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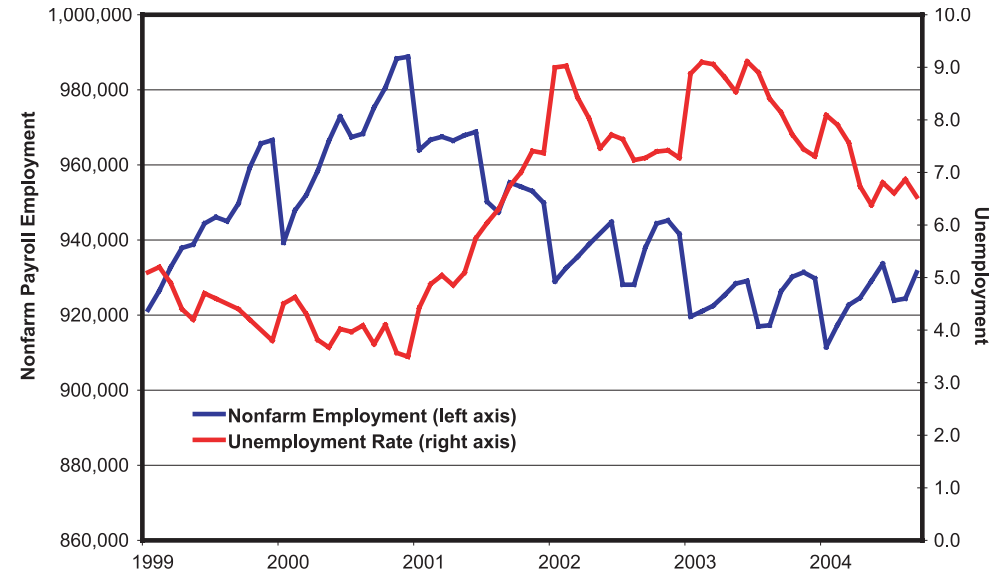
As the Portland-Vancouver economy emerges from recession, regional residents must come to terms with the realities of a restructured economy. The familiar sectors and industries upon which we based success in the past likely will no longer sustain us, at least to the degree they once did. We are simultaneously witnessing the rebuilding of an economy while suffering the symptoms of radical change.

The slowdown that began in the Portland region in the summer of 2000 was caused, in part, by cyclical downturns in several of the region's key industries. As the region continues to recover, it will most likely undergo a structural change: tomorrow's economy will look different than it did when the recession began. This paper examines that change from three perspectives. First, we consider how the industrial mix in the Portland region has changed and how it relates to national trends in industrial restructuring. Second, we describe expected changes in the occupational mix of the Portland region's workforce. Finally, we take a closer look at several companies that have made significant changes in their business models within the last few years in order to adjust to market or technological changes. We conclude with several observations about the inevitability of change and the need for resiliency.

**EVOLUTION THROUGH RECESSION AND RECOVERY:
The Portland Region's Industrial Landscape**

After two years of job declines totaling over 50,000, the Portland area has followed the nation out of recession. Figure 1 tracks both total jobs and the unemployment rate from just before the peak of the last business cycle in the summer of 2000 through the recession and into the recovery. In the first half of 2004, the Portland Metropolitan Statistical Area (PMSA)—consisting of Columbia, Clackamas, Multnomah, Washington, and Yamhill counties in Oregon and Clark county in Washington—experienced strong job growth, and the unemployment rate fell quickly. However, growth slowed in the summer. As of October 2004, total employment stands at 41,500 fewer jobs than October of 2000². The unemployment rate stands at 6.4 percent compared to 5.1 percent for the nation.

Figure 1. Total Employment and Unemployment Rate, Portland Metropolitan Region, 1999 to 2004 (not seasonally adjusted)



Source: Oregon Employment Department.

National and Local Restructuring

As the Portland economy recovers, it appears that the recession may have been caused partly by rapid structural change. As the recovery takes hold, residents of the region may find that rather than returning to the economy in place before the recession, Portland's regional economy is undergoing structural changes that will determine which industries will provide new economic opportunities for Portlanders over the next decade. In this respect, the current recovery is similar to the changes taking place nationwide. The current restructuring is also similar in some

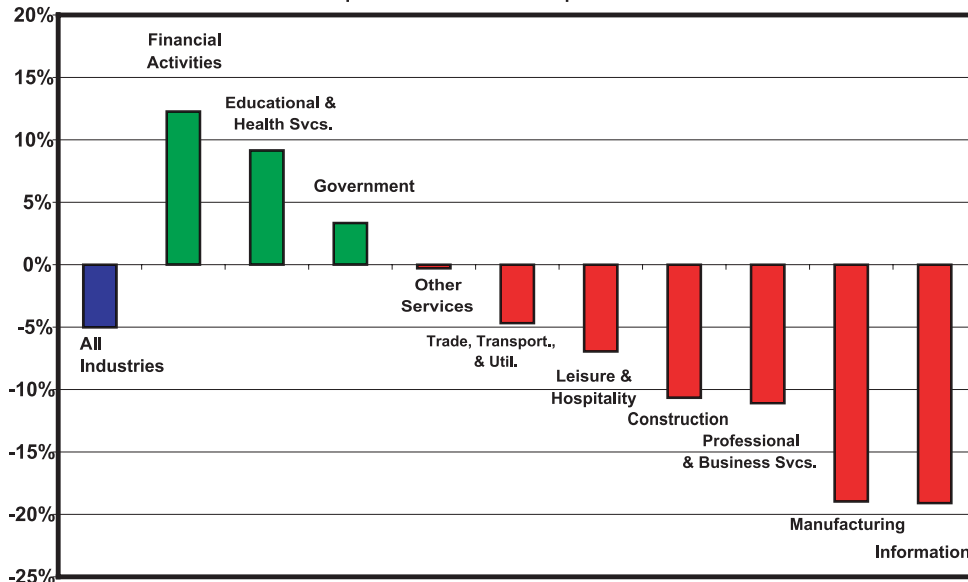
¹The authors are grateful to Scott Bailey at the Washington Department of Employment Security for assistance with data.
²Because regional data are not seasonally adjusted, we compare October employment data across years to factor out the seasonal variation in employment.

respects to those following the recessions in the 1980s and 1990s. Structural adjustments are inevitable when an economy faces fundamental changes in competitive and market factors.

The recession was broadly felt across most, but not all, of the Portland region's industries. Figure 2 shows the percentage change in employment for major industries in the Portland PMSA during the recession. Growth continued to occur in some major industries and in some minor industry segments. Growth occurred as expected in population-based industries such as educational and health services. Employment in the financial activities sector also grew, particularly in credit intermediation and related activities. These sectors added over 2000 jobs as mortgage refinancing took off due to low interest rates. Within the business service sector, call centers also added employment.

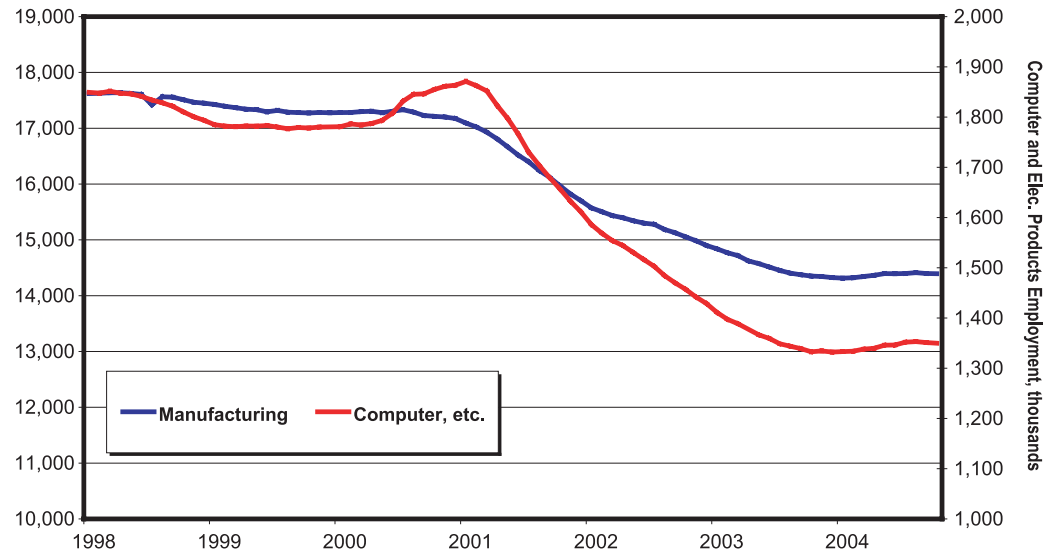
Nationwide, this recession has been particularly difficult for manufacturing industries. Manufacturing shed over three million jobs—almost 19 percent of

Figure 2. Employment Growth/Decline by Major Industry, Portland PMSA, September 2000 to September 2003



Source: Oregon Employment Department

Figure 3. Total U.S. Employment in Manufacturing and Computer and Electronic Products, 1998 to 2004



Source: U.S. Bureau of Labor Statistics

national employment—since its most recent peak in March 1998. Employment in the computer and electronic products subsector lost half a million jobs nationwide, or almost 30 percent. Figures 3 show that the fall in employment in this subsector was very sharp relative to other manufacturing industries: peak employment in this sub-sector occurred almost two years after the peak in overall manufacturing.

The decline of manufacturing jobs during the recession followed a decades-long reduction in U.S. manufacturing's share of total employment. Table 1 shows the total employment and share of employment for the United States and for the Portland region for key industries. From 1990 to 2003, manufacturing's share of national employment fell from 16.2 to 11.2 percent. Projections indicate that this trend will continue, with manufacturing employment falling by 1 percent by 2012, despite a projected increase of 14.8 percent in all sectors. Thus, manufacturing's share of total employment will fall again to only 9.2 percent of national employment by 2012.

Table 1. Employment and Share of Employment for the United States and Portland PMSA

	Employment						Share of Total Employment					
	United States (000's)			Portland PMSA			United States			Portland PMSA		
	1990	2000	2003	1990	2000	2003	1990	2000	2003	1990	2000	2003
	109,487.0	131,785.0	129,931.0	725,000	967,100	924,800	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Manufacturing	17,695.0	17,263.0	14,525.0	125,700	142,900	117,800	16.2%	13.1%	11.2%	17.3%	14.8%	12.7%
Wood product manufacturing	540.6	613.0	536.1	7,600	5,800	5,300	0.5%	0.5%	0.4%	1.0%	0.6%	0.6%
Fabricated metal product manufacturing	1,610.0	1,752.6	1,478.4	10,800	13,700	11,500	1.5%	1.3%	1.1%	1.5%	1.4%	1.2%
Machinery manufacturing	1,407.8	1,454.7	1,153.5	9,300	10,500	8,500	1.3%	1.1%	0.9%	1.3%	1.1%	0.9%
Computer and electronic product manufacturing	1,902.5	1,820.0	1,360.9	28,600	42,900	34,800	1.7%	1.4%	1.0%	3.9%	4.4%	3.8%
Transportation equipment manufacturing	2,133.3	2,055.8	1,775.4	9,600	11,200	7,500	1.9%	1.6%	1.4%	1.3%	1.2%	0.8%
Trade, transportation, and utilities	22,666.0	26,225.0	25,275.0	159,500	200,500	190,400	20.7%	19.9%	19.5%	22.0%	20.7%	20.6%
Transportation, warehousing, and utilities	3,475.6	4,410.3	4,176.7	31,400	38,000	36,400	3.2%	3.3%	3.2%	4.3%	3.9%	3.9%
Warehousing and storage	406.6	514.4	522.3	2,900	3,800	3,900	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
Information	2,688.0	3,631.0	3,198.0	16,100	27,800	23,400	2.5%	2.8%	2.5%	2.2%	2.9%	2.5%
Publishing industries, except internet	870.6	1,035.0	926.4	4,200	11,200	9,500	0.8%	0.8%	0.7%	0.6%	1.2%	1.0%
Software publishers	98.2	260.6	239.2	1,300	7,000	5,900	0.1%	0.2%	0.2%	0.2%	0.7%	0.6%
Financial activities	6,614.0	7,687.0	7,974.0	44,000	60,200	67,500	6.0%	5.8%	6.1%	6.1%	6.2%	7.3%
Finance and insurance	4,978.6	5,680.4	5,920.5	30,100	41,600	44,100	4.5%	4.3%	4.6%	4.2%	4.3%	4.8%
Credit intermediation and related activities	2,424.8	2,547.8	2,785.6	12,000	18,700	21,600	2.2%	1.9%	2.1%	1.7%	1.9%	2.3%
Professional and business services	10,848.0	16,666.0	15,997.0	77,000	128,500	116,300	9.9%	12.6%	12.3%	10.6%	13.3%	12.6%
Architectural and engineering services	941.5	1,237.9	1,228.0	6,200	10,400	9,600	0.9%	0.9%	0.9%	0.9%	1.1%	1.0%
Computer systems design and related services	409.7	1,254.3	1,108.9	5,900	9,200	7,000	0.4%	1.0%	0.9%	0.8%	1.0%	0.8%
Employment services	1,493.7	3,817.0	3,336.2	11,700	31,000	21,200	1.4%	2.9%	2.6%	1.6%	3.2%	2.3%
Leisure and hospitality	9,288.0	11,862.0	12,125.0	63,800	90,100	84,000	8.5%	9.0%	9.3%	8.8%	9.3%	9.1%
Natural Resources and Mining	765.0	599.0	571.0	1,900	1,800	1,600	0.7%	0.5%	0.4%	0.3%	0.2%	0.2%
Construction	5,263.0	6,787.0	6,722.0	37,000	53,300	48,800	4.8%	5.2%	5.2%	5.1%	5.5%	5.3%
Education and Health Services	10,984.0	15,109.0	16,577.0	73,800	103,200.0	113,200.0	10.0%	11.5%	12.8%	10.2%	10.7%	12.2%
Other Services	4,261.0	5,168.0	5,393.0	26,300	33,500	33,900	3.9%	3.9%	4.2%	3.6%	3.5%	3.7%
Government	18,415.0	20,790.0	21,575.0	99,800	125,400	128,000	16.8%	15.8%	16.6%	13.8%	13.0%	13.8%

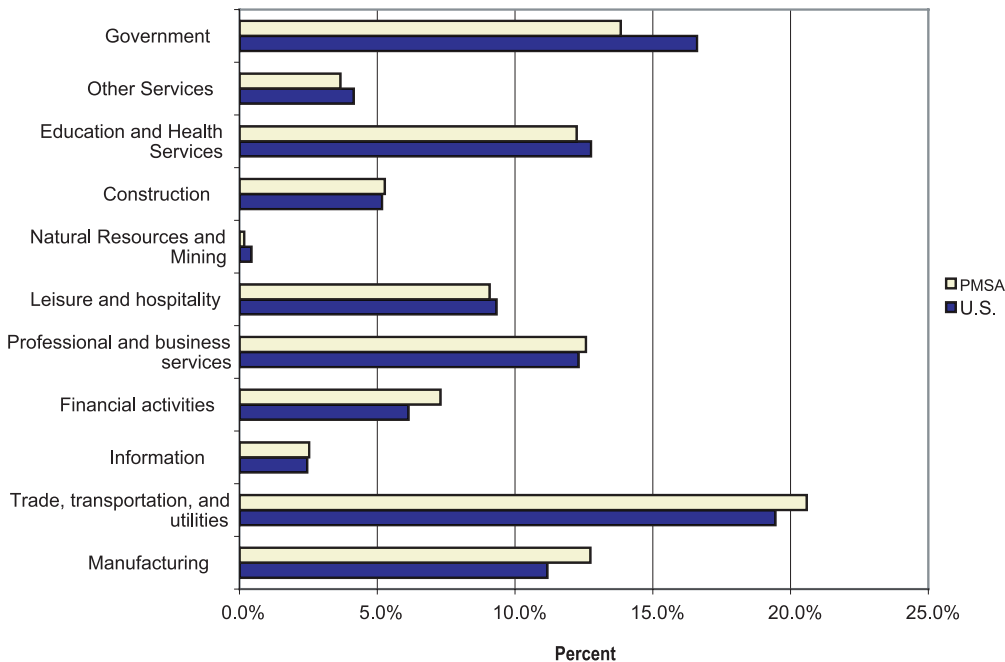
Source: Oregon Employment Department

Portland's Manufacturing Economy

The PMSA has recently enjoyed a strong position in the manufacturing economy. Figure 4 shows the percentage of employment by major industry for the PMSA and for the United States in 2003. The three industries in which the Portland region leads the nation are manufacturing; trade, transportation and utilities; and financial services.

Figure 5 further details employment shares in manufacturing. Not only has the region's employment been more dependent on manufacturing, but its share of employment in computer and electronic products has been almost four times that of the nation's. During much of the 1990s, Portland's strength in this segment of manufacturing was viewed as a sign of competitiveness and a regional asset that provided well-paying jobs in knowledge-based segments of the manufacturing economy.

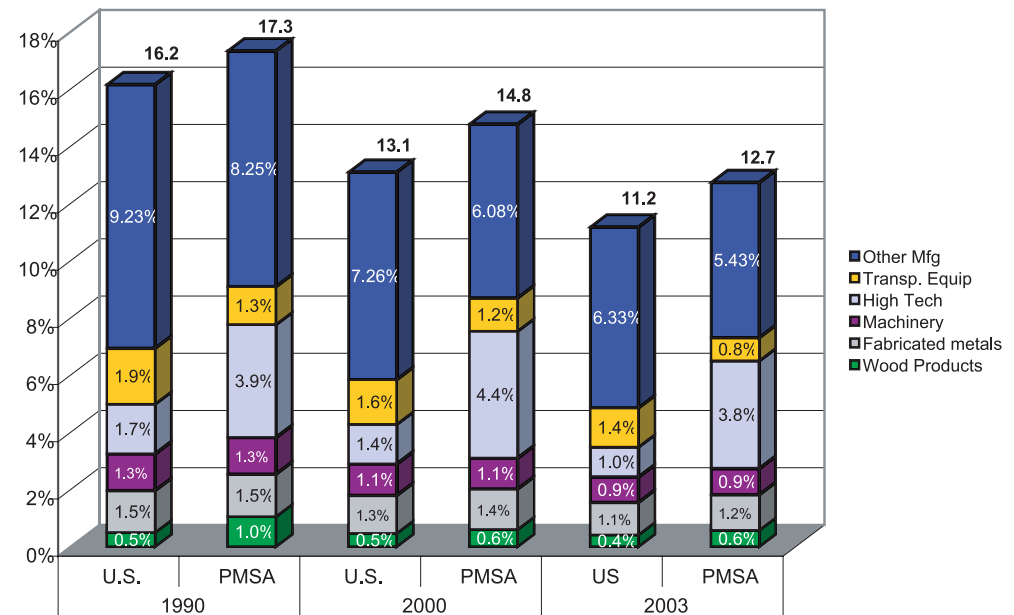
Figure 4. Share of Employment by Major Industry



Source: Oregon Employment Department

The Portland region's relative strength in manufacturing—especially in computer and electronic products—was a factor in the depth of the region's recession. The Portland region lost 26,900 manufacturing jobs during the recession—a staggering 18.5 percent of total manufacturing employment. Within manufacturing, the computer and electronic products sector has taken the greatest relative losses, with 11,800 jobs lost—over one quarter of the peak employment of 46,100 jobs in December of 2000.

Figure 5. Manufacturing Share by Sector



Source: U.S. Department of Labor Statistics and the Oregon Employment Department

Recovery and Restructuring

During the first half of 2004, Portland had one of the fastest growing manufacturing sectors among the nation's largest metropolitan areas. Jobs have been added in transportation equipment, computer and electronic products, and fabricated

metals. These industries together have created 4,400 new jobs over the past year. But to reach peak levels of employment, manufacturing would have to add an additional 20,000 jobs.

Can the region's manufacturing industries again become the engine of growth they were in the 1990s? The Oregon Employment Department projects that manufacturing will recover somewhat, although growth will be slow and employment will not reach pre-recession levels within the next decade. While the semiconductor industry still will be the source of many new jobs (adding at least 4,600 new jobs over the next ten years), it will not be the growth engine it was in the 1990s. The continuing migration of jobs overseas, the aging of this industry, technological advances, and energy cost and availability will limit the industry's growth. These predictions are consistent with observations at the national level. Groshen and Potter (2003) study the history and structure of job losses and gains during recessions and recoveries. They find that compared to earlier recessions, particularly those in the 1970s and 1980s, a higher percentage of the job losses during the 2001 recession were permanent rather than temporary layoffs. They identify specific industries that historically gain jobs following a recession as the business cycle turns positive. When these industries lose jobs during a recovery—despite their historical pro-cyclical tendencies—they are called structural loss industries. By tracking these industries over time, they are able to examine the impact of structural changes on the economy.

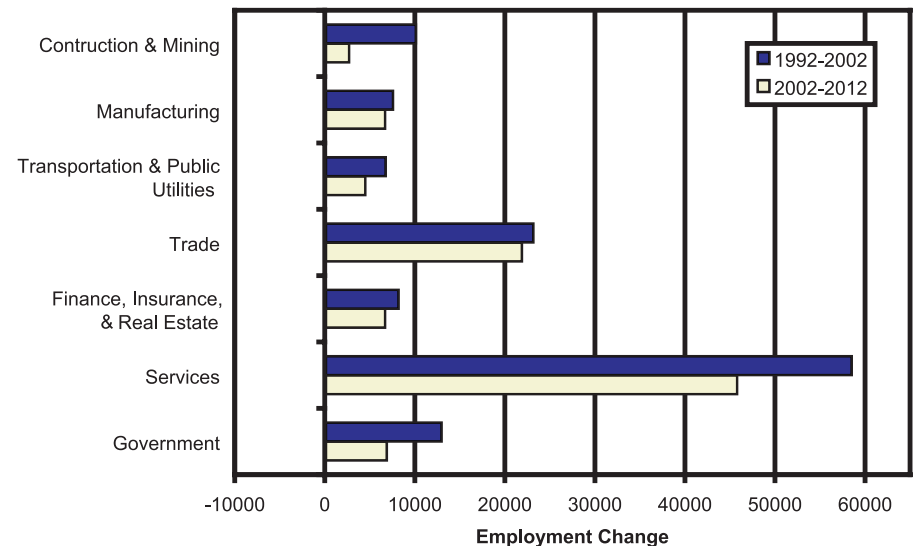
Structural changes were a much more significant part of the most recent national recession/recovery cycles than in the past. At the start of the 2001 recession, 79 percent of employees worked in one of these structural loss industries. This was a significant increase from the recessions of the 70s and 80s when structural change industries comprised only about 50 percent of employment. Even in the early 1990s, the employment share in industries undergoing structural changes was about 57 percent. This significant increase in structural job losses implies that recovery from recession requires that more employees train for and find work in different industries and occupations.

Structural changes are adding to the uncertainty surrounding the manufacturing industry in the Portland region. Groschen and Potter classified computer and electronic products as a structural change industry at the national level. Furthermore, some industry analysts speculate that the semiconductor industry is about to enter into another cyclical downturn. After a projected 30 percent growth in sales for 2004, they forecast flat or declining sales in 2005 (Sickinger, 2004).

Industries of the Future

How will the Portland Metropolitan economy look at the peak of the next business cycle? What industries are likely to fuel Portland's growth over the next five, ten, or twenty years? While it is difficult to make predictions with certainty, The Oregon Employment Department develops a ten-year forecast for each region of the state. Region 2, which includes Washington and Multnomah counties, provides a partial picture of what to expect from the region over the next decade. The projections are based on historical trends, industry and demographic relationships, state and national forecasting models, and population forecasts. They do not attempt to predict the timing of business cycles, nor the impact of external shocks such as oil price increases or unknown geopolitical factors. Figure 6 summarizes the historical and forecasted employment changes for Region 2 by major industry segment.

Figure 6. Historical and Forecasted Employment Change, Region 2



Source: Oregon Employment Department

While all major industries will add jobs over the next ten years, most will grow more slowly than they did in the past ten years. The service sector will expand most rapidly over the coming decade, accounting for almost half of the area's employment growth. Health services will grow by 25 percent as a growing and aging population increases demand for medical care.

Retail trade will also grow briskly, tracking closely with population trends. But construction will grow much more slowly than it did in the past decade. The finance, insurance, and real estate sector will grow along with the region's population, but factors such as interest rates, industry consolidation, technological changes (especially in the banking industry) and the health of the local housing market will have an impact on employment levels.

As discussed above, manufacturing will likely recover somewhat, although growth will probably be slow and employment will not reach pre-recession levels. The uncertainty about the future of the semiconductor industry blurs our view of the future for manufacturing in the region. Other components of manufacturing are expected to lose jobs. Lumber and wood products will continue its decades-long decline, primary metals is not expected to rebound with the area's economy, and the food processing and textile and apparel manufacturing sectors will continue to lose jobs to overseas production and improving technology.

OCCUPATIONAL STRENGTHS IN THE PORTLAND-VANCOUVER REGION

Another way to examine how Portland's economic structure will change is to consider what changes will occur in the way Portlanders work. How will the occupational profile of the region change? As new industries emerge and emerging technologies continue to affect production methods and service delivery, how will occupations and skill requirements change for these industries? This section considers how the region's residents make a living and the expected changes over the next ten years³.

Current Occupational Profiles

Table 2 summarizes the occupational profile of the residents of the Portland-Vancouver metropolitan region and projects how the region is expected to change over

the next decade⁴. Among these broad occupational categories, which are listed in order of 2002 employment, the employment patterns are expected to remain fairly stable. The largest share of workers in the Portland region work in office and administrative support professions followed by sales occupations, production occupations, and food preparation and serving. These ranks will change very little over the next ten years, although food preparation will outrank production operations by 2012. The greatest percentage growth in jobs will occur in healthcare and healthcare support occupations. Significant growth will also occur in computer and mathematical science occupations and in building and ground maintenance. However, because these occupations will grow from much smaller bases, a smaller number of total jobs will be added in each of these categories. We expect over 7,600 openings in computer and mathematical science occupations over the next ten years and over 13,000 in building and ground maintenance.

The expected number of openings in an occupational category depends on both the growth of that occupation and the need to replace existing workers due to turnover and retirement. Overall, almost two-thirds of total job openings over the next ten years will be from replacement openings rather than creation of new openings. But the ratio varies greatly by occupational group. At 30 percent, the lowest percentage of replacement openings occurs in computer and mathematical science occupations. The highest percentage of replacement openings is in food preparation and serving occupations, where low skill requirements and low wages contribute to a high turnover rate. Over 75 percent of the openings in this occupational category will be replacements.

Within these broad occupational categories, the distribution of occupations in the Portland region is somewhat similar to that of the rest of the United States. Table 3 shows the top 35 occupations in the Portland region, along with national employment and rank and expected growth. One of the most notable differences in ranking between the Portland region and the United States is Portland's much higher ranking for computer software engineers compared to the rest of the nation. This occupational category also is expected to grow by 23 percent over the next ten years, adding almost 1,400 new positions and creating more than 1,800 new openings. Another important difference between the Portland and U.S. rankings is the much higher rank for farm worker occupations in the Portland region. Over 4,700 openings will occur in this occupation over the next ten years, and that occupation continues to grow in this region.

³These occupational forecasts are based on industry employment forecasts, current staffing patterns, and expected changes in staffing patterns due to technological and other changes.

⁴Because occupational forecasts are developed for Workforce Development Areas, these data include the six counties in the Portland PMSA plus Cowlitz, Skamania, and Wahkiakum counties in Washington. The data are not entirely comparable because Washington occupational data include estimates of the self-employed while Oregon data do not.

Table 2. Employment by Major Occupational Categories Portland Metropolitan Area (including Southwest Washington)¹

	2002	2012	Percent	Growth	Replacement	Total
Occupation	Employment	Employment	Growth	Openings	Openings	Openings
Office and Administrative Support Occupations	169,165	190,869	12.8%	21,704	37,707	59,411
Sales and Related Occupations	111,219	129,205	16.2%	17,986	37,473	55,459
Production Occupations	80,405	87,150	8.4%	6,745	19,239	25,983
Food Preparation and Serving Related Occupations	78,141	90,054	15.2%	11,913	36,363	48,277
Transportation and Material Moving Occupations	73,015	81,942	12.2%	8,927	18,779	27,706
Education, Training, and Library Occupations	57,984	66,412	14.5%	8,428	13,164	21,592
Management Occupations	56,304	65,785	16.8%	9,482	10,512	19,994
Construction and Extraction Occupations	48,489	53,883	11.1%	5,394	9,614	15,008
Healthcare Practitioner and Technical Occupations	42,789	52,830	23.5%	10,041	10,389	20,430
Business and Financial Operations Occupations	41,735	48,330	15.8%	6,595	8,878	15,474
Installation, Maintenance, and Repair Occupations	39,811	45,292	13.8%	5,480	9,465	14,946
Building and Grounds Cleaning and Maintenance Workers	30,284	36,504	20.5%	6,220	6,869	13,089
Architecture and Engineering Occupations	29,747	34,935	17.4%	5,189	6,222	11,411
Computer and Mathematical Science Occupations	26,331	31,692	20.4%	5,361	2,263	7,624
Personal Care and Service Occupations	21,401	25,702	20.1%	4,301	6,820	11,121
Healthcare Support Occupations	19,657	24,481	24.5%	4,824	4,074	8,898
Community and Social Service Occupations	16,442	19,389	17.9%	2,947	3,035	5,982
Protective Service Occupations	16,306	19,028	16.7%	2,722	5,241	7,963
Arts, Design, Entertainment, Sports, and Media Occupations	14,057	16,693	18.8%	2,636	2,895	5,531
Farming, Fishing, and Forestry Occupations	13,209	14,976	13.4%	1,766	4,344	6,110
Life, Physical, and Social Science Occupations	10,720	12,319	14.9%	1,600	3,191	4,791
Nonclassifiable Occupations	9,408	11,717	24.5%	2,309	2,747	5,056
Legal Occupations	6,603	7,294	10.5%	691	567	1,258

Source: Oregon Employment Department; Washington Department of Employment Security

1. Includes the six counties in the Portland PMSA, plus Cowlitz, Wahkiakum and Skamania Counties

Table 3. Largest 35 occupations in the Portland Metropolitan Area (Including Southwest Washington)

Occupation					Portland Metro				
	2002 Employment		2002 Rank		2012 Employment	Percent Growth	Growth Openings	Replacement Openings	Total Openings
	Portland Metro	United States	Portland Metro	US					
Retail salespersons	30,260	3,894,760	1	1	35,320	16.7%	4,249	10,931	15,069
Office clerks, general	20,887	2,857,300	2	3	24,064	15.2%	2,667	3,772	6,387
Cashiers	19,599	3,375,510	3	2	22,795	16.3%	2,462	7,796	10,177
Registered nurses	17,039	2,239,530	4	4	21,202	24.4%	3,719	3,433	7,102
Waiters and waitresses	15,417	2,086,120	5	6	17,804	15.5%	1,940	7,934	9,824
Bookkeeping, accounting, and auditing clerks	14,934	1,728,730	6	12	16,533	10.7%	1,210	2,531	3,692
Janitors and cleaners, except maids and housekeeping cleaners	14,169	2,052,090	7	7	16,609	17.2%	1,931	2,321	4,195
Truck drivers, heavy and tractor-trailer	13,745	1,520,880	8	14	14,975	9.0%	1,290	1,537	2,877
Laborers and freight, stock, and material movers, hand	13,480	2,217,590	9	5	15,334	13.8%	1,626	4,249	5,853
General and operations managers	12,692	1,998,350	10	9	14,770	16.4%	1,833	2,097	3,902
Customer service representatives	12,326	1,854,750	11	10	14,364	16.5%	1,725	1,034	2,722
Sales representatives, wholesale and manufacturing, except technical and scientific products	12,270	1,375,380	12	18	13,975	13.9%	1,466	3,190	4,625
Stock clerks and order fillers	12,021	1,608,230	13	13	13,708	14.0%	1,491	3,901	5,374
Combined Food Preparation and Serving Workers, Including Fast Food	11,673	2,000,070	14	8	13,246	13.5%	1,158	5,390	6,519
First-line supervisors/managers of retail sales workers	10,446	1,197,190	15	22	12,110	15.9%	1,319	1,307	2,573
First-line supervisors/managers of office and administrative support workers	10,230	1,400,240	16	17	11,598	13.4%	1,157	1,865	3,000
Teacher Assistants	9,900	1,227,220	17	20	11,297	14.1%	799	1,728	2,460
Secretaries, except legal, medical, and executive	9,793	1,796,480	18	11	10,766	9.9%	665	1,492	2,126
Elementary School Teachers, Except Special Education	9,031	1,443,160	19	15	10,149	12.4%	632	1,749	2,326
Executive secretaries and administrative assistants	8,976	1,407,950	20	16	10,362	15.4%	1,191	1,499	2,669
Farmworkers and Laborers for Crops, Nurseries, and Greenhouses	8,801	218,020	21	121	10,335	17.4%	1,534	3,197	4,731
Business Operations Specialists, All Other	8,619	n/a	22	n/a	9,851	14.3%	1,121	2,130	3,242
Carpenters	8,412	856,750	23	32	9,263	10.1%	694	1,120	1,802
Receptionists and Information Clerks	8,032	1,063,020	24	24	9,641	20.0%	1,333	1,645	2,950
Postsecondary Teachers, Except Graduate Teaching Assistants	7,975	871,830	25	31	9,183	15.1%	1,208	2,342	3,550
Maids and Housekeeping cleaners	7,749	912,340	26	32	9,718	25.4%	1,145	1,487	2,506
Accountants and Auditors	7,696	888,690	27	30	8,954	16.3%	1,119	1,102	2,206
Leased Workers	7,579	n/a	28	n/a	9,656	27.4%	2,077	2,103	4,180
Maintenance and Repair Workers, General	7,453	1,212,620	29	21	8,641	15.9%	957	887	1,818
Cooks, Restaurant	7,290	715,520	30	36	8,399	15.2%	907	1,898	2,781
Food Preparation Workers	6,851	2,000,070	31	8	7,900	15.3%	872	2,431	3,284
Office and Administrative Support Workers, All Other	6,605	n/a	32	n/a	7,691	16.4%	933	1,108	2,025
Computer Software Engineers, Applications	6,539	356,760	33	81	8,036	22.9%	1,392	470	1,852
Shipping, Receiving, and Traffic Clerks	6,442	792,470	34	35	7,200	11.8%	618	1,204	1,806
Nursing Aides, Orderlies, and Attendants	6,379	1,329,310	35	19	7,953	24.7%	1,287	756	2,009

Source: Oregon Employment Department; Washington Department of Employment Security; n/a denotes data not available at the national level; Includes 6-county PMSA plus Cowlitz, Skamania, and Wahkiakum counties in Washington

Table 4. Thirty-five fastest growing occupations in the Portland Metropolitan Area (including Southwest Washington)

Occupation	2002 Employment	2012 Employment	Percent Growth	Growth Openings	Replacement Openings	Total Openings
Architects and engineering occupations						
Architects, Except Landscape and Naval	1,218	1,519	24.7%	301	78	379
Landscape Architects	366	466	27.2%	100	24	123
Electronics Engineers, Except Computer	1,937	2,419	24.9%	482	394	876
Life, physical, and social science occupations						
Economists	353	448	26.8%	95	88	183
Community and social services occupations						
Substance Abuse and Behavioral Disorder Counselors	805	1,011	25.6%	206	187	394
Marriage and Family Therapists	209	259	24.0%	50	49	99
Arts, design, entertainment, sports, and media occupations						
Art Directors	199	256	28.2%	56	47	103
Multi-Media Artists and Animators	341	433	26.9%	92	80	172
Choreographers	102	127	24.4%	25	22	47
Technical Writers	690	865	25.3%	175	233	408
Writers and Authors	407	562	37.9%	154	80	235
Interpreters and Translators	468	595	27.1%	127	99	226
Healthcare practitioner and technical occupations						
Pharmacists	1,803	2,255	25.1%	452	607	1,059
Registered Nurses	17,039	21,202	24.4%	4,163	3,857	8,020
Physical Therapists	1,165	1,447	24.2%	282	327	609
Veterinarians	468	608	30.1%	141	97	238
Nuclear Medicine Technologists	111	141	26.9%	30	28	58
Pharmacy Technicians	2,174	2,809	29.2%	635	644	1,279
Respiratory Therapy Technicians	362	455	25.7%	93	106	199
Veterinary Technologists and Technicians	621	824	32.8%	204	187	390
Healthcare support occupations						
Home Health Aides	3,561	4,535	27.3%	973	514	1,488
Nursing Aides, Orderlies, and Attendants	6,379	7,953	24.7%	1,575	915	2,489
Psychiatric Aides	183	233	27.0%	49	27	76
Physical Therapist Assistants	371	464	25.1%	93	123	216
Physical Therapist Aides	225	287	27.9%	63	75	138
Massage Therapists	232	290	24.9%	58	60	118
Medical Equipment Preparers	446	552	23.9%	107	132	239
Veterinary Assistants and Laboratory Animal Caretakers	541	706	30.3%	164	165	329
Building and grounds cleaning and maintenance operations						
Supervisors and Managers of Landscaping and Groundskeeping Workers	579	718	24.0%	139	35	174
Moids and Housekeeping Cleaners	7,749	9,718	25.4%	1,970	1,906	3,876
Personal care and service occupations						
Child Care Workers	4,450	5,775	29.8%	1,324	1,751	3,075
Residential Advisors	456	571	25.2%	115	117	232
Sales and related occupations						
Demonstrators and Product Promoters	1,279	1,650	29.0%	371	478	849
Production occupations						
Dental Laboratory Technicians	685	850	24.2%	166	209	374
Unclassified occupations						
Lensed Workers	7,579	9,656	27.4%	2,077	2,103	4,180

Includes only occupations with greater than 100 employees in 2002, and does not include "all other" categories. Includes 6-county PMSA plus Cowlitz, Skamania, and Waikeahum counties in Washington. Source: Oregon Employment Department; Washington Department of Employment Security.

Among the top 35 occupations, those with the slowest expected growth rates include bookkeepers and secretaries. This result probably reflects labor saving information technology. However, receptionists and information clerks will enjoy a relatively robust 20 percent growth rate, perhaps reflecting the continued need to provide human interactions and to manage the growing volume of information influencing the workplace.

Fast-Growing Occupations

Table 4 lists the fastest growing occupations in the region, sorted by occupational category. This list includes only occupations with employment of at least 100 in the region. It shows that many of the fast-growing occupations are not those that currently comprise a substantial share of employment. Thus, although they will experience high growth rates, the number of jobs they add will be relatively small. The exception is in the health care field, where substantial growth rates will occur on top of large employment numbers. Architects and several of the arts, design, entertainment, and media occupations will also grow quickly over the next ten years and add substantial numbers to the workforce.

Continuous Learning

In many occupations, employees must continually relearn their jobs to remain competitive in today's job market. A 2002 survey of employers in Multnomah, Tillamook, and Washington counties found that employers believe that workers will need to improve their skill levels in a broad range of occupations over the next several years. The skills most often cited include computer software application skills, Spanish language skills, and problem solving and critical thinking skills (Moller, 2002).

Furthermore, the increasing pace of technological change increases the need for lifelong learning among all workers. This requirement applies not only to the scientists and engineers who are making discoveries and applying them in industry, but also to the workers in all occupations who use technology once it has been embedded in the products and processes we use everyday.

Many employers are also reengineering jobs to deal with critical worker shortages. In the healthcare industry, many workers are performing jobs today that they

may not have been trained for ten or even five years ago. This adaptation allows healthcare providers to continue to provide services in the face of critical worker shortages. However, it also demands continuous education and clear lines of communication between employers and educators to ensure that the new expectations are reflected in training and education programs.

STORIES OF COMPANY SURVIVAL, RECOVERY, AND EVOLUTION

The evolution of the Portland-Vancouver regional economy is also apparent in the transformations taking place within the region's most successful companies. In the face of difficulties caused by changing markets, falling consumer and industrial demand, and competition from overseas, many of the region's companies have had to reinvent their businesses through innovation of products and processes, development of new markets, and increasing the value embedded in the products and services they offer. Increasingly, global markets have moved the production of commodity products overseas. The challenge for the region's companies is to identify competitive advantages that cannot be easily duplicated by low-cost competitors.

nLight Photonics

One such company is nLight. nLight was founded in July 2000 to develop high power semiconductor lasers for telecommunications networks. The company raised over \$60 million and opened a state-of-the-art 60,000 sq ft manufacturing plant in Vancouver in September of 2001. nLight had to rethink its strategy as the telecommunications industry collapsed in 2001 and 2002. As the market for high power semiconductor lasers collapsed from over \$1 billion/yr in 2000 to under \$50 million/yr in 2002, nLight faced a very difficult decision: either declare bankruptcy or refocus the company on new markets.

In the summer of 2002 with the support of the venture capitalists, nLight began the transition to higher power diodes in a broad range of wavelengths. This reorientation allowed them to target markets for industrial, medical, and defense applications. They were able to launch these products in time for the Photonics West show in San Jose in January of 2003. During 2003, nLight received a \$5 million award from the Defense Advanced Research Projects Agency (DARPA), and

additional research funds from the Air Force, which allowed nLight to improve the performance of its laser diodes, making them appropriate for a number of military applications. nLight raised \$13 million in its third round of financing in January of 2004. In August of 2004, they were awarded a \$25 million contract with the Air Force.

Today, nLight leads the world in high power semiconductor lasers and is one of the very few companies that has successfully made the transition out of the telecom downturn. Over 500 optical component companies were started in 1999 and 2000 to focus on telecommunications. Today fewer than 25 still exist.

Scott Keeney, CEO of nLight, attributes the successful transition of his company to an experienced staff with the market knowledge and the technical expertise to apply the technology to growing markets. "We have always focused on the team first. It is crucial to make sure you have the right people on the bus. With the right team in place it is much easier to make decisions on where the bus is headed."

After having doubled staff in the past year to over 70 people, nLight is poised to continue to grow as semiconductor lasers become crucial in applications ranging from industrial processes to defending aircraft from heat-seeking missiles. nLight's evolution has demonstrated the need for adaptability in the fast-changing economy and has ensured its continued contribution to the economic vitality of the Portland-Vancouver region.

Huggy Bear's Cupboards

Huggy Bear's Cupboards is a Portland cabinet maker located on Hayden Island. For most of its 25 years in business, Huggy Bear's targeted the upper end of the mid-range cabinet market and sold much of its product locally.

About six years ago, Huggy Bear's decided to re-focus its product on the highest end of the luxury custom kitchen cabinet market. This decision was based on increasing competition from the large home improvement retail outlets. Huggy Bear's needed to specialize in a market that these competitors would find difficult to penetrate, and the company saw an opportunity in the luxury cabinet market. While the mid-range cabinet market was becoming more and more competitive, no cabinetmakers west of the Mississippi were targeting the luxury market. Furthermore, Huggy Bear's felt that its highly skilled workforce and its long-standing emphasis on quality would ease the transition to this higher-end market.

To successfully implement this strategic change, Huggy Bear's had to modify its

marketing network. In the past, Huggy Bear's had marketed much of its product locally. However, with a more specialized market niche, Huggy Bear's had to sell more of its product throughout the west coast and nationwide. This redirection required recruiting and training new dealers for its products over a much broader geographic area.

Huggy Bear's also had to place an even greater emphasis on continuous training for its workers and retention of its most qualified staff. While Huggy Bear's had always tried to recruit and retain the most skilled craftsmen, its renewed emphasis on quality required implementing a continuous training program. Huggy Bear's solicits feedback from its dealer network, adapts its products and production techniques, and trains its craftsmen to implement the required changes. Huggy Bear's also has worked hard to retain its most skilled workers—those who are best able to assist with product and process improvement.

Huggy Bear's operates in a seasonal and cyclical business tied to the construction industry. Employment and/or hours per employee generally fall during the winter and during recessions. During this most recent recession, Huggy Bear's was forced to cut back on workers and on hours. But its aggressive marketing strategy focused on areas of the nation where the recession was relatively mild and high-end homebuilding was strong. That strategy has served them well. Huggy Bear's has returned to its pre-recession employment of 60 full-time workers.

OBSERVATIONS AND CONCLUSIONS

Over the last several years, the Portland region has experienced reorganization in its industrial and occupational makeup as it has struggled out of recession and toward recovery. The forecasts contained in this essay predict how our economy will grow and how our workforce will be organized within the next ten years. But a host of unforeseeable economic, technological, and social factors no doubt will affect the region's ability to organize its human, intellectual, and capital resources in response to profound changes that will shape our economy for years to come.

In 1942, the Austrian economist Joseph Schumpeter in his book *Capitalism, Socialism, and Democracy* coined the phrase "creative destruction" to describe the implications of discontinuous shocks on the economy: "The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers, goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates." (Schum-

peter 1942, p. 82). “Creative destruction” implies that the innovation necessary to recover from a failing economic system requires the destruction of the infrastructures and methodologies necessary to maintain it. In a similar vein, Stan Williams of Hewlett Packard summarized the revolutionary nature of the technological changes taking place today in information, biological, and nanotechnologies:

We are actually watching the birth of three great new technologies, all simultaneously. “Bio” is the utilization of chemistry in life to not only understand organisms but to manufacture all types of things that we have in our environment. “Info” is the harvesting, storage, and transmission of information of all sorts that we want about our environment. And “nano” is the control of matter at the scale where basic material properties are determined.

Williams goes on to explain that science in each of these areas is undergoing revolutionary changes and that each is beginning its applications phase. Together, applications in these areas will influence our economy and our lives in ways we can only imagine. And as these innovative applications flourish, creative destruction inevitably occurs, marginalizing the technologies upon which they ultimately are founded.

The changes predicted for our near future by Williams suggest the need for resiliency in our economic, social, and civic institutions. Gardner (1990) suggests that this kind of resiliency is dependent upon a set of core purposes and values that are relatively durable so that a society can direct itself in times of change according to those core values.

In the years ahead, Portland’s economy will inevitably evolve as some sectors and professions decline and others emerge and strengthen. Recessions tend to accelerate these transformations, as weak companies go out of business, unemployed entrepreneurs test new ideas, and industries are forced to improve productivity and reduce costs. While we cannot predict the exact direction and speed of that evolution, we must examine our economic, social, and civil institutions and evaluate their ability to respond to change. At the same time, we must keep in mind that the process of creative destruction, by its very nature, will cause problems for those who

must struggle through the inevitable transformation. Keeping a firm grasp of our core values will allow us to continuously invent a new economy for the region while addressing the problems that change causes for many members of our society.

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