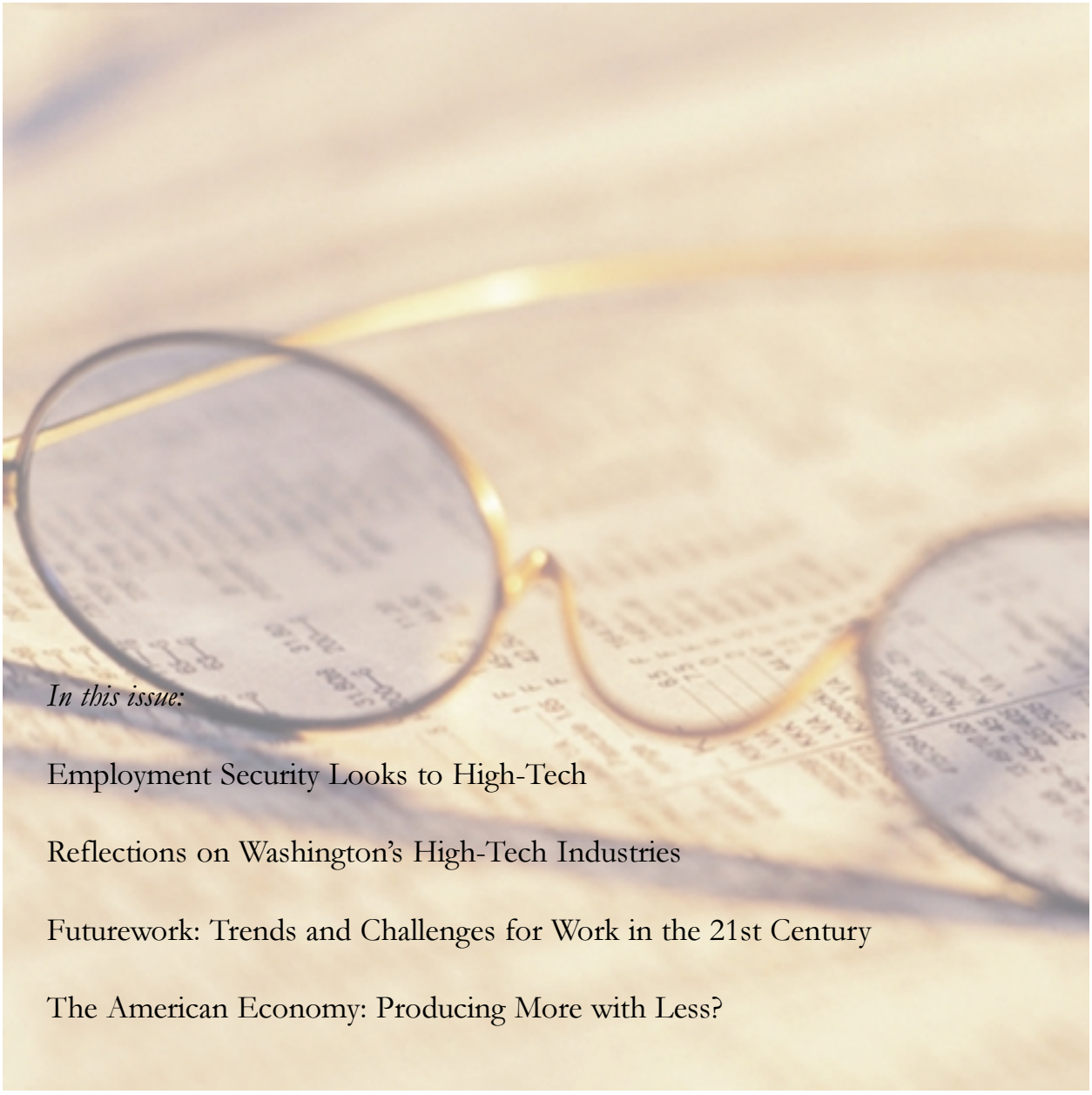
Washington State Employment Security Department

LABOR MARKET INFORMATION

REVIEW

A Quarterly Review of Washington State Labor Market and Economic Trends



In this issue:

November 2000

The *LMI Review* is published by the Labor Market and Economic Analysis (LMEA) Branch of the Washington State Employment Security Department (ESD).

The purpose of the *LMI Review* is to provide timely information and analysis of the state labor market conditions in support of public and private activities that expand employment opportunities and reduce unemployment.

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For additional labor market information, contact our

- *homepage at* ***www.wa.gov/esd/lmea***
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- *Labor Market Information Center (LMIC) at* ***1-800-215-1617***

Employment Security Looks to High-Tech

Commissioner
Carver Gayton

COMMENTARY

A rash of failures of *dot coms* this Fall sent reporters scurrying for information about the plight of these workers, what type of work they did and just how many were out of work. All questions without quick and easy answers.

Reporters who still are pursuing the illusive information on these new jobs will find the feature article in the current *LMI Review*, "*Reflections on Washington's High-Tech Industries*," very interesting. It will add to their understanding of how and why the High-Tech workers' earnings and work habits differ from the norm. There is no agreement on which industries are truly high-tech, much less defined as *dot com*.

The feature article relies on the Bureau Of Labor Statistics' definition that an industry is high-tech if employment of high-tech workers in both research and development accounts for at least twice the share of those in all industries.

Simply put, high-tech workers are found across all industries and have experienced growth in recent years that sometimes make them difficult to identify.

A companion article on occupations for work in the 21st Century gives some insight into the Internet explosion of electronic e-commerce, the business of buying, selling, or conducting other transactions via the Internet.

Of course, Employment Security is working to fine tune our labor market information about these rapidly expanding occupations.

As a major department in a state that is a three-time winner of the Digital State award, Employment Security has a commitment to doing business on the Internet.

We took two major steps recently to meet the challenge to provide more opportunities for citizens to conduct on-line transactions with our department.

Workers laid off from their jobs are now able to file unemployment claims using personal computers from their homes, the library, or any other location where they can access the Internet. Clients can file claims 24-hours a day, seven days a week at *go2ui.com*. Since the service was announced the first of October, more than 4,440 claims had been filed on the Internet through Thanksgiving week.

Meanwhile, the state of Washington has launched a workforce development system, called WorkSource Washington, to make it easier for job seekers and employers to get the help they need.

At the heart of WorkSource is a web site loaded with information and employment features for workers and employers. By visiting the website at *go2worksource.com*, workers can search more than 17,000 local job orders, apply for multiple jobs on-line with a single click and link.

Employers can post and manage multiple jobs on line, search 8,000 resumes, view and use detailed labor market information and link to details on tax credits, business resources and more.

Governor Gary Locke described Washington's use of technology as a groundbreaking relationship between citizens and government, a *dot gov* relationship with the citizen in charge.

Employment Security will continue to build on and strengthen that relationship with our customers. ■

Still Going Strong After All These Years

Second Quarter 2000 QUARTERLY ANALYSIS

State Quarterly Review

During the second quarter, employment increased by 14,000 jobs, while unemployment inched up to 4.7 percent. Manufacturing employment losses slowed considerably, while services employment continued its rise. With prices inching upward during the quarter, there was some concern about accelerating inflation. However, these concerns have been allayed by spending moderation and the uptick in unemployment. In short, there is no reason to think that the state will not complete another year of its outstanding economic performance, which dates back to 1983.

Good Employment Figures

We expect employment to increase during the second quarter of every year. This expectation is based upon years of observation and common sense: students are actively seeking to fill jobs that are only open during the summer months in construction and tourism-related industries. The problem, of course, is that it is hard to discern a secular increase in employment from the regular summer-related surge unless we specifically control for the latter. Thus, employment figures are "seasonally adjusted" to remove the summer effect, leaving only the "trend" or "cycle" effect.

Seasonally adjusted nonfarm employment for the second quarter 2000 was up 19,000 over the first quarter to 2,703,200. In terms of percentage change, this growth was 0.7 percent over the quarter, or 2.9 percent at an annual rate. At first glance, this would appear to be a very strong surge indeed. However, there is one more small adjustment that must be made to the data. The first quarter numbers were artificially low due to the SPEEA strike at Boeing, which makes the over-the-quarter change artificially high. Taking this strike into consideration, the growth in employment would be 14,000 workers, or a 2.1 percent annualized growth rate. This lower number is a more accurate representation of the quarterly change; it is also respectable in its own right. Over the year, nonfarm employment is up 2.8 percent.

Manufacturing, durables, and aircraft and parts employment figures are affected by the same SPEEA strike. This atypical feature leads to over-the-quarter figures showing growth at each level, which smacks in the face of reality. Thus, the figures below account for the strike. As such, manufacturing employment dropped by 0.2 percent, or at an annual rate of minus 0.7 percent, to 354,800. This revision puts the second quarter more in line with the over-the-year change. From June 1999, manufacturing is down 2.6 percent. This is the eighth consecutive quarter of manufacturing cuts; but it is the smallest drop over that time.

Manufacturing's employment figure is the sum of durables and nondurables employment. Durables employment was off 400, or down 0.3 percent, to 246,300. Over the year, employment in durables is down 4.1 percent. Nondurables, on the contrary, moved ahead nearly one percent over the year, or up 1,000 to 108,500. From the first quarter, nondurable goods employment gained 230 jobs, or inched forward by an annual rate of 0.8 percent.

Of course, durable goods employment dropped because of the downsizing in aircraft and parts industries—a trend that is now tapering off. Aircraft and parts dropped only 870 workers from the rolls, or 1 percent of the work force. From June of last year, employment is down 11.4 percent to 88,600.

Construction industries added 1,470 jobs to reach a total of 160,000, an increase of nearly 1 percent. This is an increase of 5.4 percent from this time last year. Note, again, that these figures are seasonally adjusted, taking into account the normal summertime surge in construction employment. Wholesale and retail trade was unchanged from the first quarter, remaining at 651,600 employees. Over the year, however,

wholesale and retail trade added 20,000 jobs, or grew 3.2 percent. Retail trade is up 3.5 percent from June 1999.

Services industries, which account for nearly 30 percent of total nonfarm employment, added 6,450 jobs, an increase of an annual rate of 3.4 percent. Since June of last year, services has surged nearly 5 percent. Such growth isn't consistent across all services industries, however. The fastest growing sub-group of industries is business services, in which employment jumped by 11.8 percent over the year. For the quarter, business services have added 3,300 employees, an increase of an annualized 7.4 percent.

Not-Too-Bad Unemployment Figures

Seasonally adjusted unemployment continued its slow upward trend during the second quarter. The rate rose one-tenth of one percent to reach 4.7 percent, but is below the second quarter 1999 rate of 4.9 percent.

The unemployment rate for the current year is calculated (or if one prefers, estimated) by the Employment Security Department using a Bureau of Labor Statistics model. The primary input to the model is the state's Unemployment Insurance claims rate. Combined with this are a seasonal component and a trend component. Contrary to popular belief, the Current Population Survey is not the primary factor in the model; indeed, the CPS plays little role whatsoever in current-year calculations. The result is that model estimations of the unemployment rate are the most accurate estimations possible.

On the other hand, the CPS plays a significant role in last year's unemployment numbers. For previous years, the unemployment rate is "benchmarked" against the CPS estimates, and forced to conform to certain statistical guides. The result of this is that comparisons to the previous year's estimates can be misleading.

The unemployment rate for the country dropped to 4 percent, well below last year's rate of 4.3 percent.

Personal Income: Plenty to Go Around

More detailed data regarding personal income for the first quarter 2000 are now available from the Bureau of Economic Analysis (BEA). According to the BEA, state personal income increased 1.3 percent for the quarter, down from the fourth quarter's 3.9 percent. Since the end of the first quarter of 1999, personal income was up 9.5 percent. State nonfarm personal income increased at a slightly higher rate of 1.4 percent for the first quarter. Wage and salary disbursements dropped from the fourth quarter's 5 percent rate to a modest 1 percent. The over-the-year increase in wages and salaries was an impressive 11.2 percent.

Earnings in manufacturing were off a pronounced 3 percent for the quarter. Earnings are the sum of wages and salaries, other labor income, and proprietor's income. Most of this decline was due to a steep 4 percent drop in durables, compared to a much smaller one-tenth of 1 percent drop in nondurables. From the first quarter of 1999, earnings in manufacturing have declined 1.5 percent. In the fourth quarter, durables were down 2.6 percent, whereas nondurables earnings were up 2.7 percent. Over the year, durables' earnings sank 4 percent, while nondurables increased 6.1 percent.

Earnings for construction were up 2.9 percent for the quarter. This brings the over-the-year increase to 15.4 percent. Although transportation, communication, and utility wages were up by only two-tenths of one percent for the quarter, from the first quarter 1999, wages have shot up 11.2 percent. Wholesale trade earnings were up 2.9 percent in the first quarter. Retail trade, on the contrary, was down by one-tenth of one percent. From last year's first quarter, both wholesale and retail trades' wages are up nearly 7 percent.

Finance, insurance, and real estate earnings were up 1.9 percent for the quarter. FIRE earnings over the year were up slightly more at 2.1 percent. The big mover-and-shaker in the earnings category was services. For the quarter, services' earnings were up a modest 2.1 percent. However, from first quarter 1999 earnings have

Continued page 4

risen 21.8 percent. Services industries accounted for 41 percent of all private earnings in the state for the first quarter.

Thus, construction and services account for the majority of earnings growth in the state. Over-the-year changes show these two industry divisions as the big winners. This is the labor market at work: these divisions have shown the highest demand for workers, and have responded with the wage increases needed to attract new workers. The primary difference, of course, is that in services, the growth engine has been business services, where earnings are inclusive of stock options, compared to construction where the earnings increases are truly wage gains. Nonetheless, pay them and they will come (to work). For 1999, Washington's per capita income increased 6.1 percent, an increase second only to Massachusetts' rate of 6.5 percent.

At the local level, the Seattle-Bellevue-Everett metropolitan area enjoyed the number two spot in the country for income growth in 1998, according to a newly released study by the BEA. The S-B-E area saw income jump 10.4 percent from 1997 to 1998, and nearly 10.5 percent from 1996-1998. Personal income for the area was $85.2 million in 1998, with a population of 2.3 million. This yielded per capita income of $36,850 for the year.

Prices Bounce Along

Local prices are measured via the Seattle-Tacoma-Bremerton consumer price index (generally referred to as the Seattle CPI). The Seattle CPI was up 3.7 percent for the year ending in June. The nationwide CPI was up 3.3 percent over the same time. Both figures are up from their respective increases of 3.2 percent in the first quarter. This increase reflects several factors: most importantly, it tells the story of increasing energy costs, but also shows the upward pressure on prices exerted by higher housing costs.

Gross State Product: Elite Company

The Commerce Department's Bureau of Economic Analysis released final estimates for Washington's 1998 Gross State Product. Real GSP is an inflation-adjusted measure of the value added in production by the state's labor and property. The latest release covers output from 1992 through 1998. Over that time, Washington's annual average growth rate in real GSP was 4.4 percent. By comparison, the nation's real GDP averaged 3.9 percent during that period.

Washington's growth rate of 4.4 percent placed the state 12th among all states, with Arizona 1st with a growth rate of 7.5 percent. Washington's neighbors to the south and east were in the top ten. Oregon grew at 7.2 percent (2nd) and Idaho grew by 6.1 percent (8th).

Major industry contributions to GSP over the time frame broke down this way: Services added 1.4 percent, FIRE added six-tenths of one percent, transportation another six-tenths, and manufacturing four-tenths of a percent. In comparison, Oregon's manufacturing industries accounted for 3.7 percent of that state's growth—a much more highly concentrated industry mix than in Washington.

National Quarterly Review

The real Gross Domestic Product for the country advanced 5.6 percent in the second quarter 2000, according to the final estimates of the Bureau of Economic Analysis. The revised first quarter real GDP growth was 4.8 percent. These rates are seasonally adjusted annual rates. Most analysts expect growth to slow for the third and fourth quarters to somewhere between 3 and 3.5 percent. The year's growth would top 4 percent in either case, just slightly less than last year's 4.2 percent. Current dollar GDP increased 8.2 percent in the second quarter, reaching a level of $9.95 billion.

The acceleration in the nation's growth was primarily caused by upturns in inventory investment and federal government spending. In the first quarter, inventory investment contracted, thereby subtracting 1.8 percent from real GDP. In

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Figure 1

Nonagricultural Wage and Salary Workers[1]

Washington State, Seasonally Adjusted, In Thousands, Benchmarked: March 1999

Source: *Employment Security and Office of the Forecast Council*

				Numeric Change	
	2nd Qtr 2000	1st Qtr 2000	2nd Qtr 1999	1st Qtr 2000 to 2nd Qtr 2000	2nd Qtr 1999 to 2nd Qtr 2000
TOTAL NONAGRICULTURAL EMPLOYMENT	2,703.2	2,684.2	2,633.8	19.0	69.4
MANUFACTURING	354.7	350.4	366.4	4.3	-11.7
Durable Goods	246.3	242.1	258.5	4.2	-12.2
Lumber & Wood Products	33.3 [2]	33.6 [2]	34.0	-0.3	-0.8
Logging	7.1	7.1	7.4	0.1	-0.3
Sawmills & Plywood	22.6	23.0	22.7	-0.3	-0.1
Furniture & Fixtures	4.9	4.9	4.6	-0.1	0.2
Stone, Clay, & Glass	8.7	8.8	8.7	-0.1	0.0
Primary Metals	11.4	11.5	11.9	-0.1	-0.5
Aluminum	7.0 [2]	7.2 [2]	7.2 [2]	-0.2	-0.3
Fabricated Metals	15.0	15.0	14.4	0.0	0.6
Industrial Machinery & Equipment	25.2	25.2	25.0	0.0	0.2
Computer & Office Equipment	6.3	6.2	6.6	0.1	-0.3
Electronic & Other Electrical Equipment	18.9	18.4	18.7	0.5	0.2
Transportation Equipment	104.8	100.8	117.7	4.0	-12.9
Aircraft & Parts	88.6	84.5	101.6	4.1	-13.0
Instruments & Related	14.8	14.7	14.9	0.1	-0.1
Miscellaneous Manufacturing	9.4	9.3	8.6	0.1	0.8
Nondurable Goods	108.5	108.3	107.9	0.2	0.5
Food & Kindred Products	41.1	40.6	41.0	0.5	0.1
Preserved Fruits & Vegetables	13.6	13.5	13.9	0.1	-0.2
Textiles, Apparel, & Leather	8.5	8.7	8.6	-0.2	-0.1
Paper & Allied Products	15.6	15.7	15.9	-0.1	-0.3
Printing & Publishing	24.5	24.5	24.1	0.0	0.4
Chemicals & Allied Products	6.2	6.2	6.0	0.0	0.1
Petroleum, Coal, Plastics	12.7	12.7	12.3	0.0	0.4
MINING & QUARRYING	3.3	3.3	3.4	0.0	-0.1
CONSTRUCTION	160.0	158.5	151.8	1.5	8.2
General Building Contractors	43.7	43.4	42.1	0.3	1.6
Heavy Construction, ex. Buildings	20.1	20.4	19.3	-0.2	0.8
Special Trade Contractors	96.1	94.8	90.4	1.3	5.7
TRANSPORTATION, COMMUNICATION & UTILITIES	144.7	143.7	138.4	1.0	6.2
Transportation	94.6	94.7	90.9	-0.1	3.7
Trucking & Warehousing	32.0	32.3	32.5	-0.3	-0.5
Water Transportation	8.9	9.0	8.7	-0.1	0.2
Transportation by Air	29.6	29.4	25.7	0.2	3.8
Communications	33.4	32.9	31.8	0.5	1.6
Electric, Gas & Sanitary Services	16.6	16.1	15.7	0.5	0.9
WHOLESALE & RETAIL TRADE	651.6	651.6	632.6	0.0	19.1
Wholesale Trade	157.2	157.1	154.1	0.1	3.0
Retail Trade	494.5	494.5	478.4	-0.1	16.0
General Merchandise	50.8	50.2	49.4	0.7	1.4
Food Stores	71.2	72.0	69.8	-0.7	1.4
Eating & Drinking	182.9	184.1	177.1	-1.2	5.8
FINANCE, INSURANCE, & REAL ESTATE	137.1	136.8	136.9	0.3	0.1
Finance	61.6	61.2	61.1	0.4	0.5
Insurance & real estate	75.5	75.5	75.9	-0.1	-0.4
SERVICES	767.4	760.9	732.3	6.4	35.1
Hotels & Lodging	27.7	27.7	28.5	0.0	-0.8
Personal Services	23.0	23.1	23.2	-0.1	-0.1
Business Services	185.0	181.7	165.2	3.3	19.7
Health Services	189.6	189.5	187.7	0.1	1.8
Educational Services	37.1	36.8	35.6	0.3	1.5
Social Services	60.2	59.8	59.1	0.3	1.1
Engineering & Management Services	69.7	69.4	65.7	0.3	4.1
GOVERNMENT	484.4	479.0	471.9	5.4	12.4
Federal	75.5	69.4	67.2	6.1	8.3
State	139.4	139.0	137.4	0.4	2.0
State Education	74.3	73.9	73.2	0.4	1.1
Local	269.4	270.6	267.3	-1.2	2.2
Local Education	142.0	141.6	141.5	0.4	0.6
Workers in Labor-Management Disputes	2.2	7.2	2.2	-5.0	0.0

1/ Excludes proprietors, self-employed, members of the armed forces, and private household employees. Includes all full- and part-time wage and salary workers receiving pay during the period that includes the 12th of the month. 2/ Excludes workers on strike.

Labor Market And Economic Indicators

Figure 2
Total Nonagricultural Employment Change
Washington State & Nation, Seasonally Adjusted
Source: *Employment Security Department*

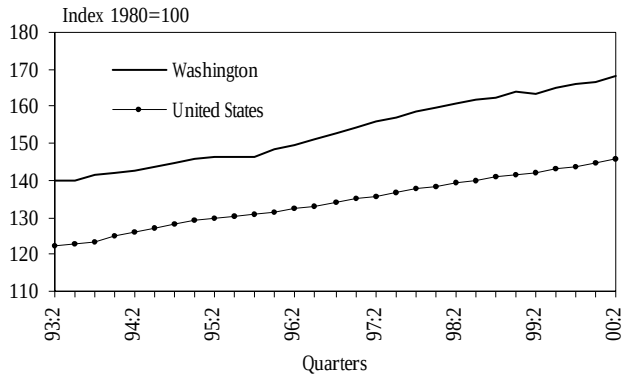


Figure 3
Manufacturing & Nonmanufacturing Employment Change
Washington State, Seasonally Adjusted
Source: *Employment Security Department*

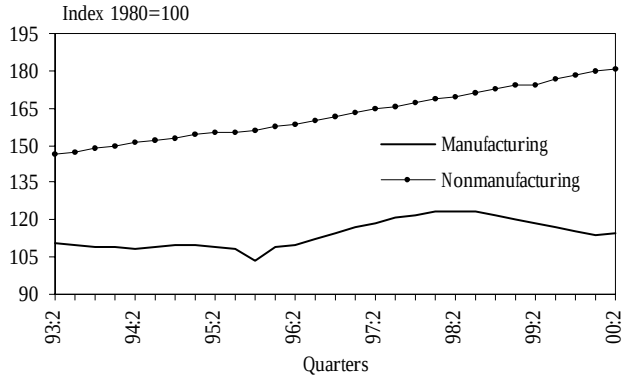


Figure 4
Unemployment Rates
Washington State & Nation, Seasonally Adjusted
Source: *Employment Security Dept., U.S. Dept. of Labor*

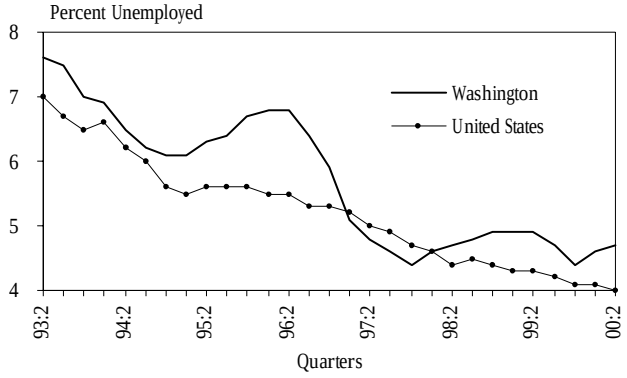


Figure 5
New Housing Units Authorized
Washington State, Seasonally Adjusted
Source: *U.S. Department of Commerce*

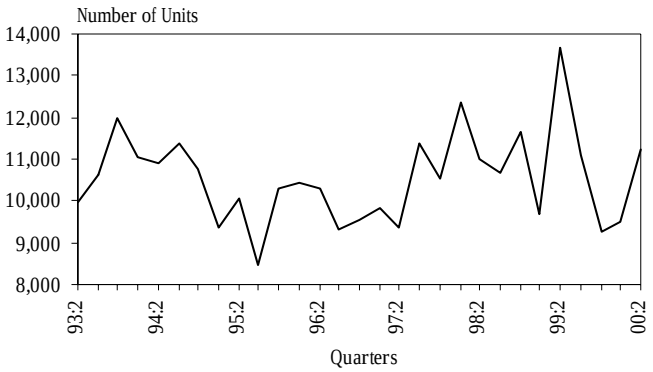


Figure 6
Consumer Price Index
All Urban Customers
Source: *Bureau of Labor Statistics*

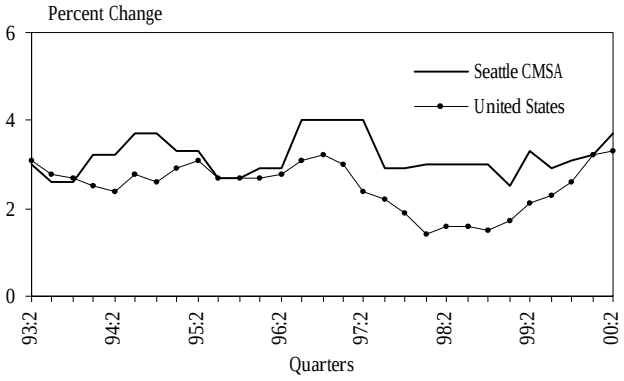
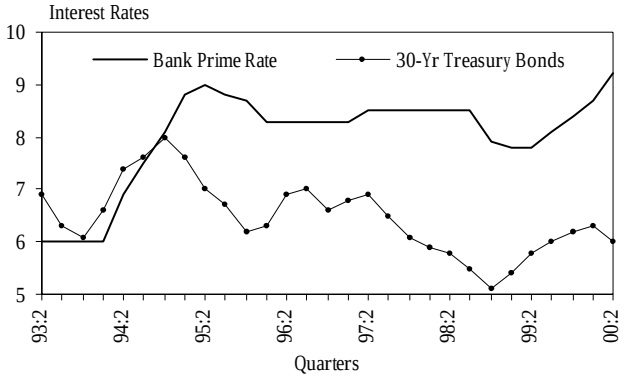


Figure 7
Selected Interest Rates
Percent Annual Rate
Source: *Federal Reserve Board*



the second quarter, inventory investment added 1.7 percent to the total. Federal government spending experienced a similar flip-flop of contribution to real GDP, moving from a minus nine-tenths of one percent to a positive one percent in the second quarter. Inventory investment, also known as unplanned investment, is a residual category that expands or contracts to absorb the difference between current production and final sales. The gist of this accounting tool is to keep the present quarter's output in the present quarter's growth.

The major contributors to growth were nonresidential fixed investment, which added 1.9 percent to real GDP, and personal consumption expenditures on services, which increased real GDP by 1.8 percent. Investment in equipment and software added 1.7 percent. The major drag on growth was no surprise: imports clipped 2.5 percent off of growth for the quarter, much more than the 1.6 subtraction from the first quarter. The difference is due mainly to the increased imports of goods, and particularly imports of capital goods, like computers and telecommunications equipment, as well as consumer goods.

Real personal consumption expenditures (PCE) increased by 3.1 percent in the second quarter, compared to the second quarter's jump of 7.6 percent. PCE on durable goods dropped by 5 percent, after shooting up by 23.6 percent in the first quarter. Moderation was the rule in nondurable goods and services as well, with growth dropping from 6 percent and 5.2 percent to 3.6 percent and 4.6, respectively. The modest growth of PCE was the lowest such growth since the second quarter of 1997, when expenditures grew only 1.9 percent.

Motor vehicle output contracted 4.5 percent in the second quarter. In the absence of motor vehicle output's abatement, real GDP would have grown 6 percent. Continuing its blistering pace, final sales of computers increased a whopping 55.4 percent. Excluding final sales of computers, real GDP would have been a more reserved, though still brow-furrowing quick, 5.2 percent. The production pace in computers tugged down the GDP price index by two-tenths of a percent. In other words, if the computer hardware producers weren't enjoying phenomenal productivity gains, prices would be rising much quicker across the board, as measured by the GDP price index.

Productivity and Labor Costs: Good News

The BEA estimated that business sector productivity shot ahead at 6.5 percent for the quarter. Nonfarm business productivity was at 5.7 percent. Meanwhile the Federal Reserve Board of Governor's productivity estimates for manufacturing came in at 5.4 percent. For durable goods, the rate was a beefy 10.6 percent, offset by a decline in nondurable goods productivity of eight-tenths of 1 percent.

Increasing productivity means that wages can drift upward without increasing unit-labor costs, unless those wage drifts are more significant than the productivity increases. Indeed, unit labor costs in durable goods manufacturing shrank a full 7 percent. In comparison, nondurable goods' productivity rate translated into an increase of unit labor costs of 4.5 percent. For the business sector as a whole, unit labor costs pulled back one-tenth of 1 percent for the quarter. This despite the fact that hourly compensation scaled upward by 6.4 percent, the largest increase in that measure since the fourth quarter of 1997. Changes in unit labor costs reflect changes in both hourly compensation and productivity. As is probably obvious by now, if it weren't for the massive productivity gains in the production of computer hardware, unit labor costs would be showing significant acceleration across the business sector.

The BLS tracks employment costs with its employment cost index (ECI), which is not seasonally adjusted. The second quarter results show that from June of 1999, the compensation costs for all civilian workers increased 4.4 percent, slightly ahead of inflation. Whether this is good news or bad depends upon which side of the paycheck one is on. Wages and salaries increased 4 percent, while benefits costs surged

Continued page 8

5.3 percent over the year. In private industry specifically, wage and salary costs were up 4.1 percent and benefits costs were up 5.7 percent. Both types of compensation costs were more constrained at the government level. The ECI measures changes in compensation costs, which include wages, salaries, and employer contributions for employee benefits.

Not surprisingly, benefits costs have run above wage and salary costs for the third consecutive quarter. For the second quarter, wage and salary costs increased 1 percent, while benefits costs were slightly higher at 1.1 percent, down from a much steeper increase of 2 percent in the first quarter.

Private industry workers enjoyed even higher compensation growth; or, put another way, private industry employers suffered faster growing wage bills than did government industry managers. Goods producing industries saw compensation costs rise 4.8 percent over the year, while up 1.2 percent for the quarter. The largest jump came for aircraft manufacturing where wage, salary, and benefits costs soared 8.4 percent over the year, and 2.1 percent for the quarter. Services producing industries' costs were up 4.4 percent from June 1999, and 1.2 percent from the first quarter. The most significant gains were in business services, with total compensation rising 5.1 percent over the year, and 1.4 percent over the quarter.

Unemployment and Employment: And More Good News

The nation's unemployment rate for the second quarter was a flat 4 percent. This composite rate results from combining the rate among adult men (3.3 percent), adult women (3.7 percent), and teenagers (12.3 percent). The quarterly unemployment rate for Hispanics came in at 5.6 percent, below the rate for Blacks (7.7 percent) and above the rate for Whites (3.4 percent).

Seasonally adjusted nonfarm employment increased 926,000 to 131.5 million over the quarter, or seven-tenths of 1 percent. Most of this gain, 900,000, was due to expansion in the services-producing sector, an increase of eight-tenths of 1 percent. This brought services producing employment to 105.8 million, more than four times the goods employment level of 25.7 million.

The unemployment and employment data are derived from two sources: a household survey and an establishment survey. The household survey yields information on unemployment, total employment, and labor force participation. The establishment survey generates data on payroll employment by industry, weekly hours, and hourly and weekly earnings.

■ *William S. Dillingham*
Senior Economic Analyst

Reflections on Washington's High-Tech Industries

FEATURE ARTICLE

In this election year, high-tech is of high importance. This is true, naturally, because the idea of high-tech has broad implications for the economy as a whole. Think of how innovations translate into productivity-enhancing technology, high-tech workers' earnings and work-habits diverge from the norm leading to sociological changes, and more tech-related consumer products reach the shelves changing the nature of what we consider "necessary" goods. All of this, of course, begins with the worker.

Thus, the visible, yet nebulous concept of high-technology industries in Washington merits a closer look. This article serves up the data on employment and earnings in Washington's high-tech sector.

What the data point to is a surprising conclusion: High-tech industries are not, in general, significantly different from their non-high-tech cousins, in terms of employment growth and wage growth. There are, of course, exceptions—exceptions that tend to obscure the rest of the story. This article brings to light the forgotten high-tech industries. For the sake of comparison, these data are compared to the state's overall employment and earnings numbers.

Definitions

There is no agreement on which industries are truly high-tech. Some lists include everything from fertilizer manufacturing to motion picture production. These lists, however, don't adequately define the category; they simply fill it.

The now-defunct Congressional Office of Technology Assessment described high-tech industries as those "that are engaged in the design, development, and introduction of new products and innovative manufacturing processes, or both, through the systematic application of scientific and technical knowledge." Many analysts have argued that this is too broad in that by this definition the application of technology is sufficient, but not necessary, in making a firm high-tech. The National Science Foundation, for its part, looks at the share of scientists, engineers, and technicians in an industry's employment and the share of total spending going to research and development.

The Bureau of the Census attempted to build support for a general list of high-tech industries by consulting industry analysts. The resulting list was: biotechnology, life sciences technology, opto-electronics, computers and telecommunications, electronics, computer-integrated manufacturing, materials design, aerospace, weapons, and nuclear technology. Many analysts said this was too rigid and limiting because it didn't allow for the affects of technology in industries not commonly thought of as technology driven.

The Bureau of Labor Statistics sought a middle ground by further refining the definition of high-tech industries as those peopled by technology-oriented workers. These workers have an "in-depth knowledge of the theories and principles of science, engineering, and mathematics." This knowledge doesn't require tertiary degrees *per se*, but higher education is generally thought to be required for high-tech work.

The definition used in this paper follows the BLS definition by categorizing an industry as high-tech if employment of high-tech workers in both research and development accounts for at least twice the share of those workers in all industries. The present list includes, but is not limited to, the high-tech industries first published in these pages in December 1997. The new list, like the old, was not created with state-level data, but was created by the BLS using national data. Taking the list as given, then, what is presented here uses state numbers generated by the Employment Security Department.

Some industries on the BLS list, like computers and data processing, are not controversial.

Continued page 10

However, other industries, at first blush, strike one as decidedly not "techy." For example, soap, cleaners, and toilet goods sounds comically non-high-tech. These industries' inclusion speaks to the substance of the definition of high-tech: There are large numbers of high-tech workers in the research and development branches of these industries.

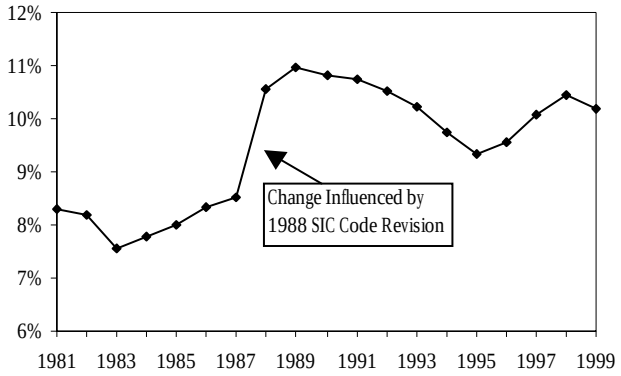
A note on average wages: The high-tech average wages used here are "weighted," as opposed to "simple'" averages. This method of computing an average takes the relative size of an industry into account. Thus, industries that accounted for larger shares (compared to other high-tech industries) of the state's total wages had their average wages weighted by more in the process of determining the high-tech average wage. For example, the simple average high-tech wage for 1999 was $87,650; the weighted average was $137,930. A weighted average gives a more realistic picture of the high-tech sector's average wage structure.

Employment

The two decades worth of data presented here offer the most detailed analysis of state-level data to date. The first statistic to note is that over the period from 1981 to 1999, high-tech employment accounted for an average of 9.5 percent of total state employment. As *Figure 8* makes clear, however, the high-tech share has been anything but steady. Furthermore, there was an unusual shift in the data in 1988. The reason: Data on employment and wages are collected and categorized by industry code. When the code changes, large numbers of workers "move" from one industry to another, even though nothing economic was associated with the change. This was the case in 1988 when there was a large upward shift in high-tech employment due to nothing other than a code change.

Figure 9 shows how employment has grown on average for each of the 32 industries over the relevant time period. Also included are the average high-tech and overall state employment

Figure 8
High-Tech Employment as a Share of Total Employment
Washington State, 1981-1999
Source: *Employment Security Department*



growth rates. Over the 19-year period, high-tech employment has grown faster than the statewide average—4.3 percent versus 2.8 percent. Note that the high-tech average is *not* the average of the high-tech industries' averages; rather, it is an average of total high-tech employment growth.

The table shows that the high-tech composite's average employment growth and the state's average employment growth are right in the middle of the list. Employment in just a few more than half of the high-tech industries in Washington grew faster than the state average. Somewhat fewer than half of the high-tech industries grew slower than the state. From this it is hard to conclude that high-tech was and is the dominant employment growth-sector of the state's economy. This conclusion is reinforced when growth rates are looked at over time. *Figure 10* compares high-tech's employment growth rates with the state's.

From this figure, it is clear that high-tech employment is more volatile than statewide employment. Further, it appears that high-tech's higher average growth rate over the entire 19-year span is due to the strong spike in the late 1980s. In fact, in 1988 the ordinance and search/navigation equipment industries experienced atypically strong growth due primarily to code changes. Overall, volatility appears to be due primarily to strong employment swings in aircraft and parts, a major player in high-tech.

Figure 11 shows the geographical concentrations of high-tech workers by county for 1999. Snohomish County boasts the highest ratio of

Figure 9
Employment Growth by Industry
Washington State, 1981-1999
Source: *Employment Security Department*

Industry	Growth	Industry	Growth
Ordnance and Accessories, NEC	372.0%	Engineering & Architectural Services	4.5%
Engines and Turbines	26.7%	**Hi-Tech**	**4.3%**
Search and Navigation Equipment	18.4%	**State**	**2.8%**
Misc. Electrical Equipment & Supplies	17.3%	Special Industry Machinery	1.9%
Household Audio and Video Equipment	14.7%	Measuring and Controlling Devices	1.8%
Drugs	12.3%	Aircraft and Parts	1.8%
Computer and Data Processing Services	11.6%	Construction and Related Machinery	1.5%
Electrical Industrial Apparatus	8.0%	Petroleum Refining	0.6%
Motor Vehicles and Equipment	7.6%	Agricultural Chemicals	0.4%
Management and Public Relations	7.1%	Communications Equipment	-0.1%
Medical Instruments and Supplies	6.6%	Guided Missiles, Space Vehicles, Parts	-0.7%
Electronic Components and Accessories	6.4%	Industrial Organic Chemicals	-1.0%
Miscellaneous Chemical Products	6.4%	Paints and Allied Products	-1.8%
Research and Testing Services	6.0%	Photographic Equipment and Supplies	-2.3%
Soap, Cleaners, and Toilet Goods	5.8%	Industrial Inorganic Chemicals	-2.4%
Computer and Office Equipment	5.5%	Electric Distribution Equipment	-2.8%
General Industrial Machinery	4.9%	Plastics Materials and Synthetics	-3.1%

Figure 10
Employment Growth Rates Compared
Washington State, 1981-1999
Source: *Employment Security Department*

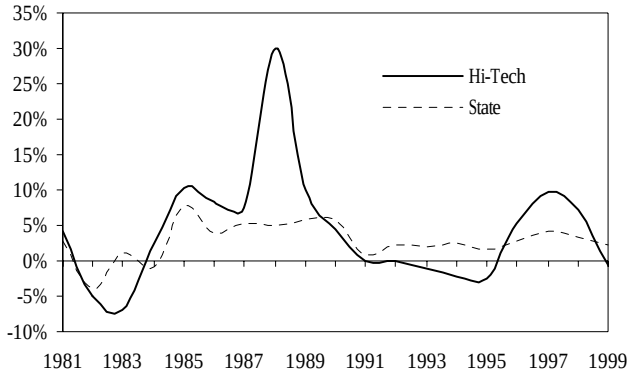
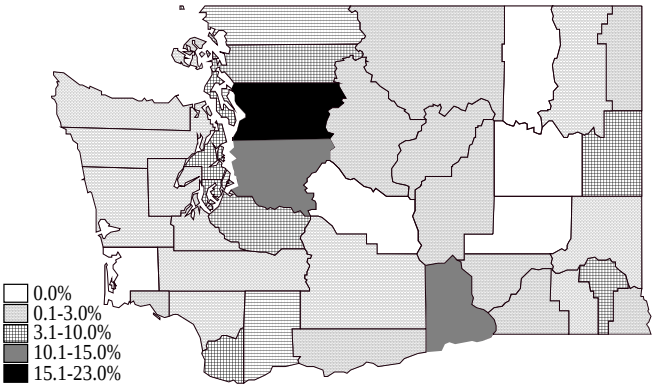


Figure 11
Percent High-Tech to Total County Average Employment
Washington State, 1999
Source: *Employment Security Department*



high-tech jobs to non-high-tech jobs in the state. Indeed, nearly one of four employees in the county works in the high-tech industry. King and Benton counties are on the second tier. Whatcom, Skagit, Island, Kitsap, Pierce, Clark, Skamania, Garfield, and Spokane counties have lesser, but still significant, concentrations.

These ratios, however, can be slightly misleading. King County, for example, has 165,140 high-tech workers, over 60 percent of the state's total and over three times the number in Snohomish County. However, since King County has a much larger employment base, its ratio is smaller than Snohomish's. The same is true at the other end of the spectrum: Skamania County has only slightly more than 100 high-tech workers, but because of its small employment base, it still ranks among the state's top counties in terms of high-tech employment concentrations. Overall, six of Washington's 39 counties (King, Snohomish, Clark, Spokane, Pierce, and Benton) account for 93 percent of high-tech employment.

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Earnings

Washington's average high-tech wage was 288 percent higher than the statewide average wage in 1999; that's $138,572 versus $35,724. This huge difference hasn't always been the case. In 1981, the average high-tech wage was $26,371, only 54 percent higher than the statewide average wage of $17,023. Nonetheless, high-tech has always meant high-paying jobs and it means extraordinarily high-paying jobs today. *Figure 12* compares the growth in actual wages for the high-tech sector with the state's average wage.

That high-tech workers have always earned more than the average should be no surprise. These workers are better educated than the average worker is. Moreover, the statewide average includes individuals with little or no tertiary education, students, and part-time workers. All these groups would tend to drag down the average wage. Yet, for most of the period the state average grew at a rate only slightly less than that for the high-tech composite. This is reflected by the fact that the two lines seem to only slightly diverge over most of the time period.

What is so surprising in the graph is that since 1994, high-tech workers have experienced nearly hyperbolic wage growth. The reason for this is no secret: stock options. Over the past five years, many archetypal high-tech firms have made stock options part of the standard remuneration package for permanent employees. The rationale for this is straightforward: it costs the firm much less in operating expenses and it makes the employees much more motivated to work hard. After all, with stock, workers become part owners with a vested interest in a firm's success.

Figure 13 shows that high-tech wage growth rates have experienced much more volatility than the state's average wage. Again, it has only been since 1994 that tech wages have shown sustained (and incredible) growth, reaching nearly 35 percent in 1998 and 1999.

Figure 14 shows average wage growth from 1981-1999 for all high-tech industries compared to the high-tech composite and the state average.

Whereas average employment growth in high-tech industries was not significantly different from the statewide average employment growth, the same cannot be said for wages. In fact, average high-tech wages grew at a significantly higher rate than the statewide average wage. However, this growth rate differential isn't necessarily the result of a general trend in all high-tech industries. What the table also shows is the high-tech composite rate's dependence on the stellar performance of just two industries: drugs and computer and data processing. In 1999, for example, the wage growth rates for these two industries were, respectively, 91.7 percent and 23.9 percent. Note, also, that the fastest growing industry in terms of employment was the slowest in terms of wages.

Figure 12
Average Wage Growth
Washington State, 1981-1999
Source: *Employment Security Department*

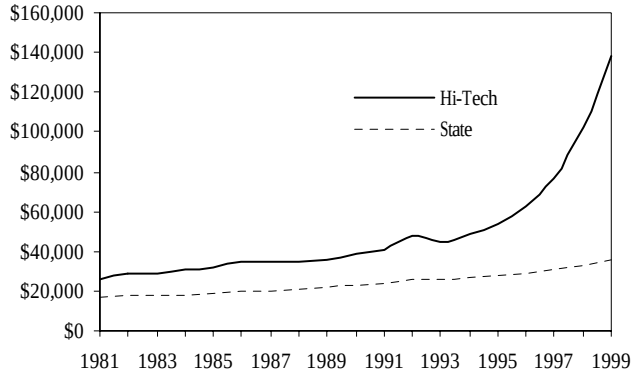

Figure 13
Wage Growth Rates
Washington State, 1982-1999
Source: *Employment Security Department*

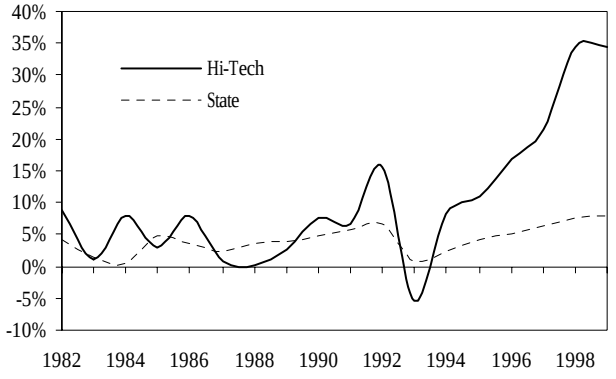

Figure 14
Average Wage Growth for High-Tech Industries
Washington State, 1981-1999
Source: *Employment Security Department*

Industry	Growth	Industry	Growth
Drugs	14.6%	Paints and Allied Products	4.6%
Computer and Data Processing Services	14.1%	Agricultural Chemicals	4.6%
High-Tech	**10.2%**	Miscellaneous Chemical Products	4.5%
Computer and Office Equipment	8.2%	Aircraft and Parts	4.2%
Search and Navigation Equipment	6.5%	**State**	**4.2%**
Measuring and Controlling Devices	6.3%	Engineering & Architectural Services	4.0%
Management and Public Relations	6.3%	Misc. Electrical Equipment & Supplies	3.9%
Medical Instruments and Supplies	6.1%	General Industrial Machinery	3.8%
Communications Equipment	5.9%	Engines and Turbines	3.7%
Research and Testing Services	5.2%	Motor Vehicles and Equipment	3.7%
Petroleum Refining	5.0%	Plastics Materials and Synthetics	3.6%
Guided Missiles, Space Vehicles, Parts	5.0%	Household Audio and Video Equipment	3.5%
Electrical Industrial Apparatus	5.0%	Special Industry Machinery	3.5%
Industrial Organic Chemicals	4.9%	Photographic Equipment and Supplies	3.2%
Electronic Components and Accessories	4.7%	Construction and Related Machinery	3.0%
Industrial Inorganic Chemicals	4.7%	Soap, Cleaners, and Toilet Goods	2.8%
Electric Distribution Equipment	4.6%	Ordnance and Accessories, NEC	2.6%

In sum, high-tech wages are normally above the average state wages, reflecting the higher than average education and training that make high-tech workers capable of high-tech work. However, the recent significant divergence between high-tech and the statewide average wages is primarily due to extraordinary wage and salary growth in a small number of industries. Further, although the data don't allow for this type of disaggregation, these high wages are almost certainly due to exercised stock options—a slippery fish in terms of analysis.

Industries of Interest

It has traditionally been the case that the aircraft and parts industry drove the state's economy by sheer dent of its size. In the early 1980s, the industry controlled an average of 8 percent of the state's wages and 4.5 percent of the state's employment. By 1999, the industry accounted for 6.1 percent of wages and 3.7 percent of employment.

The decline in significance isn't exclusively due to industry downsizing, or to a general growth in the rest of the economy. As *Figure 15* and *Figure 16* reveal, aircraft and parts now must share dominance of the state economy with the fast-growing computer and data processing industry.

Figure 15 shows that in addition to experiencing significant cycles, aircraft and parts employment has been trending down over the past 2 decades. Computer and data processing, however, has grown steadily during this time. It appears to be only a matter of when, not if, computer and data processing will become the state's 500 pound gorilla.

Continued page 14

Figure 15
Industry Employment as a Share of Total Employment
Washington State, 1981-1999
Source: *Employment Security Department*

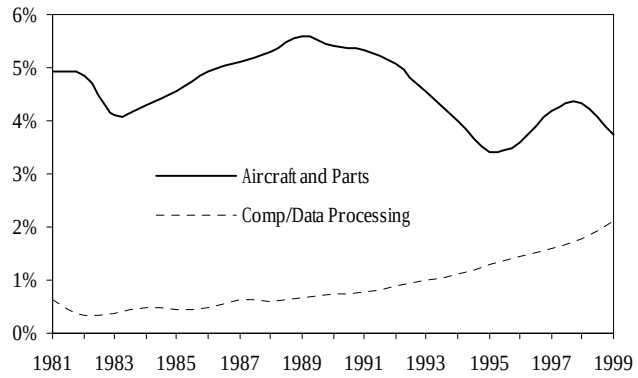

Figure 16
Industry Wages as a Share of Total State Wages
Washington State, 1981-1999
Source: *Employment Security Department*

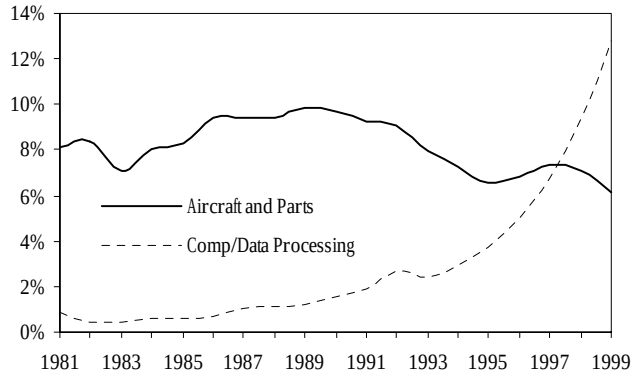

Figure 16 makes it clear that wage shares of aircraft and parts compared to state total wages have followed a strikingly similar pattern to that industry's employment shares. The same is generally true for computer and data processing, except that wage shares have been growing much faster than employment during the past five years in particular. Regarding wages, the gorilla is already in the living room.

Conclusions

The high-tech sector of the Washington economy accounted for exactly 25 percent of the state's total wages in 1999, this despite representing only 10.2 percent of the state's total employees. In 1981, these figures were 12.5 percent and 8.3 percent. From this perspective, high-tech industries would appear to be at the very heart of the state's record economic expansion, now in its 18th consecutive year.

However, a closer examination of the data reveals that this isn't necessarily the case. High-tech jobs grew at a rate only moderately higher than the statewide average, and this was the result of non-economic changes in a small number of industries. High-tech wages, too, were above the statewide average, but only significantly so because of a small number of industries. Finally, within any single high-tech industry, there is likely to be a bi-modal wage distribution; i.e., two groupings of wages, one high (corresponding to true high-tech workers) and one low (corresponding to non-high-tech workers). For example, within the computer and data processing industry, there are computer engineers and personnel clerks on the payrolls, with the former earning nearly 3 times as much per hour as the latter. The significance of this is clear: even within industries that have shown spectacular wage growth, these gains aren't uniform across the work force. Future research, then, may be better directed at high-tech occupations, and not high-tech industries.

Technology, then, has been very important to the state's economy, but not in an easily identifiable, quantifiable way. To cop a phrase, we may not be able to accurately define high-tech, but we're not sure if we know it when we see it either.

■ *William S. Dillingham*
Senior Economic Analyst

Futurework: *Trends and Challenges for Work in the 21st Century*

OCCUPATIONS

An adapted excerpt from a U.S. Department of Labor report (Labor Day 1999)

Just a few decades ago, business magazines celebrated the latest office technology—cutting edge equipment such as electric typewriters and dictaphones. Today, it is digital phones and personal digital assistants.

We are living in a world few could have imagined 50 years ago. What will the workplace look like half a century from now? This article reflects on that question by highlighting three issues defining the 21st century workplace: the work being done, the effects of technology and globalization, and the implications of workplace change.

Work Shifts

We anticipate the types of jobs people will have in this century based on long-term trends. At the time of the Revolutionary War, the U.S. economy was largely agricultural. But the importance of nonagricultural employment grew as manufacturing developed, eventually overtaking agricultural employment shortly after the Civil War. This shift from agriculture to manufacturing was followed by a second major shift—from manufacturing to services.

Since 1919, the earliest year for which Bureau of Labor Statistics (BLS) data are available, nonfarm employment in the service-producing sector has exceeded that in the goods-producing sector. Nearly all employment growth has been in services and BLS projects that growth to continue.

Employment change. The number of jobs in the nonfarm goods-producing sector has been fairly stable since 1970 and is projected to remain so over the 1998-2008 period. Construction is the only major goods-producing industry in which employment is projected to increase. Although it is still the largest employer among goods-producing industries, manufacturing now accounts for only half the share of total nonfarm employment it did in 1970. Between 1998 and 2008, manufacturing is projected to decline by 89,000 jobs to 18.7 million.

More efficient assembly-line techniques introduced in the early 20th century meant fewer workers could produce more goods at a lower cost. During the latter part of the century, technology-based productivity increases have caused a similar result: more goods with fewer employees. Although manufacturing's share of total employment has declined, it still accounts for a robust 30 percent of total gross domestic product today—as it has for the last three decades.

Widespread use of "just-in-time production" contributes to manufacturing's need for fewer employees. With just-in-time production, firms schedule production based on the needs of their retail outlets or product users. Doing so allows them to avoid costly inventory holding and to avoid producing items that are selling slowly or not at all.

Imports of goods produced in low-wage factories abroad were a major cause of the recent loss of U.S. manufacturing jobs. But the response of U.S. businesses to import competitively was equally important, especially in the textile and apparel industries. In response to import threats, some textile firms have invested heavily in laborsaving capital equipment, further reducing employment.

Growth in service jobs. Since 1970, most job growth has been in the service-producing sector. This trend is expected to continue as nonhousehold service-producing jobs are projected to increase over 19 million between 1998 and 2008 *(see Figure 17 on the next page)*.

Healthcare jobs have increased since the 1950s, more than in any other comparable industry group. This is so in part because of services required for an aging population, along with new technology making it possible for people

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Figure 17
Employment by Major Industry Division
United States, 1998 and Projected 2008
Source: *Bureau of Labor Statistics*

Industry division	Thousands of jobs 1998	2008	Change 1998-2008	% Change 1998-2008	% Distribution 1998	2008
Total, all industries	140,514	160,795	20,281	14	100	100
Nonfarm wage & salary	124,887	144,526	19,640	16	89	90
Goods producing	25,347	25,694	347	1	18	16
Mining	590	475	-115	-19	0.4	0.3
Construction	5,985	6,535	550	9	4	4
Manufacturing	18,772	18,684	-89	0	13	12
Durable	11,170	11,277	107	1	8	7
Nondurable	7,602	7,406	-196	-3	5	5
Service producing	99,540	118,832	19,293	19	71	74
Transportation, communications, & utilities	6,600	7,541	941	14	5	5
Wholesale trade	6,831	7,330	499	7	5	5
Retail trade	22,296	25,363	3,067	14	16	16
Finance, insurance, & real estate	7,408	8,367	960	13	5	5
Services	36,586	48,543	11,957	33	26	30
Government	19,819	21,688	1,869	9	14	14
Federal Government	2,686	2,550	-136	-5	2	2
State and local government	17,133	19,138	2,005	12	12	12

Note: "Total, all industries" also includes agriculture, private household, and secondary jobs.

today to recover completely from ailments and injuries that decades ago would have been fatal or permanently disabling. Jobs in medical offices, clinics, and health maintenance organizations have grown rapidly as the healthcare industry strives to provide more services in less expensive ways. Nurse practitioners, who receive more training than registered nurses, have increased in number as the healthcare industry relies on them as cost-effective providers of medical care. Health services employment is projected to increase by 2.8 million jobs between 1998 and 2008.

Contracted-out business activities are part of the reason employment in business services has grown so rapidly. Activities previously done within firms are now accomplished externally by other businesses that specialize in these functions. This causes rapidly expanding employment in businesses such as computer services, data processing, advertising, and mailing and reproduction.

One force driving the growth in service jobs has been a shift in work done in the home from family members to service workers. Like employers, families are either "contracting out" or bypassing altogether some of the work they used to do themselves.

To illustrate, consider family mealtimes. For meals eaten at home, people increasingly buy prepared or partially prepared foods. Food stores have responded to this preference for convenience by adding features such as delis and salad bars and hiring workers to staff them. Fast food, carryout, and food delivery restaurants have also hired workers to meet demand. In addition, growth in the number of meals eaten outside the home—the result of both a long-term trend and the recent economic boom—has led to an increase in employment at eating and drinking establishments. And children in homes where

limited cooking is done are expected to continue the trend into their adulthood.

Increases in the percentage of women who work outside the home have contributed to the growth in retail services and products. Greater spending power and limited free time have inspired the growth of stores that provide convenience—from catalog and Internet shopping to greater emphasis on customer service and personal shopper services.

Child care, too, is being "contracted out" to daycare centers and nannies. The child daycare services industry is projected to add 196,000 jobs between 1998 and 2008. Similar changes are occurring in the care of the increasing population of elderly persons. Residential care institutions—which provide 24-hour, year-round personal care and incidental health care—have multiplied, along with nursing homes and home healthcare services.

Employment in government has been decreasing at the Federal level and increasing at the State and local level. During most of the past decade, Federal Government employment has declined, settling to its lowest level in 30 years. In contrast, State and local government employment, particularly in education, has increased and is projected to continue to grow through 2008.

Technology and Globalization

The networking of businesses, industries, and homes is changing the way—and the speed with which—people do business. Technological change is also intertwined with globalization. The technologies underlying the Internet and telecommunications have increased information flow between countries, speeding globalization. At the same time, the spread of free markets has promoted greater competition worldwide, creating strong incentives for domestic producers to adopt new technologies.

Technology and business. Computers and information technology have affected almost every industry. For example, computer-managed inventories and just-in-time manufacturing and servicing help businesses to control costs. Barcode scanners help businesses meet consumer demand more effectively. New and established industries alike benefit from advancing technology.

Leading manufacturers have developed computer links to their suppliers and customers. Their suppliers minimize inventories and downtime by following progress on the production line via computer hookup, allowing them to accurately schedule material shipping. Their customers have computer access to the latest production status and thus know precisely when to expect delivery. For example, a major airplane manufacturer maintains a parts-distribution website that speeds the pace at which planes are serviced. Locating a part used to take 5 to 10 hours, often forcing cancellation of a flight; now, parts are located within minutes.

Electronic commerce, or e-commerce—the business of buying, selling, or conducting other transactions via the Internet—may reduce the use of conventional stores, increase mail delivery services, and reduce inventory. The popularity of some online firms has prompted other companies to diversify for business on the World Wide Web. Between 1996 and 1997, sales through e-commerce more than doubled—from $15.5 to $38.8 billion—and in 1998, sales are estimated to have exceeded $300 billion. Total e-commerce is expected to reach $1 trillion per year by 2005.

New learning technologies enable employers to train their workers more efficiently and effectively. For example, the Federal Technology Training Initiative forges partnerships among Federal agencies, State and local governments, private industry, and universities. These partnerships have created technology-based materials and methods for providing training and continuing education to Federal workers.

Technology and jobs. Over the last century, declines in the number of mass-production jobs were offset by increases in office and service jobs: Instead of industrial machinery, these workers' tools are telephones, fax machines, and personal computers—tools that are available outside the workplace as well as inside. People working out of home offices have at their disposal an array of technology that includes mobile phones, laptop computers, e-mail, and the Internet.

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Occupations *continued*

The continued evolution of technology affects both emerging and existing jobs. Five occupations projected to grow fastest between 1998 and 2008 are computer related—computer engineers, computer support specialists, computer systems analysts, database administrators, and desktop publishing specialists. That growth is part of the reason professional specialty occupations, the group four of those five occupations fall into, is projected to be the fastest growing occupational group—increasing 27 percent between 1998 and 2008 *(see Figure 18)*.

But many workers in "nontech" jobs also expect their work to involve some technological know-how. For example, many administrative workers must now be familiar with word-processing programs, accounting and billing software, computer-based human resources packages, and multiline telephone systems that provide call forwarding, voice mail, and conference bridges.

Technology has also broadened access to information for workers and businesses. One-stop career centers meld personal contact with physical and electronic methods of job hunting. Touchscreen kiosks simplify career search and application procedures. Internet websites provide information about job openings, education and training opportunities, company information, and more; jobseekers for some positions are able to apply directly online.

Globalization. The 1990s will be remembered for the spread of free markets. The fall of the Iron Curtain in 1989 has led to free market economies in China, Eastern Europe, and nearly all countries of the former Soviet Union. Concurrently, many countries in Asia and Latin America have reduced their barriers to free capital markets. The result has been expansion of trade and movement of capital and information between countries.

International trade may contribute to job growth in sectors where the United States exports heavily. In many durable goods industries—such as industrial machinery, electronics products, and transportation equipment—exports account for large parts of total production and employment. Overall employment in these industries has usually risen since 1993. International trade probably has little effect on overall unemployment rates in the United States since the U.S. labor market is likely flexible enough to adjust to these kinds of sector shifts and to generate low unemployment rates over the long term.

Some people fear international trade causes competition for jobs with the lowest-wage countries, leading to wage reductions around the

Figure 18
Employment by Major Occupational Group
United States, 1998 and Projected 2008
Source: *Bureau of Labor Statistics*

	Employment				Employment Change	
	Numbers (000s)		% Distribution		Numbers (000s)	Percent
Occupational Group	**1998**	**2008**	**1998**	**2008**	**1998-2008**	**1998-2008**
Total, all occupations	140,514	160,795	100	100	20,281	14
Executive, administrative, and managerial	14,770	17,196	11	11	2,426	16
Professional specialty	19,802	25,145	14	16	5,345	27
Technical and related support	4,949	6,048	4	4	1,098	22
Marketing and sales	15,341	17,627	11	11	2,287	15
Administrative support, including clerical	24,461	26,659	17	17	2,198	9
Services	22,548	26,401	16	16	3,853	17
Agriculture, forestry, fishing, and related	4,435	4,506	3	3	71	2
Precision production, craft, and repair	15,619	16,871	11	11	1,252	8
Operators, fabricators, and laborers	18,588	20,341	13	13	1,753	9

Note: Detail may not equal total or 100 percent because of rounding

world. But the contrary appears to be true. Following trade agreements of the 1990s, U.S. wage levels ended a 20-year period of stagnation. And countries—including South Korea and Taiwan—that have attracted employers from the United States and Europe usually experience rising wages, narrowing the wage gap between their workers and U.S. workers.

Workplace Change

Technological change and international competition have created a need for workers who are educated and highly skilled. In addition to demanding increased skills, however, employers will also demand a more flexible work force. Nontraditional work arrangements help employers meet a variety of staffing needs and help workers meet personal, professional, or other goals or obligations.

Demand for skills. Three out of four U.S. workers are in occupations that do not require a bachelor's degree. That distribution is expected to remain about the same in the near future, with workers in occupations requiring short-term on-the-job training composing nearly 40 percent of the work force in 2008 *(see Figure 19)*.

Although most of the fastest growing jobs will require a college degree, the majority of new jobs being created—from home health aides to desktop publishers—require knowledge other than that gained from earning a degree. For workers in those jobs, good basic reading, communication, and mathematics skills play an important role in getting a job and developing a career.

A 1996 American Management Association survey of midsize and larger businesses found that 19 percent of job applicants taking employer-administered tests lacked the math and reading skills necessary for the jobs they were applying for. That percentage increased to almost 36 percent in 1998. The report attributed the sharp increase in the deficiency rate to the higher literacy and math skills required in today's workplace.

Skill requirements have increased for many jobs in the U.S. economy. Consider the change in machine shops from manually operated machine tools, such as lathes and drilling machines, to computer-programmed machine tools. The machine tool operator today is more likely to insert a programmed diskette into a control module than to set measurement devices manually. In fact, some jobs in the machine shop have been "de-skilled" while others have been redesigned to require formal education in abstract skills such as use of programming languages.

Nontraditional workers. Workers across all skill levels are in nontraditional work arrangements—that is, in work situations different from

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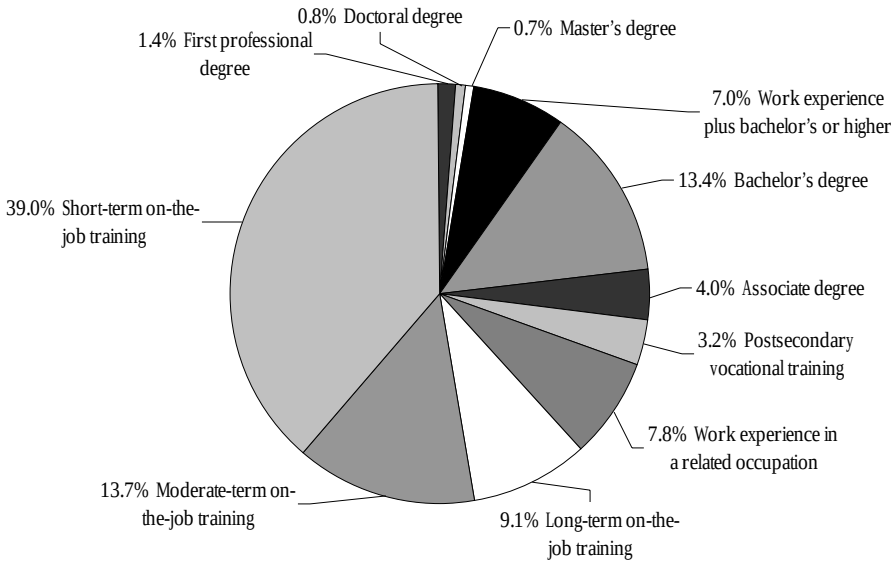
Figure 19
Percent of Employment Distribution by Education and Training Categories
United States, Projected 2008
Source: *Bureau of Labor Statistics*



the standard full-time, year-round job in which an employer usually provides workers with benefits, training, and retirement pension. The nontraditional work force includes multiple jobholders, contingent and part-time workers, and people in alternative work arrangements.

The latter group is defined by BLS to include independent contractors and workers who are on call, temporary, and employees of contract companies. Of the 13 million workers in alternative work arrangements, independent contractors compose the majority—8.5 million—with temporary workers accounting for another 1.3 million.

Nearly four out of five employers, in establishments of all sizes and in all industries, use some form of nontraditional staffing. Among the most common reasons they cite are to accommodate workload fluctuations and to fill positions that are temporarily open due to permanent employees' short-term absences. Staffing strategies that combine traditional and nontraditional employees may help firms become more efficient, protect against layoffs, or use workers with special skills as the need arises.

The perception of nontraditional work arrangements is mixed. Some people view this large and growing work force as one employers relegate to second-class employment—with no worker benefits, little or no mutual loyalty, and all risk borne by the employee—while employers benefit from lower costs. Others see the nontraditional work force as an opportunity for workers to achieve a flexible work schedule, reach a better balance between work and other interests, gain new experiences, or bridge periods of traditional employment. The increase in nontraditional staffing arrangements may require a reexamination of future definitions of employer, worker, and workplace.

What Does the Future Hold?

Preparing for tomorrow's workplace involves more than simply knowing what to expect. Acting on that knowledge—obtaining education, skills training, and occupational information for career planning—is the key to succeeding in the work force of the future.

Meet with your school's career counselor and visit your local library to learn more about the occupations and industries that interest you. Among the helpful resources you should consult is the 2000-01 *Occupational Outlook Handbook*, which contains detailed information for about 250 occupations. The *Handbook* is available in print, on CD-ROM, and online at *http://stats.bls.gov/ocohome.htm*.

The *Occupational Outlook Quarterly* is also available online at *http://stats.bls.gov/opub/ooq/ooqhome.htm*.

For other BLS employment, occupational, and related information, visit the Bureau's website, *http://stats.bls.gov*.

For career information from the U.S. Department of Labor, check out America's Career Kit. It currently includes three databases: America's Job Bank *(http://www.ajb.dni.us)*, America's Career InfoNet *(http://www.acinet.org)*, and America's Learning Exchange *(http://www.alx.org)*.

To view the complete Futurework report online, set your browser to *http://www.dol.gov/dol/asp/public/futurework*.

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The American Economy: *Producing More with Less?*

PRODUCTIVITY

Without a doubt, the 1990s were the decade of the American worker. Between 1990 and 1999, labor productivity—that is, output per hour of all persons working—in the nonfarm business sector grew at an average rate of 1.9 percent per year. That was half of a percentage point higher than the average growth rate in the 1980s.

What could cause such an increase? Either improvements in technology or changes in the production process that would enable workers to get more done in the same amount of time or the same amount done in less time. In either case, the end result is the same: more output per hour from workers, which is good for everyone. Why? Because higher productivity in a particular sector of the economy—or in the economy as a whole—means resources that can then be put to use elsewhere are freed up, which drives economic growth and leads to higher wages and income. The U.S. economy excelled at this task in the 1990s.

More-Productive Workers or More Jobs?

What change might have caused the increase in productivity growth in the 1990s? This question is easier asked than answered. The data do show, however, that while productivity was growing around 1.9 percent a year during the decade, employment at private nonfarm businesses was also growing an average of 1.9 percent a year. One might mistakenly believe, then, that productivity was rising each year only because more workers (mixed with more capital) were on the job, and not because technological changes enabled workers to become better at what they were doing. In other words, it was simply more jobs, not more-productive workers, driving the growth.

This conclusion is wrong for a fundamental reason related to the difference between increases in *production* and increases in *productivity*. If a firm hires more workers and, consequently, produces more output, production has increased, but not necessarily productivity. Increases in productivity occur only when the current work force is able to produce more output in the same amount of time, not just when more workers show up at the plant (along with additional capital) and then produce more output. Thus, for productivity growth to have increased half of a percentage point between the 1980s and 1990s, an improvement in either technology or the production process must have occurred. In other words, a change must have ensued that enabled workers to become better at what they do.[1]

Another way to see this is to look at employment and productivity growth rates across the two decades. In the 1980s, private, nonfarm employment grew an average of 2 percent each year—marginally faster than in the 1990s—while productivity was growing only 1.4 percent a year on average—half of a percentage point slower than in the 1990s. With employment growth remaining basically unchanged between the decades, and average productivity growth jumping half of a percentage point, it's logical to conclude that a change ensued that enabled workers to become better at what they do. So is this the end of the story? Not exactly.

Stellar Performer

Economists know that actually *measuring* productivity is extremely difficult, especially when the economy is broken into its major sectors—manufacturing and nonmanufacturing. Of the two,

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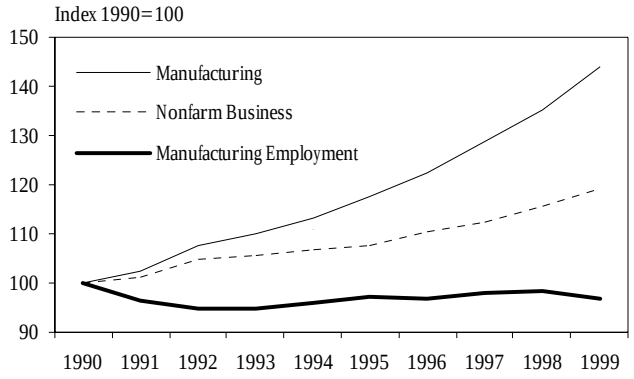
[1]*Saying that workers are better at what they do needs not imply that they are more skilled or educated. It could mean that the capital they work with is more advanced, which subsequently makes the workers more productive.*

manufacturing is the easier sector to work with because firms in this sector produce concrete, physical output that can be counted. The task should be simple then: 1) count all the output, and 2) count the number of hours the workers spent producing the output.

Productivity at nonmanufacturing firms, on the other hand, is more difficult to gauge because these firms do not produce physical, concrete output that can be counted. For example, how should the output of a nurse, a teacher or—here's a scary thought—an economist be measured? The best that analysts can do is to try to value the amount of time these workers spend producing their services and then use this figure as an estimate of the value of their output. Although not exactly precise, it beats guessing. Because of this measurement predicament, the Bureau of Labor Statistics does not publish productivity data for nonmanufacturing firms; instead, it focuses more on the business sector (the whole economy minus government), the nonfarm business sector and the manufacturing sector, which is part of the other two.

Figure 20
Productivity in the 1990s
United States
Source: *Bureau of Labor Statistics*



By the end of the 1990s, manufacturing sector productivity was 45 percent higher than at the start of the decade. Over the same period, productivity in the overall economy—minus farming and government—was only 20 percent higher. Can manufacturing firms really churn it out that much faster? Apparently, even though the manufacturing productivity data are somewhat exaggerated.

In the 1990s, the manufacturing sector was the stellar performer in terms of productivity growth. Between 1990 and 1999, this sector's labor productivity grew at an average rate of 4 percent a year—clearly outperforming the rate for the nonfarm business economy as a whole, as *Figure 20* shows. What the figure does not show, however, is that manufacturing's productivity growth rate in the 1980s averaged only 2.6 percent per year, which itself is certainly nothing to sneeze at. The more important point, though, is the jump in the rate from 2.6 percent to 4 percent between the 1980s and 1990s.

In this case, there is no confusing higher productivity with higher production. Output was increasing, not because more workers were on the job, but because the workers were becoming more productive. In the 1990s, employment at manufacturing firms, as also illustrated by *Figure 20*, was actually lower by the end of the decade than at the beginning. In fact, while manufacturing productivity growth was increasing 4 percent a year during the 1990s, employment at these firms was falling an average of 0.5 percent each year. Fewer and fewer workers were producing more and more goods.

Statistics Can Mislead

Case closed? Not really, even though manufacturing is the "easy" sector to measure productivity in. The problem is that counting the output and hours—especially the hours—at manufacturing firms is not always as straightforward as it seems. When the BLS collects the information about the number of hours people are working at manufacturing firms, it counts only the hours of those who are actually *on the payrolls* at the firms. If these were the only people working for manufacturers, then there would be no discrepancy. But they're not. Manufacturing companies, like many other firms, hire temporary workers who do not appear on their books, but instead on the books of the temporary employment agencies supplying them (which are classified as nonmanufacturing firms). In other words, more

people than the BLS is counting are producing the manufacturing output. Therefore, the numbers the BLS reports for manufacturing productivity are slightly exaggerated because the bureau is undercounting the true number of people working at these plants.

How exaggerated are the data? Economists Marcello Estevão and Saul Lach tackled just this question in two recent studies. To answer the question, Estevão and Lach first had to determine how many manufacturing workers were in fact employed by temporary agencies. They estimated that manufacturing firms actually employed around 890,000 uncounted temporary agency workers, which adds to the reported 18.5 million manufacturing workers. While not a tremendous amount overall, the 890,000 figure is far from insignificant. When Estevão and Lach then recalculated the productivity numbers and included these uncounted workers, they found that the official manufacturing productivity growth figures were overstated by about half of a percentage point per year. In other words, including all of the workers lowered average manufacturing productivity growth in the 1990s from 4 percent to about 3.5 percent per year.

Continuing to Crank It Out

Productivity growth in the manufacturing sector still outpaced the average rate for the economy in the 1990s, although the gap between the two is narrower than at first believed. The discrepancy in the manufacturing productivity growth data, however, does not occur in the nonfarm business productivity numbers because temporary workers are included in these data. In any case, the bottom line is that workers actually produced more with less during the last decade.

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For Further Reading

Estevão, Marcello M., and Saul Lach. "Measuring Temporary Labor Outsourcing in U.S. Manufacturing," NBER Working Paper No. 7421 (November 1999).

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Segal, Lewis M., and Daniel G. Sullivan. "The Growth of Temporary Services Work," Journal of Economic Perspectives (Spring 1997), pp. 117-36.

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