INCENTIVES FOR HIGH TECHNOLOGY

A Study of Ways to Encourage Growth and Diversification

Prepared By

The Department of Revenue
Research and
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STATE OF WASHINGTON
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THE EFFECT OF B&O TAX CREDITS
For Qualified Research & Development

Incentives for High Technology proposes a business-and-occupation tax credit for certain research and development activities. To better understand how these credits would work, we have prepared three examples. They show the relative effects of the credits on large, medium-sized and startup high-tech companies. Please note that not all of a company's research and development activities will qualify. Only those portions associated with developing a qualified new product (as opposed to upgrades or refinements to an existing product) are eligible. Some companies, such as startups, spend a much higher percentage of their revenues (including research grants) on R&D, and the program provides proportionately greater assistance to them. Theoretically, all of a startup's expenditures could be R&D, eliminating its B&O tax liability.

	Large Company	**Medium Company**	**Startup Company**
Annual gross revenues	$2 billion	$5 million	$100,000
Annual R&D expenditures	$200 million	$2 million	$100,000
Qualifying R&D expenditures	$100 million	$1 million	$100,000
B&O taxes before credit (at services rate of 2.13 percent)	$42.6 million	$106,500	$2,130
Preliminary B&O tax credit at 2.5 percent of qualifying expenditures	$2.5 million	$25,000	$2,500
Net B&O tax credit ($2 million maximum allowable tax credit per year, with no carry forward of unused credits; credit cannot exceed tax liability)	$2 million	$25,000	$2,130
Net B&O taxes after credit	$40.6 million	$81,500	- 0 -
Tax credit as a percent of pre-credit B&O tax liability	4.7%	23.5%	100%
Tax credit as a percent of gross revenues	0.1%	0.5%	2.13%

INCENTIVES FOR HIGH TECHNOLOGY

Governor Mike Lowry's 1994 legislative proposal to stimulate economic growth and diversification by building on Washington State's technological base

Dec. 21, 1993

Competing for smarter jobs

The industrial revolution is over. Competitiveness no longer means cheap land, cheap labor and low taxes. New manufacturing plants don't always lead to stable, high-paying jobs. The rules of economic development have changed. Regions now compete for good jobs based on the quality of their educational systems, the skills of their workers, the capabilities of their transportation systems, and the attractiveness of their environments. Clusters of interdependent industries have become more important than individual industries to a region's comparative advantage. Our competitors are using increasingly sophisticated efforts to generate high-value activities that support high-paying jobs. In doing so, they are following a fundamental rule of economic development: Build upon your strengths. Today's pursuit is not simply for jobs: it is for high-wage jobs in growth areas of the economy.

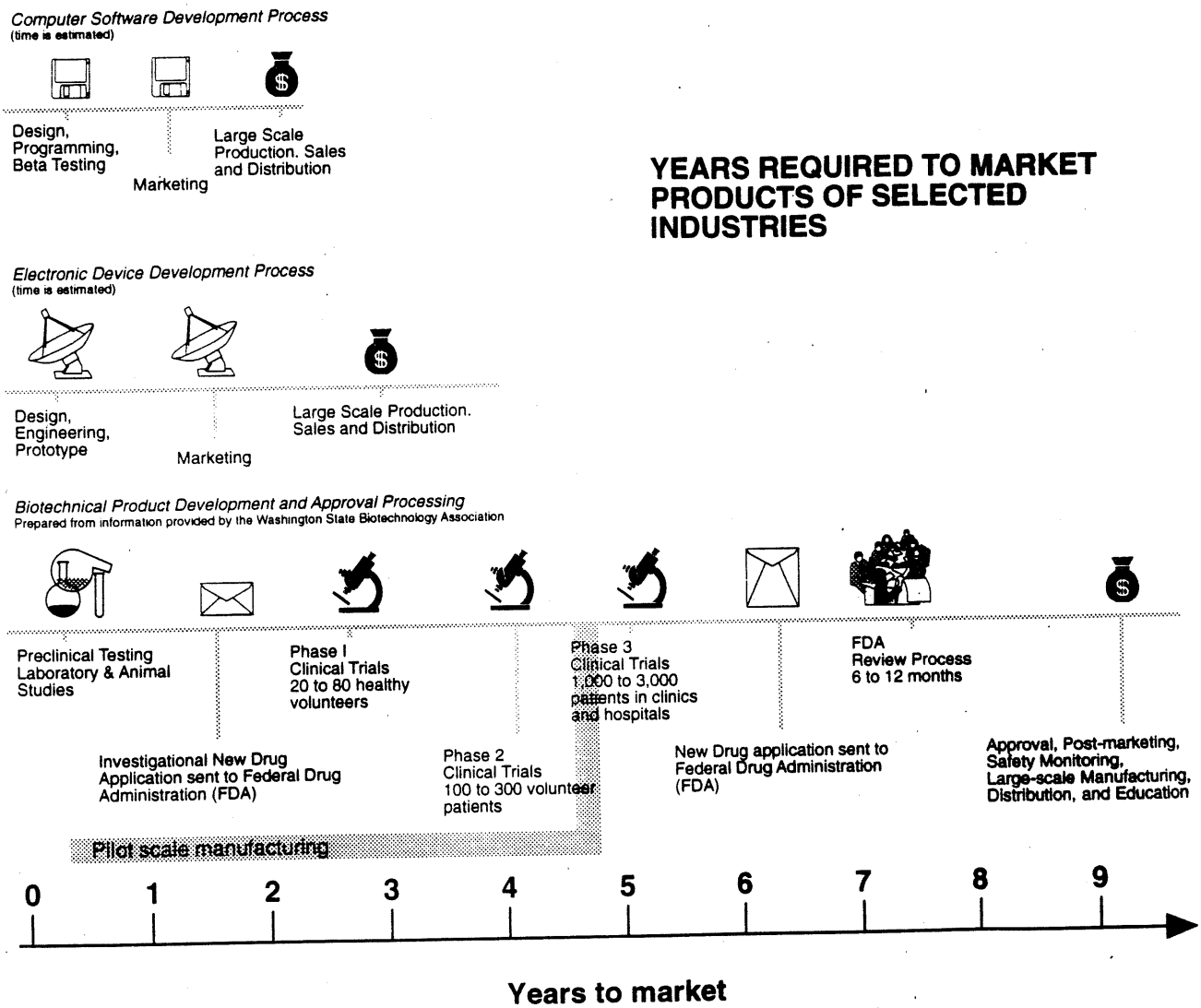
Our competitors are using increasingly sophisticated efforts to generate high-value activities that support high-paying jobs.

Washington is fortunate to have both the prerequisite foundation for economic development and a robust high-technology sector. This provides a good springboard for pursuing desirable jobs that will improve the quality of life of our residents. We have an existing base of biotechnology, software and electronics companies that have made Washington an acknowledged technological leader among the states. Many of these companies have been attracted to the Pacific Northwest by the quality of our public and private research institutions. Others have been spun off from the aerospace foundation on which our economy has relied for much of this century. Still others were drawn by key market players such as The Microsoft Corporation.

Much of this has occurred with little intervention by the state of Washington. Most of the state's efforts — through marketing and tax incentives — have been directed at attracting new manufacturing plants as a source of jobs. While the state has been successful at this effort, competing for the limited pool of firms that can locate anywhere in the world is no longer a firm basis for economic development strategy.

Intervening earlier to produce quality jobs

The goal of *Incentives for High Technology* is to stimulate economic growth much earlier in the process by generating high-paying research-and-development (R&D) jobs that may eventually result in construction of manufacturing plants as well. By encouraging companies in earlier stages of development, when their resources generally are limited and profits may be non-existent, the state can leverage its investment. Helping a fledgling biotechnology company, for example, may result in a much greater impact than trying to attract an established, profitable out-of-state manufacturer that may require a much larger financial incentive to move to this state.



By focusing on research and development, the state can intervene earlier in the process, when a company begins turning ideas and scientific discoveries into usable products. Such a policy capitalizes on Washington's healthy infrastructure of public and private research facilities and high-tech businesses that are well positioned to produce spin-offs.

Past state economic development efforts have focused on encouraging companies to build manufacturing plants in this state by providing deferrals of sales taxes that those companies would pay on construction of facilities. That, however, is really the last step in the process, when a company's decision about where to site a plant becomes a purely economic equation: where costs will be lowest.

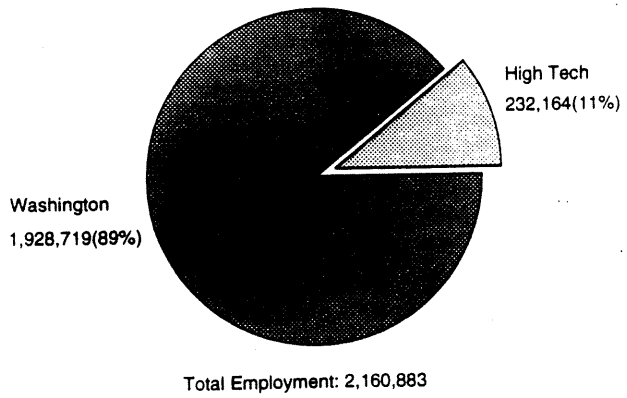
By focusing on research and development, the state can intervene earlier in the process, when a company begins turning ideas and scientific discoveries into usable products.

With its relatively low business and occupation (B&O) tax rate on manufacturing, comparatively low property taxes, and absence of corporate or personal income taxes, Washington already competes favorably with other states for manufacturing plants. Even so, sources of raw materials, the labor force, and the regional quality of life are far more important factors than state tax policy in siting of manufacturing plants.

Strengthening, stabilizing our economy through diversification

Historically, Washington's economy has been vulnerable to the cyclical nature of the aerospace industry. While many jobs are still tied to aerospace, the emergence of a variety of "high-technology" companies has helped reduce the state's dependence on the fortunes of one industry. As a result of this diversification, Washington has been able to weather the current Boeing downturn, as well as job losses in the timber and metals industries, without falling into recession. While gross business income remained flat during the first quarter of 1993, it never slipped into negative territory and recorded a 2.2 percent gain during the second quarter.

High tech employment as a percentage of Washington's labor force



High tech employment grew by 20.1 percent between 1988 and 1991, while overall state employment grew 13 percent

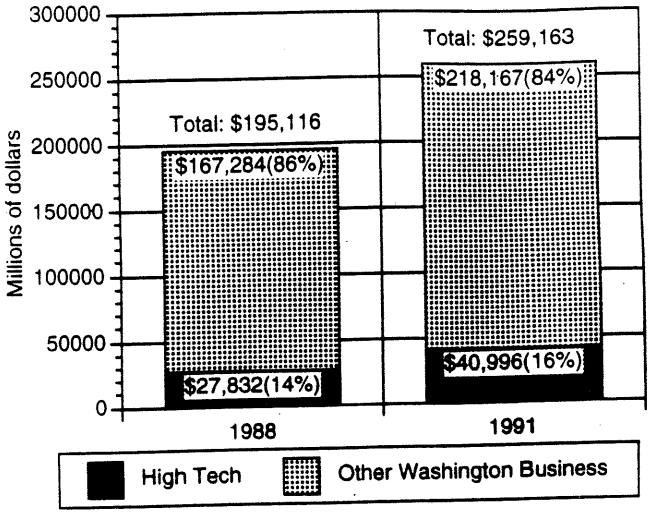
State Department of Revenue statistics shows that companies engaged in such areas as computer hardware and software, advanced electronic devices, biotechnology, the environment, and materials science have helped offset job losses elsewhere in our economy.

High technology: a growth sector

In 1988, high tech constituted 14.3 percent, or $27.8 billion, of $195.1 billion in gross business income (GBI) reported in the state. By 1991, that was up to 15.8 percent of $259.2 billion in GBI, or nearly $41 billion. High-tech employment, according to the Department of Employment Security, rose from 10.1 percent of overall state employment in 1988 to 10.7 percent in 1991. In 1991, high-tech employment stood at 232,164 of the state's 2.16 million work force. Biotechnology grew much faster, nearly tripling from 5,231 employees in 1988 to 14,850 in 1991.

The Monthly Labor Review ranks Washington fifth in the nation in the proportion of work force involved in high-tech industries. Another source, the nonprofit Corporation for Enterprise Development, ranks this state sixth for its proportion of scientists and engineers in the work force. Yet another way of analyzing Washington's high-tech stature is through the eyes of a competitor, the state of Massachusetts. A special report, "Can Massachusetts Compete?", identified Washington as one of that state's six principal high-tech competitors, along with Arizona, California, Maryland, North Carolina and Texas. The Massachusetts Technology Council, which did the ranking, cited Washington's established base of high-tech companies and its skilled labor, good universities, venture capital and research facilities as key ingredients needed to attract high-technology firms.

Gross Business Income



Washington's relative "high tech" ranking

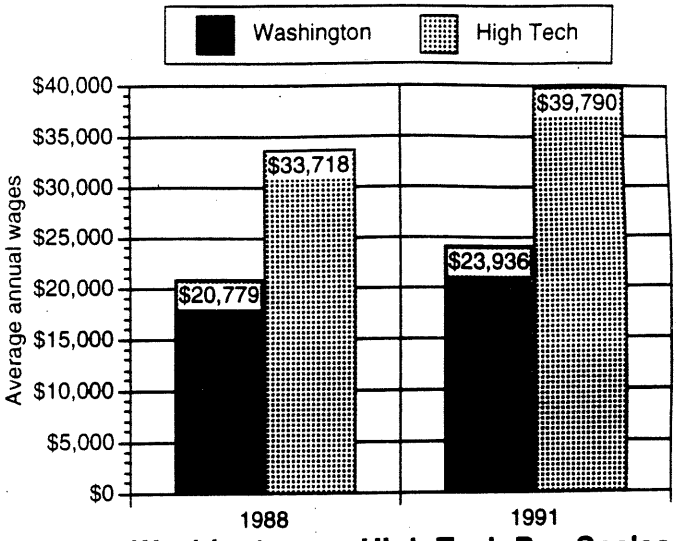
Measure of R&D spending	State Rank	Source
Total State R&D	7	Statistical Abstracts of the United States
Industry R&D	7	Statistical Abstracts of the U.S.
University R&D	22	Corp. for Enterprise Development (CfED)
Federal R&D	11	CfED
Small business innovation & research grants	21	CfED
Patents issued	20	CfED

Selecting the right technologies

Not all high-technology companies are equal from a wages standpoint, however. With that in mind, Governor Mike Lowry directed the Department of Revenue to identify portions of the state's high-technology industry that have high job growth and pay high wages, then to develop proposals for stimulating expansion of those sectors.

In an effort to identify the most desirable high-technology activities, the Department of Revenue examined which sectors experienced the greatest job growth between 1988 and 1991. Through that sorting process, it became clear that businesses that spent large portions of their revenue on research and development also appeared to generate the most growth in high-paying jobs.

Washington companies that spent 150 percent of the United States average on research and development (as a percentage of revenues) paid their workers 66 percent more than the statewide average in 1991, $39,790 compared to $23,936 per year. Moreover, pay increases for these high-tech jobs continue to outstrip the broader work force, up 18 percent from 1988-91 compared to 15.2 percent for the average worker. If the aerospace component of these high-tech industries is excluded, high-tech pay jumped 27.4 percent between 1988 and 1991.



Washington vs. High Tech Pay Scales

Defining targeted high-technology sectors

In order to leverage limited state resources most effectively, the state must target those segments of the high-technology sector that are creating the most high-wage research-and-development jobs. Industry sectors are too blunt an instrument for defining high technology because they include companies whose activities could be considered technological but which fail to provide significant numbers of high-wage jobs. For the purposes of this proposal, the Department of Revenue has developed a narrower definition, which includes business engaged in:

- Biotechnology: Biochemistry, molecular biology, genetics and engineering dealing with the transformation of biological systems into useful processes and products.

- Advanced computing: Leading edge technologies used in the designing and development of computing hardware and software. This includes innovations in both hardware and software design.

- Electronic devices: The design and development of electronic materials and devices, including integrated circuits, optics, superconductivity, lasers and electromagnetism.

- Advanced materials: Includes ceramics, high-value metals and new and improved wood-based materials.

- Environmental technology: Environmental assessment, prevention, cleanup and alternative energy sources.

EFFECTIVE B&O TAX RATES IN RELATION TO PROFIT
HYPOTHETICAL FIRM WITH $1,000,000 ANNUAL SALES

Based on 1990 Average Margins for Major Manufacturing Activities

	Profit Margin *	B&O Tax as % of Profit**
Food products	3.91%	13.2%
Apparel/textiles	2.50	20.6
Wood products	2.25	22.9
Furniture	1.61	32.0
Pulp/paper	5.26	9.8
Printing	4.27	12.1
Chemicals	8.95	5.8
Stone/clay/glass	4.09	12.6
Metals	2.03	25.4
Fabricated metals	3.63	14.2
Machinery	6.34	8.1
Electric machinery	4.51	11.4
Transportation equipment	5.25	9.8
Instruments	6.15	8.4
Misc manufacturing	3.13	16.5
TOTAL MANUFACTURING	4.99%	10.3%

* Based on sample of latest federal corporate tax return from Source Book, 1990, Statistics of Income IRS. Data do not include noncorporate firms.

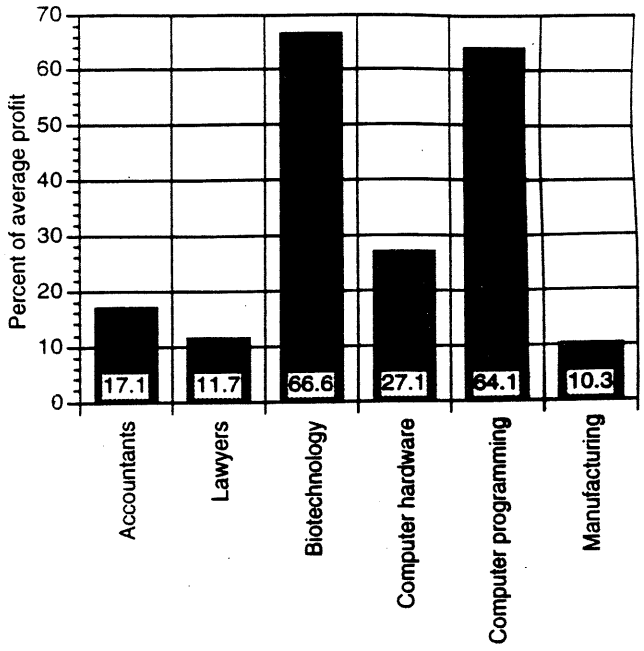
** Assumes all activities are subject to the 0.515 percent B&O rate, yielding an annual tax liability of $5,150 for a firm with $1 million in gross sales.

Targeting incentives

The state now treats most federal government research grants and funding for contract research as income and taxes it at service business and occupation tax rates of up to 2.5 percent. This is a tax on the gross income received regardless of profits or losses. Even when some high-tech companies begin to manufacture a product, they still may be taxed at the service rate rather than the much lower manufacturing rate of 0.515 percent. Some software products are taxed at the service rate because they involve royalties, for example. In addition, all machinery and equipment purchases used in research are subject to the retail sales or use tax.

The current economic slowdown, coupled with limited state resources, dictates a highly targeted program of stimulating desirable business growth through carefully targeted tax incentives. Targeting also recognizes that current tax policy presents obstacles to certain types of high-tech companies, especially biotechnology, by taxing them long before they ever turn out a marketable product, and taxing them at relatively high service business and occupation tax rates rather than lower manufacturing rates.

Comparative B&O tax rates*



* Derived from Robert Morris Associates' 1990 Annual Statement Studies. To the extent that non-corporate firms are included in each industry's profit margin data, margins are overstated because owner's compensation is excluded from wage expense.

Evaluating industry profit margins

One measure of the tax burden the state places on an industry sector is its business and occupation taxes as a percentage of profits. State taxes averaged 10.3 percent of the profits of a typical manufacturing operation in 1990, but fully 66 percent of the profits of biotechnology firms. Such a disparity suggests that the tax burden being placed on research-and-development activities may be disproportionately high. Biotechnology profit margins also are among the slimmest of service industries, standing at 3.2 percent in 1990. Computer programming companies paid 64.1 percent of their average 3.9 profit margins in taxes, and computer hardware manufacturers paid the equivalent of 27.1 percent of their profits in B&O taxes.

Tax incentives to stimulate research and development

Incentives for High Technology proposes two tax incentives to stimulate the creation of R&D jobs: a B&O tax credit for research and development expenditures and a new sales and use tax deferral program to help high-tech companies defer the cost of setting up R&D facilities.

B&O TAX CREDIT FOR R&D EXPENDITURES

Under this proposal, high-tech companies would receive a credit against the state business and occupation (B&O) tax for certain high-tech research and development expenditures. To qualify, a firm must exceed statewide industry average R&D expenditures by 50 percent and be engaged in specified research-and-development activities conducted in Washington in the following fields: biotechnology, advanced computing, electronic device technology, advanced materials and environmental technology. Currently, these industries spend approximately 0.61 percent of gross receipts on eligible R&D activities. To be eligible, the amount of high-tech R&D expenditures must equal at least 0.92 percent of a firm's gross income.

Research-and-development expenditures are limited to wages, benefits, supplies and computer expenses incurred by a taxpayer to discover information that is technological in nature and to be used to develop new or improved products, processes, techniques, formulas, inventions or software. R&D spending would not include land or structure; depreciable property; research conducted after production has begun; adaptation of existing business components; surveys and studies; duplication of existing business components; foreign research; social science and humanities research; market research or testing; quality control; sale promotion and service; computer software developed for internal use; and research in areas such as improved style, taste, and seasonal design.

The credit would be allowed for R&D work performed under contract or collaborative agreement, as well as for internal R&D done by the firm with no direct compensation. For nonprofit institutions, the amount of the credit would equal 0.515 percent of the firm's eligible expenditures. For all other firms, the credit would be calculated at 2.5 percent of the expenditures. The amount of credit is limited to the firm's B&O liability each year and there is no carry-forward of unused credits. Each firm is limited to a maximum $2 million of credit per year.

The program would contain a sunset date of ten years after enactment. This should be a sufficient period of time to assist firms that have begun operations in recent years and those that will form during the remainder of the decade. Legislative review after ten years will allow a reassessment of the results and a policy determination of whether the tax incentives should then be extended.

STATE REVENUE IMPACT

(assuming effective date of July 1, 1994)

Credit for R&D expenditures exceeding the statewide average by 50 percent (limited to maximum of $2 million per firm):

FY 1995	$10.7 million
FY 1996	13.0
FY 1997	14.3

SALES AND USE TAX DEFERRALS FOR HIGH-TECH FIRMS

This program allows the deferral of sales and use tax due for new R&D facilities and related equipment in the specified "high-tech" areas: biotechnology, advanced computing, electronic device technology, advanced materials and environmental technology.

Under existing programs, an R&D or manufacturing firm locating in a distressed area may defer sales and use tax on construction costs and the acquisition of machinery and equipment. Also, firms that were not engaged in R&D or manufacturing prior to 1985 may defer taxes.

Under this proposal, facilities could be located in any county in Washington. While new construction is not required, facilities must be previously unoccupied by the firm and used primarily for high-tech research or "pilot scale manufacturing." The leasing of existing structures would be included. The repayment scheduling would be separately geared to the completion of the R&D facility and the pilot manufacturing facility.

For biotechnology firms, the deferral period would be five years following completion of the investment, and the tax repayment period would be 6 years; other industries would have the same deferral/payback period as the existing program (three-year deferral, five-year payback). While any age firm could participate (including those older than 1985), only a one-time usage of the deferral is allowed for each investment program.

This incentive also would include a 10-year sunset clause so its effectiveness can be evaluated.

STATE REVENUE IMPACT

(assuming effective date of July 1, 1994)
Sales tax deferral for new R&D facilities:

FY 1995	$ 9.3	million*
FY 1996	19.6	
FY 1997	21.5	

* Estimated impact for fiscal 1995 is lower than in the 1996-97 biennium because of the time it will take for companies to gear up for the program.

Legislative review after ten years will allow a reassessment of the results and a policy determination of whether the tax incentives should then be extended.

Can we afford it?

Critics may argue that the state can ill afford to provide even limited tax breaks to industry while it faces cutbacks in state services to comply with the Initiative 601 expenditure limits. One of the things voters were telling us by approving I-601 is that their own incomes are under pressure because of tough economic times, and they are concerned about their earning power in the future. In reality, the state can scarcely afford not to take at least modest steps to help the long-term economy grow. An analysis of the 1995-97 biennium indicates that the state can afford to grant limited tax incentives, cut governmental spending and still build up its cash reserves for future bienniums. One could argue that the government spending cuts will be made regardless of any economic incentives, and the only effect of the incentives will be to reduce the size of the cash reserves.

In reality, the state can scarcely afford not to take at least modest steps to help the long-term economy grow.

Investing for the future

We must build a high-wage, highly skilled economy by focusing our efforts where we can make a difference to the vitality, diversity and sustained competitiveness of Washington's economy. Although Washington has enjoyed a stronger economy than the nation, it has areas of weakness that this proposal seeks to rectify. In its *1993 Development Report Card for the States,* The Corporation for Enterprise Development ranked Washington as one of the top three states in terms of its potential to attract new businesses providing high-paying jobs. However, it criticized Washington for its lack of economic diversity. *Incentives for High Technology* seeks to address that shortcoming by stimulating the expansion of other high-tech industries that are both growing and that pay well. By building upon our established base of biotechnology, computer and electronics firms, we can both solidify and expand the presence of those industries in our state. Through highly targeted tax incentives, Washington can not just maintain its ranking as one of the nation's top R&D states, but improve it.

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INCENTIVES FOR HIGH TECHNOLOGY
A Study of Ways to Encourage Economic Growth and Diversification

INTRODUCTION

Washington is fortunate to have both the prerequisite foundation for economic development and a robust high-technology sector. This provides a good springboard for pursuing desirable jobs that will improve the quality of life of our residents. We have an existing base of biotechnology, software and electronics companies that have made Washington an acknowledged technological leader among the states. Many of these companies have been attracted to the Pacific Northwest by the quality of our public and private research institutions. Others have been spun off from the aerospace foundation on which our economy has relied for much of this century. Still others were drawn by key market players such as The Microsoft Corporation.

Much of this has occurred with little intervention by the state of Washington. Most of the state's efforts, through marketing and tax incentives, have been directed at attracting new manufacturing plants as a source of jobs. While the state has been successful at this effort, competing for the limited pool of firms that can locate anywhere in the world is no longer a firm basis for economic development strategy.

The goal of "Incentives for High Technology" is to stimulate economic growth much earlier in the process by generating high-paying research and development (R&D) jobs that may eventually result in construction of manufacturing plants as well. By encouraging companies in earlier stages of development, when their resources generally are limited and profits may be non-existent, the state can leverage its investment. Helping a fledgling biotechnology company, for example, may result in a much greater impact than trying to attract an established, profitable out-of-state manufacturer that may require a much larger financial incentive to move to this state.

This report examines how tax incentives granted to high-tech industries may stimulate economic growth and diversification as well as job creation in Washington State. Five main topics were studied resulting in the two tax proposals. The five main topics of the study are:

1. Defining the High-Tech Industry

   A new Washington definition of high technology is offered by modifying and adding to existing definitions. We also

offer a definition of Research and Development to fit the needs of our recommendations.

2. Current state of high-tech industries in Washington.

   This section contains a summary description of the high-tech industry as it exists in the state of Washington. Statistical information is provided which compares the high-tech industry's employment, wages, and gross business income to all other Washington businesses.

3. Existing tax treatment of the industry.

   In this section a brief summary of the various taxes presently being imposed on the high-tech industry is presented.

4. Programs in other states.

   Eight categories of incentives are compared with other states and the state of Washington. The categories are, technology offices; technology/research centers; research grants; seed/venture capital; equity/royalty investment; information/networking; technical/managerial assistance; technical training; incubator programs; and research parks.

5. Washington's relative high-tech ranking.

   Statistical information comparing Washington's national ranking in high-tech employment, activities related to high-tech, educational attainment, and Washington's relative economic development profile and income is presented.

Several publications, other agencies, and the Department's data base were the main resources used for the study.

The last few pages of this report contain two proposals for tax incentives. The proposals were developed from the information contained in this study as well as input from other agencies and industry. These are summarized below:

PROPOSAL 1.

A credit against the Business & Occupation tax for research & development expenditures.

PROPOSAL 2

Sales and use tax deferral program for new or expanding high-tech industries.

DEFINITIONS OF "HiGH-TECH"

The following broad definition is used by the Small Business Administration.

High-technology industry: primarily engaged in the development, refinement, testing, marketing, commercialization, manufacturing or modification of a product that involves the application of modern technologies found in such fields as: computer/information processing and analysis, electronics, advanced materials, transportation, energy conversion and use, environmental and natural resources, and life sciences.

Modern technologies found in these fields that are considered "high-technology" include, but are not limited to the following (listed by field);

Computer/information processing and analysis
hardware and software development, system design, robotics, signal processing, and mathematical modeling,

Electronics
microelectronics, semiconductors, electric equipment and instrumentation, electromagnetic radiation, microwave and millimeter electronics, optical devices and lasers,

Advanced materials
processing, manufacturing, and repair of magnetic, high conducting, ceramic, composite, and insulation materials, biomaterials, and polymers,

Transportation
mechanical perfor nce, control, and measurement of the hydrodynamics, aerodynamics, and oustic properties of transportation materials,

Energy conversion and use
fluid mechanics, heat transfer, refrigeration, propulsion/ combustion technology, electric power, nuclear power and research, energy use and conversion,

Environmental and natural resources
ocean and atmospheric sciences, water management, earth sciences, and nuclear, chemical, and biological waste management,

Life sciences
medical instrumentation, biotechno y, microbiology, genetic engineering, behavioral sciences, and physiolog

The much narrower Oregon definition is:

Businesses engaged in research in the fields of biotechnology, advanced computing, electronic device technology, advanced materials and environmental technology but only to the extent that such research is conducted in the state. Research will not include surveys and studies; duplication of existing business components; foreign research, social science and humanities research; public polling; market research; quality controls; routine market testing; sales promotion; sales service; computer software developed for internal use; and research for improved style, taste, seasonal design, etc.

Biotechnology: Biochemistry, molecular biology, genetics and engineering dealing with the transformation of biological systems into useful processes and products.

Advanced computing: Leading-edge technologies used in the designing and development of computing hardware and software. This includes innovations in designing of the full spectrum of hardware from hand-held calculators to super computers, including all peripheral equipment. It also incudes innovations in design and development software executing on all computing hardware for any purpose.

Electronic device technology: The design and development of electronic materials and devices such as advances in integrated circuits and superconductivity.

Advanced materials: Means high value metals and new and improved wood-based materials.

Environmental technology: Environmental assessment, cleanup and alternative energy sources.

In order to leverage limited state resources most effectively, the state must target those segments of the high-technology sector that are creating the most high-wage research and development jobs. Industry sectors are too blunt an instrument for defining high-technology because they include companies whose activities could be considered technological but which fail to provide significant numbers of high-wage jobs. Likewise, there were no definitions used by other states that we could adopt without some modification to fit our purpose. Oregon's definition came closest, but left out some important industries in the high-technology arena. The other shortcoming of all definitions we considered was the lack of a definition of "research." We have combined Oregon's definition, added modifications of the Small Business Administration definition, and included a definition of "research" to develop a Washington definition of high-tech industries.

For the purposes of this study, Washington's definition of high-tech will be:

Businesses that spend more than 150 percent of the statewide industry average on research and development and are engaged in research in the fields of biotechnology, advanced computing, electronic device technology, advanced materials and environmental technology, but only to the extent that such research is conducted in Washington. Research will not include surveys and studies; duplication of existing business components; foreign research, social science and humanities research; public polling; market research; quality controls; routine market testing; sales promotion; sales service; computer software developed for internal use; and research in areas such as improved style, taste or seasonal design.

Biotechnology: Biochemistry, molecular biology, genetics and engineering dealing with the transformation of biological stems into useful products.

Advanced Computing: Leading-edge technologies used in the designing and development of computing hardware and software. This includes innovations in both hardware and software design.

Electronic Devices: The design and development of electronic materials and devices, including integrated circuits, optics, superconductivity, lasers and electromagnetism.

Advanced Materials: Includes ceramics, high-value metals and new and improved wood-based materials.

Environmental technology: Environmental assessment, prevention, cleanup and alternative energy sources.

WASHINGTON'S PRESENT SCIENCE AND TECHNOLOGY PROGRAMS

This section briefly describes several programs that benefit the high-technology industry in Washington. This information is taken from Science and Technology Programs in the States, 1992, published by Advanced Development Distribution, Inc.

The Office of Industrial Science and Technology in the Department of Trade and Economic Development initiates policy and program development in science and technology for economic development. It also coordinates state technology activities involving universities, industry and government. The state's influence is exerted through university-based applied research on technologies with commercial potential and through the transfer of technology to Washington companies for commercialization.

TECHNOLOGY/RESEARCH CENTERS

The Washington Technology Center (WTC) attracts private and federal funds to state universities for commercially promising research in advanced materials, compound semiconductors, computer systems, software manufacturing systems, microsensors, and plant and animal biotechnology. New technologies created by this research are transferred to private companies or entrepreneurial ventures for commercial development; qualified Washington firms are given priority. Also offered is scientific information and consultation to small- and medium-size companies through the Technology Assistance Program. WTC is funded under the Washington Department of Trade and Economic Development, but is administered by its own board of directors. Participating universities include the University of Washington (UW), Washington State University (WSU), Tri-Cities University Center, Seattle University, Gonzaga University, and the State's regional universities.

According to the publication, the Spokane Intercollegiate Research and Technology Institute is being developed by a consortium of Gonzaga University, Whitworth College, Eastern Washington State University, WSU, and Spokane Community College. Operating with research grants and subscriptions from businesses, it is designed to develop advanced technology businesses and otherwise serve Eastern Washington.

SEED/VENTURE CAPITAL

Under this category the publication lists the retail sales and use tax defer and business and occupation tax credit programs, which are described in more detail under Proposal 2.

INFORMATION/NETWORKING

The State works closely with four private industry associations to promote the exchange of information within advanced technology sectors that are important to Washington's economy:

The American Electronics Association Washington Council
The Washington State Biotechnology Association
The Washington Council for Technology Advancement, established under the Greater Seattle Chamber of Commerce
The Washington Software Association.

TECHNICAL/MANAGERIAL ASSISTANCE

The Washington Research Foundation (WRF) is a privately funded agency that provides for the licensing and transfer of intellectual property to industry from the State's universities under contract from WTC, UW, WSU, and the Eastern Washington University. Its primary disclosure source is the University of Washington.

The Washington State University Research Foundation (WSURF) provides the same services under contract from the Department of Trade and Economic Development, WTC, and the same university sponsors. WSURF's primary technology disclosure source is Washington State University.

Within the University of Washington, the Office of Technology Transfer represents its faculty on matters of patents, licenses, disclosures, and other intellectual property.

TECHNICAL TRAINING

Technical training and related managerial assistance in support of advanced technology applications is supported by:

Puget Sound Electronics Training Foundation
Seattle University Software Engineering
Tri-Cities University Center
Private Industry Councils
Washington State Skills Program
Women in Engineering Initiative
UW Computer Science & Technology
Washington Colleges and Universities
Washington Community Colleges
Washington Vocational Technical Institutes

INCUBATOR PROGRAMS

The State's Commission on Vocational Education has, since 1986, assisted private nonprofit groups in developing incubator facilities. Incubator facilities are located in Seattle, the tri-cities area and Spokane.

RESEARCH PARKS

The Washington State University Research and Technology Park, the first of its kind in the Pacific Northwest, is presently being developed by WSU adjacent to its main campus in Pullman. Industrial tenants can share university research resources, hire faculty as consultants, and employ graduate students as part-time skilled workers. The nearby University of Idaho supplies an additional pool of faculty and graduate students, and the two schools have combined annual research funding of $75 million. An advisory group of local and regional firms -- the WSU Research Park Innovation Center -- provides local entrepreneurs with consulting, marketing information, financial advice, and access to investors.

SURVEY OF OTHER STATES

A telephone survey of several states to request information on high-technology programs was attempted; however the results of the survey were inconclusive (survey questions are included in Appendix 2). A publication, entitled Science and Technology Programs in the States, 1992, published by the Advanced Development Distribution, Inc. provided the following information we sought. A summary of the high-technology programs as published in the document follows.

Technology Offices: Forty-four states, including Washington, have boards, commissions, authorities, or offices to oversee and coordinate their high technology efforts. Some merely advise the Governor or Legislature; others actively manage the programs; most are designed to encourage public-private partnerships.

Technology/Research Centers: Usually located at, or affiliated with universities, these centers strive to increase cooperation between academic institutions and technology-based industry. Thirty-eight states, including Washington, support such centers.

Research Grants: Such programs are an important component of the high-tech strategies of 28 states (Washington does not have such a program). There is a continuing emphasis on university participation, although these programs increasingly require matching funds and/or active participation by industrial partners. They may specify particular disciplines and fields or be open-ended, but newer programs put greater emphasis on the commercialization of results.

Seed/Venture Capital: Half of the states (Washington is included, but only the sales and use tax deferral programs are listed) provide or leverage, on a non-equity basis, risk financing for early stage companies that are unable to find traditional sources of funding.

Equity/Royalty Investment: These programs provide capital to companies with commercially feasible products or processes, typically as operating expenses for purchasing land and equipment or for commencing full-scale production. Equity investments provide a financial stake in the company's success, while royalty investments are essentially loans that are repaid to the state based on sales. These programs are a publicly accepted way of recapturing such investments in the seven states that make them, but they remain prohibited in many other states, either by constitutional (Washington included)and statutory provisions or by political sentiment.

Information/Networking: These programs provide both a clearinghouse for business and technical information and catalytic mechanism for getting people and institutions together on a voluntary basis. In the 22 states (Washington is included) that have such programs, there is a growing emphasis on synergy -- coordinating existing university and private sector activities -- and on the creation of passive or interactive computer data bases.

Technical/Managerial Assistance: These programs provide hands-on assistance to technology companies in such areas as business plans, marketing strategies, personnel accounting, and sources of financing. This category also includes those programs using engineering professionals to evaluate products and manufacturing processes to assist firms in adopting enhanced designs and methods. Many involve arranging for needed help from experts in universities or research institutions. (Thirty-seven states, including Washington, offer this service).

Technical Training: Only 12 states (Washington included) identified training programs specifically for high-technology industry, but technical skills are receiving growing emphasis in many "conventional" training programs, particularly in states whose growth is restrained by a large manufacturing workforce that lacks the skills to participate in advanced technology industry. Assistance can take the form of state-run programs or financial or technical support for private training programs.

Incubator Programs: Incubator facilities offer subsidized rent and shared support services for start up companies, often for limited periods of time. They also provide a physical focus for the delivery of technical and managerial assistance. Most incubators are located in or near advanced technology centers, university campuses, or research parks. Few of the 21 states (Washington is included) that support such programs operate the facilities directly; more frequently they help municipalities or public universities set up incubators as components in local economic development strategies.

Research Parks: Fourteen states (Washington is included) also support programs to create research parks, often located near the same universities that house their technology/research centers. Seldom a centerpiece of current state high-tech policies, research parks nevertheless provide a location for carrying out those policies and for attracting a critical mass of technology-based industry.

The following table illustrates how Washington's programs compare with programs available in the states of Arizona, California, Idaho, Maryland, Oregon, Utah, and Virginia.

Table 1

SCIENCE AND TECHNOLOGY PROGRAMS

COMPARISON OF SELECTED STATES

Shaded area indicates state has a program in that category.

	ARIZONA	CALIFORNIA	IDAHO	MARYLAND	OREGON	UTAH	VIRGINIA	WASHINGTON
Technology/Research Centers								
Seed/Venture Capital								
Information/networking								
Technical/Managerial Assistance								
Technical Training								
Incubator Programs								
Research Parks								

*** Represents the Sales and Use Tax and B&O tax credit programs.*

Source: *Science and Technology Programs in the States, 1992, Advanced Development Distribution, Inc.*

HIGH-TECHNOLOGY INDUSTRIES IN WASHINGTON STATE

The State of Washington has developed a reputation as a "high-tech" state, but it is not easy to identify how important high-technology industries are to the state's economy. There is no generally accepted definition of "high-tech" and technology evolves very rapidly. However, some measures of the scale of high-technology industries are presented in the following text and tables.

R. Gary Schweikhardt of Washington Biotechnology Funding, Inc, presents some figures on the high-tech sector in a paper published by the nonprofit economic development coalition, Forward Washington. He states that 900 technology-based companies in the Puget Sound region employed 59,862 workers and had an aggregate market value of more than $32.5 billion in 1992.

Tables 1 to 8 below were constructed using state data sources to provide further detail and another perspective on the importance of high-technology industries to the Washington economy. Employment and payroll information are derived from Employment and Payrolls in Washington State by County and Industry, 1988 and 1991, published by the Department of Employment Security. Employment refers to covered or insured employees in the private sector only.

The data on gross business income comes from the Quarterly Business Review published by the Department of Revenue. It should be noted that there are some differences between the Standard Industry Classification (SIC) assignments used to produce the employment figures and the gross income data. Employment Security assigns SICs on an establishment basis and therefore there may be several for a particular firm with multiple operations. Revenue assigns a single SIC to the firm, based on the activity that produces the majority of its income. Therefore, there may be discrepancies between the firms classified by employment in Tables 6 and 7 and those which are included in Table 8.

The definition of high-tech used in constructing the tables is based on the amount of research and development spending in each three digit SIC or industry. Hadlock, Hecker, and Gannon surveyed manufacturing and selected nonmanufacturing industries in the U.S. and identified those industries where R&D spending was equal to or above the average R&D spending for all industries; those high R&D SICs were defined as "high-tech" ("High-technology Employment: Another View, Monthly Labor Review, July 1991).

The high-tech industries are further subdivided into those that spend at least 150 percent of average R&D expenditures (50 percent greater then average) and those that spend between 100 percent and 150 percent of the average expenditure on R&D. In the following tables, the Small Business Administration

definition of high-tech is used with the qualifier of R&D spending equal to or greater than 150 percent of the national average being added. Tables 6, 7, and, 8 however, provide a complete presentation of the data.

The first set of tables provide an overview of the scale of high-tech business activity in Washington. In Table I, Gross Business Income is the indicator of economic activity. It is evident that, when defined broadly, high-tech represents a significant proportion of Washington business activity.

Table I
GROSS BUSINESS INCOME; WASHINGTON TOTAL AND High-tech
($000,000)

YEAR	WASHINGTON TOTAL	High-tech	High-tech AS A PERCENT OF TOTAL
1988	$195,116	$27,832	14.3%
1991	$259,163	$40,996	15.8%
Percent change	32.8%	34%	10.5%

Source: DOR.

In 1988, as illustrated in figure 1, high-tech cor ed 14.3 percent, or $27.8 billion, of $195.1 billion in gross business incom GBI) reported in the state. By 1991, that was up to 15.8 percent of $259.2 b ion in GBI, or nearly $41 billion.

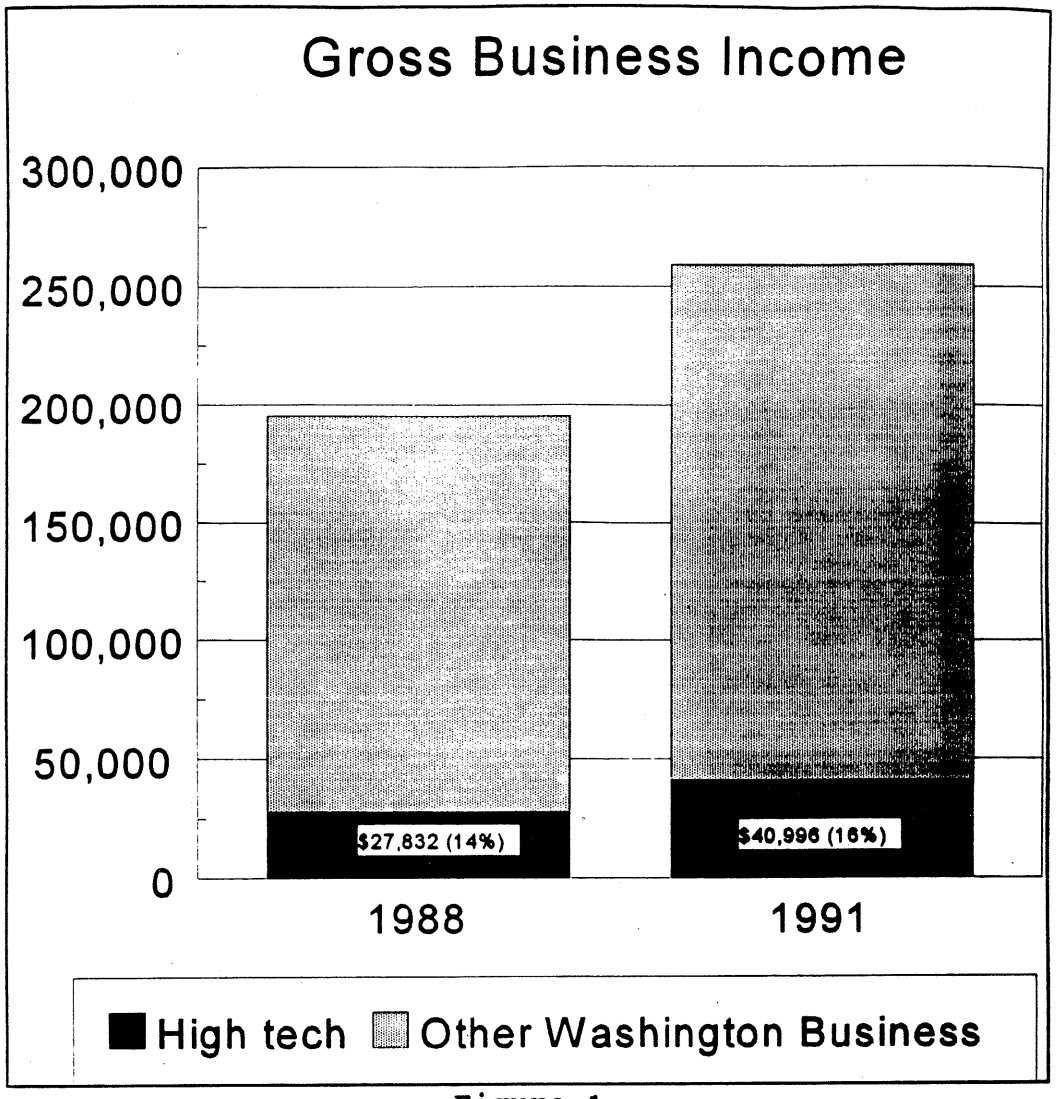

Figure 1

Historically, Washington's economy has been vulnerable to the cyclical nature of the aerospace industry. While many jobs are still tied to aerospace, the emergence of a variety of "high-technology" companies has helped reduce the state's dependence on the fortunes of one industry. As a result of this diversification, Washington has been able to weather the current Boeing downturn, as well as job losses in the timber and metals industries, without falling into recession. While gross business income remained flat during the first quarter of 1993, it never slipped into negative territory and recorded a 2.2 percent gain during the second quarter.

Department of Revenue statistics show that companies engaged in such areas as computer hardware and software, advance electronic devices, biotechnology, the environment, and materials science have helped offset job losses elsewhere in

our economy. Figure 2 illustrates these statistics.

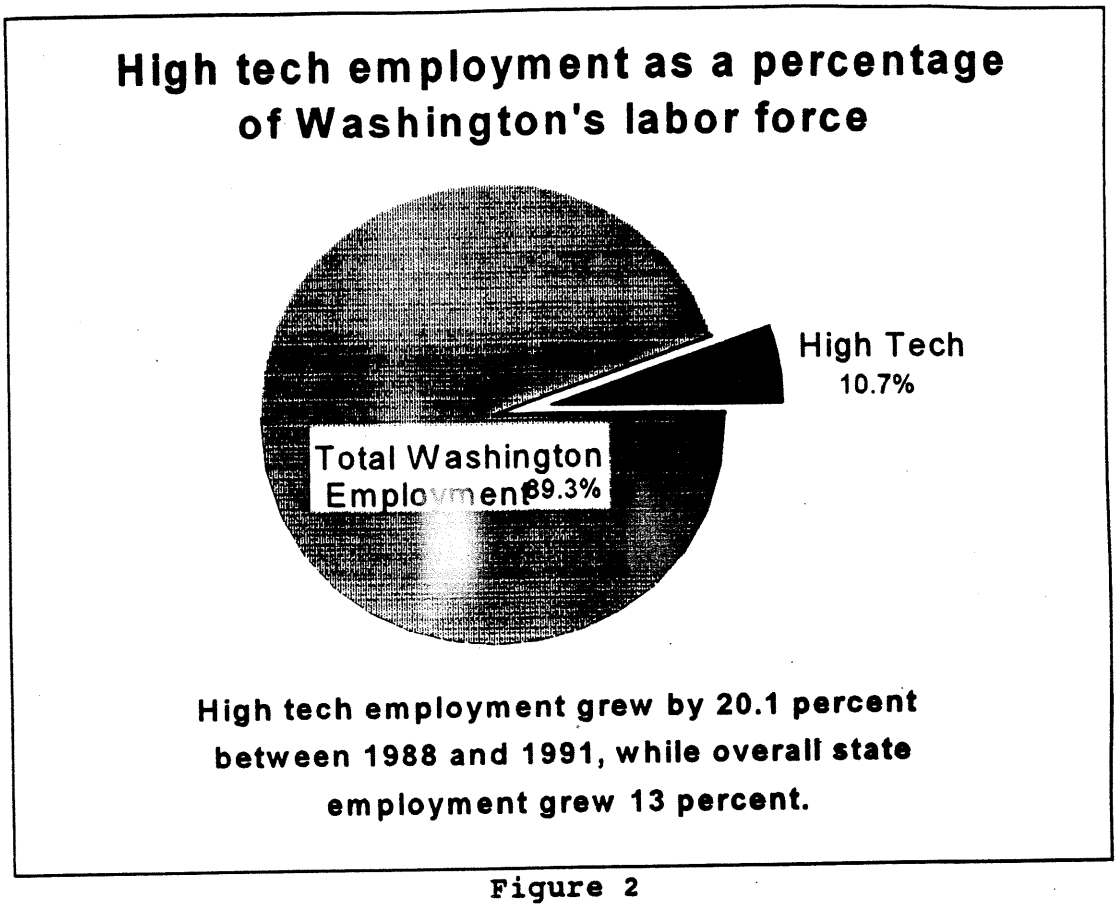

Figure 2

In Table 2 high-tech industries are compared to the rest of the state with regard to employment levels.

Table 2
EMPLOYMENT; WASHINGTON TOTAL AND HIGH-TECH (ETC.)

YEAR	WASHINGTON TOTAL	HIGH-TECH	HIGH-TECH AS PERCENT OF TOTAL
1988	1,911,482	193,286	10.1%
1991	2,160,883	232,164	10.7%
Percent change	13.04%	20.1%	5.9%

Source: Employment Security.

It is clear from Table 3 that the high-tech industries are more capital intensive than labor intensive since the employment ratios are lower than the GBI ratios below. Table 3 presents the relative pay scale for high-tech industries. High-tech industries pay above average wages.

Table 3
PAY SCALE; WASHINGTON TOTAL AND HIGH-TECH
(Average annual wages per FTE)

YEAR	WASHINGTON	HIGH-TECH	HIGH-TECH AS A PERCENT OF WA
1988	$20,779	$33,718	162%
1991	$23,936	$39,790	166%
Percent Change	15.2%	18.0%	2.5%

Source: Employment Security.

Note: Total wages divided by average annual employment, including part time and piece work employees.

Washington companies that spent 150 percent of the United States average on research and development (as a percentage of revenues) paid their workers 66 percent more than the statewide average in 1991. Moreover, pay increases for these high-tech jobs continue to outstrip the broader work force, up 18 percent from 1988-91 compared to 15.2 percent for the average worker. If the aerospace component of these high-tech industries is excluded, high-tech pay jumped 27.4 percent between 1988 and 1991. (See Figure 3)

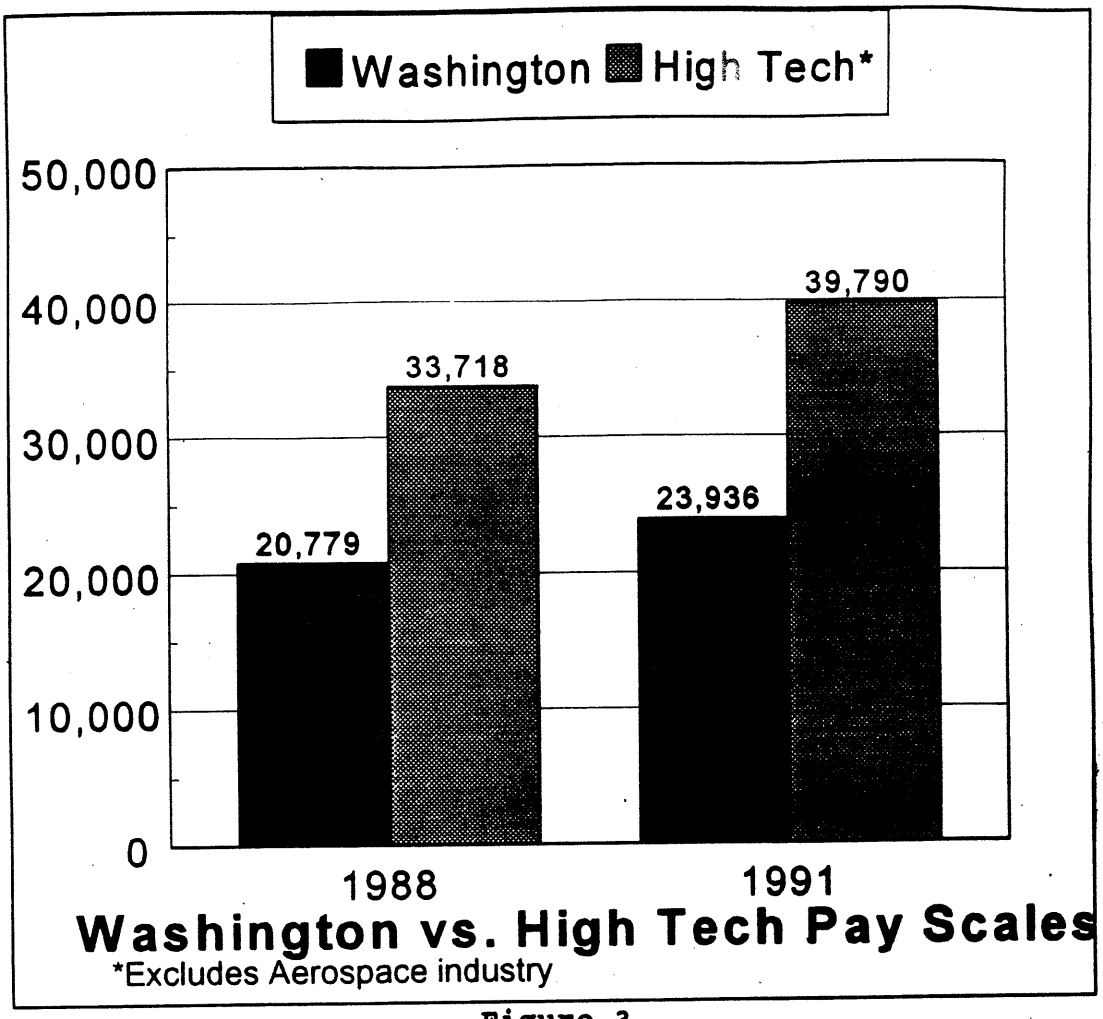

Figure 3

From Table 4 it can be seen that employment in biological research almost tripled between 1990 and 1991. Such a large percentage increase is possible because of the small number of employees involved and because of a rapidly growing economy.

The annual rate of growth in employment fell to approximately 2 percent in 1992 as economic growth in the state declined. As seen in Table 5, average wages for the industry declined 1 percent in 1992 after steady growth the three previous years.

TABLE 4
EMPLOYMENT (#'S)

BIOLOGICAL RESEARCH (COMMERCIAL)
SIC CODE 8731

CALENDAR YEAR	EMPLOYED (MONTHLY AVERAGE)	% INCREASE IN EMPLOYMENT
1988	5,231	
1989	5,092	-2.66%
1990	5,754	13.00%
1991	14,850	158.08%
1992	15,197	2.34%

Source: Employment Security Data

TABLE 5
AVERAGE WAGES ($)

BIOLOGICAL RESEARCH (COMMERCIAL)
SIC CODE 8731

CALENDAR YEAR	EMPLOYED (MONTHLY AVERAGE)	% INCREASE IN EMPLOYMENT
1988	$32,906	
1989	$34,934	6.61%
1990	$36,497	4.47%
1991	$40,006	9.61%
1992	$39,573	-1.08%

Source: Employment Security Data.
Average wage is total wages divided by average employment.

The last five tables present more detailed information. Tables 6 and 7 provide details on employment and pay scale for selected high-tech industries. The

industries were selected for inclusion into these tables because they employ relatively large numbers of workers, and because these SIC Codes all are from the highest R&D category (150 percent of average R&D expenditures).

Tables 8 and 9 that follow provide more detail about employment patterns and pay scales in high-tech industries. These tables present data for all of the SICs defined as high-tech that appear in the Employment Security data. Also available in Table 6 are the relative differences between the two categories of high-tech industries as defined by the amount of R&D spending (100-150 percent and above 150 percent of average R&D expenditures). It is significant that 95 percent of total high-tech employment is attributable to those firms whose R&D spending is at least 50 percent greater than the national average.

The last table, Table 10, provides the same detailed information for Gross Business income.

Table 6
HIGH-TECH EMPLOYMENT IN WASHINGTON: SELECTED INDUSTRIES

SIC CODE	Highest R&D Industries in WA R&D Emp 150% of U.S. Average	Employment 1988	 1991	Changes in Employment Number of Employees	 Percent of Change
	Total WA High-tech Employment	193,286	232,164	38,878	20.1%
			116,869		
	Employment, Excluding Aircraft	92,349		24,520	26.6%
	Aircraft & Parts	100,937	115,295	14,358	14.2%
	Nonferrous rolling & drawing	3,082	2,569	(513)	-16.6%De
	Special industry machinery	2,868	3,165	297	10.4%
357	Computer & office equipment	5,418	6,415	997	18.4%
367	Electronic components & access	5,181	5,111	(70)	-1.4%
371	Motor vehicles & equipment	4,323	3,674	(649)	-15.0%
381	Search & navigation equipment	1,827	3,633	1,806	98.9%
382	Measuring & controlling devices	6,800	5,173	(1,627)	-23.9%
384	Medical instruments & supplies	3,081	4,336	1,255	40.7%
737	Computer & data processing svcs	10,737	16,018	5,281	49.2%
871	Engineering & architectural svcs	13,838	18,950	5,112	36.9%
873	Research & testing svcs	9,760	20,168	10,408	106.6%
874	Management & public relations	6,167	7,392	1,225	

Source: Employment Security

Table 6a
HIGH-TECH PAY SCALE IN WASHINGTON: SELECTED INDUSTRIES

SIC CODE	Highest R&D Industries in WA R&D Emp 150% of U.S. Average	Employment 1988	 1991	Changes in Employment Number of Employees	 Percent of Change
-	Average Pay for High-tech in WA	33,718	39,790	6,072	18.0%
-	High-tech Pay Excluding Aircraft	30,004	38,213	8,209	27.4%
372	Aircraft & parts	37,116	41,389	4,273	11.5%
335	Nonferrous rolling & drawing	32,017	39,667	7,650	23.9%
355	Special industry machinery	26,867	30,565	3,698	13.8%
357	Computer & office equipment	28,912	35,521	6,609	22.9%
367	Electronic components & access	23,508	29,129	5,621	23.9%
371	Motor vehicles & equipment	29,700	33,848	4,148	14.0%
381	Search & navigation equipment	33,333	39,139	5,806	17.4%
382	Measuring & controlling devices	30,221	35,706	5,485	18.1%
384	Medical instruments & supplies	32,057	38,149	6,093	19.0%
737	Computer & data processing svcs	38,881	59,475	20,594	53.0%
871	Engineering & architectural svcs	32,682	37,405	4,723	14.5%
873	Research & testing svcs	27,310	35,803	8,493	31.1%
874		24,908	29,962	5,054	20.3%

Table 7
TOTAL EMPLOYMENT IN WASHINGTON HIGH-TECH INDUSTRIES

SIC CODE	Highest R&D Industries in WA R&D Emp 150% U.S. Average	Employment 1988	Employment 1991	Changes in Employment Number of Employees	Changes in Employment Percent of Change
-	Total WA High-tech Employment	193,286	232,164	38,878	20.1%
-	Employment. Excluding Aircraft	92,349	116,869	24,520	26.6%
372	Aircraft & Parts	100,937	115,295	14,358	14.2%
281	Industrial inorganic chemicals	680	1,737	1,057	155.4%
282	Plastics materials and synthetics	244	183	(61)	-25.0%
283	Drugs	64	552	488	762.5%
284	Soaps, cleaners and toilet goods	190	210	20	10.5%
285	Paints and allied products	832	626	(206)	-24.8%
286	Industrial organic chemicals	204	218	14	6.9%
287	Agricultural chemicals	474	581	107	22.6%
289	Miscellaneous chemical products	294	372	78	26.5%
291	Petroleum refining	1,616	1,908	292	18.1%
335	Nonferrous rolling & drawing	3,082	2,569	(513)	-16.6%
355	Special industry machinery	2,868	3,165	297	10.4%
357	Computer & office equipment	5,418	6,415	997	18.4%
362	Electrical industrial apparatus	930	553	(377)	-40.5%
366	Communications equipment	2,867	1,411	(1,456)	-50.8%
367	Electronic components & access	5,181	5,111	(70)	-1.4%
371	Motor vehicles & equipment	4,323	3,674	(649)	-15.0%
381	Search & navigation equipment	1,827	3,633	1,806	98.9%
382	Measuring & controlling devices	6,800	5,173	(1,627)	-23.9%
384	Medical instruments & supplies	3,081	4,336	1,255	40.7%
386	Photographic equip & supplies	199	137	(62)	-31.2%
737	Computer & data processing svcs	10,737	16,018	5,281	49.2%
871	Engineering & architectural svcs	13,838	18,950	5,112	36.9%
873	Research & testing svcs	9,760	20,168	10,408	106.6%
874	Management & public relations	6,167	7,392	1,225	19.9%
899	Services, not elsewhere classified	331	504	173	52.3%
	Sub Totals	182,944	220,891	37,947	20.7%
	Highest R&D as % of Total	94.6%	95.1%		
	Next Highest R&D Industries				
	R&D Emp. 100-150% of Average				
229	Miscellaneous textile goods	539	438	(101)	-18.7%
261	Pulp mills	2,104	2,157	53	2.5%
267	Misc. converted paper products	2,312	2,603	291	12.6%
348	Ordnance & accessories, n.e.c	24	32	8	33.3%
351	Engines & turbines	91	96	5	5.5%
356	General industrial machinery	511	822	311	60.9%
359	Industrial machines, n.e.c.	3,312	3,450	138	4.2%
365	Household audio & video equip	819	985	166	20.3%
369	Misc electrical equip. & supplies	254	450	196	77.2%
379	Misc transportation equipment	376	240	(136)	-36.2%
	Sub Totals	10,342	11,273	931	9.0%

Source: Employment Security

Table 8
PAY SCALE IN WASHINGTON HIGH-TECH INDUSTRIES

SIC CODE	Highest R&D Industries in WA R&D Emp 150% of U.S. Average	Employment 1988	Employment 1991	Changes in Employment Number of Employees	Changes in Employment Percent of Change
-	Average Pay for High-tech in WA	33,718	39,790	6,072	18.0%
-	High-tech Pay Excluding Aircraft	30,004	38,213	8,209	27.4%
291	Petroleum refining	41,922	46,815	4,893	11.7%
737	Computer & data processing svcs	38,881	59,475	20,594	53.0%
282	Plastics materials and synthetics	37,347	42,528	5,181	13.9%
286	Industrial organic chemicals	37,269	38,577	1,308	3.5%
372	Aircraft & parts	37,116	41,389	4,273	11.5%
281	Industrial inorganic chemicals	36,257	44,963	8,706	24.0%
381	Search & navigation equipment	33,333	39,139	5,806	17.4%
871	Engineering & architectural svcs	32,682	37,405	4,723	14.5%
384	Medical instruments & supplies	32,057	38,149	6,093	19.0%
335	Nonferrous rolling & drawing	32,017	39,667	7,650	23.9%
382	Measuring & controlling devices	30,221	35,706	5,485	18.1%
371	Motor vehicles & equipment	29,700	33,848	4,148	14.0%
366	**Communications equipment**	**28,949**	**36,055**	**7,106**	**24.5%**
357	Computer & office equipment	28,912	35,521	6,609	22.9%
899	Services, not elsewhere classified	27,997	32,806	4,809	17.2%
285	Paints and allied products	27,907	29,932	2,025	7.3%
386	Photographic equip & supplies	27,435	33,081	5,646	20.6%
873	Research & testing svcs	27,310	35,803	8,493	31.1%
355	Special industry machinery	26,867	30,565	3,698	13.8%
289	Miscellaneous chemical products	25,822	31,359	5,538	
287	Agricultural chemicals	25,344	31,553	6,209	24.5%
874	Management & public relations	24,908	29,962	5,054	20.3%
362	Electrical industrial apparatus	23,548	26,009	2,461	10.4%
367	Electronic components & access	23,508	29,129	5,621	23.9%
284	Soaps, cleaners and toilet goods	23,157	25,937	2,780	12.0%
283	Drugs	18,703	43,950	25,246	135.0%
	Next Highest Industries				
	R&D Emp. 100-150% of Average				
261	Pulp mills	36,295	41,631	5,336	14.7%
267	Misc. converted paper products	25,737	28,800	3,063	11.9%
356	General industrial machinery	23,528	29,733	6,205	26.4%
359	Industrial machines, n.e.c.	21,895	24,740	2,845	13.0%
351	Engines & turbines	21,429	35,776	14,348	67.0%
365	Household audio & video equip	17,991	21,034	3,043	16.9%
229	Miscellaneous textile goods	17,477	20,231	2,755	15.8%
348	Ordnance & accessories, n.e.c	16,583	17,838	1,254	7.6%
379	Misc transportation equipment	15,213	21,987	6,775	44.5%
369	Misc electrical equip. & supplies	13,626	15,539	1,913	14.0%

Source: Employment Security

Table 9
GROSS BUSINESS INCOME IN WASHINGTON HIGH-TECH INDUSTRIES

SIC CODE	Highest R&D Industries in WA R&D Emp 150% of U.S. Average	Employment 1988	Employment 1991	Changes in Employment Number of Employees	Changes in Employment Percent of Change
-	Total WA High-tech G.B.I.	27,832	40,996	13,164	47.3%
-	G.B.I. Excluding Aircraft	11,559	15,325	3,765	32.6%
372	Aircraft & Parts	16,272	25,671	9,399	57.8%
281	Industrial inorganic chemicals	679	1,286	607	89.4%
282	Plastics materials and synthetics	60	75	15	24.1%
283	Drugs	65	139	74	112.9%
284	Soaps, cleaners and toilet goods	18	26	8	47.2%
285	Paints and allied products	68	84	16	23.1%
286	Industrial organic chemicals	229	256	27	11.8%
287	Agricultural chemicals	81	92	11	13.5%
289	Miscellaneous chemical products	204	220	16	7.9%
291	Petroleum refining	1,648	630	(1,019)	-61.8%
335	Nonferrous rolling & drawing	34	83	48	140.9%
355	Special industry machinery	259	365	107	41.2%
357	Computer & office equipment	138	256	118	86.0%
362	Electrical industrial apparatus	53	98	45	85.5%
366	Communications equipment	52	110	58	110.6%
367	Electronic components & access	985	1,267	282	28.7%
371	Motor vehicles & equipment	136	138	2	1.3%
381	Search & navigation equipment	5	1	(4)	-77.4%
382	Measuring & controlling devices	629	366	(263)	-41.8%
384	Medical instruments & supplies	279	408	129	46.3%
386	Photographic equip & supplies	27	49	22	80.0%
737	Computer & data processing svcs	1,040	2,953	1,913	184.0%
871	Engineering & architectural svcs	1,179	1,899	720	61.1%
873	Research & testing svcs	607	980	373	61.4%
874	Management & public relations	473	982	509	107.7%
899	Services, not elsewhere classified	78	100	23	28.9%
	Subtotals	25,299	38,536	13,237	52.3%
	Highest R&D Firms as % of Total	90.9%	94.0%		
	Next Highest R&D Industries				
	R&D Emp. 100-150% of Average				
229	Miscellaneous textile goods	24	24	(9e-02)	-0.4%
261	Pulp mills	1,361	1,253	(108)	-7.9%
267	Misc. converted paper products	350	393	44	12.5%
348	Ordnance & accessories, n.e.c	1	0	(1)	-84.8%
351	Engines & turbines	44	49	5	11.1%
356	General industrial machinery	71	67	(4)	-5.9%
359	Industrial machines, n.e.c.	548	548	0	-0.1%
365	Household audio & video equip	9	16	7	79.4%
369	Misc electrical equip. & supplies	22	30	8	34.8%
379	Misc transportation equipment	103	80	(23)	-22.6%
	Subtotals	2,533	2,460	(73)	-2.9%

In summary, high-tech industries represent an important and growing part of the state's economy. Using a broad measure of high-technology based on research and development spending, approximately 15 percent of gross business income in 1991 was derived from the labor intensive high industries. High-tech employment was a somewhat smaller proportion of total employment in 1991, a little more than 10 percent. However, high-tech jobs are desirable because the average wage is significantly higher than state wide average wages.

The rate of growth in the high-tech sectors between 1988 and 1991 is probably not sustainable in the long run. That three year period was one of unusually rapid economic growth, and rates of growth have been substantially lower, if not flat, in the years since 1991. For example, employment in biotechnology jumped 158% in 1991, from an average of 5,754 employees statewide in 1990 to 14,850 in 1991. In 1992, however, employment rose only by 347 employees in the biotech sector, an annual increase of just 2.3 percent.

It is also important to note that by 1991 more than 50 percent of the state's high-tech employment was in industries other than the aircraft industry, when high-tech is broadly defined. Employment and average wages also grew more rapidly between 1988 and 1991 in the non-aircraft high-tech sectors than in the aircraft sector, though gross business income in the aircraft industry exhibited more rapid growth in that period.

WASHINGTON'S RELATIVE "HIGH-TECH" RANKING

There is no generally accepted definition of a high-tech industry; likewise there is no one statistic to accurately measure Washington's high-tech ranking relative to other states. Therefore, a range of data that is often thought to be related to employment in high-technology industries is presented below.

The most common definitions of high-tech involve expenditures on research and development. The following table indicates Washington's ranking relative to the other states with respect to expenditures on research and development (R&D). Sources are described in the end notes.

Table 10
WASHINGTON'S R & D RANKING

Measure of R&D spending	State Rank	Source (Notes)
Total State R&D (1992)	7	DOR (1)
Industry R&D	7	DOR (2)
University R&D	22	CfED (3)
Federal R&D	11	CfED (4)
Small Business Innovation & Research Grants	21	CfED (5)
Patents Issued	20	CfED (6)

Other measures of high-tech involve employment, either in industries defined to be high-tech, or by educated/skilled employees. Washington's relative ranking on various employment measures is presented in Table 11.

Table 11
WASHINGTON'S RANKING BY HIGH-TECH EMPLOYMENT

Employment Measure	State Rank	Source (Notes)
Scientist/Engineers in the workforce	6	CfED (7)
Proportion of work force in high-tech industries	5	Monthly Labor Review (8)

In addition to investment in R&D other measures of firm activity may be related to the growth of high-tech industries.

Washington's rank for these firm activities is listed in Table 12.

Table 12
Washington's Rank in Firm Activities Related to High-tech

Measure of Firm Activity	State Rank	Source (Notes)
Manufacturing Capital Investment (machinery)	18	CfED (9)
New Companies	1	CfED (10)
Venture Capital Investments	6	CfED (11)
Commercial & Industrial Loans	15	CfED (12)
SBIC Financing	39	CfED (13)

Another factor which may be related to the development of high-tech industries is the educational attainment of a state's residents. Washington's rank on various measures of educational attainment is presented in Table 13.

Table 13
WASHINGTON'S EDUCATIONAL ATTAINMENT RANKING

Education Measure	State Rank	Source (Notes)
High School Graduation	19	CfED (14)
Adult literacy	4	CfED (15)
High School Education Attainment	1	CfED (16)
Collage Education Attainment	7	CfED (17)
Science/Engineering Graduate Students	39	CfED (18)

The amount of high-tech industry in a state is related to the state's economic development profile in general and also to state income. Table 14 presents data concerning Washington's income and development relative to the other states.

Table 14
WASHINGTON'S RELATIVE DEVELOPMENT PROFILE AND INCOME

Measure	State Rank	Source (Notes)
Average Annual Pay	18	Statistical Abstracts (19)
Per Capita Income	13	SPR/Dept. of Commerce (20)
Economic Development Grade (Average)	4	SPR/CfED (21)

One last way to analyze Washington's high-tech ranking is through the eyes of high-tech states that are potential competitors. In the special report "Can Massachusetts Compete?" written for the Massachusetts Special Commission on Business Tax Policy, Robert Tannenwald reports that the state of Washington has been identified as one of Massachusetts' six principal high-tech competitors by the Massachusetts Technology Council, along with the states of Arizona, California, Maryland, North Carolina, and Texas. The Council ranks these states as high-technology states in part because they possess skilled labor, good universities, venture capital, and research facilities that high-tech companies find attractive. Also considered in the Technology Council's state ranking is the production of high-

tech products such as computers, software, electrical components, telecommunications equipment, and control instruments.

Notes:

(1) Compiled from Statistical Abstracts of the United States, 1992. Total funds for research and development divided by state population, 1989 data.

(2) Compiled from the Statistical Abstracts of the U.S., 1992. Industry funds for research and development divided by state population, 1989 data.

(3) Corporation for Enterprise Development, CfED. CfED's publication The 1993 Development Report Card for the States is the most comprehensive source and the source for CfED data below. Measure is dollars per capita, Fiscal Year 1991 (Federal).

(4) Dollars per capita, Fiscal Year 1990 (Federal).

(5) SBIR grants may indicate how technologically sophisticated a state's business base is. Dollars per worker, Fiscal Year 1990 (Federal).

(6) Number of patents issued per one million population, 1991.

(7) Number of engineers, architects, surveyors, math and computer scientists, and natural scientists per 1,000 workers, 1989.

(8) "High-technology Employment: Another View" in the Monthly Labor Review, July 1991, by Paul Hadlock, Daniel Hecker, and Joseph Gannon. The authors define by R&D expenditures.

(9) Investment in new and used machinery and equipment as a percentage of value added, 1990.

(10) Number of companies applying for new employment service account numbers, per 1,000 workers, October 1991-September 1992.

(11) Private venture capital fund disbursements, dollars per worker, preliminary 1992.

(12) Domestic commercial and industrial loans as a percent of total domestic loans of commercial banks, 2nd Quarter, 1992.

(13) SBIC's are federally licensed investment companies that offer long term

financing for disadvantaged entrepreneurs. SBIC financing in a state, dollars per worker.

(14) High school graduates as a percent of Fall 1986, ninth grade enrollment, 1989-90.

(15) Percentage of illiteracy among the adult population, ages 18-64, 1985.

(16) Percent of heads of household with at least 12 years of education, 1989-1990.

(17) Percentage of heads of households with at least four years of college, 1989-1990.

(18) Number of science and engineering graduate students in doctorate-granting institutions, per one million population,

(19) Statistical Abstracts of the U.S. 1992. Washington's ranking would be 17th if Washington D.C. were excluded.

(20) U.S. Department of Commerce, in Survey Current Business (April, 1993). Reprinted in State Policy Reports, SPR, first July 1993 issue.

(21) SPR, in the first July 1993 issue, created an average grade for each state from the CfED 1993 Development Report Card. This is an aggregation of the data that the CfED warns against.

PRESENT TAX LIABILITY OF THE HIGH TECH INDUSTRY

Most federal government research grants and funding for contract research are treated as income and taxed at the service and other activities classification of the business & occupation tax.

Income derived from production of a product is treated as income from manufacturing and taxed at the manufacturing classification of the business & occupation tax. Sales for resale are taxable under the wholesale classification of the B&O tax. Sales at retail are taxable under the retailing classification of the B&O Tax. The multiple activities tax credit is available for products produced and sold in Washington, thereby eliminating double taxation that would otherwise result.

All machinery and equipment purchases used in research are subject to the retail sales or use tax.

Sales and use tax deferrals are available to businesses that locate anywhere in the sate, as long as they have not been engaged in manufacturing or research and development activities in this state prior to June 14, 1985. (Chapter 82.61 RCW).

Sales and use tax deferrals are available to research and development, and computer related service businesses locating or expanding their work force, machinery and equipment, and plant complex in a county that has been designated as distressed (currently 22 of the 39 counties qualify) (Chapter 82.60 RCW), neighborhood reinvestment areas or timber impact areas. This program also allows for a waiving of sales and use tax due on direct labor costs resulting from construction and equipment installation contracts. Persons eligible under this program are also eligible for the business and occupation tax credit program.

Business and occupation tax credits of $1,000 for each new full-time employee are available to manufacturing, research and development, and computer related service businesses located in a distressed county, neighborhood reinvestment area, or timber impact area when they create or expand their work force by creating and filling new full-time employment positions for 12 consecutive months. (Chapter 82.62 RCW).

One measure of the tax burden the state places on an industry sector is its business and occupation taxes as a percentage of profits. State taxes averaged 10.3 percent of the profits of a typical manufacturing operation in 1990 (see figure 4), but fully 66 percent of the profits of biotechnology firms. Such a

disparity suggests that the tax burden being placed on research and development activities may be disproportionately high. Biotechnology profit margins also are among the slimmest of service industries, standing at 3.2 percent in 1990. Computer programming companies paid 64.1 percent of their average 3.9 profit margins in taxes, and computer hardware manufacturers paid the equivalent of 27.1 percent of their profits in B&O taxes.

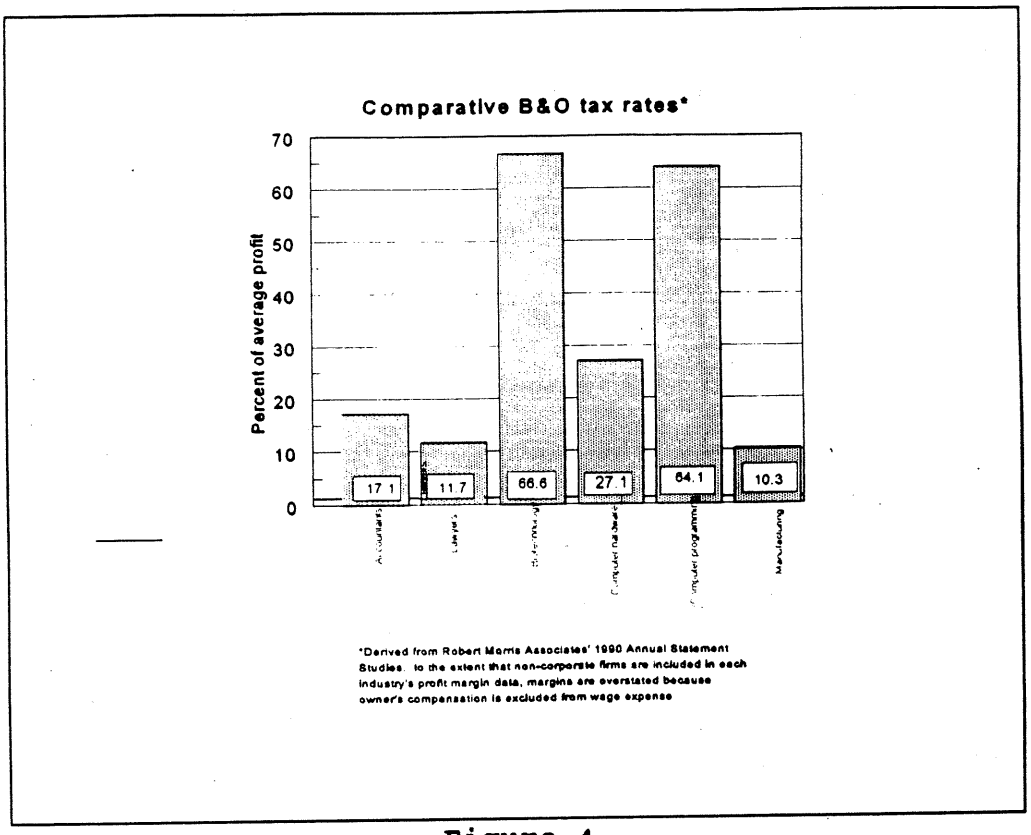

Figure 4

TAX OPTIONS

Incentives for High-Technology proposes two tax incentives to stimulate the creation of R&D jobs: a B&O tax credit for research and development expenditures and a new sales and use tax deferral program to help high-tech companies defer the cost of setting up R&D facilities. Table 3 indicates that wages in high-tech industries are 162 percent of Washington's average wage. Steve Hoddes, in "Advanced Technology Initiatives Possible Goals, Strategies and Policy Options," states that one purpose of advanced technology initiatives is to promote new sources of high-wage jobs. In the same publication he states one of the possible goals is to increase the economic health of existing technology-based firms.

The current economic slowdown, coupled with limited state resources, dictates a highly targeted program of stimulating desirable business growth through carefully targeted tax incentives. Targeting also recognizes that current tax policy presents obstacles to certain types of high-tech companies, especially biotechnology, by taxing them long before they ever turn out a marketable product. (see figure 5)

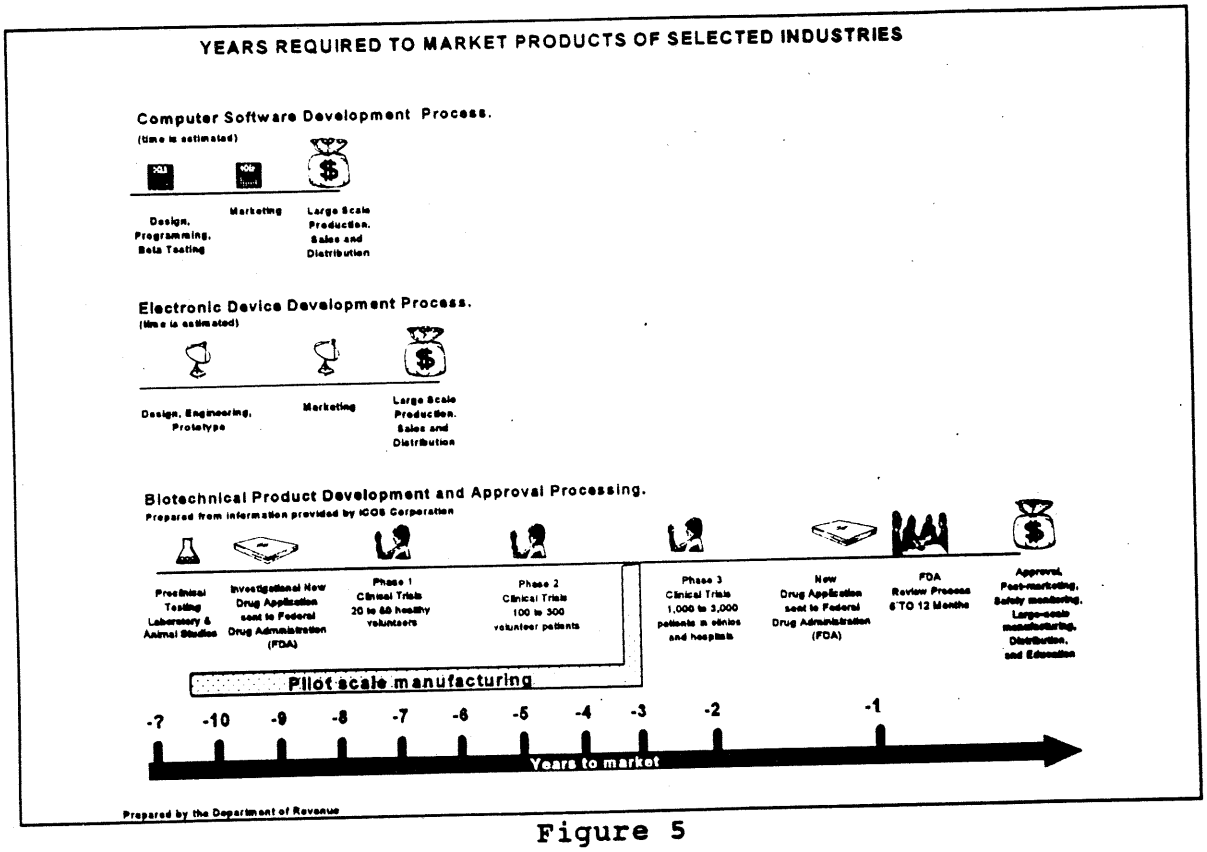

Figure 5

With this in mind the Department has formulated two tax-related proposals for consideration. The two proposals described on the following pages are described in general terms. There are some qualifications which apply to both proposals:

- Primarily engaged: The words primarily engaged are used in the proposals; they mean:

  > Over 50 percent of the gross income of the business results from research and development activities. Once the business qualifies, all gross income of the business would be subject to the threshold (Proposal 2).

- Criteria for incentives: The high, medium, low, and none rankings are assigned in their broadest terms. If a proposal is tied directly to the creation of jobs, for instance, a high rating is given for "Job Creation." On the other hand if a proposal is available to a business in any geographical location in the state, the rating for "Geographic diversification" is none.

PROPOSAL 1.

B&O TAX CREDIT FOR R&D EXPENDITURES

Under this proposal, high-tech companies would receive a credit against the state business and occupation (B&O) tax for certain high-tech research and development expenditures. To qualify, a firm must exceed statewide industry average R&D expenditures by 50 percent and be engaged in specified research and development activities conducted in Washington in the following fields: biotechnology, advanced computing, electronic device technology, advanced materials and environmental technology. Currently, these industries spend approximately 0.61 percent of gross receipts on eligible R&D activities. Therefore, to be eligible, the amount of high-tech R&D expenditures must equal at least 0.92 percent of a firm's gross income.

Research and development expenditures are limited to wages, benefits, supplies and computer expenses incurred by a taxpayer to discover information that is technological in nature and to be used to develop new or improved products, processes, techniques, formulas, inventions or software. R&D spending would not include land or structure; depreciable property; adaptation of existing business components; surveys and studies; duplication of existing business components; foreign research; social science and humanities research; market research or testing; quality control; sales promotion and service; computer software developed for internal use; and research in areas such as improved style, taste, and seasonal design.

The credit would be allowed for R&D work performed under contract or collaborative agreement, as well as for internal R&D done by the firm with no direct compensation. For nonprofit institutions, the amount of the credit would equal 0.515 percent of the firm's eligible expenditures. For all other firms, the credit would be calculated at 2.5 percent of the expenditures. The amount of credit is limited to the firm's B&O liability each year and there is no carry-forward of unused credits. Each firm is limited to a maximum $2 million of credit per year.

The program would contain a sunset date of 10 years after enactment. This should be a sufficient period of time to assist firms that have begun operations in recent years and those that will form during the remainder of the decade. Legislative review after 10 years will allow a reassessment of the results and a policy determination of whether the tax incentives should then be extended.

STATE REVENUE IMPACT

This impact assumes an effective date of July 1, 1994.

Credit for R&D expenditures exceeding the statewide average by 50 percent (limited to maximum of $2 million per firm)

FY 1995	$10.7 million
FY 1996	13.0
FY 1997	14.3

PROS:

Could be quite effective in stimulating business investment and additional high-wage jobs..

Would eliminate most B&O liability for start-up high-tech firms.

CONS:

Potential administrative problems.

Other new and low-profit businesses would want the same treatment.

Hard to measure success of program.

DOES THIS PROPOSAL MEET THE CRITERIA FOR INCENTIVES?

	High	Medium	Low	None
Job Creation	☐	■	☐	☐
High Wage Jobs	☐	■	☐	☐
Economic Stability	☐	■	☐	☐
Environmentally clean industries	☐	■	☐	☐
Geographic diversification	☐	☐	☐	■

PROPOSAL 2

This program allows the deferral of sales and use tax due for new R&D facilities and related equipment in the specified "high-tech" areas: biotechnology, advanced computing electronic device technology, advanced materials and environmental technology.

Under existing programs, any R&D or manufacturing firm locating in a distressed area may defer sales and use tax on construction costs and the acquisition of machinery and equipment. Also, firms that were not engaged in R&D or manufacturing prior to 1985 may defer taxes.

Under this proposal, facilities could be located in any county in Washington. While new construction is not required, facilities must be previously unoccupied by the firm and used primarily for high-tech research or "pilot scale manufacturing." The leasing of existing structures would be included. The repayment scheduling would be separately geared to the completion of the R&D facility and the pilot manufacturing facility.

For biotechnology firms, the deferral period would be five years following completion of the investment, and the tax repayment period would be six years; other industries would have the same deferral/payback period as the existing program (three-year deferral, five-year payback). While any age firm could participate (including those older than 1985), only a one-time usage of the deferral is allowed for each investment program.

This incentive also would include a 10-year sunset clause so its effectiveness can be evaluated.

REVENUE IMPACT:

Assumes an effective date of July 1, 1994.

Sales tax deferral for new R&D facilities:

FY 1995	$ 9.3 million*
FY 1996	19.6
FY 1997	21.5

*Estimated impact for fiscal 1995 is lower than in the 1996-97 biennium because of the time it will take for companies to gear up for the program.

PROS:

Modification of established program.

Should assist in attracting environmentally clean industries to the state.

Allows for tax relief during the research and development years, and low repayment over a period of years.

Should help attrach high wage jobs.

CONS:

Holding the line difficult with Target

Other new businesses not defined as "High-technology" industry may want same treatment. further up chain & distribution other businesses with older technologies

Hard to measure success of program.

Impact on local government.

Negative revenue impact.

DOES THIS PROPOSAL MEET THE CRITERIA FOR INCENTIVES?

	High	Medium	Low	None
Job Creation	☐	■	☐	☐
High Wage Jobs	■	☐	☐	☐
Economic Stability	☐	■	☐	☐
Environmentally clean industries	■	☐	☐	☐
Geographic diversification	☐	☐	■	☐

APPENDIX 1

OTHER NON-TAX RELATED ALTERNATIVES.

- Paid leave for in-state and out-of state specialists while assisting individual or groups of high-tech industries or academic institutions.

- Development of a non-profit entity to provide high-tech reference on-line information as a source for high-technology industries and their vendors.

- Provide an appropriation to develop a special fund mechanism through bond issues to assist in the financing of high-tech businesses locating in Washington.

- Fast track zoning/permit applications for new high-tech businesses locating in Washington.

- Revive the discussion of Business and industrial development corporations (BIDCOs). BIDCO's are private institutions, authorized and regulated by state governments. They are intended to provide a flexible financing tool to supplement existing financial institutions. They can offer a wide range of financing assistance to businesses, including debt financing and equity investments. They are also capable of providing access to the federal Small Business Administration's loan guarantee programs.

  In the states in which BIDCOs have been authorized, they are capitalized with private equity investments, and they also have the capacity to borrow funds in capital markets to finance their operations. BIDCOs supplement existing capital markets and are designed to be able to participate in a wide variety of financial transactions with existing institutions. Existing financial institutions are among the primary investors in BIDCOs in the states in which they presently exist.

  Credits could be provided for investments in BIDCOs against the business and occupation tax, the insurance premium tax, and the public utility tax. Credits are usually on a declining basis and phase out after a number of years.

- Provide funding or a program to develop incubators in various areas of the state. This type of program is usually set up as a component in local economic development strategies.

Incubator facilities offer subsidized rent and shared support services for start up companies, often for limited periods of time. They also provide a physical focus for the delivery of technical and managerial assistance. Most incubators are located in or near advanced technology centers, university campuses, or research parks.

Businesses locating within incubators could be given a lease-hold tax exemption for three years or incubators could be included within the sales tax deferral programs.

APPENDIX 2

SURVEY OF OTHER STATE'S HIGH-TECHNOLOGY PROGRAMS

Seven states, Arizona, California, Idaho, Maryland, Oregon, Utah and Virginia, were surveyed by telephone to determine what incentives were offered in those states for high-technology businesses. The questions asked were:

1. Has your state defined "high-technology"?

2. Does your definition of high-technology depend on:

   Expenditures for research and development?
   Workforce education level?
   Type of product?
   Competitiveness in markets? (includes international)
   Application of modern technologies in the development, refinement, testing, marketing, commercialization, manufacturing or modification of a product?

3. Is your definition in statute?

   What is the reference number?

4. Does your state provide tax incentives for high-technology businesses to either locate in your state or remain in your state? (deferrals, exemptions, credits, property tax relief)

   Please provide the statute number.

5. Do you have any statistics to show the effectiveness of the incentives? (Total tax dollars deferred, credits granted, increased revenue base, increased employment).

6. Do you know of any local government incentive programs?

   Do you have the name of a contact person and phone number?

7. Do you know of any other incentive programs offered by your state? (grants, low interest loans, others)

8. What agency administers those programs?

   Do you have the name and number of a contact person?

9. Do you have any materials you could send me?