonincremental tax credit to all firms with qualified expenses. The total amount of the credit taken each year by all firms cannot exceed \$3 million. This nonincremental credit is in addition to a 10 percent incremental credit also offered by the state for expenditures in excess of a base amount. Maine has three R&D incentives for firms. The first is a basic incremental credit. The second is a super incremental credit for firms with expenses exceeding 150 percent of average R&D expenses. The third allows expensing of eligible equipment by firms engaged in high tech activities. Although most states allow unused tax credits to be carry forward, Louisiana and New Jersey allow unused tax credits to be sold under certain conditions.

IX. Suggestions for Modification of the State Credit

Georgia policymakers have as of late considered modifications to the state R&D tax credit. The purpose of these modifications would be to make the state more attractive to firms specializing in R&D activities. Several possible modifications to the credit are discussed below. Each option is considered on the basis of its administrative feasibility and its potential success in achieving the goal of increased employment and investment to the state of Georgia.

- *Option 1.* Make the state credit permanent.
- *Option 2.* Expand the tax credit to include applied research activities.

Currently, the state credit is not permanent but is temporary in that it is tied to the federal credit which is set to expire in December of 2005. Making the state credit permanent would enable firms to have more certainty in their R&D planning. R&D efforts are usually long-term projects with a fairly long time horizon. Having more certainty in this process might increase R&D expenditures. Altering the definition of qualified expenditures eligible for the credit will reduce the cost of R&D in the state and may make the state more attractive to R&D firms. The difficulty in doing this is that the definition of qualified expenses is very complex. Presently states rely on the federal government to determine those activities which are eligible for the credit. By decoupling from the federal definition, the state would then have to take on the responsibility of setting its own regulations and monitoring returns. Such expenses could add greatly to the cost of administering the credit.¹⁶

- *Option 3.* Allow a (whole or partially) refundable tax credit or allow firms to sell unused credits.

Currently, unused credits can be carried forward 10 years. Since many firms have negative tax liabilities, they cannot use these credits.¹⁷ In these cases the credit has very little influence on the firm's level of R&D. To expand its impact, the credit

¹⁶ Response to this option comes from informal discussions with state tax officials at the Georgia Department of Revenue.

¹⁷ According to data on Georgia corporate returns, only about 40 percent of returns have a positive tax liability.

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could be made refundable. Many European countries do this, as does Hawaii and Iowa.¹⁸ Another approach would be to allow the unused credits to be sold. Both New Jersey and Louisiana allow firms to sell their excess credits under certain conditions.¹⁹ In Louisiana for instance, only small firms are allowed to sell their excess credits. An alternative to a private market for unused credits is to allow the state to refund some portion of the excess credits, such as 80 percent, which would represent the market price for excess credits. This would expand the influence of the tax credit by making the credit valuable to all firms regardless of their tax status. It would add to the cost of the program as more firms would be eligible for the credit. It would also add to the administrative cost of the credit since additional auditing would be necessary.

- *Option 4.* Adjust the calculation of the base of R&D.

The current calculation for the base amount creates a disincentive for undertaking a large amount of R&D in any one year.²⁰ Since the base is dependant on past R&D expenditures, increasing R&D expenditures substantially in one year or even increasing R&D expenditures steadily over time creates a higher and higher base for the firm. Only expenditures in excess of the base are eligible for the credit. By increasing the base one year, the firm will cause some qualified R&D expenditures to be ineligible for the credit in future years since they no longer exceed the base. In fact this formula gives firms the opportunity to game the system by having low expenses for three years and combining their expenditures together in the fourth year.²¹ In doing so, the firm creates an artificially low base so that more expenses can be subject to the credit. The original federal legislation contained this type of base computation as well but it was changed for tax years beginning after 1989 because of complaints from taxpayers.

¹⁸ Iowa will double the value of the tax refund under certain conditions.

¹⁹ New legislation passed in 2005 by the Georgia Assembly provides a tax credit to certain Georgia firms in the film industry. The legislation allows any unused credits generated by the tax provision to be sold.

²⁰ See Eisner, et. al. (1984) and Altshuler (1988) for a thorough discussion of how the base computation affects the value of the federal credit.

²¹ See Billings, et. al. (1991).

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- *Option 5.* Exempt purchases of tangible property used in the production of research and development from state and local sales tax.

Several states exempt from state and local sales tax the purchase of tangible property used in research and development activities. This would reduce the cost of R&D in the state and would have the potential effect of increasing R&D activities in Georgia. To make the administration easier, other states require firms to apply for a tax-exempt status for their equipment. In this way the burden of proof is on the state and not each retailer to determine if an exemption is appropriate.

X. Suggestions for Next Steps

Without any guidance from academic studies, it is difficult to determine the size of the effect on R&D expenditures from any of the changes discussed above. In theory, adoption of any provision which expands the scope of the R&D tax credit will result in an increase in R&D activity in the state. But, the size of the increase in activity is not expected to be large. The academic literature has found, in general, the impact of economic development incentives to be fairly small.

As a first step it may be beneficial to take a state inventory of existing high-tech and R&D firms, other government sponsored R&D programs, and university sponsored research programs in order to understand the players and resources already active in the state. Discussions with these organizations may help identify the most useful type of support for this industry and a particular niche for the state of Georgia. If modifications to the tax credit are found to be warranted, the more prudent approach would be to consider the exemption of purchases of tangible property, modifications to the base calculation, and the possibility of refundable credits. Attempting to decouple the state definition of qualified expenses from the federal definition may encourage more R&D activity in the state but at a large administrative cost in terms of audits and regulations.

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