

## CHAPTER 3

### GROWTH AND DIVERSIFICATION

This chapter is devoted to measuring the growth of the high technology sector in Washington and diversification of the state's economy. While the previous chapter focuses on the participants in the two high tech incentive programs, this chapter addresses the growth of the high tech sector in Washington in general and makes comparisons to Washington and the U.S. economy.

The main points of this chapter are:

- Washington's share of national high tech R&D employment has remained stable in the last ten years.
- The average annual wage in Washington's high tech sector has increased from \$65,000 in 1995 to \$130,000 in 2001. Excluding computer software (SIC 737), average wages have increased from \$46,000 to \$66,000 during the same time.
- Rural county high tech employment has declined somewhat for the three years for which county breakdowns are available, 1997, 1998 and 1999.
- Manufacturing jobs have declined in Washington as they have in the rest of the nation.
- R&D spending by firms taking the B&O tax credit has increased as a percent of national R&D spending, from 0.8 percent in 1995 to 2.3 percent in 2002.
- Patents for firms in Washington's high tech sectors have increased 180 percent after enactment of the incentives. Almost half of the increase is attributable to the data processing/software patent class.

While the evidence falls short of proving that the state's incentives are the cause of this growth, it suggests that Washington's high tech tax incentives could have had an effect on growth of the high tech sector in this state.

### EMPLOYMENT IN WASHINGTON'S HIGH TECHNOLOGY SECTOR

Washington's high tech sector employment achieved some modest growth in relation to national employment in the high tech sectors from 1990 to 2000. The high tech sector is difficult to identify by industry because high tech activities occur in a multitude of different industrial classifications. However, 12 industries include almost 60 percent of all participants. These categories are as follows:

- Chemical Manufacturing (SIC 2800)
- Computer Manufacturing (SIC 3570)
- Electronic Component Mfg (SIC 3600)
- Trans Equipment Mfg (SIC 3700)
- Instrument Manufacturing (SIC 3800)
- Wholesale Professional Equip (SIC 5040)
- Wholesale Electrical Equip (SIC 5060)
- Retail Electronics (SIC 5730)
- Computer Software (SIC 7370)
- Medical Laboratories (SIC 8070)
- Engineering Services (SIC 8710)
- Research Services (SIC 8730)

**Employment in Washington's High Tech Sector Compared to U.S.**

Washington's share of national high tech R&D employment has remained stable in the last decade for these 12 sectors combined. However, industry-by-industry results are mixed. Some industries gained a slight share, while most maintained their share or declined somewhat. Computer software and electronic component manufacturing have increased in share of U.S. employment. Computer manufacturing and engineering services have declined somewhat.

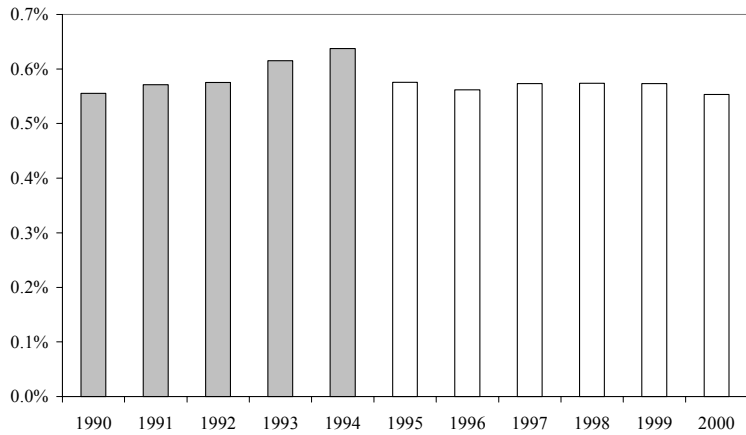
**Table 3.1  
Employment in WA and U.S. 12 High Tech Sectors**

	<b>WA Employment</b>	<b>U.S. Employment</b>	<b>WA Percent of U.S.</b>
1991	252,650	11,088,290	2.3%
1992	254,358	10,986,691	2.3%
1993	252,088	11,005,539	2.3%
1994	258,962	11,163,743	2.3%
1995	256,867	11,577,155	2.2%
1996	271,118	11,987,602	2.3%
1997	296,269	12,498,642	2.4%
1998	313,871	13,034,915	2.4%
1999	308,685	13,311,194	2.3%
2000	313,501	13,743,358	2.3%

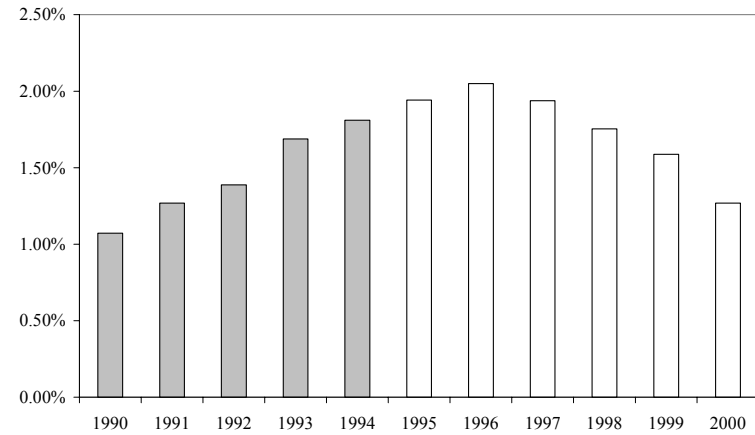
**Charts 3.A**

**Washington High Tech Sector Employment as a Percent of U.S. High Tech Sector Employment**

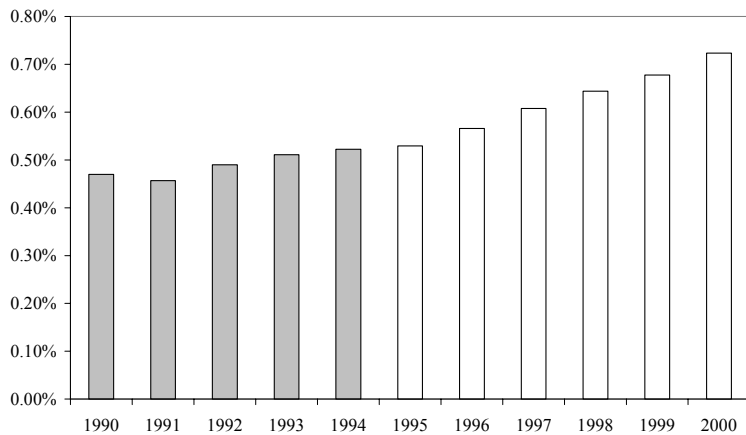
**Chemical Manufacturing (SIC 2800)**



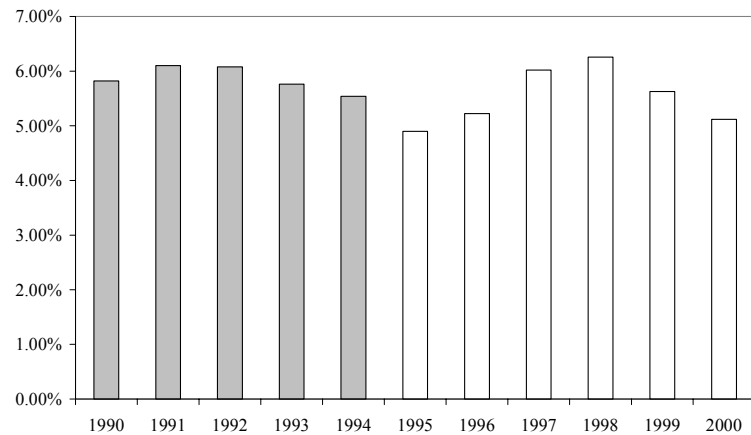
**Computer Manufacturing (SIC 3570)**



**Electronic Component Manufacturing (SIC 3600)**



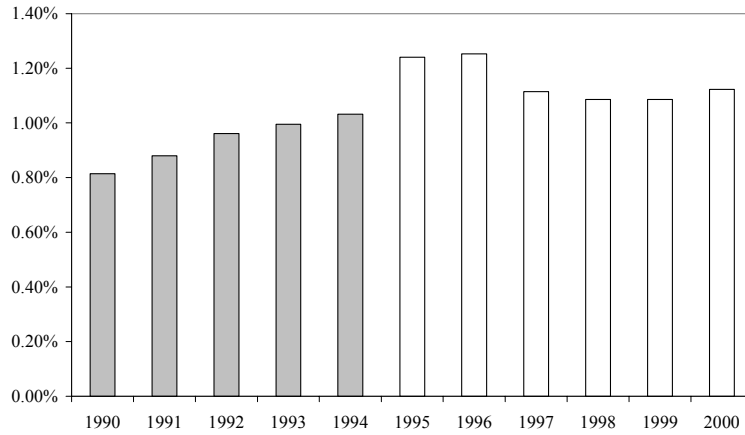
**Transportation Equipment Manufacturing (SIC 3700)**



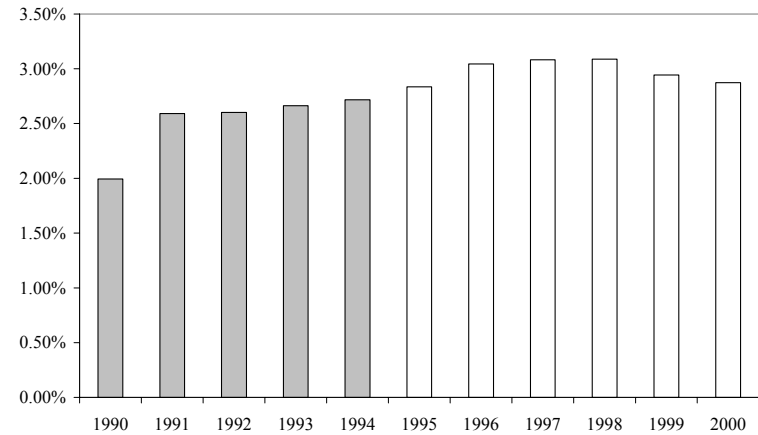
■ Before implementation of high tech incentives

□ After implementation of high tech incentives

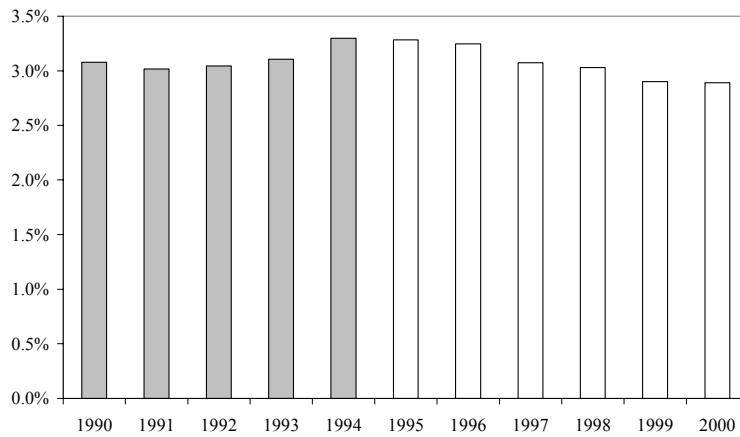
**Instrument Manufacturing (SIC 3800)**



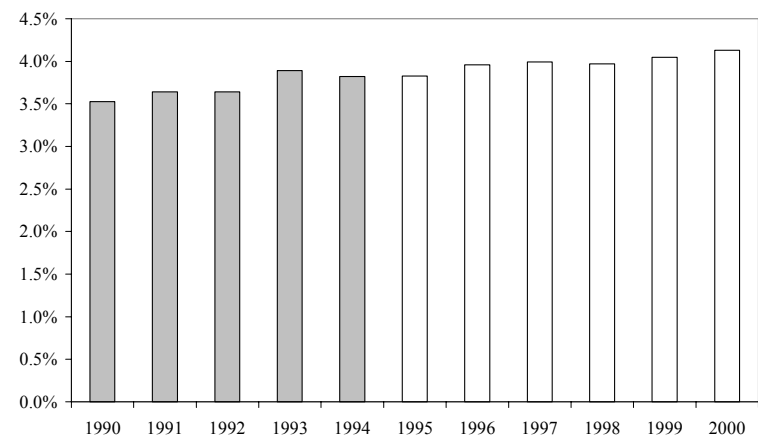
**Wholesale Professional Equipment 5040**



**Wholesale Electrical Equip (SIC 5060)**



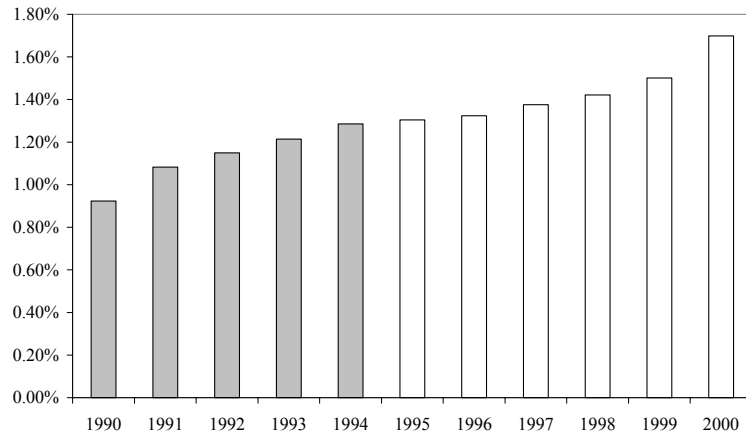
**Retail Electronics (SIC 5730)**



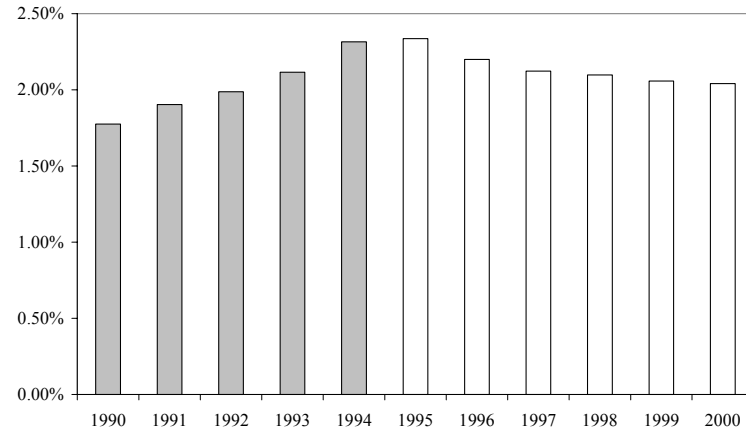
■ Before implementation of high tech incentives

□ After implementation of high tech incentives

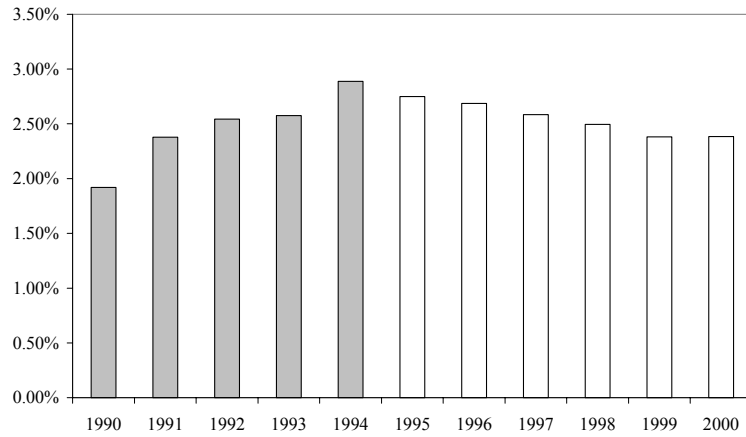
**Computer Software (SIC 7370)**



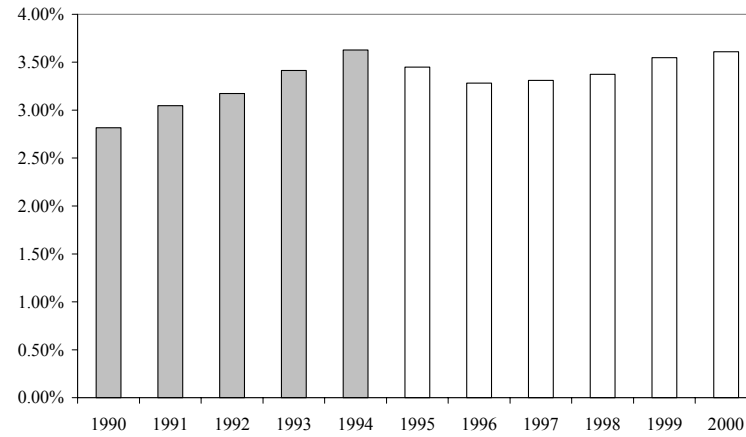
**Medical Laboratories (SIC 8070)**



**Engineering Services (SIC 8710)**



**Research Services (SIC 8730)**



■ Before implementation of high tech incentives

□ After implementation of high tech incentives

### Average Wages for Firms Participating in High Tech Tax Incentives

Average wages for firms identified in the high tech sector have increased significantly from 1995 to 2001, the last year for which employment data are available. The average annual wage has increased from \$65,000 in 1995 to \$130,000 in 2001. Excluding computer software firms, average wages have increased from \$46,000 to \$66,000. The inclusion of software firms tends to inflate wages since stock options valued at the contemporary market rate are included.

**Table 3.2**  
**Average Wages for Firms Participating in the High Tech R&D Tax Incentive Programs\***

	1995	1996	1997	1998	1999	2000	2001
Chemical Manufacturing (SIC 2800)	\$50,082	\$53,755	\$56,037	\$56,356	\$60,773	\$83,789	\$66,182
Computer Manufacturing (SIC 3570)	47,937	50,688	54,661	65,978	72,269	85,771	82,584
Electronic Component Mfg (SIC 3600)	33,473	35,616	35,718	38,038	43,418	46,373	46,696
Trans Equipment Mfg (SIC 3700)	43,041	44,716	47,603	50,008	53,229	57,993	59,880
Instrument Manufacturing (SIC 3800)	45,577	48,505	51,590	62,539	58,249	63,175	62,444
Wholesale Professional Equip (SIC 5040)	61,440	53,155	56,131	64,846	76,827	107,601	81,471
Wholesale Electrical Equip (SIC 5060)	30,007	34,690	39,066	42,115	55,650	61,446	58,226
Retail Electronics (SIC 5730)	49,524	52,199	54,226	62,407	69,091	77,077	68,884
Computer Software (SIC 7370)	109,385	147,829	195,836	273,963	360,956	264,029	203,044
Medical Laboratories (SIC 8070)	50,882	54,257	62,858	72,953	77,470	88,348	80,843
Engineering Services (SIC 8710)	43,995	44,949	48,966	52,282	53,966	56,346	58,780
Research Services (SIC 8730)	45,701	47,786	49,525	54,352	67,829	94,878	68,693
Average Wage All Participants	64,946	79,390	100,785	136,017	183,304	160,254	129,937
Average Wage Excluding Software (SIC 7370)	\$45,551	\$47,280	\$50,101	\$56,776	\$63,451	\$77,728	\$66,474
Average Nonagricultural Wage Statewide	\$27,886	\$29,373	\$30,612	\$32,955	\$35,843	\$37,293	\$36,941

\*The calculation of average wage requires matching employment and wage data that is only available for actual incentive participants.

### High Tech Sector Employment in Rural Counties

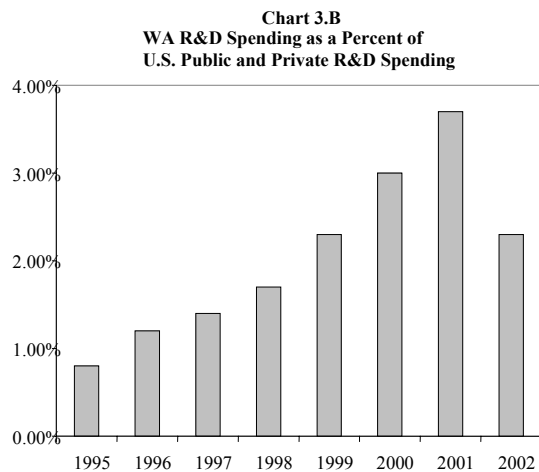
In the three years for which data are available from the Bureau of Labor Statistics, high tech employment in rural counties has declined from 7.9 percent of statewide high tech employment in 1997 to 5.6 percent in 1999.

**Table 3.3**  
**Employees in High Tech Sectors Located in Rural and Nonrural Counties**

	1997	1998	1999	Total
<b>Urban Counties</b>	151,204	164,498	278,564	221,352
Rural Counties	<u>13,021</u>	<u>15,078</u>	<u>16,550</u>	<u>16,233</u>
Total	164,225	179,576	295,114	237,585
Rural Percent of Total	7.9%	8.4%	5.6%	6.8%

**R&D Investment Spending**

The amount of Washington high tech R&D spending for firms receiving high tech tax incentives is reported on the initial survey and declaration. This represents over 75 percent of all R&D spending in the state and is a proxy for growth in R&D investment. High tech R&D spending in Washington has more than tripled relative to national R&D public and private spending, increasing from 0.8 percent in 1995 to 2.3 percent in 2002. The R&D spending in Table 3.4 and Chart 3.B excludes capital spending but includes stock options, which qualify for the B&O credit.



**Table 3.4**  
**High Tech R&D Spending by Firms Taking the B&O Credit as a Share of U.S. Spending**

	Washington R&D Spending	Share of National R&D Spending (Public and Private)
1995	\$1,478,941,000	0.8%
1996	2,387,157,500	1.2%
1997	3,048,773,100	1.4%
1998	3,724,318,700	1.7%
1999	5,563,025,300	2.3%
2000	7,994,269,400	3.0%
2001	10,300,619,900	3.7%
2002	6,811,048,800	2.3%

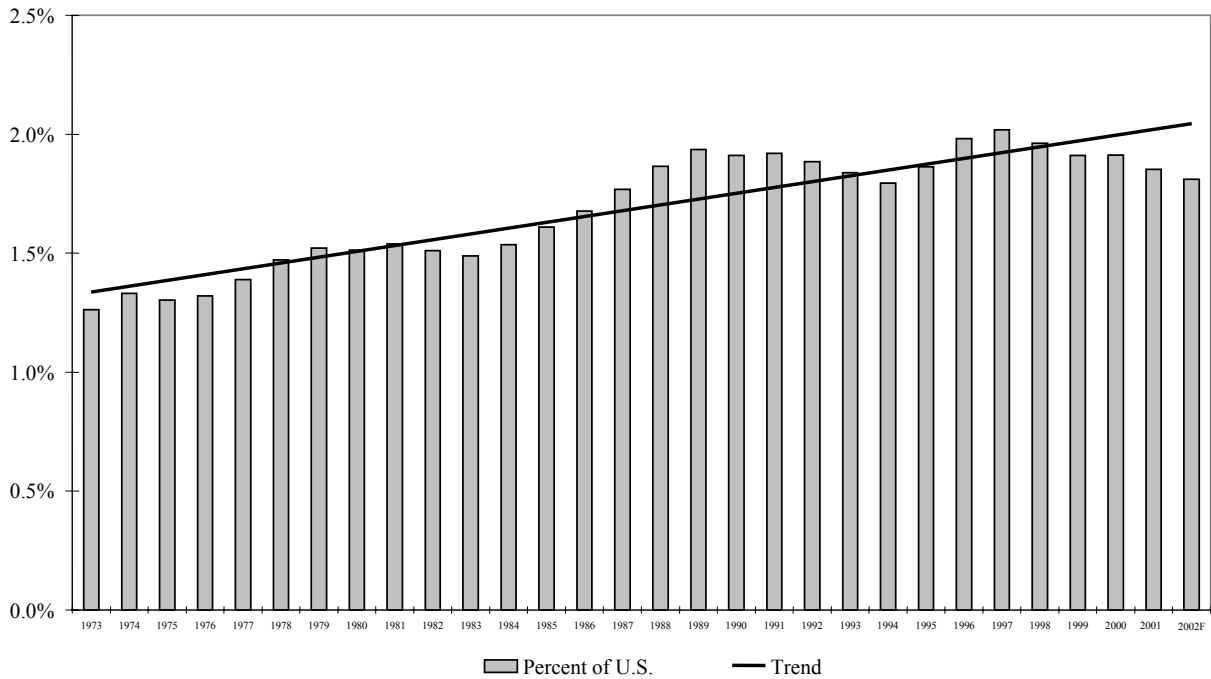
### EMPLOYMENT IN WASHINGTON'S MANUFACTURING SECTOR

The Legislature expressed interest in the manufacturing sector as well as the high tech sector in enacting the high tech R&D tax incentives. RCW 82.63.005 states in part:

The legislature further finds that stimulating growth of high technology businesses early in their development cycle, when they are turning ideas into marketable products, will build upon the state's established high technology base, creating additional R&D jobs and subsequent manufacturing facilities.

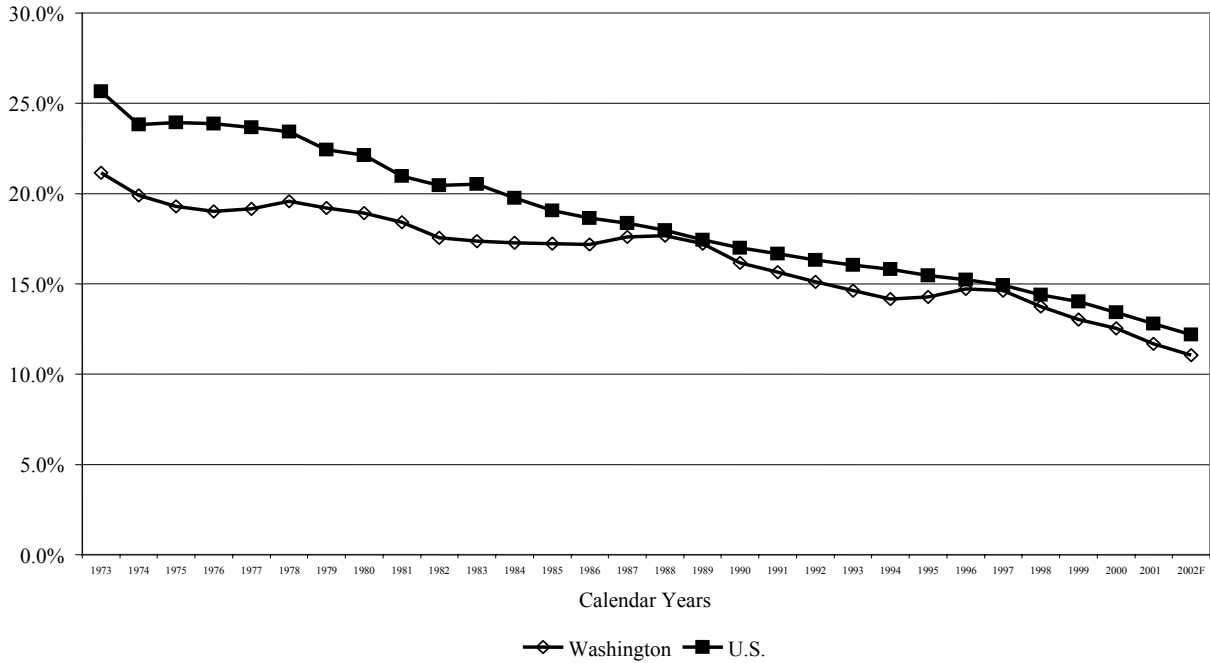
Washington's share of U.S. manufacturing employment has been cyclical over the last 30 years and declined since 1997, but the general trend is up from 1.3 percent in 1973 to the 1.8 percent forecasted in 2002. However, both the U.S. and Washington manufacturing employment is declining as a share of total employment.

**Chart 3.C**  
**Washington Manufacturing Employment as a Percent of U.S.**





**Chart 3.D**  
**Manufacturing Employment as Percent of Total Employment**



**PATENTS GRANTED TO WASHINGTON FIRMS**

Data on patents granted to Washington firms is presented as a measure of growth in product diversification and growth in R&D. Patents are not an exact measure of new research activity or new products, but the wealth of available patent data do allow comparisons of Washington and U.S. trends. It is reasonable to assume that a relative increase in R&D activity leads to more patents which is a step on the way to creating new products. Detailed patent data, available from the U.S. Patent Office, includes patents by year, by patent or industry class, and by location of patent holder.

**High Technology Patents**

The data presented concerns a narrow set of patents, those that are the most related to the five research activities specified in RCW 82.63.010, the high tech sales and use tax deferral. The U.S. Patent Office assigns each patent to one of 394 classes. The 55 classes that are most similar to the Washington high tech activities are listed at length in Appendix A along with Washington's rank relative to other states.

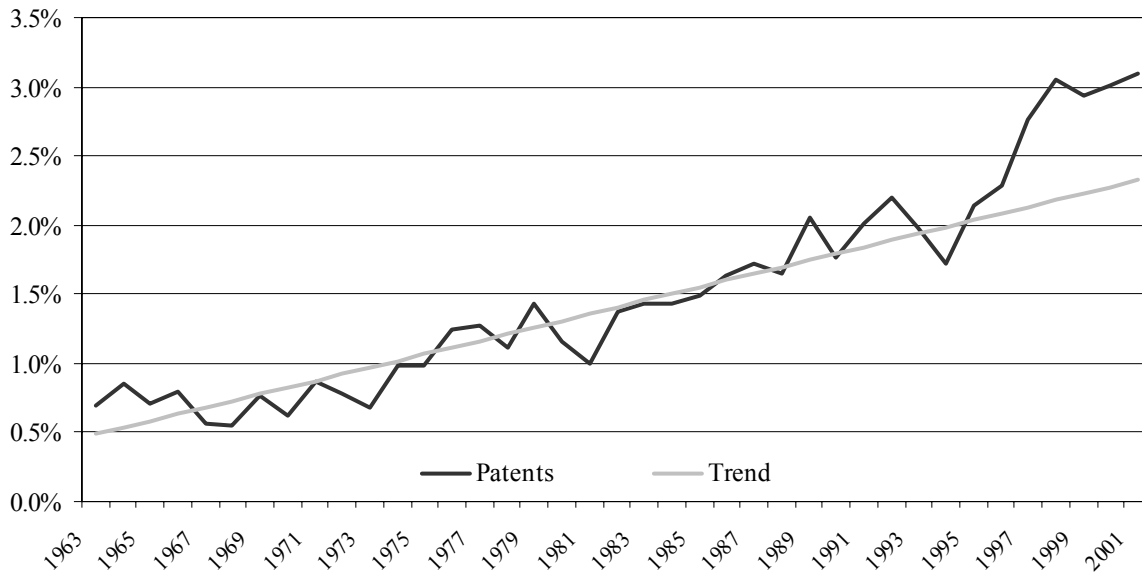
Table 3.5 shows annual high tech patents issued for both Washington and the U.S. at five-year intervals between 1965 and 1990, and every year thereafter. The state's share of high tech patents has grown considerably, rising more than threefold over the last 36 years, from well under 1 percent to over 3 percent of U.S. high tech patents.

**Table 3.5**  
**Patents in High Technology Industries: WA v. U.S.**

Year	Number of Patents		WA
	WA	U.S.	% of U.S.
1965	54	7,684	0.7%
1970	57	9,097	0.6%
1975	103	10,410	1.0%
1980	97	8,333	1.2%
1985	132	8,884	1.5%
1990	219	12,453	1.8%
1991	276	13,703	2.0%
1992	317	14,408	2.2%
1993	306	15,409	2.0%
1994	287	16,658	1.7%
1995	370	17,334	2.1%
1996	453	19,855	2.3%
1997	605	21,910	2.8%
1998	916	30,076	3.0%
1999	921	31,336	2.9%
2000	960	31,880	3.0%
2001	1,069	34,568	3.1%

Chart 3.E plots the Washington high tech patent share of U.S. patents compared to the 30-year trend. This chart shows that Washington's share of U.S. high tech patents jumped noticeably after 1994 compared to the trend.

**Chart 3.E**  
**High Technology Industries: WA as a Percent of US**



Although both the table and chart suggest that the high tech incentive programs have encouraged the growth in Washington high tech patents, the jump in Washington's share of high tech patents in the more recent years might be related to Washington's high concentration of data processing/software activity.

This industry class was responsible for almost half of the increase in Washington's share of patents since enactment of the incentives. The U.S. Patent Office has attributed growth in this area to a surge in electronic commerce and software development along with increasing global competitiveness. Some software developers appear to be patenting smaller components, such as lines of code, within their software programs.