CHAPTER 5

PROFILES OF FIRMS TAKING THE R&D CREDIT

This chapter uses survey data to describe characteristics of firms taking the R&D credit. The firms are described in terms of employment, job creation, company growth and new products. The data in this chapter are estimated from 330 survey responses (51.6 percent of firms mailed to). The survey results were extrapolated to the approximately 800 firms that have taken the R&D credit over the past five years.

Data were collected for all industries that participate in the R&D credit program. However, due to a poor response rate in the aerospace industry, this industry is not included in any of the estimates in this chapter. Data in Part One is broken down by industries for SIC 36, Electronic and Electrical Equipment Manufacturing; SIC 38, Instruments Manufacturing; SIC 50, Wholesaling; SIC 73, Business Services (including software) and SIC 78, Engineering, Accounting, Research and Management. These SICs represent the majority of firms that are taking the R&D credit.

Part One of this chapter describes the firms. Part Two estimates the direct impact per million dollars of R&D spending and the additional direct economic impacts enabled by the R&D credit. Part three describes the methodology for collecting and estimating data in Parts One and Two.

Part One: Total Economic Impact on the Economy

Employment

Firms taking the R&D credit currently employ over 168,000 people in Washington State (including aerospace) with average wages over $80,000 per year. This is approximately 6 percent of total employment in Washington State. Washington employment for firms taking the R&D credit represents 42.7 percent of their U.S. employment. This percentage varies considerably by industry. SIC 73, Business Services (including software), has only 35 percent of its U.S. employment in Washington. SIC 87, Engineering, Accounting, Research and Management, employs over 91 percent of its workforce in Washington.

Table 5.1

Current Employment by Firms Taking the R&D Credit: Estimated Total Employees in Washington State and Percentage of U.S. Employment in Washington State

SIC	Total Employees in Washington State	Washington State Employment as Percent of Firms' U.S. Employment
36-Electronic and Electrical Equipment	9,475	81.8%
38-Instrument Manufacturing	11,866	63.4%
50-Wholesale Trade	3,044	24.9%
73-Business Services (Incl. Software)	37,978	35.4%
87-Engineering, Research and Related	13,623	91.2%
All SICs	96,396	42.7%

Of the 96,396 employees of firms taking the R&D credit, 48 percent or 46,645 employees are currently working in research and development. This percentage also varies considerably by industry. SIC 38, Instruments Manufacturing, employs the lowest percentage of its workforce in research and development -- 20 percent. In contrast, SIC 87, Engineering, Accounting, Research and Management, employs over 68 percent of its workforce in research and development.

Table 5.2

Current Estimated Washington R&D Employment for Firms Taking the R&D Credit		
SIC	Total R&D Employees in Washington State	R&D Employment as Percent of Total WA Employment
36-Electronic and Electrical Equipment	2,189	23.1%
38-Instrument Manufacturing	2,368	20.0%
50-Wholesale Trade	1,193	39.2%
73-Business Services (Incl. Software)	19,390	51.1%
87-Engineering, Research and Related	9,276	68.1%
All SICs	46,645	48.4%

An estimated 65.3 percent of R&D spending is devoted to wages. SIC 73, Business Services (including software), spends the highest percentage of R&D spending on wages -- 70.7 percent.

Table 5.3

Percentage of R&D Spending Devoted to Wages	
SIC	Percentage of R&D Spending Devoted to Wages
36-Electronic and Electrical Equipment	60.7%
38-Instrument Manufacturing	65.0%
50-Wholesale Trade	64.9%
73-Business Services (Incl. Software)	70.7%
87-Engineering, Research and Related	59.4%
All SICs	65.3%

Firms taking the R&D credit created 19,459 new jobs within the last year. Of these new jobs, an estimated 5,614 were research and development jobs.

Table 5.4

New Positions and New R&D Positions Created in the Last Year by Firms Taking the R&D Credit		
SIC	New Positions Created	New R&D Positions Created
36-Electronic and Electrical Equipment	895	210
38-Instrument Manufacturing	1,229	327
50-Wholesale Trade	1,313	333
73-Business Services (Incl. Software)	8,716	2,408
87-Engineering, Research and Related	2,260	771
All SICs	19,459	5,614

Washington residents were hired for 11,450 new jobs in the last year. This represents almost 59 percent of total new jobs that were added. The new jobs filled by Washington residents include 2,897 research and development jobs. New R&D positions filled by Washington residents represent over 51 percent of all new R&D jobs.

Table 5.5

Estimated New Positions Filled by Washington Residents				
SIC	Number of All New Positions Filled by WA Residents	Percent of All New Positions Filled by WA Residents	Number of New R&D Positions Filled by WA Residents	Percent of R&D Positions Filled by WA Residents
36-Electronic and Electrical Equipment	612	68.3%	123	58.5%
38-Instrument Manufacturing	899	73.1%	231	70.5%
50-Wholesale Trade	828	63.0%	209	62.9%
73-Business Services (Incl. Software)	4,651	53.4%	1,121	46.5%
87-Engineering, Research and Related	1,270	56.2%	395	51.3%
All SICs	11,450	58.8%	2,897	51.6%

New Research Facilities

Of the nearly 800 firms that have taken the R&D credit over the past five years, 1.2 percent moved research facilities into the state. Almost 10 percent built research facilities during the time that they took the R&D credit.

Table 5.6

Percentage of Firms Taking the R&D Credit Moving a Research Facility From Out of State or Building a New Facility Within the Past Five Years		
SIC	Percent Moving a Research Facility	Percent Building a Research Facility
36-Electronic and Electrical Equipment	0.0%	10.0%
38-Instrument Manufacturing	0.0%	4.2%
50-Wholesale Trade	0.0%	14.3%
73-Business Services (Incl. Software)	0.0%	6.8%
87-Engineering, Research and Related	0.0%	13.2%
All SICs	1.2%	9.7%

The new research facilities hired 2,902 new employees over the past five years. Over 80 percent of the new employees hired for the new research facilities were Washington residents.

Table 5.7

Estimated Number of Employees Hired Over the Past Five Years for New Research Facilities			
SIC	Number of Hires for New Facilities	Percent of Hires That Were WA Residents	Number of Washington Residents Hired
36-Electronic and Electrical Equipment	131	95.0%	124
38-Instrument Manufacturing	232	100.0%	232
50-Wholesale Trade	70	83.3%	58
73-Business Services (Incl. Software)	1,410	69.4%	978
87-Engineering, Research and Related	200	89.8%	180
All SICs	2,902	80.4%	2,332

For some firms with new research facilities, activities related to the new facilities caused other hiring to occur in Washington over the past five years. Over 3 percent of firms taking the R&D credit hired employees for activities related to the new facility. The number of these other employees hired totaled 824, most of which were Washington residents.

Table 5.8

Other Hiring Resulting Over the Past Five Years From New Research Facilities			
SIC	Percent of Firms Doing Other Hiring Because of New Facilities	Number of Other Employees Hired	Number of Other Washington Employees Hired
36-Electronic and Electrical Equipment	5.0%	262	209
38-Instrument Manufacturing	0.0%	0	0
50-Wholesale Trade	10.7%	14	14
73-Business Services (Incl. Software)	1.4%	385	385
87-Engineering, Research and Related	4.3%	115	111
All SICs	3.3%	824	800

New Products

R&D spending led to the creation of new products, services or processes for more than three-quarters of the firms taking the R&D credit. Nearly 44 percent of firms taking the R&D credit expanded over the past five years because of the new product service or process. All of these firms expanded in Washington State.

Table 5.9

Firms Creating a New Product, Service or Process Over the Past Five Years Because of R&D Spending		
SIC	Percent Creating a New Product, Service or Process	Percent Expanding Because of New Products, Services or Processes
36-Electronic and Electrical Equipment	75.0%	45.0%
38-Instrument Manufacturing	75.0%	33.3%
50-Wholesale Trade	75.0%	67.9%
73-Business Services (Incl. Software)	72.1%	36.1%
87-Engineering, Research and Related	63.2%	38.2%
All SICs	75.8%	43.5%

Expansion by firms taking the R&D credit resulted in 15,481 new jobs in Washington over the past five years. Average annual salaries for these new jobs were $112,000.[1] Average wages vary considerably by industry. SIC 73, Business Services (including software), has average annual salaries of almost $119,000. In contrast, SIC 87, Engineering, Accounting, Research and Management, hired new employees at an average annual salary of less than $50,000.

Table 5.10

Estimated Employment and Wages of Washington Residents Resulting from Expansion, New Products, Services or Processes Over the Past Five Years		
SIC	Employment of Washington Residents Resulting from Expansion	Average Annual Wages of Washington Employees Hired Because of Expansion
36-Electronic and Electrical Equipment	874	$71,444
38-Instrument Manufacturing	988	$48,689
50-Wholesale Trade	265	$78,471
73-Business Services (Incl. Software)	7,927	$118,974
87-Engineering, Research and Related	531	$49,890
All SICs	15,481	$112,045

[1] Survey respondents seem to have used different definitions of income in answering this question. Some firms probably included stock options, which would account for the high average wage in SIC 73, Business Services (including software).

An estimated 1,545 patents resulted from R&D spending during the period of time that firms participated in the R&D spending credit program.

Table 5.11

Estimated Number of Patents Resulting From R&D Spending During Program Participation	
SIC	Number of Patents
36-Electronic and Electrical Equipment	95
38-Instrument Manufacturing	192
50-Wholesale Trade	11
73-Business Services (Incl. Software)	586
87-Engineering, Research and Related	242
All SICs	1,545

The final value of all products that resulted from R&D spending by firms taking the R&D credit amounted to a one-year value of nearly $10.4 billion. This annualized value is about 74 percent of the total 1998 gross business income for the firms participating. Nearly half of this value is estimated to have originated from SIC 73, Business Services (including software). The high ratio of new product sales to current sales (74 percent) implies a high rate of product turnover.

Table 5.12

Annualized Value of All Products Resulting from R&D Spending During Program Participation	
SIC	Annualized Final Value of Products
36-Electronic and Electrical Equipment	$684,353,600
38-Instrument Manufacturing	$658,927,701
50-Wholesale Trade	$165,879,201
73-Business Services (Incl. Software)	$5,048,932,416
87-Engineering, Research and Related	$567,857,348
All SICs	$10,376,426,638

An estimated 27 percent of the firms taking the credit contracted with at least one other company over the past five years to do some aspect of production, marketing or distribution of the products which resulted from the R&D spending. For these firms $642 million, or 6 percent of the total

value of the new products, was added by the companies with whom they contracted. More than $369 million of the value added by other firms was added by Washington firms. (The $642 million is included in the total $10.4 billion value.)

Table 5.13

Value Added by Other Firms (Included in Final Value Estimates in Table 12)		
SIC	Value Added by Other Firms	Value Added by Other Washington Firms
36-Electronic and Electrical Equipment	$25,092,965	$10,204,473
38-Instrument Manufacturing	$56,695,238	$46,773,571
50-Wholesale Trade	$9,676,287	$7,042,186
73-Business Services (Incl. Software)	$269,607,594	$155,721,628
87-Engineering, Research and Related	$34,025,047	$17,012,524
All SICs	$642,544,285	$369,015,623

Part Two: Marginal Impact of Additional R&D Spending and the Direct Impact of the State of Washington's Investment in High Tech Firms Via the R&D Credit

This part analyzes the marginal impact on the Washington State economy of R&D spending and the additional economic impact that can be attributed to the R&D credit. The analysis assumes that the R&D credit increases high tech spending by the amount of the credit. A further assumption is that firms receiving the credit use the extra money in the same way that they use other funds devoted to high tech R&D. This analysis does not include any stimulative effects of the tax credit on the high tech industry in Washington because of lower taxes. For example, the analysis does not include the impact of firms choosing to locate in Washington because of the R&D credit.

Given these assumptions, the R&D credit can be considered as the state of Washington's contribution to high tech R&D spending. This chapter shows the return on that spending in terms of the changes it directly causes in the state's economy.

Tables 5.14-5.16 are calculated from the survey data. The estimates for each type of economic impact shown below are calculated by first estimating the impact per million dollars of R&D

investment, then multiplying that impact ratio by the amount of the credit. For example, the state's return on investment in terms of R&D jobs in Washington State is calculated by dividing the total number of new positions by total R&D spending for firms taking the credit. The ratio of jobs per dollar of investment is multiplied by the total R&D credit. The resulting 41 new R&D positions are the state of Washington's direct contribution to new R&D jobs in the state.

One-Year Employment Impact

Last year's total R&D credit of $24.2 million paid for 1,199 Washington employees of the high tech industry. The credit directly caused 70 new jobs. Washington residents were hired for 41 of these jobs.

Table 5.14

Employment Directly Resulting From 1999 R&D Spending and Tax Credits		
Employment Type	Jobs per $1 Million R&D Spending	Additional Jobs Resulting From 1999 R&D Tax Credit
Total Washington R&D Employment	49.47	1,199
New R&D Positions Created in 1999	2.88	70
New R&D Positions Filled by WA Residents	1.70	41

Employment Impact of All Five Years of the R&D Credit

In addition to paying for approximately 1,199 Washington employees per year, the combined five-year contribution to R&D spending directly caused 36 employees to be hired for a new facility, 29 of which were filled by Washington residents. An additional 10.4 employees were hired for other activities related to the new facility. All of the jobs related to other activities were filled by Washington residents, according to survey responses.

Table 5.15

Additional Employment Directly Resulting From Five Years of R&D Spending and Tax Credits		
Employment Type	Additional Jobs Per $1,000,000 R&D Spending	Additional Jobs Resulting From 1995-99 R&D Tax Credit
Employees Hired for New Facilities	0.33	36
WA Residents Hired for New Facilities	0.27	29
Additional Jobs Filled by WA Residents	0.09	10
WA Residents Employed Because of Expansion Resulting From New Products, Services or Processes	1.77	190

Other Economic Impacts of All Five Years of the R&D Credit

In addition to the employment impact, over the lifetime of the program, the R&D credit directly enabled 19 patents. New products with an annual value of $127.6 million were also directly caused by additional spending that the R&D credit enabled. Of the value of new products, $17 million came from value added by other Washington firms with whom the high tech firms contracted.

Table 5.16

Other Economic Impacts Directly Resulting From Five Years of R&D Spending and Tax Credits		
Impact Type	Additional Impact Per $1Million R&D Spending	Additional Impact Resulting From 1995-99 R&D Tax Credit
Number of Patents	0.18	19
Annualized Value of Products Resulting From R&D	$1,185,233	$127,594,325
Value Added by Other Firms in WA	$158,543	$17,067,646

Part 3: Methodology

Data presented in Parts One and Two were collected via a survey of all firms that have taken the R&D credit. (Survey questions are included in the Appendix.) Washington State University Social and Economic Sciences Research Center administered the survey.

Although the entire population of firms taking the R&D credit was surveyed, 51.6 percent responded. The results of the survey therefore are used as a sample and extrapolated to the entire population of firms taking the credit. Therefore, all information that is reported in this chapter is an estimate. Accuracy of the estimates relies on both the representativeness of the sample and the accuracy of the taxpayers' responses.

The distribution of the sample of respondents approximately parallels the population for both SIC and size (excluding aerospace). The sample covers 50.5 percent of total employment and 32 percent of total gross business income for population of all taxpayers taking the credit (excluding aerospace).

Inaccuracies in taxpayer responses are minimized first by unambiguous wording of the survey questions, and second by cleaning up the response data. Some questions on the survey corresponded to known information about the taxpayer. Responses to these questions were checked against the known data. Any responses that differed considerably from the known data were considered as unreliable and removed from the sample. Other questions were also checked for unreasonable answers.