

Business Indicators ♦ March 2004

The US High Technology Sector

Measuring the size of the high technology sector

Most analysts recognize that the high technology sector has played an important role as an engine of growth in the North American economy during the last two decades. Despite this, there is still relatively little hard data about the contribution made to the economy by this sector, primarily because high tech products are produced by many different types of industries, and most statistics are reported based on a more traditional classification of industries.

For some years, BC Stats has been producing estimates of the impact that the high technology sector has on the provincial economy. More recently, the analysis was expanded to include the economies of other large provinces within Canada. While this information has proved useful, there has been no basis for comparing the performance of the high technology sector in this country with that of our important competitors south of the border. This paper represents an effort to provide comparable and consistent high technology statistics for selected US states and for the US economy as a whole.

A BC-based definition

The definition of the high technology sector used to derive the estimates presented in this paper was developed by examining various lists of industries that manufacture or provide high tech goods and services.¹ It includes industries that are clearly high tech in nature, but do not necessarily have much of a presence in this province. On the other hand, some in-

dustries that might be considered high tech related (e.g., computer wholesalers and retailers) have been excluded because there is little or no published information about them.

It should be noted that the definition of the high-tech sector used in this and other BC Stats reports is BC based. For example, battery manufacturing, which has a significant high technology component (due to the fuel cell industry) in this province, but might not be considered high tech in other jurisdictions, has been included. At the same time, it is possible that the definition may exclude some industries that have a high tech component in other regions but not in BC.

What's included in the high tech sector?

NAICS

Code	Description
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325189	Other Inorganic Chemicals
3254	Pharmaceutical & Medicines
3331	Commercial & Service Industry Machinery
334	Computers & Electronic Products
335315	Switchgear, Relay & Industrial Controls
33591	Battery
33592	Communication & Energy Wire & Cable
33599	All Other Electrical Equipment & Components
3364	Aerospace Products & Parts
3391	Medical Equipment & Supplies
5112	Software Publishers
5142	Data Processing
54133	Engineering
5415	Computer Systems Design & Related

Based on Canadian 1997 North American Industry Classification System (NAICS) codes

Estimates were produced for the US as a whole, and for six states where high technology activities account for a larger-than-average share of total employment: California, Colo-

¹ More information on the process used to develop the definition of the high technology sector can be found on our website at:

<http://www.bcstats.gov.bc.ca/pubs/bcbi/bcbi0107.pdf>

rado, Massachusetts, New Hampshire, Oregon and Washington. Together, these states account for nearly 30% of the jobs, and about a third of total gross domestic product (GDP) in the US high technology sector. By comparison, 19% of total employment, and 22% of the US GDP originates in these six states.

US GDP and Revenue Data

The US is still in the process of converting to NAICS as its standard industrial classification system. GDP and revenue estimates published by various agencies in the US are currently reported on a Standard Industrial Classification (SIC) basis.

In the absence of NAICS-based GDP and revenue data, estimates for the US high technology sector were constructed by applying high tech ratios (calculated using data that is reported on a NAICS basis) for manufacturing and selected service industries to SIC industry aggregates for manufacturing, business and "other" services—the industry groupings corresponding to the ratios.

The GDP and revenue estimates presented in this paper should be viewed as preliminary. When published GDP and revenue aggregates have been updated to conform exactly to NAICS definitions, the US high technology numbers in this report will be revised. However, information available to date suggests that adjustments to totals for manufacturing and the other industries will be relatively small, so this is not expected to substantially alter the results.

Once the NAICS GDP data are available, it will also be possible to refine the estimation of real GDP figures for the US high tech sector, using more industry-specific price indexes.

Employment and related statistics are already reported using NAICS classifications.

How big is the US high technology sector?

High technology industries generated about 7% of GDP in the US in 2001², more than dou-

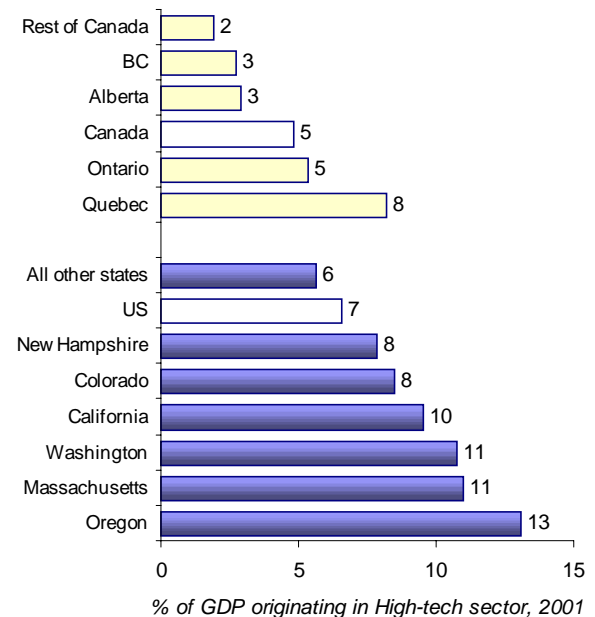
² Data used to generate the high technology estimates in this report come from the online databases of the US Bureau of the Census and the Bureau of Economic Analysis.

2001 is the latest year for which estimates of GDP and other related economic statistics (by state) have been published. The 2002 data is expected to be released later this spring.

The US currently uses 1996 as its base year for calculating real GDP; in Canada, the base year in use is 1997. Therefore, comparisons of the relative size of the high tech sector in the economy are based on current dollar figures.

ble the 3% share in BC, and also substantially more than in Canada as a whole, where high tech activities accounted for just under 5% of the nation's GDP. Among the six states studied, Oregon (13%), Massachusetts (11%) and Washington (11%) were the most dependent on high technology industries in 2001.

High technology industries are important economic drivers in some US states



Data Source: BC Stats

Figure 1

GDP in the US high technology sector reached \$1.0 trillion³ in 2001, compared to \$50 billion for all of Canada. California led the states, with a total high tech GDP of \$201 billion in that year. In BC, high tech industries generated \$3 billion of GDP in 2001, less than one-tenth of Washington's high tech GDP (\$37 billion).

It should be noted that 2001 marked the beginning of a substantial slowdown in the high technology sector. Although GDP figures for 2002 and later years are not yet available, it is

³ Unless otherwise noted, dollar values quoted in this article have been restated in Canadian currency, based on an annual average of the Canada/US exchange rate.

likely that the high technology sector's share of total GDP has declined since 2001.

5.2 million Americans work in high technology industries

The US high tech sector employed 5.2 million people in 2002, about a sixth (878,000) of whom were located in California. High tech firms also employed large numbers of workers in Massachusetts (215,000), Washington (183,000) and Colorado (130,000). There were nearly twice as many high technology workers in California as in all of Canada (474,000) in 2002. Ontario's high technology workforce (213,000) was almost as big as that in Massachusetts. New Hampshire (40,000) was the only state among the six studied where employment in the high technology sector was lower than in BC (45,000).

Overall, about 4% of the US non-farm workforce was employed in high tech industries in 2002. The Canadian average was just under 4%. Among the six states studied, rates ranged from 4% in Oregon to 7% in Washington. In BC, high tech industries employed about 3% of the non-agricultural/fishing workforce.⁴

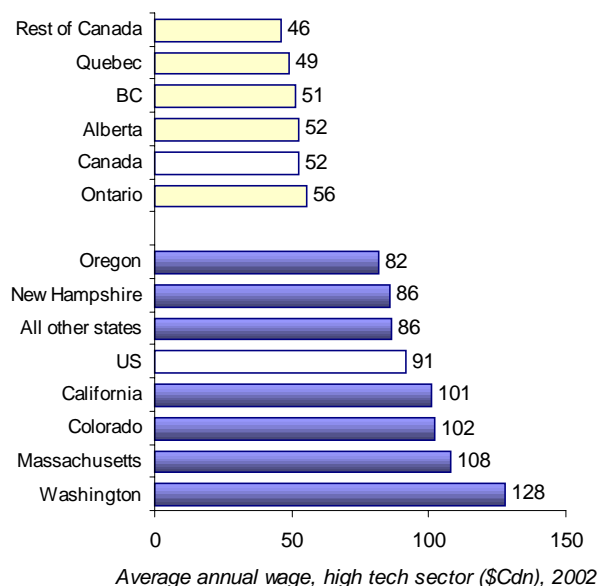
Workers in the US high technology sector earned pay packets totalling about \$474 billion in 2002. The total payroll in Canada's high tech sector was \$25 billion in that year.

Average annual wages in the US high tech sector were about twice as high as in Canada—a differential that is only partly explained by the low value of the Canadian dollar. In Canadian funds, the average worker in the US high tech sector earned about \$91,000 in 2002, compared to about \$52,000 in Canada. High tech workers in Washington (\$128,000) had the biggest average pay packets, reflecting the high wages received by workers in the software publishing industry.

⁴The employment data used in this report comes from an employer survey, so self-employed workers are excluded.

In 2001, high technology firms in the US earned revenues of \$2.0 trillion. Total revenues in the Canadian high technology sector were \$94 billion in the same year.

Average annual wages in the US high tech sector are higher than in Canada



Data Source: BC Stats
Figure 2

High technology industries are key players in the US, especially in the manufacturing sector

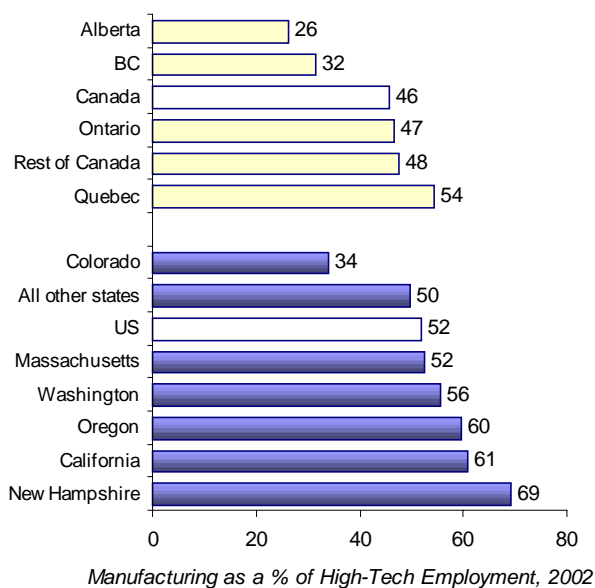
High technology industries play a much bigger role in the US economy than they do in Canada. In some states, high tech industries are key players, particularly in the manufacturing sector.

About 18% of the jobs in the US manufacturing sector are in high technology industries. Among the states studied, high tech firms provide anywhere from roughly a quarter to a third of the manufacturing jobs. Oregon (22%) is least dependent on high technology manufacturing, while high tech industries such as aerospace dominate Washington's manufacturing sector, accounting for 35% of the jobs. Thirty-two percent of all manufacturing jobs in California are in high technology industries.

Twenty-one percent of US manufacturing shipments originate in the high tech sector. Among the six states studied, the dependency on high technology industries is substantially greater, ranging from 32% in Oregon to 45% in both Massachusetts and Washington. For the remaining states, the average ratio is much lower (17%). GDP data show similar trends.

By comparison, the high tech sector is still relatively small in Canada. Overall, about 10% of Canadian manufacturing shipments originated in high technology industries in 2001. Among the four provinces for which data is available, Quebec (20%) was the only region where these industries accounted for a substantial share of total manufacturing shipments. As is the case in Washington, the aerospace industry plays a big role in Quebec's manufacturing sector. Just 6% of British Columbia's manufacturing shipments originated in high tech industries in 2001.

One out of every two jobs in the US high technology sector is in manufacturing



Data Source: BC Stats

Figure 3

Manufacturing dominates US high technology sector

In all but one of the six states studied, manufacturing dominates the high technology

sector. This occurs to a much greater extent in the US than is the case in Canada. In British Columbia, for example, just under a third of the jobs (and a similar percentage of total GDP) are in manufacturing industries.

Colorado (34%) is the only state where manufacturing firms do not account for at least half of the jobs in this sector. In New Hampshire, two out of every three high technology jobs were in manufacturing industries.

The high technology sector since 2001

US data (by region) is not as up-to-date as the comparable figures for Canada, but even though 2001 is the last year for which a complete set of estimates is available, the data clearly show the effect of the recent downturn in the high technology sector. Overall, employment in the US high tech sector was flat in 2001, but plunged 8.8% in the following year, led by a 17.9% decline in New Hampshire. All of the other states studied cut back on the size of their high technology workforce by at least 10% in 2002. In Canada, employment in the high technology sector increased (+2.4%) in 2001, but most of the gain was eroded in the following year, when the number of jobs dropped 1.9%, a decline which was mirrored in BC.

High tech revenues slipped 0.1% in 2001, with sharp declines recorded in both Oregon (-14.5%) and New Hampshire (-14.3%). In Canada, the downturn in revenues was more marked (-7.3%) in 2001, and was followed by a similar drop (-5.6%) in 2002.

Trends since 1997

Trends in GDP and employment since 1997 highlight differences in the stage of development of the high technology sector in the US compared to Canada's. In the US, high technology industries are well established, and play key roles in the economies of states such as Oregon, Massachusetts, Washington and California, where they generate at least 10% of total GDP. Canada's high tech sector is less well developed. This is reflected, to a certain

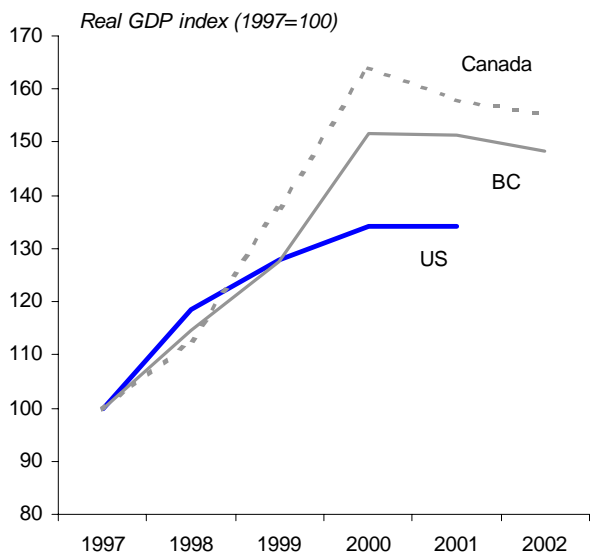
extent, in the sector's performance since the mid-1990s.

In the US, the high tech sector posted solid growth, but did not see the strong gains that occurred in Canada during the late 1990s. Between 1997 and 2001, Canada's high tech sector expanded 58%, compared to a 34% increase in the US over the same period.

This is especially noteworthy since the Canadian economy as a whole lagged the US during this period. Between 1997 and 2001, real GDP in the US expanded 26.3%, compared to a 16.1% increase for all of Canada; however, much of this difference in growth can be traced back to the depreciation of the Canadian dollar. The exchange rate factor (used to convert the US data into Canadian funds) accounted for 11.9% of the increase in real GDP (for both the economy as a whole, and the high technology sector) in the US.

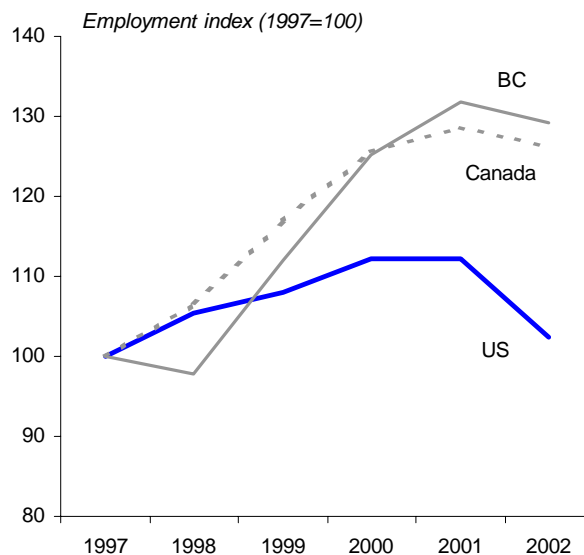
Among the states, Oregon (+91%) posted the strongest gain, while New Hampshire saw the size of its high tech sector shrink between 1997 and 2001. In Canada, Quebec (+68%) was the top performer in the high tech sector.

Canada's high technology sector expanded rapidly during the late 1990s, with GDP increasing substantially more than in the US



Data Source: BC Stats
Figure 4

Job growth in Canada's high technology sector was also more rapid than was the case south of the border



Data Source: BC Stats
Figure 5

Trade in high technology commodities

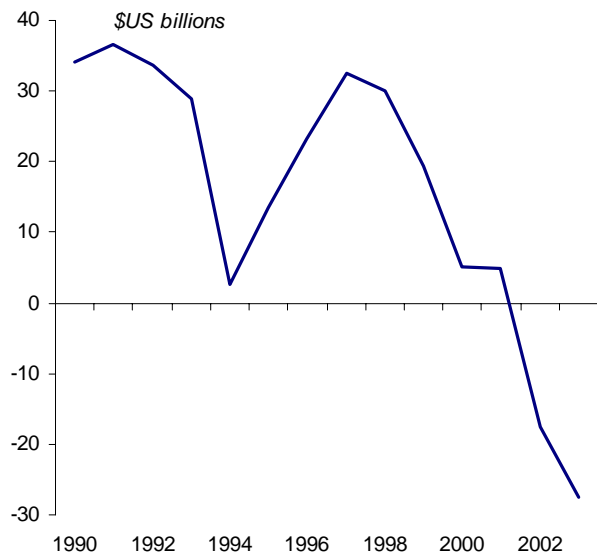
The US exported \$151.5 billion⁵ worth of high technology goods in 2003. Japan was the top destination for high tech goods produced in the US (\$15.6 billion), followed by Canada (\$12.2 billion). The value of high tech exports from the US has been falling for the last three years after peaking at \$197.1 billion in 2000. From 2000 to 2003, US high tech exports dropped 23.1%. The decline was not limited to any particular destination, but rather was distributed across all countries. This slump coincides with the falling fortunes of the high tech sector in general and the rash of dotcom failures occurring in 2001.

US imports of high technology products also fell, dropping 12.1% from a peak of \$222.1 billion in 2000 to \$195.3 billion in 2001. However, since then imports have experienced two consecutive years of increase, climbing to \$207.2 billion in 2003. As a result, the United States balance of trade in high tech goods, which was once a surplus of over \$30 billion, has been in a deficit for the last two years. In 2003, the

⁵ Note: All dollar figures in this section are US dollars.

American high tech trade deficit stood at \$27.4 billion.⁶

US high technology balance of trade moves into deficit



Data Source: BC Stats

Figure 6

China was the top origin for US imports of high tech goods in 2003, at \$29.3 billion, followed by Japan at \$22.4 billion and Mexico at just under \$18.0 billion. Imports from China have skyrocketed over the last decade, rising over 18,000% from \$162.2 million in 1990. Other Asian countries, such as South Korea, Taiwan and Singapore, have also substantially increased the value of their high tech shipments to the United States, although not to the same degree as China. Canada shipped \$13.7 billion worth of high tech goods to the US in 2003, ranking it seventh as a supplier of high tech goods to the United States. This is well down from the peak of \$22.4 billion shipped in 2000.

⁶ Note that the balance of trade is calculated by taking the difference of total exports (including re-exports) and subtracting imports. The \$151.5 billion figure for 2003 excludes re-exports. Total exports in 2003 were \$179.8 billion.

Aerospace products are the primary high tech export from the US. In 2003, the US exported \$47.3 billion worth of aerospace goods. Computers and telecommunications (\$39.4 billion) ranked second, followed by Electronics (\$36.4 billion). The top imported commodities were computers and telecommunications products, with \$110.1 billion worth of these goods entering the US in 2003. Life sciences commodities, which are basically medical device technologies, were the second largest group of high tech imports (\$30.9 billion), followed by electronics (\$25.1 billion) and aerospace goods (\$22.8 billion).

Comparison with Canada and BC

Canadian high technology exports in 2003 were approximately 12% of the value of American high tech exports. High technology commodities comprised 23% of total United States domestic exports in 2003, compared to only 7% in Canada and 2% in British Columbia. However, for imports, the share of high technology products was only slightly higher in the United States, at 17%, compared to 12% in Canada.

High Technology Commodity Exports

\$Million (Cdn)	2000	2001	2002	2003
USA*	\$292,785	\$267,039	\$240,692	\$212,303
Canada	\$42,221	\$34,595	\$28,013	\$25,273
BC	\$923	\$748	\$685	\$628
Alberta	\$4,375.7	\$2,439	\$1,890	\$1,262
Ontario	\$15,186	\$13,513	\$10,282	\$8,388
Quebec	\$20,677	\$16,948	\$14,497	\$14,350

High Technology Commodity Imports

\$Million (Cdn)	2000	2001	2002	2003
USA*	\$329,975	\$302,435	\$307,944	\$290,285
Canada	\$57,512	\$50,393	\$44,421	\$40,804
BC	\$4,475	\$4,480	\$4,077	\$3,739

* Converted from US dollars using an average annual exchange rate

Note that high technology exports for Canada, Alberta, Ontario and Quebec and imports for Canada are based on high tech definitions developed for British Columbia. If these definitions were derived specifically for any of those regions, they might differ slightly