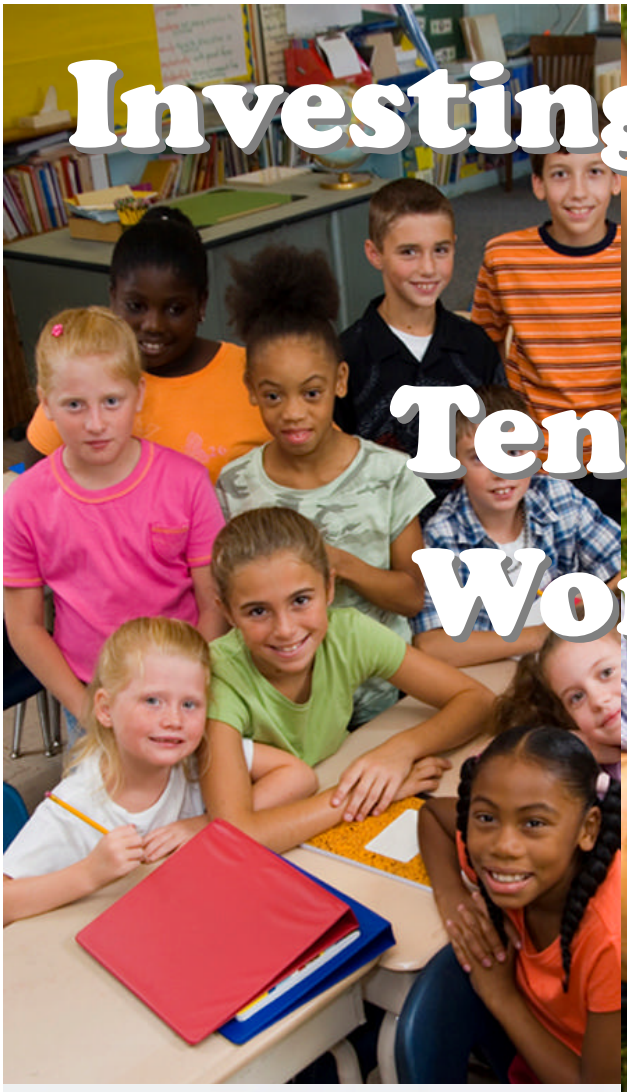

Investing for Growth in Tennessee's Workforce

Tennessee Department of Labor
and Workforce Development
Employment Security Division
Labor Market Information Section

Investing for Growth in Tennessee's Workforce to 2016

Tennessee Department of Labor and Workforce Development
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September 2008

Summary

This annual report of Tennessee employment by the Department of Labor and Workforce Development covers the period 2006 through 2016. This research finds that higher levels of skill and knowledge are necessary to reduce current and projected occupational shortages. Technological innovations such as computers, satellites, biotechnology, and lasers have improved productivity in both service-providing and goods-producing industries. Rising costs of oil and core commodities have sharply increased by the summer of 2008. Innovative efforts in energy and continued focus on skills and knowledge can help with the new challenges.

Complexity requires an adequate supply of skills and knowledge that are advanced, new, groundbreaking, and competitive globally. Traditional skills continue to be in demand as they are redefined in the global setting. More jobs are likely to become available in industries providing services than in the industries producing goods. Emergent and demand occupations requiring these abilities, including the "green" industries are identified. Successful training programs have content adequate to train employees to provide skills, provide knowledge, and attract new talent. Supply and demand for occupations are described through cluster analysis.

Employment growth, higher wages, and reduced poverty are consistent with growth in skills and knowledge. Needed skills include active listening, reading comprehension, speaking, time management, and critical thinking. Knowledge needs include customer and personal service, English language, mathematics, administration and management, and public safety and security.

The report is divided into several parts, including historical employment from 1990 to 2007, projected industry employment for 2006 to 2016, contemporary structural change, wages, green industries, and skill and cluster analyses of employment.

Produced in partial fulfillment of the requirements for the PY 2007 Workforce Information Grant, Employment and Training Administration, U.S. Department of Labor.

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Executive Summary

The following report contains important trends in Tennessee's employment from 1990 through the present and includes projections through 2016. Demographic characteristics are favorable to growth in Tennessee employment. Knowledge, skills, and educational characteristics important to Tennessee's growing industries are highlighted. Projected occupational shortages are identified. Challenges currently facing Tennessee in education and income, but relative emerging global trends, are identified. Tennessee has developed several innovative approaches to these challenges; promising areas for future investment are described. Workforce investment is a key to Tennessee's positive economic outlook.

Historical Employment to 2008 (page 23)

- Shifts in Tennessee's employment from manufacturing to services during the 1990s have had a significant impact on workforce requirements.
- State and national trends are closely linked in Tennessee, although there are some differences in unemployment and employment through the years.
- Tennessee added 13,900 jobs for 0.5 percent growth in 2007. This is lowest growth since 2003.
- Goods-producing employment decreased significantly in 2007. Manufacturing decreased significantly. This has been the trend for the past years.
- Service sector growth was positive during 2007, but was much slower than in 2006.

Projected Employment to 2016 (page 12)

- The manufacturing industries are projected to decline through 2016. More than 2000 new jobs will be created in education and health services; trade, transportation, and utilities; and leisure and hospitality.
- Employment in the service-providing sector is expected to show significant growth through 2016. The goods-producing sector is likely to remain flat chiefly since manufacturing is expected to decline.

Current Employment, Economic Indicators, and Wages (page 24)

- Tennessee unemployment is increasing sharply in June 2008.
- Help-wanted advertisements are sharply down.
- Poverty has increased since 2001.
- The price of oil is at previously unseen levels.
- The Consumer Price Index (CPI) significantly increased from March to June 2008
- Wages for management have increased significantly relative to other occupations
- Wages for services are down, including accommodation and food services and other services.
- College degrees are a buffer against high unemployment (page 46).

Knowledge and Skill Needs (40)

- Educational and training programs must produce graduates with skills and knowledge pertinent to a wide range of occupations.
- Skills of high importance include coordination, social perceptiveness, time management, and critical thinking.
- Knowledge needs that rank highly include customer and personal service, English language, mathematics, and administration and management.
- Valued work styles include dependability, attention to detail, integrity, cooperation, and self-control.

Supply and Demand in Tennessee (page 49)

- Occupational areas with a quite a bit more supply compared to demand include communications, arts and crafts, optometry, dentistry, and educational administration. These areas are very competitive.
- Occupational areas with more supply than demand include general business and management, surgical technology, social sciences, foreign language postsecondary teaching, biology, and general engineering (page 53). These are the competitive occupations.
- Shortage occupational areas include health, teaching, and construction. Registered and licensed practical nurses and dental and pharmacy workers are in demand. Shortage occupations include pharmacy assistants and technicians, dental assistants, and teachers in preschool and elementary programs. Special education teachers are needed in preschool, kindergarten, and elementary schools. Construction worker shortages include painters, ironworkers, pipe-fitters, insulation workers, and maintenance and repair workers. Workers are needed in heating, air, and refrigeration.

Investing for Growth in Tennessee's Workforce 2006-2016

Analyses of Tennessee employment trends from 1996 to 2006, and employment projections to 2016, provide the framework for detailed status of the workforce by industry, occupation, education, and wage levels. With the 21st Century proceeding, workers in emerging industries compete for global advantage, as they train for occupations in industries with available jobs. Analyses of occupations reveal skills and knowledge needed now for increased productivity and innovation. Classifying occupations by supply and demand clusters helps to clarify the match between worker resources and industry needs.

Current employment trends show an increase in unemployment at both the national and state levels. Workforce recovery may be slow, with projections for the short term for the years 2008 and 2009 showing an average annual growth of 0.6 percent. Long term projections for 2006-2016 show an expected 1.2 percent per year average employment growth.

Tennessee Employment Change in 2007

Tennessee had a growth rate of 0.5 percent during 2007, with 13,900 jobs added. Year 2007 has the lowest growth rate since 2003 when the state's employment declined by 1,700. About 29,200 jobs were added in the service-providing industries (1.3 percent increase; Table 1, page 8). Most job gains and higher growth rates were in the education and health services and leisure and hospitality sectors.

Table 1. Growth in Service-Producing Industries in Tennessee, 2007

Industry	Jobs Gained	Percentage Gained
Trade, Transportation and Utilities	3,800	0.6%
Information	100	0.2%
Financial Activities	600	0.4%
Professional & Business Services	3,000	0.9%
Educational & Health Services	9,500	2.8%
Leisure & Hospitality	6,100	2.3%
Other Services	1,600	1.6%
Government	4,400	1.1%

Employment in goods-producing industries showed a decline by 15,300 jobs (2.9 percent decrease) during 2007. Construction gains of 3,200 (up 2.4 percent) partially offset manufacturing losses. Manufacturing jobs declined by 18,500 during 2007. Manufacturing has declined every year since 1996, except for 1998, when it increased by 600 jobs. Most of the manufacturing decline in recent years has been concentrated in nondurable goods. Durable goods industries declined during 2007 by 13,500, with losses of 3,800 in transportation equipment, 2,000 in fabricated metals, and 1,800 in wood product manufacturing.

Tennessee Demography

Modest Dependency in Tennessee. Some have projected a labor shortage for the long term as the baby boom years 1946 to 1964 dissolve in retirements between 2011 and 2029, using 65 years as a general retirement age. If there is debate in the U.S. concerning the effect of these dynamics, the picture in Tennessee is a consideration. Tennessee appears to rank favorably with modest dependency ratios through 2030. The dependency ratio for those under 18 is projected to be less from 2010 through 2030 than in 2000. The ratio for those over 65 is now about equal to the nation, and promises to remain about equal through 2030.

Tennessee, in 2000, was ranked 29th in percentage of population 65 and older (12.4 percent) and is projected to be 29th in 2010 (13.3 percent) and 34th in 2030 (19.2 percent) (U.S. Census, 2004). Those under 18 are projected to be 23.7 percent of the population in 2010 and 24.3 percent in 2030, down from 24.6 percent in 2000 (Table 21, page 59). Tennessee will have less population under 18 well past 2010 and an advantageous proportion of working-age population past 2010. Proportions of the population over 65 will be about the same as the nation for these periods.

Demographic Factors and Educational Needs. Tennessee, the 16th largest state in 2000, is projected to be 15th in size by 2030 (U.S. Census, 2004). It is expected to have the 17th most rapid growth rate during the period. Detail on Tennessee's population, income, and population are shown online (http://www.sourcetn.org; Tennessee State Government, 2007b). Population growth and economic improvement are conditional, however, depending on the opportunities for training for workers in the state and the proper allocation of resources for the expected increase in population. There are significant workforce needs for individuals with degrees such as First Professional, PhD, MA, BA, and AA. Tennessee is projected to have a working-age population with stable growth through 2030, according to projections by the Census Bureau (2004). Employment is likely to continue to grow along with population change and increase after 2010 (CBER, 2007).

I. Short and Long Term Projections

Size of Industry Sector. Tennessee's employment is greatest in the sectors of trade, transportation, and utilities (over 600 thousand) and education and health services (over 500 thousand) (Table 2, page 11). Manufacturing (about 400 thousand), professional and business services (over 300 thousand), and leisure and hospitality (about 260 thousand) are leading industries. Government, financial activities, other services, and construction each have over 100 thousand employees.

General Growth for Short and Long Terms. Growth through 2016 is expected to be about 1.2 percent (Table 2, page 11). Short term growth (through 2009) is projected to be less at 0.6 percent per annum (Table 3, page 11). Employers shed jobs for a sixth straight month in June 2008 at the national level, and the service sector unexpectedly reversed (Stoddard). Long term and short term employment growth (Figure 1, page 12; Figure 2, page 12), as well as contemporary economic events, show some conflicting trends as described on the following pages.

Projected Long Term Employment 2006 through 2016

Growth Rates for the Long Term. Employment is projected to increase from 2006 to 2016 in all industry sectors except manufacturing, which is expected to decline (Table 2, page 11; Figure 1, page 12, contains long and short term growth rates). Management of companies and enterprises (3.2 percent annual growth), health services (2.3 percent), and construction (1.9 percent) are projected to increase strongly (Table 22, page 60). Wholesale and retail trade are expected to grow 1.1 percent and 1.0 percent per year, respectively. Transportation and warehousing as well as finance and insurance are projected to grow 1.3 and 1.2 percent per year, respectively. Real estate and rental and leasing are projected to grow by 0.9 percent. General projections for the long term, or 2006 to 2016 (Table 22, page 60), are the following:

- **The growth rate for 2006 to 2016 is significant at 1.2 percent per annum.**
- **Some people-oriented services and construction are likely to show significant growth.**
- **Manufacturing is projected to decline for the long term.**

Table 2. Long Term Employment Projections for Industry Sectors, In Thousands, Tennessee, 2006-2016

Industry	2006 Estimated Employment	2016 Projected Employment	Number of New Jobs	Annual Growth Rate
Natural Resources and Mining	35.46	38.97	3.5	0.9%
Construction	130.27	157.66	27.39	1.9%
Manufacturing	399.4	375.81	-23.6	-0.6%
Trade, Transportation, and Utilities	609.82	679.05	69.23	1.1%
Information	49.46	50.31	0.85	0.2%
Financial Activities	141.43	158.09	16.66	1.1%
Professional and Business Services	317.25	386.29	69.04	2.0%
Education and Health Services	548.1	662.85	114.74	1.9%
Leisure and Hospitality	268.49	310.69	42.21	1.5%
Other Services (Except Government)	124.98	135.85	10.87	0.8%
Government	187.25	213.57	26.32	1.3%
Total	2811.9	3169.1	357.2	1.2%

Table 3. Short Term Employment Projections for Industry Sectors, In Thousands, Tennessee, 2007-2009

Industry	2007 Estimated Employment	2009 Projected Employment	Number of New Jobs	Annual Growth Rate
Natural Resources and Mining	37.2	37.3	0.2	0.2%
Construction	134.8	135.6	0.8	0.3%
Manufacturing	380.9	358.3	-22.6	-3.0%
Trade, Transportation, and Utilities	608.8	617.4	8.5	0.7%
Information	49.8	50.5	0.7	0.7%
Financial Activities	144.9	146.0	1.1	0.4%
Professional and Business Services	320.2	323.0	2.8	0.4%
Education and Health Services	558.8	585.3	26.5	2.3%
Leisure and Hospitality	281.8	291.0	9.2	1.6%
Other Services (Except Government)	127.0	133.4	6.4	2.5%
Government	211.5	211.5	-0.1	0.0%
Total	2855.6	2889.2	33.6	0.6%

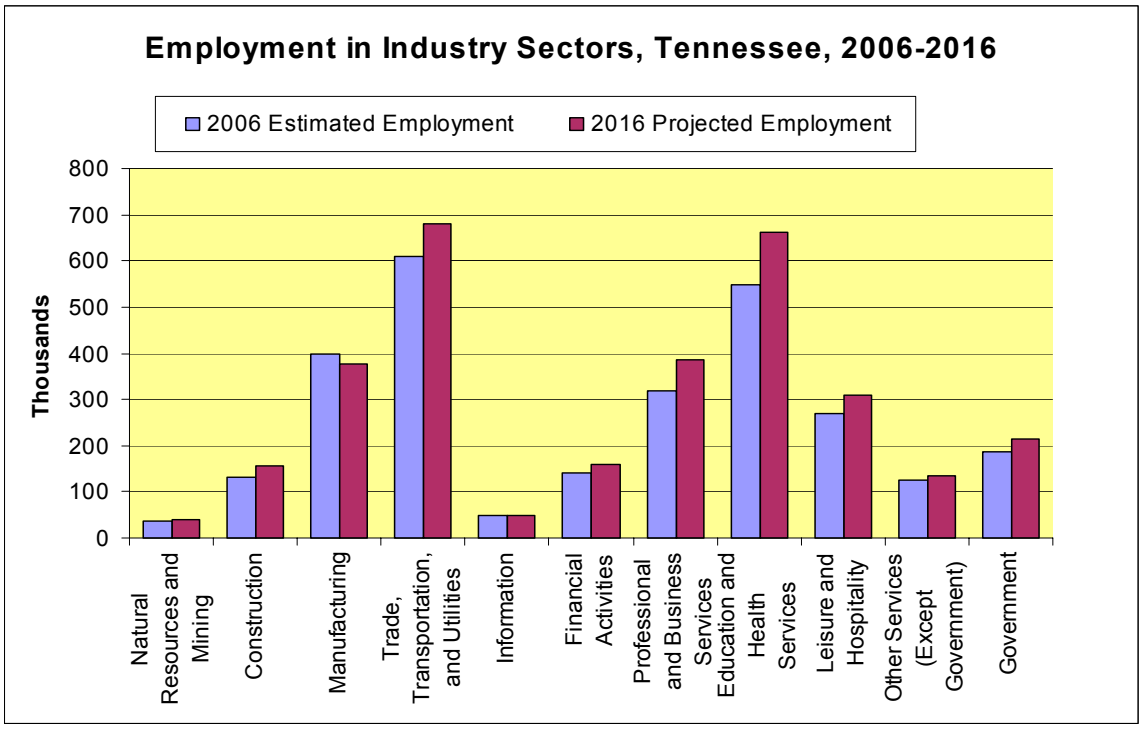

Figure 1. Employment in Industry Sectors, Tennessee, 2006-2016

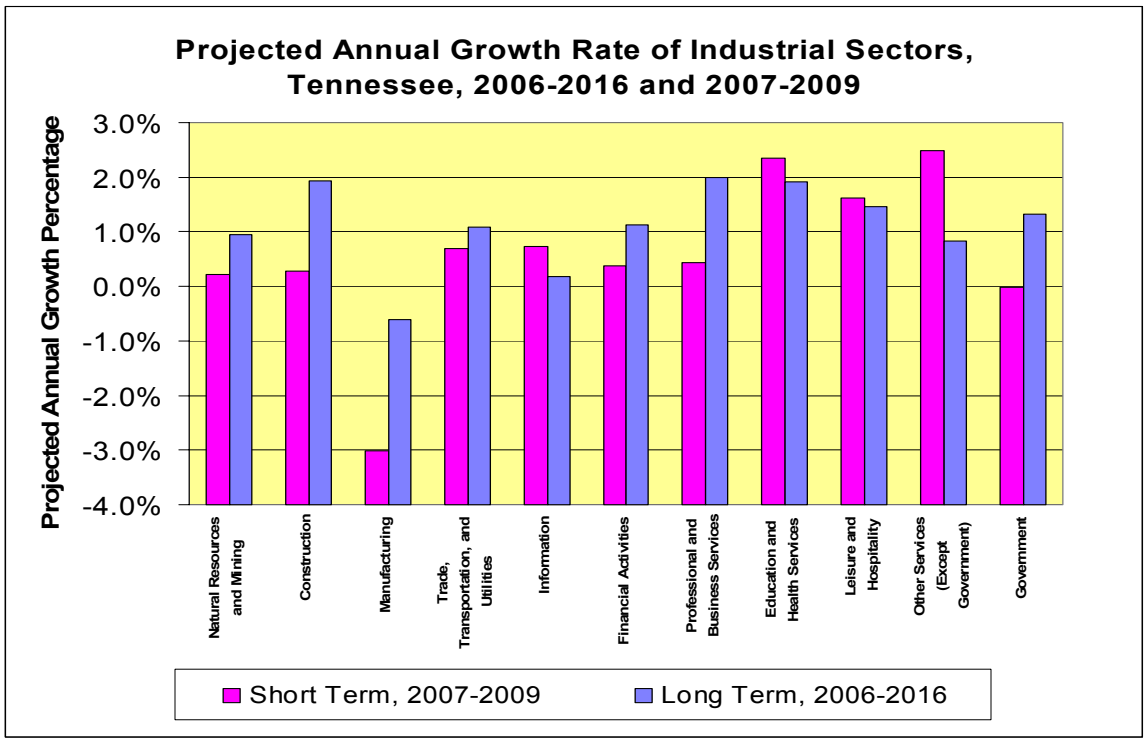

Figure 2. Projected Annual Growth Rate of Industrial Sectors, Tennessee, 2006-2016, 2007-2009

Growth of Occupations. Legal and healthcare support occupations are expected to grow at 2.5 and 2.4 percent per year for 2006-2016, respectively (Table 4, page 14). Healthcare practitioners and community and social services occupations could grow rapidly at 2.2 and 2.0 percent. The growth rate for protective service is ranked ahead of that for computer and mathematical occupations at 1.9 and 1.8 percent, respectively. The top eleven of the 22 categories include education, training, and library; construction and extraction; business and financial operations; food preparation and serving-related; and personal care and service occupations. Other occupational categories are expected to grow at or below the state growth rate.

Most Rapidly Growing Occupations. Employment of pharmacy technicians is expected to grow the most rapidly at 4.6 percent per year (Table 5, page 15). This occupation requires an associate's degree or more. Network systems and data communications analysts, which require a BA or more, are expected to grow at 4.4 percent. Home health aides do not earn high salaries, but it is a growing category. Pharmacists earn median income of $107,800 per year.

Occupations by Number of New Jobs. An abundance of jobs will be found for retail salespersons (Table 6, page 16); more than 18,000 new jobs per year are expected. Customer service representatives, registered nurses, and food preparation workers also host a large number of new jobs. Some of the jobs have attractive salaries, such as registered nursing at $54,000 per year. Elementary school teachers as well as accountants and auditors have good salaries. Many of the jobs with numerous openings require only moderate or short term training. Elementary school teachers as well as accountants and auditors require a BA or more.

Table 4. Projections of Major Groups of Occupations, Tennessee, 2006 through 2016

SOC	Title	2006 Estimate	2016 Projection	Job Growth	Growth Rate
00-0000	Total, All Occupations	3,007,840	3,378,980	371,150	1.2%
23-0000	Legal Occupations	13,870	17,680	3,810	2.5%
31-0000	Healthcare Support Occupations	69,000	87,310	18,310	2.4%
29-0000	Healthcare Practitioners and Technical Occupations	157,370	194,740	37,370	2.2%
21-0000	Community and Social Services Occupations	47,470	58,030	10,570	2.0%
33-0000	Protective Service Occupations	59,670	72,090	12,430	1.9%
15-0000	Computer and Mathematical Occupations	39,860	47,860	8,000	1.8%
25-0000	Education, Training, and Library Occupations	156,880	187,370	30,490	1.8%
47-0000	Construction and Extraction Occupations	138,440	163,320	24,880	1.7%
13-0000	Business and Financial Operations Occupations	89,620	105,150	15,530	1.6%
35-0000	Food Preparation and Serving Related Occupations	235,140	275,500	40,360	1.6%
39-0000	Personal Care and Service Occupations	75,350	87,680	12,340	1.5%
49-0000	Installation, Maintenance, and Repair Occupations	128,320	144,630	16,310	1.2%
37-0000	Building and Grounds Cleaning and Maintenance Occupations	111,210	123,720	12,510	1.1%
41-0000	Sales and Related Occupations	294,420	326,920	32,490	1.1%
45-0000	Farming, Fishing, and Forestry Occupations	24,780	27,710	2,940	1.1%
43-0000	Office and Administrative Support Occupations	478,680	530,100	51,420	1.0%
11-0000	Management Occupations	188,160	205,830	17,670	0.9%
19-0000	Life, Physical, and Social Science Occupations	14,750	15,890	1,150	0.8%
17-0000	Architecture and Engineering Occupations	36,340	38,480	2,140	0.6%
53-0000	Transportation and Material Moving Occupations	276,870	294,960	18,100	0.6%
27-0000	Arts, Design, Entertainment, Sports, and Media Occupations	43,810	45,770	1,960	0.4%
51-0000	Production Occupations	327,860	328,250	380	0.0%

Source: Tennessee Department of Labor and Workforce Development
Employment Security Division, Research and Statistics Section, 7/11/2008

Table 5. Projections of Top 25 Fastest Growing Occupations by Growth Rate, 1500+ Employees with Wages and Training, Tennessee, 2006 through 2016

SOC	Title	Est 2006	Proj 2016	Ann. Gr. Rate	2007 Median Annual Wage**	TR*
29-2052	Pharmacy Technicians	7,970	12,540	4.6%	$26,100	6
15-1081	Network Systems and Data Communications Analysts	2,810	4,340	4.4%	$62,600	5
31-1011	Home Health Aides	10,760	15,610	3.8%	$18,700	11
29-1051	Pharmacists	5,640	7,960	3.5%	$107,800	1
15-1031	Computer Software Engineers, Applications	3,310	4,630	3.4%	$69,900	5
23-2011	Paralegals and Legal Assistants	3,730	5,180	3.3%	$36,900	6
13-2051	Financial Analysts	2,220	3,080	3.3%	$59,100	5
39-9021	Personal and Home Care Aides	12,310	16,850	3.2%	$18,000	11
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	2,670	3,650	3.2%	$35,200	7
21-1023	Mental Health and Substance Abuse Social Workers	2,830	3,860	3.2%	$28,900	3
31-9092	Medical Assistants	9,220	12,600	3.2%	$25,700	7
43-3011	Bill and Account Collectors	12,270	16,570	3.0%	$28,500	11
39-9041	Residential Advisors	1,920	2,570	2.9%	$18,900	10
21-1093	Social and Human Service Assistants	3,190	4,250	2.9%	$25,300	3
43-5011	Cargo and Freight Agents	2,490	3,320	2.9%	$38,000	10
11-9011	Farm, Ranch, and Other Agricultural Managers	5,370	7,070	2.8%	$56,200	4
21-1014	Mental Health Counselors	2,880	3,780	2.8%	$26,000	3
25-2041	Special Education Teachers, Preschool, Kindergarten, and Ele	4,330	5,620	2.6%	$39,200	5
43-6012	Legal Secretaries	3,390	4,390	2.6%	$32,400	7
15-1032	Computer Software Engineers, Systems Software	2,800	3,620	2.6%	$72,300	5
33-3021	Detectives and Criminal Investigators	2,320	3,000	2.6%	$44,500	8
31-2021	Physical Therapist Assistants	1,750	2,250	2.6%	$45,900	6
41-3031	Securities, Commodities, and Financial Services Sales Agents	3,260	4,200	2.6%	$82,000	5
43-4051	Customer Service Representatives	48,360	62,400	2.6%	$27,300	10
25-9031	Instructional Coordinators	2,110	2,710	2.6%	$49,500	3

*TR (Training): 1: 1 Prof, 2: Ph.D., 3: MA, 4: BA+Work, 5:BA, 6: AA, 7: Post Secondary, 8: Related Work Experience, 9: Long Term Training, 10: Moderate Term, 11: Short Term, **Wages are 2007

Source: Tennessee Department of Labor and Workforce Development
Employment Security Division, Research and Statistics Section, 7/11/2008

Table 6. Projections of Top 25 Occupations by Employment Growth with Wages and Training, Tennessee, 2006 through 2016

SOC	Title	Est 2006	Proj 2016	Ann. Gr.	2007 Median Annual Wage**	TR*
41-2031	Retail Salespersons	85,980	104,710	18,730	$19,300	11
43-4051	Customer Service Representatives	48,360	62,400	14,030	$27,300	10
29-1111	Registered Nurses	51,960	65,410	13,450	$54,000	6
35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	56,290	68,360	12,070	$14,500	11
53-3032	Truck Drivers, Heavy and Tractor-Trailer	73,170	83,140	9,970	$36,800	10
35-3031	Waiters and Waitresses	49,750	58,960	9,210	$14,200	11
43-9061	Office Clerks, General	56,220	64,620	8,400	$24,600	11
25-2021	Elementary School Teachers, Except Special Education	30,740	38,000	7,250	$42,000	5
31-1012	Nursing Aides, Orderlies, and Attendants	31,850	38,580	6,730	$21,300	11
37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaner	42,750	48,660	5,910	$18,800	11
43-3031	Bookkeeping, Accounting, and Auditing Clerks	37,510	42,850	5,340	$29,000	10
33-9032	Security Guards	22,830	27,980	5,150	$19,400	10
51-2092	Team Assemblers	67,490	72,500	5,000	$26,600	10
31-1011	Home Health Aides	10,760	15,610	4,850	$18,700	11
29-2052	Pharmacy Technicians	7,970	12,540	4,570	$26,100	6
39-9021	Personal and Home Care Aides	12,310	16,850	4,540	$18,000	11
25-9041	Teacher Assistants	27,270	31,730	4,460	$18,000	11
43-6011	Executive Secretaries and Administrative Assistants	33,210	37,650	4,440	$32,600	7
43-3011	Bill and Account Collectors	12,270	16,570	4,300	$28,500	11
47-2061	Construction Laborers	23,690	27,750	4,070	$24,400	10
43-4171	Receptionists and Information Clerks	20,000	23,810	3,810	$23,000	11
41-1011	First-Line Supervisors/Managers of Retail Sales Workers	39,870	43,510	3,640	$32,000	8
49-9042	Maintenance and Repair Workers, General	33,170	36,810	3,640	$31,100	9
13-2011	Accountants and Auditors	17,200	20,740	3,540	$49,700	5
39-9011	Child Care Workers	26,610	30,100	3,480	$15,800	11

*TR (Training): 1: 1 Prof, 2: Ph.D., 3: MA, 4: BA+Work, 5:BA, 6: AA, 7: Post Secondary, 8: Related Work Experience, 9: Long Term Training, 10: Moderate Term, 11: Short Term, **Wages are 2007

Source: Tennessee Department of Labor and Workforce Development
Employment Security Division, Research and Statistics Section, 7/11/2008

Short Term Employment for 2008 and 2009

Tennessee is expected to show a 0.6 percent average annual increase in employment in 2008 and 2009 according to Department of Labor and Workforce short-term projections. About 33,600 new jobs are expected from the second quarter of 2007 to the second quarter of 2009 (Table 3, page 11).

Manufacturing is expected to decline sharply for 2007 to 2009, with a per annum decrease of 3.0 percent (Table 3, page 11; Figure 2, page 12). Education and health services and other services are expected to increase strongly by 2.3 and 2.5 percent, respectively. Short term projections for 2007 to 2009 are:

- **Manufacturing is expected to decline sharply.**
- **Education, health, and other services are likely to show strong growth.**
- **Construction, professional, and business services, finance, and government show signs of weak growth**.

Goods-producing jobs are likely to have an average annual 2.0 percent decline for 2008 and 2009 (Table 7, page 18), but services-providing jobs expected to grow annually at 1.2 percent. "Other services (except government)" are expected to grow at 2.0 percent or more; as are educational services and health care and social assistance. Industry sectors growing between 1.0 and 2.0 percent annually include arts, entertainment, and recreation; accommodation and food services; management of companies and enterprises; transportation and warehousing; and wholesale trade. Industry employment growing at or above the average rate for the state includes professional, scientific, and technical services; information; and real estate and rental and leasing. Industries expected to grow less rapidly than the state average include agriculture; retail trade; construction, finance and insurance; and administrative and support and waste management and remediation. Government is expected to be stable. Utilities, mining, and manufacturing are likely to have some net job losses for the two years.

Table 7. Jobs Gained and Lost with Annual Wages in Thousands for Industry Major Groups, Ranked by Projected Growth Rate, 2008 and 2009

(Thousands)

SOC	Industry	G/S	2007 Qtr 2	2009 Qtr 2	# Jobs Gain/ Lost	% Grwth/ Year	2007 Q2 Avg. Ann.
	Total Employment, All Jobs except Self-Employed and Unpaid Family Workers		2855.6	2889.2	33.6	0.6%	$37.4
	Goods-Producing	**G**	552.9	531.2	-21.7	-2.0%	$42.7
	Service-Providing	**S**	2302.5	2358.0	55.2	1.2%	$36.2
81	Other Services (Except Government)	S	127.0	133.4	6.4	2.5%	$26.2
61	Educational Services	S	235.4	246.7	11.3	2.4%	$39.2
62	Health Care and Social Assistance	S	323.3	338.6	15.2	2.3%	$40.2
71	Arts, Entertainment, and Recreation	S	33.1	34.4	1.3	1.9%	$28.8
72	Accommodation and Food Services	S	248.6	256.6	7.9	1.6%	$14.8
55	Management of Companies and Enterprises	S	24.2	24.9	0.6	1.3%	$68.7
48	Transportation and Warehousing	S	143.4	146.7	3.3	1.1%	$45.9
42	Wholesale Trade	S	133.2	136.0	2.8	1.1%	$53.0
54	Professional, Scientific, and Technical Services	S	108.2	110.1	1.9	0.9%	$53.4
51	Information	S	49.8	50.5	0.7	0.7%	$48.0
53	Real Estate and Rental and Leasing	S	36.8	37.3	0.5	0.7%	$35.4
11	Agriculture, Forestry, Fishing and Hunting	G	33.9	34.2	0.3	0.4%	$25.8
44	Retail Trade	S	328.6	331.1	2.5	0.4%	$25.3
23	Construction	G	134.8	135.6	0.8	0.3%	$38.8
52	Finance and Insurance	S	108.1	108.7	0.6	0.3%	$57.8
56	Administrative and Support and Waste Management and Remediation	S	187.7	188.0	0.3	0.1%	$28.3
92	Government	S	211.5	211.5	-0.1	0.0%	$39.1
22	Utilities	S	3.6	3.5	-0.1	-0.8%	$60.3
21	Mining	G	3.3	3.1	-0.1	-2.2%	$49.6
31	Manufacturing	G	380.9	358.3	-22.6	-3.0%	$45.5

Occupations are listed by growth rates and the number of new jobs they offer. Among detailed occupations (Table 8, page 20), social and human service assistants, network systems and data communications analysts, home health aides, self-enrichment teachers, graduate teaching assistants, and postsecondary chemistry teachers are projected to have strong growth rates in 2008 and 2009. Expanding occupational groups (Table 9, page 21) include community and social services; healthcare support; education, training, and library; healthcare practitioners and technical; and personal care and service occupations. Half the job growth is expected in three major occupational groups rich in number of jobs, and in variety of job opportunities. These groups are food preparation; education, training, and library; and healthcare practitioners and technical.

Community and social services are expected to grow at 3.2 percent for 2008 and 2009 (Table 9, page 21). Health care support occupations may grow at 2.5 percent. Education, training, and library occupations are expected to grow at 2.4 percent per year. The data show that construction and production occupations are likely to be slow in growth or decline.

Table 8. Projections of Top 25 Detailed Occupations by Growth Rate, 1500+ Employees with Wages and Training, Tennessee, 2008 and 2009

SOC	Title	Est. 2007 Qrtr 2	Proj. 2009 Qrtr 2	Ann. Gr. Rate	Median Annual Wage**	TR*
21-1093	Social and Human Service Assistants	20,610	22,570	4.7%	$25,300	3
15-1081	Network Systems and Data Communications Analysts	2,840	3,070	4.0%	$62,600	5
31-1011	Home Health Aides	10,920	11,820	4.0%	$18,700	11
25-3021	Self-Enrichment Education Teachers	2,030	2,190	3.9%	$29,800	8
25-1191	Graduate Teaching Assistants	2,730	2,940	3.8%	$21,100	2
25-1052	Chemistry Teachers, Postsecondary	1,580	1,700	3.7%	$66,800	2
25-1081	Education Teachers, Postsecondary	1,820	1,950	3.6%	$55,100	2
29-2052	Pharmacy Technicians	8,210	8,800	3.6%	$26,100	6
25-1121	Art, Drama, and Music Teachers, Postsecondary	1,860	2,000	3.6%	$50,400	2
25-1071	Health Specialties Teachers, Postsecondary	2,180	2,340	3.5%	$61,800	2
31-2021	Physical Therapist Assistants	1,790	1,920	3.5%	$45,900	6
21-1015	Rehabilitation Counselors	2,230	2,390	3.4%	$21,700	3
27-2022	Coaches and Scouts	2,740	2,920	3.1%	$23,500	9
21-1023	Mental Health and Substance Abuse Social Workers	3,320	3,530	3.1%	$28,900	3
39-9021	Personal and Home Care Aides	13,750	14,620	3.1%	$18,000	11
21-1014	Mental Health Counselors	2,950	3,140	3.1%	$26,000	3
31-9092	Medical Assistants	9,500	10,100	3.1%	$25,700	7
25-1194	Vocational Education Teachers, Postsecondary	1,890	2,010	3.1%	$43,200	2
25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary School	4,380	4,640	3.0%	$39,200	5
27-3031	Public Relations Specialists	2,890	3,060	3.0%	$38,800	5
39-9041	Residential Advisors	1,950	2,060	2.9%	$18,900	10
29-1123	Physical Therapists	3,730	3,950	2.9%	$71,700	3
25-9031	Instructional Coordinators	2,130	2,250	2.8%	$49,500	3
25-2012	Kindergarten Teachers, Except Special Education	3,790	4,010	2.8%	$39,800	5
13-1011	Agents and Business Managers of Artists, Performers, and Athletes	2,820	2,970	2.7%	$67,000	4

*TR (Training): 1: 1 Prof, 2: Ph.D., 3: MA, 4: BA+Work, 5:BA, 6: AA, 7: Post Secondary, 8: Related Work Experience, 9: Long Term Training, 10: Moderate Term, 11: Short Term, **Wages are 2007

Source: Tennessee Department of Labor and Workforce Development
Employment Security Division, Research and Statistics Section, 3/4/2008

Table 9. Projections of Major Groups of Occupations, Tennessee, 2008 and 2009

SOC	Title	2007 Quarter 2	2009 Quarter 2	Job Growth	Annual Growth Rate
00-0000	Total, All Occupations	3,052,900	3,087,400	34,580	0.6%
21-0000	Community and Social Services Occupations	52,700	56,100	3,430	3.2%
31-0000	Healthcare Support Occupations	70,500	74,000	3,510	2.5%
25-0000	Education, Training, and Library Occupations	154,200	161,600	7,460	2.4%
29-0000	Healthcare Practitioners and Technical Occupations	163,200	169,800	6,640	2.0%
39-0000	Personal Care and Service Occupations	77,300	80,200	2,880	1.8%
35-0000	Food Preparation and Serving Related Occupations	243,800	251,800	7,990	1.6%
27-0000	Arts, Design, Entertainment, Sports, and Media Occupations	44,700	45,900	1,160	1.3%
15-0000	Computer and Mathematical Occupations	40,700	41,600	910	1.1%
23-0000	Legal Occupations	14,900	15,300	320	1.1%
13-0000	Business and Financial Operations Occupations	92,900	94,700	1,830	1.0%
19-0000	Life, Physical, and Social Science Occupations	15,700	16,000	300	0.9%
37-0000	Building and Grounds Cleaning and Maintenance Occupations	109,000	111,000	2,060	0.9%
45-0000	Farming, Fishing, and Forestry Occupations	25,800	26,100	360	0.7%
43-0000	Office and Administrative Support Occupations	490,800	495,200	4,410	0.4%
41-0000	Sales and Related Occupations	296,300	298,800	2,480	0.4%
11-0000	Management Occupations	196,700	198,000	1,320	0.3%
49-0000	Installation, Maintenance, and Repair Occupations	129,400	130,200	740	0.3%
33-0000	Protective Service Occupations	61,700	61,900	160	0.1%
53-0000	Transportation and Material Moving Occupations	276,500	276,900	390	0.1%
47-0000	Construction and Extraction Occupations	142,400	142,500	110	0.0%
17-0000	Architecture and Engineering Occupations	36,400	36,300	-90	-0.1%
51-0000	Production Occupations	317,300	303,500	-13,770	-2.2%

Source: Tennessee Department of Labor and Workforce Development
Employment Security Division, Research and Statistics Section, 3/4/2008

II. Contemporary Structural Change

Unemployment Dynamics

Employment in Tennessee increased an average of 1.1 percent per year from 1997 to 2007, with nonagricultural employment rising from 2,584,000 to 2,796,600. The rate of employment growth in Tennessee from 1990 to 2007 barely surpassed the nation; however, from 2002 to the present, it has lagged the nation slightly. Tennessee had a relatively slow recovery in employment from the 2001 slowdown (Figure 3, page 23); Center for Business and Economic Research, 2006, page 13; monthly figures in Figure 4, page 23; Tennessee State Government, 2007a). The unemployment rate has clearly exceeded the national rate since 2005 (Figure 5, page 24; monthly figures in Figure 6, page 24).

- Tennessee employment has grown at about the national rate since 2002.
- Tennessee experienced significant employment loss in 2001.
- Tennessee's unemployment rate has exceeded the national rate since 2005.

National news for employment is not uplifting. However, incoming data are just a "clue" of things to come and not a sure indicator. Future trends can be assigned a probability but are not determined by the past. Nevertheless, the graph of "help wanted" advertisement shadows a W-shaped economic downturn[1], an omen of a more protracted recovery than normal (Figure 7, page 25). Speaking about change in help-wanted advertisements and new advertisements Gad Levanon (The Conference Board) says:

> *"July is typically a slow month in terms of labor demand, but this month advertised vacancies were weaker than we would expect. There is little evidence of any approaching turning point in labor demand. Changes in the volume of job advertising typically lead employment trends, and considering the declines in advertised vacancies for all of 2008, the outlook for the labor market remains gloomy — exactly the sentiment weighing on consumer attitudes."*

Help wanted advertisements lead changes in employment since they anticipate employment of future months. These advertisements can be considered a management "sentiment" of future business needs, as well as a reflection of current revenues and profits. Help-wanted ads in this way can be considered a leading indicator.

[1] W-shaped downturns show hesitation toward recovery, since an initial and partial recovery is reversed by a further downturn and deepening slowdown. The shape or pattern indicates a fully protracted downturn-and-recovery cycle.

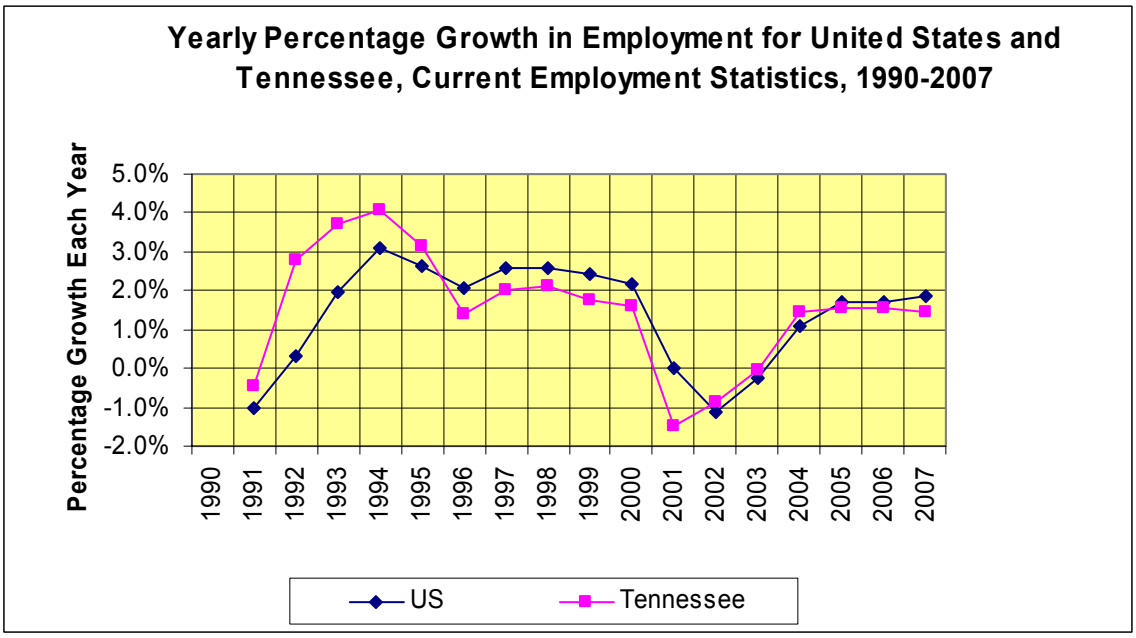

Figure 3. Monthly Percentage Growth in Employment for United States and Tennessee, 1990-2008, Derived From Current Employment Statistics

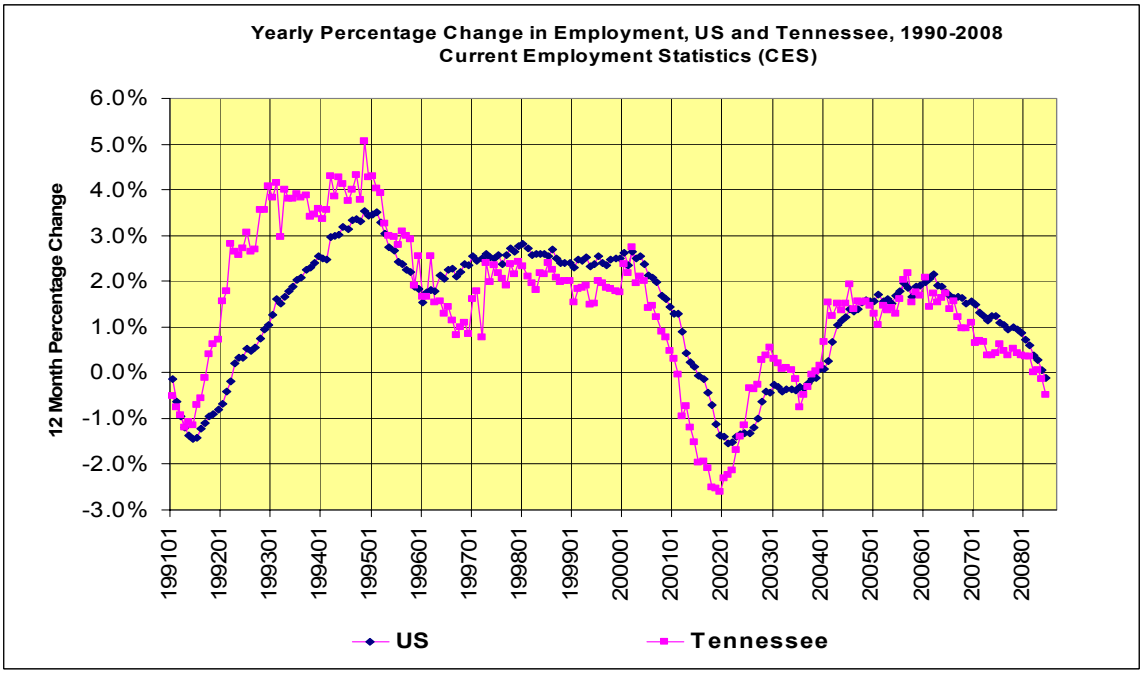

Figure 4. Change in Employment in US and Tennessee by Month, 1990- 2008.

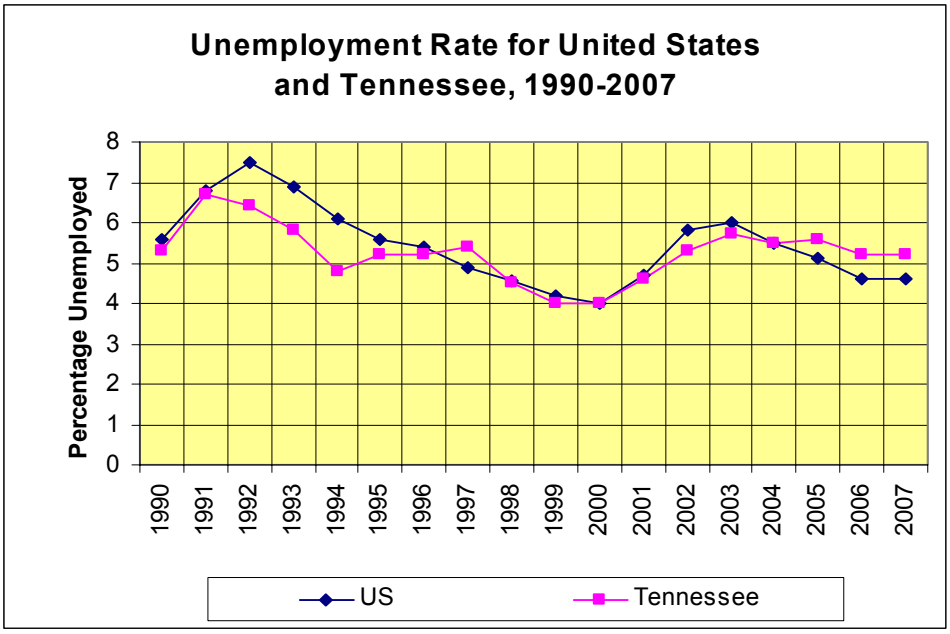

Figure 5. Unemployment Rate for United States and Tennessee, 1990-2007

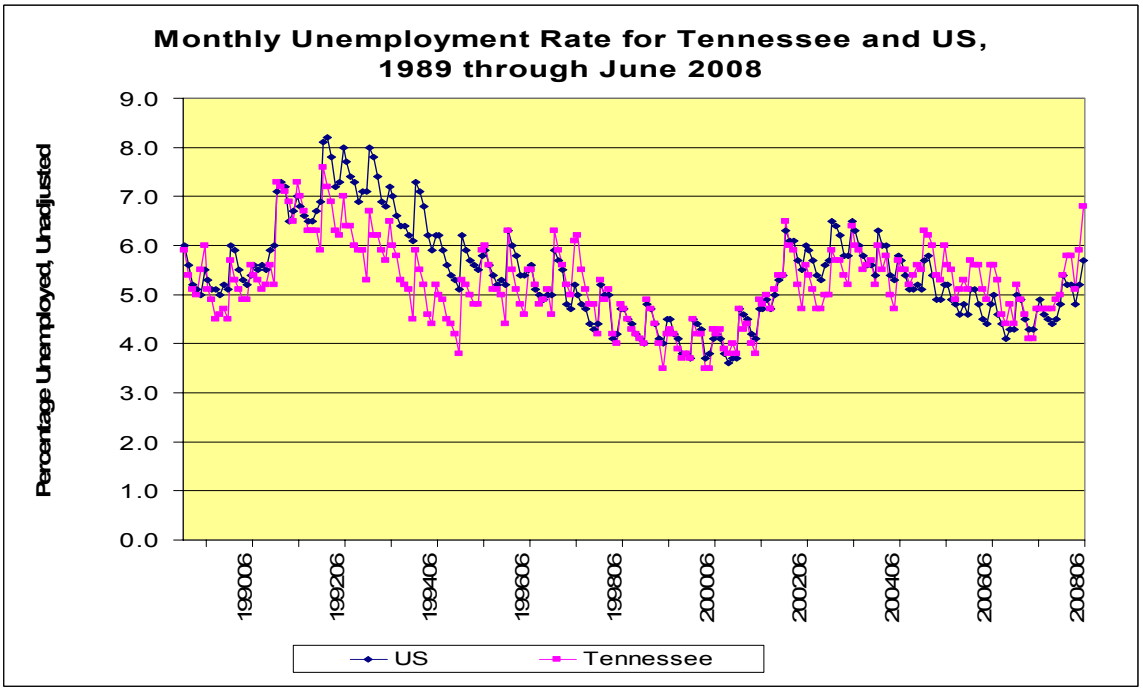

Figure 6. Monthly Unemployment Rate for Tennessee and US, 1989 through June 2008

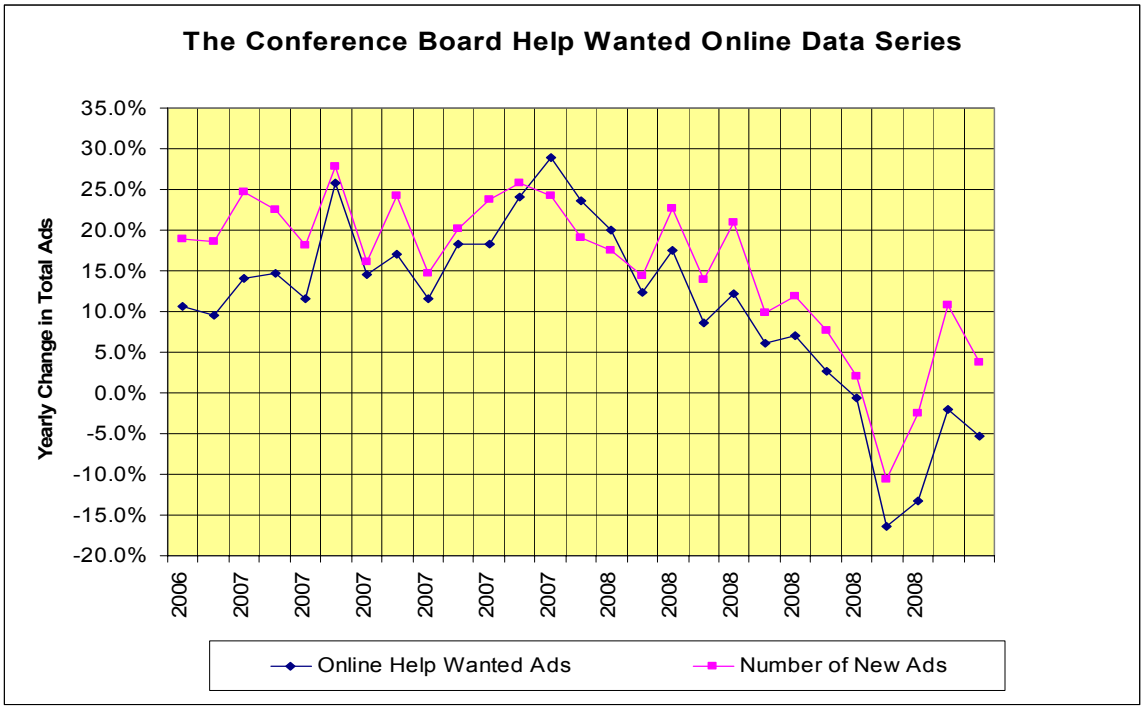

Figure 7. The Conference Board Help Wanted Online Data Series, US, May 2006 through July 2008

Unemployment is one road to poverty for an individual; another is cataclysmic illness. The healthcare system, job training, and efficiency of the market are important factors in maintaining the general welfare of the population. Poverty is a measure of those unemployed, those employed at wages below the level for sustaining healthy lifestyles, and those who cannot work. The next section discusses recent trends in poverty in Tennessee and the U.S.

Increase in Poverty in Tennessee and the U.S.

Recent data show that poverty in the U.S. has increased since 2001, both at 100 percent and 125 percent of the poverty line (100 percent poverty in Figure 8, page 27; 125 percent poverty in Figure 9, page 27). The 100 percent poverty line is the resource line at which poverty is strictly defined. The 125 percent poverty line is 125 percent of the resource value of the 100 percent line, or 25 percent greater.

Recent increases in poverty suggest that policies may be necessary to avert greater increases. The rate of growth of poverty in Tennessee has surpassed that of the nation from 2001 to 2006 (Figure 10, page 28). Tennessee's 100 percent poverty rate has increased more sharply relative to the nation than its 125 percent rate. The nation is becoming more poor as Tennesee, but Tennessee is becoming much poorer than the nation.

The current increase in the unemployment rate is a concern since poverty shadows that increase. Poverty is more than a concept, but a daily fact in a significant fraction of the population. Poverty is undesirable since it clearly contributes to negative social phenomena such as poor health status and malnutrition, low educational achievement, pronounced income gaps, social dislocation, and crime rates. Crime rates are a reality, especially when one has been the victim of violence or theft.

Knowledge of the root causes provides the keys to poverty's eventual demise. Poor health, cataclysmic health events, unemployment, and low education can produce poverty. It is desirable to remove or control the factors producing poverty. Any improvement in the employment picture in Tennessee will likely decrease poverty, but there are other focused and effective solutions.

A useful conceptual tool to reduce poverty is the social safety net (USAID). The safety net is composed of workable programs that reduce poverty by mitigating its causes. Safety nets deepen the interaction of government and society. Public attention empowers individuals and families, communities, and firms to acquire and retain assets through protecting the assets of the poor. Working social safety nets can reduce poverty over the short term, such as during economic slowdowns, as well as prevent poor people from falling into deeper poverty. Ultimately, it provides a foundation for individuals to escape poverty

A workable program to reduce poverty would include stable food and energy prices, increases in the minimum wage, more universal benefits such as health care and sick leave, expanded job opportunities, educational encouragement, reduction of debt and asset building strategies for low and moderate income families, and greater financial

literacy (Burd-Sharps). Incentives would increase the well-being of poverty-threatened population economically, educationally, psychologically, and socially.

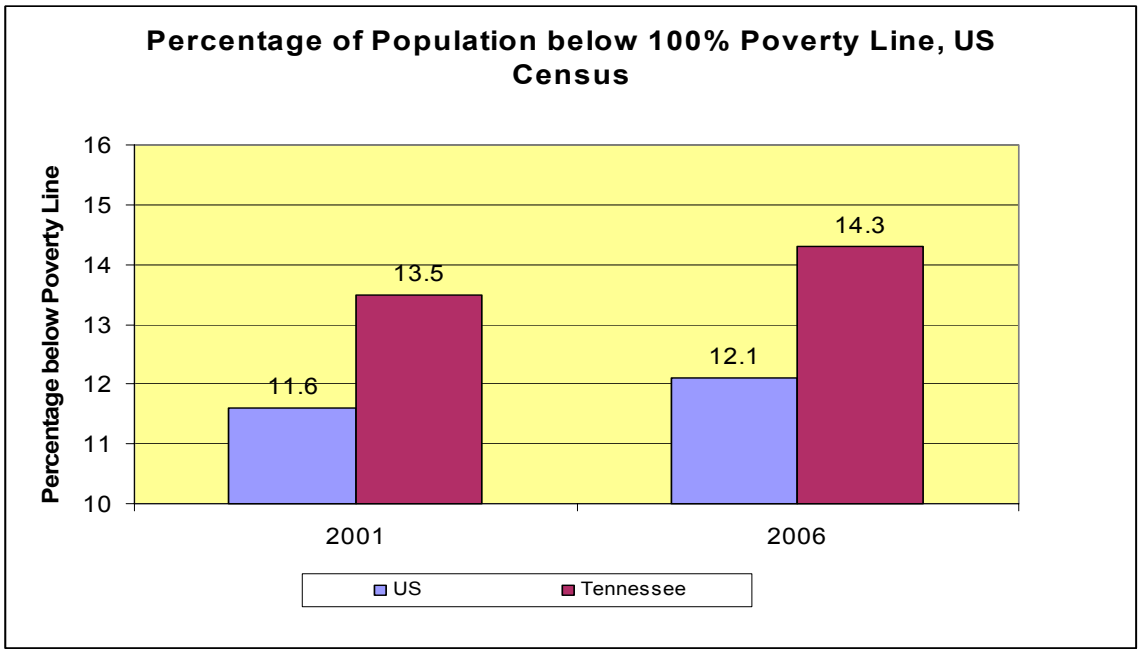

Figure 8. Percentage of Population below 100 % Poverty Line.

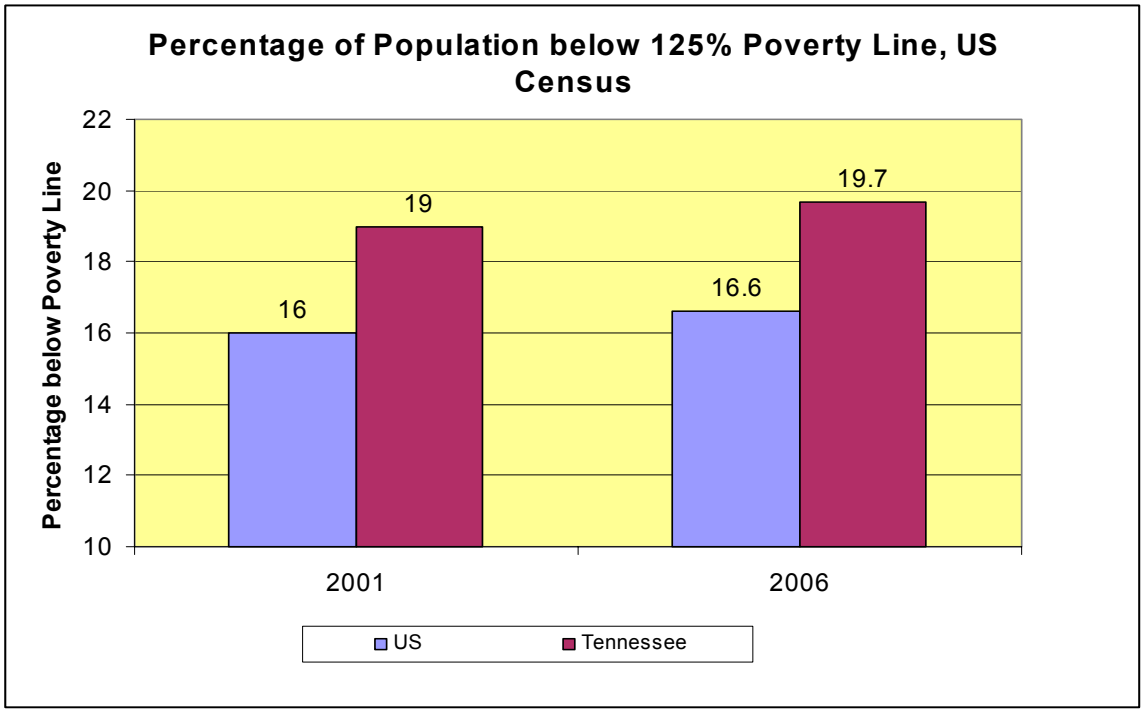

Figure 9. Percentage of Population below 125% Poverty Line.

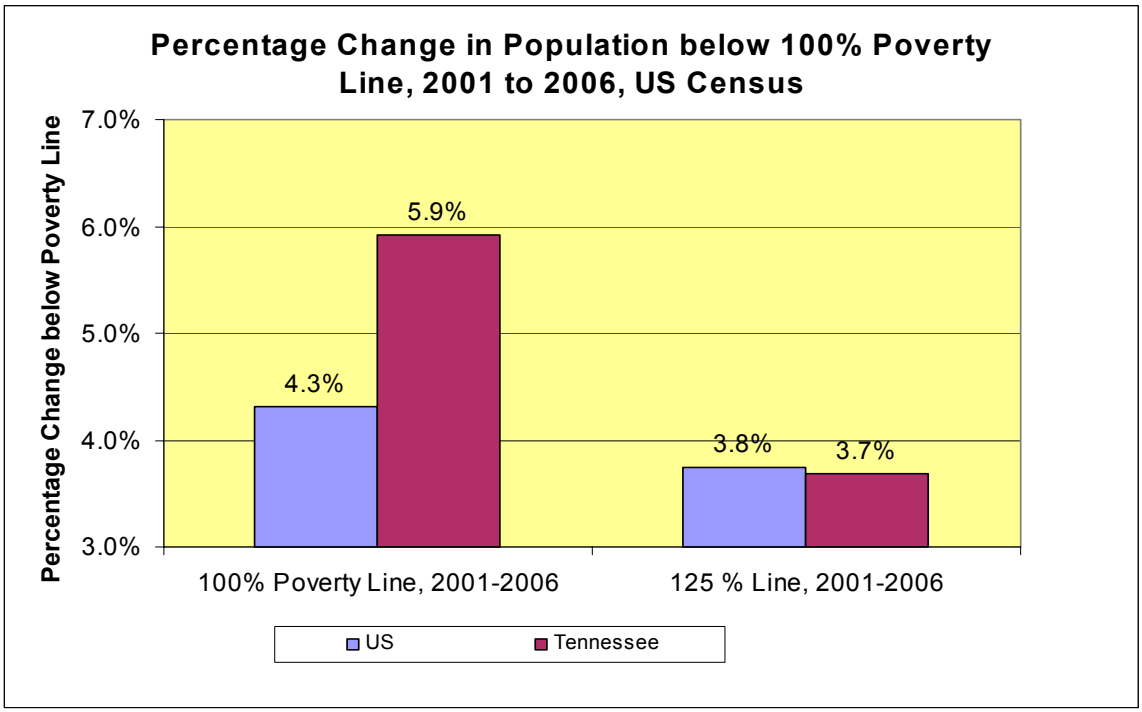

Figure 10. Percentage Change in Population below 100 % Poverty Line, 2001-2006.

Energy, Housing, Finances, and Inflation in the U.S.

The price of oil per barrel has produced an economic shock with previously unseen prices of over $140 per barrel in 2008 from less than the $40 per barrel of previous years (Figure 11, page 29). The consumer price index (CPI, Figure 12, page 30) increased each month since late 2007, mostly due to volatile food and energy prices. Inclement weather, perhaps coupled with questionable environmental and infrastructure practices, is one factor that has driven up food prices. Floods in the Upper Mississippi Drainage Basin destroyed enormous acres of planted crops.

The CPI (consumer price index) is a measure of inflation. The core rates of CPI, which exclude food and energy, are less, but continued increases in food and energy would be sure to bring about a lagged increase in CPI itself. The continuing increases in CPI make it difficult to stimulate the economy through further decreasing prime interest rates, since further increases in CPI could be the result. Normally, decreasing interest rates stimulates growth of economic activity, but it can contribute to increased inflation in difficult circumstances (Poole, 2007).

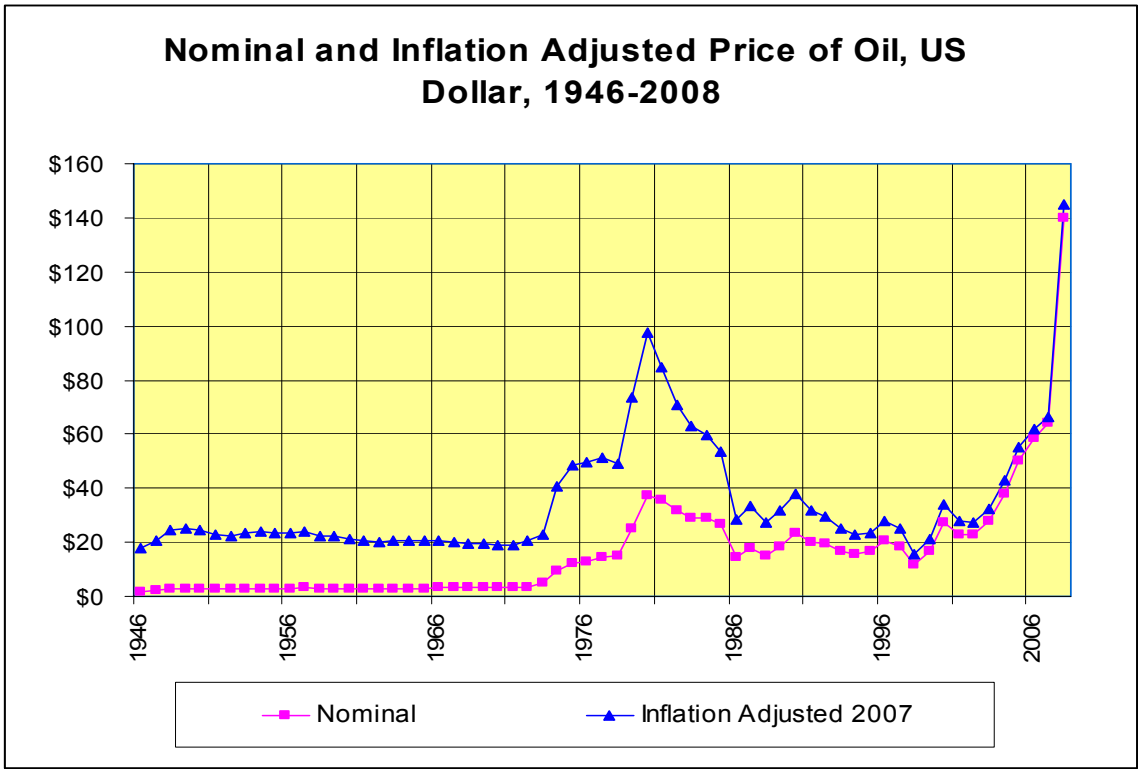

Figure 11. Nominal and Inflation Adjusted Price of Oil, US Dollar, 1946-2008

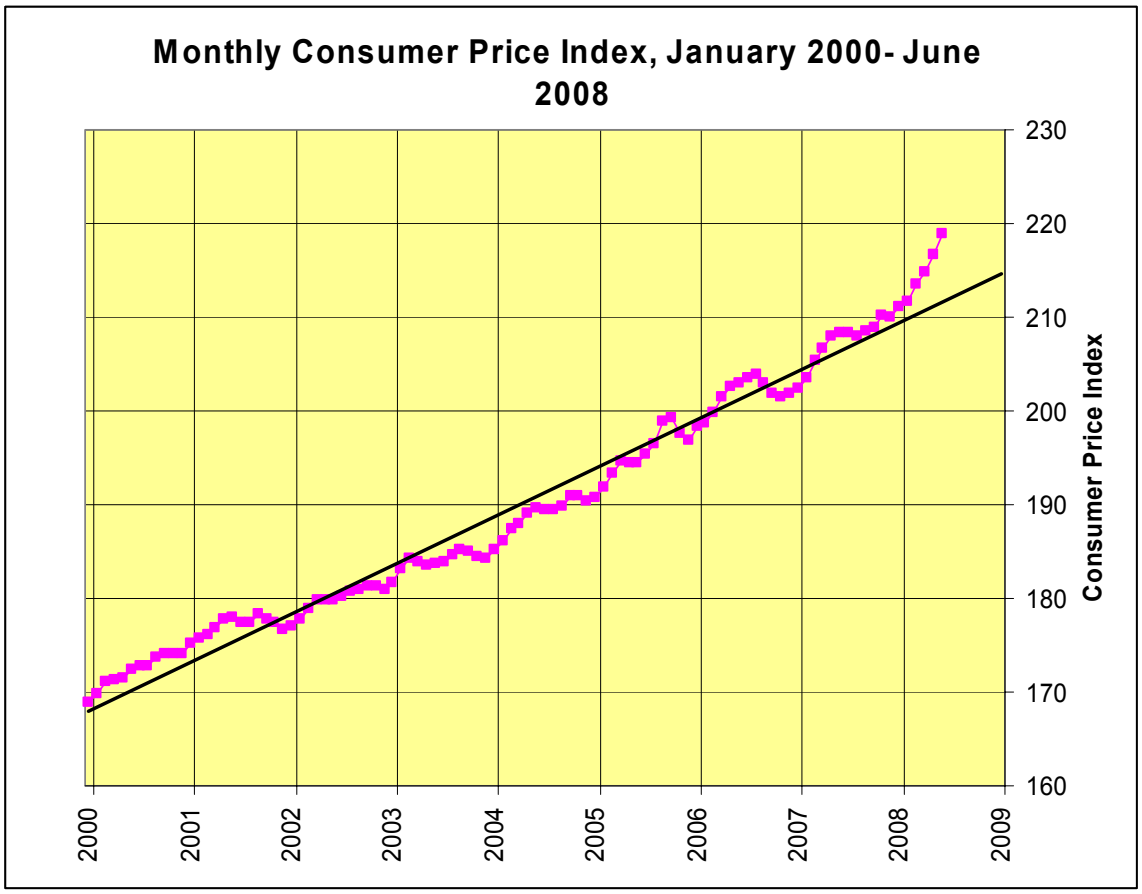

Figure 12. Monthly Consumer Price Index, January 2000 through June 2008

The job market depends highly on good outcomes on the housing market, food and energy, and financial institutions. Continued lower house prices, troubled finances, and and energy bubbles would be an omen. Gross domestic product has proved resilient through the early part of this year, fortunately. Exports have provided a support for economic activity in the US, as a benefit of global growth. Consumer spending has held up fairly well. Growth this year is expected to increase by the end of the year, according to federal officials (Guha, 2007). Achieving stability in housing and stock prices would be essential to strengthen the financial groups to deleverage for a favorable outcome at the end of 2008, however.

Improvement in energy usage can correct one foundation of the current market slowdown. Creation of renewable energy can decrease the cost of energy over the long run, address the eroding value of the dollar, and reduce cost of living. Innovation will create jobs in the energy field, helping to decrease unemployment and reinvigorate some of the declining industries.

Wages in Tennessee since 2002

Wages since 2002 in industries reported by the Quarterly Census of Employment and Wages (QCEW) show a 2.9 percent annual increase (Table 10, page 32). These are for years from quarter 4 2004 through quarter 3 2006, with each 4 quarters constituting the year. Average wages increased from roughly $33,000 in 2002 to $37,000 in 2006. Slowdown cycles, of course, affect the precision and meaning of these figures, but they do give a general comprehension of change during this period.

Greatest percentage gains for this period are in management (7.8 percent per year increase), mining (5.4 percent), real estate (4.3 percent), arts, entertainment, and recreation (4.3 percent), and Agriculture, Forestry, Fishing & Hunting. Slowing increases in wages include those in other services (1.6 percent), accommodation and food services (1.8 percent), utilities (2.0 percent), and retail trade (2.1 percent).

Changes in wages for industries appear socially negative. Although wages have increased during the last few years, growth is uneven across industries, with lower paid workers falling further behind. Industries of higher average wages increased their advantage, generally. Finance and insurance as well as utilities grew at a rate below average, although their wages are historically higher. Mining wages showed strength. Relatively low-paid service industries, including other services, accommodation and food services, and retail showed weaker than average wage growth. Changes in wages reflect, in part, differences in educational levels of workers. Other factors, such as leverage to gain advantageous salaries, may also be at work. Differences in wages are partly a result of less than vigorous overall economic growth.

Occupational wages (Table 11, page 33) show greater than average increases from May 2003 to May 2007 in community and social services occupations; healthcare practitioners and technical occupations; architecture and engineering occupations; farming, fishing, and forestry occupations; and management occupations—all above 3.9 percent increase per year during 2003 to 2007. Slower rates of wage growth (ranked from lower growth to higher) include construction and extraction occupations; production occupations; installation, maintenance, and repair occupations; life, physical, and social science occupations; transportation and material moving occupations; business and financial operations occupations; and sales and related occupations—all at 2.2 percent or less per year growth in average wages.

Factors influencing increases in occupational wages include needs of the culture, with increased wages promoting hiring in these areas, including social services, healthcare, community and infrastructure maintenance and improvements, farming, and management. Decreased wages in construction, production, and installation and repair reflect increased competition among firms in these industries. Computer and mathematical occupations continue to receive high wages, but these occupations are now in their stable period.

Table 10. Year-over-Year (YOY) Wage and Wage Growth in Tennessee for Major Industry Groups,From 2002 Quarter 4 to 2006 Quarter 3, Quarter Census of Employment and Wages (QCEW), by 2006 Wage Growth

Industry Group	YOY 2002 Wage	YOY 2006 Wage	Annual Growth Rate
Management of Companies and Enterprises	$49,900	$67,400	7.80%
Mining	$44,600	$55,100	5.40%
Real Estate and Rental and Leasing	$30,800	$36,400	4.30%
Arts, Entertainment, and Recreation	$29,600	$35,000	4.30%
Agriculture, Forestry, Fishing & Hunting	$21,800	$25,700	4.30%
Wholesale Trade	$44,300	$51,500	3.80%
Professional and Technical Services	$47,400	$54,000	3.30%
Health Care and Social Assistance	$34,800	$39,700	3.30%
Information	$41,100	$46,200	3.00%
Construction	$34,200	$38,500	3.00%
Manufacturing	$39,500	$44,300	2.90%
Finance and Insurance	$52,300	$58,200	2.70%
Administrative and Waste Services	$24,000	$26,600	2.70%
Transportation and Warehousing	$39,500	$43,700	2.50%
Public Administration	$34,200	$37,600	2.40%
Educational Services	$31,600	$34,700	2.40%
Retail Trade	$22,800	$24,800	2.10%
Utilities	$51,500	$55,800	2.00%
Accommodation and Food Services	$13,400	$14,400	1.80%
Other Services, Ex. Public Admin	$23,900	$25,400	1.60%
Total, All Employees	$33,000	$37,000	2.9%
CPI Change	181.2	203.4	2.6%

Table 11. Growth in Average Annual Wages in Tennessee for Major Occupational Groups, May 2003 to May 2007

		Average Annual Wage		
		May 2003	May 2007	Annual Growth Rate
00-0000	All Occupations	$31,910	$35,380	2.6%
	CPI Change	183.5	207.9	3.0%
21-0000	Community and social services occupations	$29,140	$34,540	4.3%
29-0000	Healthcare practitioners and technical occupations	$48,590	$57,580	4.3%
17-0000	Architecture and engineering occupations	$53,490	$63,080	4.2%
45-0000	Farming, fishing, and forestry occupations	$21,400	$25,090	4.1%
11-0000	Management occupations	$66,440	$77,370	3.9%
23-0000	Legal occupations	$67,940	$77,900	3.5%
27-0000	Arts, design, entertainment, sports, and media occupations	$35,500	$40,580	3.4%
31-0000	Healthcare support occupations	$21,210	$23,900	3.0%
37-0000	Building and grounds cleaning and maintenance occupations	$18,570	$20,910	3.0%
43-0000	Office and administrative support occupations	$25,720	$28,960	3.0%
25-0000	Education, training, and library occupations	$35,340	$39,510	2.8%
33-0000	Protective service occupations	$27,440	$30,280	2.5%
15-0000	Computer and mathematical occupations	$54,410	$60,040	2.5%
39-0000	Personal care and service occupations	$20,180	$22,210	2.4%
35-0000	Food preparation and serving related occupations	$15,820	$17,370	2.4%
41-0000	Sales and related occupations	$28,400	$30,940	2.2%
13-0000	Business and financial operations occupations	$51,420	$55,980	2.1%
53-0000	Transportation and material moving occupations	$26,630	$28,900	2.1%
19-0000	Life, physical, and social science occupations	$50,170	$54,390	2.0%
49-0000	Installation, maintenance, and repair occupations	$33,970	$36,660	1.9%
51-0000	Production occupations	$27,500	$29,300	1.6%
47-0000	Construction and extraction occupations	$30,750	$32,620	1.5%

Source: Occupational Employment Statistics; http://www.bls.gov/oes/oes_dl.htm

Emerging Industries and Economic and Workforce Development

Tennessee is poised to lead the way in alternative fuels production, with the approval of funding for a proposed $40 million ethanol plant in East Tennessee and a $125 million grant from the United States Department of Energy for a bioenergy center at the Oak Ridge National Laboratory. Other state funding is available for developing "green islands," or distribution centers for biofuels in Tennessee. Biofuels include ethanol and biodiesel. Biofuels can be made from corn and soybeans, and research is under way on the feasibility of developing cellulosic-based fuels from plants such as switchgrass or the tulip poplar (Owenby, 2007). Jobs related to alternative fuels production would include farmers and/or foresters needed to grow and harvest crops, refining and distribution jobs, and agricultural scientists to develop new types of fuel and refining processes.

The Tennessee Valley Authority, through the Green Power Switch program (www.greenpowerswitch.com), has added to its hydroelectric generation the capacity for wind and solar energy generation. This is partially financed through consumer check-off on electricity bills. In addition, consumers who generate their own power through alternative means can sell excess power back to TVA through the grid.

These initiatives have the potential for creating new industries, especially in the rural areas of Tennessee where job creation is at a premium.

The labor requirements for renewable energy range from collecting fuel to manufacturing components to building and running power plants. Policy and technological advances have caused this industry to develop steadily in the past decade, providing a variety of job opportunities both at home and abroad.

Generally, there are two types of renewable energy: central-station and distributed generation. The majority of the United States' renewable energy generation comes from central-station plants such as wind, geothermal, and biomass. This is because the United States for many decades has relied on electricity generated by large central-station power plants connected by long transmission and distribution wires. With this infrastructure already in place, this trend is not likely to change in the near future.

Wind and Photovoltaics Jobs.

It is predicted in a report published by the Renewable Energy Policy Project in Washington, D.C., (Singh with Fehrs, 2001) that the following jobs will be required for the wind and solar renewable energy industry:

- Manufacturing of all finished parts to be incorporated in power plants
- Delivery of goods to power plants
- Construction/installation of power plants, including project management
- Operations and maintenance of power plants

Solar photovoltaic (PV) presents a strategic opportunity for skilled labor as a distributed energy technology. This system is more suited for rooftops, requiring the skills of building trades such as roofers, electricians, and sheet metal workers who previously had no role in electricity generation. Some of the major components of labor requirements for wind power generation will be in the manufacturing and assembly of wind turbine components.

In 2005, Tennessee produced 90 percent of its electricity from two sources: coal and nuclear power. Congress has recently been considering setting a renewable electricity standard, which requires electricity providers to supply a minimum percentage of their power from clean energy sources. Both a 15 and a 20 percent standard are under consideration.

A recent national study (Union of Concerned Scientists, April 2007) using a model from the United States Energy Information Administration examined the potential economic effects for Tennessee of implementing the 20 percent standard. Clean energy dollars go toward high quality jobs in manufacturing and construction, as well as jobs in operations, maintenance, finance, sales, shipping, and other industries. The 20 percent standard is expected to generate 4,300 new jobs in Tennessee, as wind, bioenergy, and solar power resources are expanded. Many of the new jobs would be in rural areas.

Tennessee would gain not only from renewable energy generating facilities but from the manufacture and assembly of components for renewable energy facilities. In meeting the national standard, 960 new long-term jobs would be created in the manufacture of components for wind turbines, solar photovoltaic panels and films, biomass facilities, and geothermal power plants, which would rank Tennessee 17th among all states and boost opportunities for exports.

In addition to creating jobs, Tennessee would reap the economic benefit of $538 million in new capital investment in renewable energy, $1.79 billion in new income for farmers and rural landowners, and $21 million in new property tax revenues to help local governments fund schools and other public services.

III. Skill and Cluster Analyses of Employment

Knowledge and Skill Needs

Providing workers adequate training and education brings positive outcomes, including higher pay, success in international competition, increased productivity, technological expertise, worker versatility, and employee retention. Satisfied workers are more likely to have a good match between pay, training, effort, and personal interest. Educational programs responsive to employment change can help the state transition from low wage manufacturing to knowledge-based industries. Skills most necessary for the growing industries include active listening, reading comprehension, speaking, time management, and critical thinking. The most important knowledge requirements include customer and personal service, English language, mathematics, administration and management, and education and training. The most-valued work styles are dependability, attention to detail, integrity, and cooperation.

Skills,Knowledge, and Work Values Compatible with Service, Health, Science, and Globalization

Rapid growth in the service-providing industries such as health and educational services places more emphasis on skills and knowledge. Globalization and increased international competition create greater needs for social, linguistic, and cultural skills. The TAP coalition (Business Roundtable: Tapping America's Potential, 2008) states in a report that American economic prosperity is showing signs of atrophy in scientific and technological strength, as other nations are excelling at developing human capital. America's shortcomings are ostensibly in science, technology, engineering, and mathematics (STEM). Deficiencies in the occupational workplace include (1) lack of critical skills; (2) lack of individuals with degrees in specific knowledge areas, and (3) scarcity of employees with work styles compatible with increased productivity.

Improved training is one response to the greater demands of the workplace. Most occupational growth is expected for occupations requiring short-term training (Figure 13, page 37), but jobs requiring an associate degree or more are growing at high rates (Figure 14, page 37). Wages generally increase with the amount of training required, but also vary by the specific industry and occupation of the job. Job seekers may want to invest in training and education to get a boost in salary.

The Occupational Information Network (O*Net) provides information on the knowledge, skills, and work activities of occupations. Skills forecasting requirements are given by the Employment and Training Administration (ETA). The specific skills needed in each state depend on the occupation and industry mix.

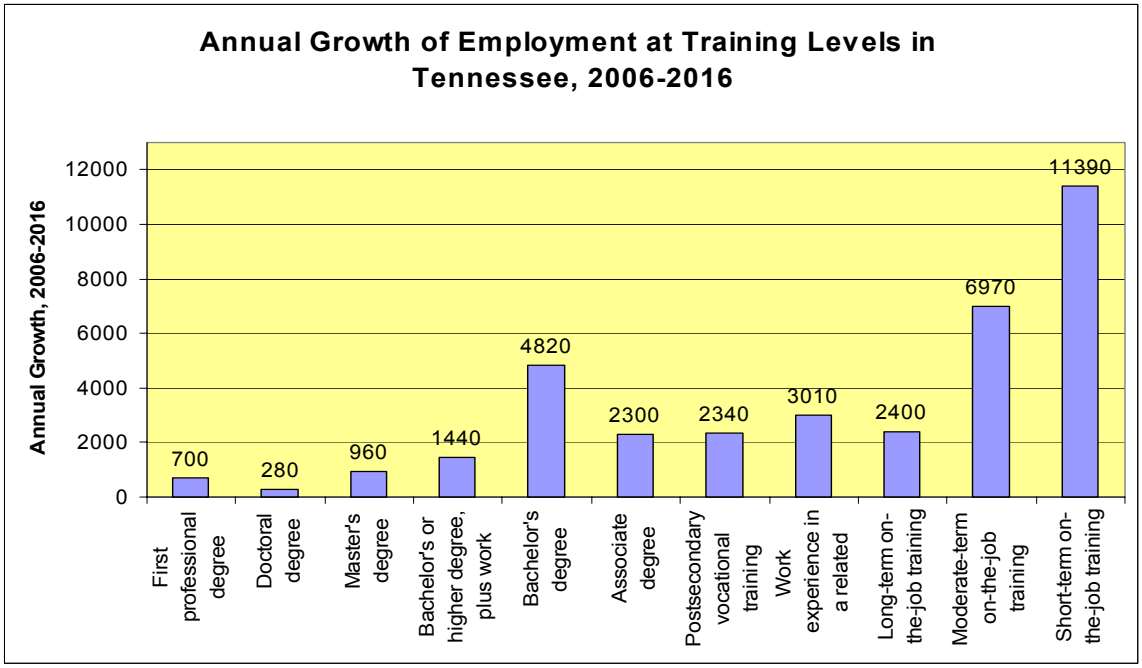

Figure 13. Annual Growth of Employment at Training Levels in Tennessee, 2006-2016

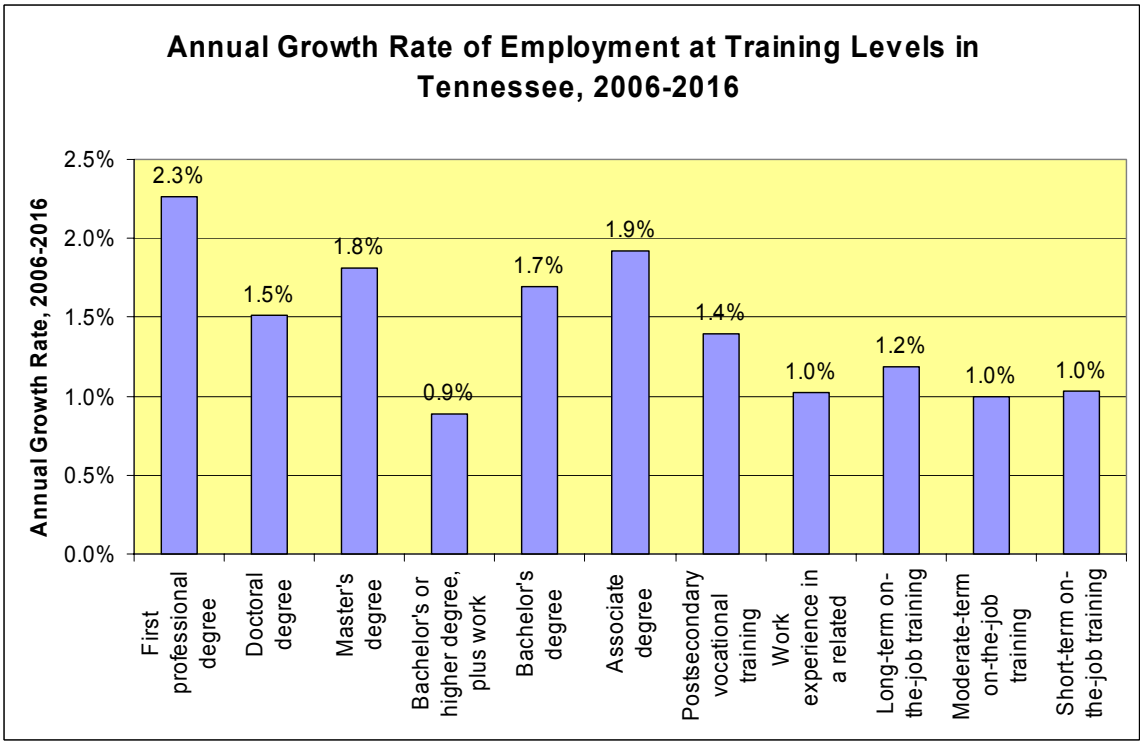

Figure 14. Rate of Growth of Employment at Training Levels in Tennessee, 2006-2016

Training Levels Needed in Industries.

The Occupational Employment Statistics (OES) survey supplies data on the occupations within each industry, or the staffing patterns. The Current Employment Statistics (CES) survey provides the most current estimate of number of employees within each industry. Employment of detailed industries within broader CES industries is calculated using the Quarterly Census of Employment and Wages (QCEW). Applying OES staffing patterns to CES-based current employment data creates updated staffing patterns. With educational levels for each occupation provided by the Bureau of Labor Statistics, it is possible to estimate educational needs within growing industries. A given occupation has, of course, a variety of educational levels among its workers, so the most suitable educational level is chosen for a given occupation. Table 23, page 64, provides the probable educational levels within each industry.

Natural Resources and Mining (including agriculture) is principally staffed by workers with short or moderate term on-the-job training and workers with bachelors' degrees or higher plus work experience. Manufacturing primarily employs workers with moderate term training up to those with bachelors' degrees plus work experience, as does construction. Increasing demand for first professional degrees is seen in trade, transportation, and utilities. However, only short or moderate term on-the-job training is required for nearly 3 of 4 jobs in this sector.

The Information industry employs various postsecondary vocationally training workers, but also many with associate's and bachelor's degrees. Bachelor-degreed workers are numerous in financial activities, and in professional and business services, although the largest proportion of workers still have only short or moderate term training. Perhaps no industry uses a wider swath of educational levels than education and health services, but other services as well as government are similar. Half of government jobs require long term training or more. The leisure and hospitality industry employs a great number of workers with on-the-job experience.

The fastest growing educational category among the self-employed is for jobs requiring a doctoral degree; a growing number of jobs in health care require these degrees also. First professional degree growth is manifest in information; trade, transportation, and utilities; and professional and business services. Growth is above average in government, also. On-the-job experience is needed for many jobs in natural resources and mining, construction, manufacturing, trade and transportation, leisure and hospitality, other services, and government.

Less Training Required for Occupations with Large Numbers of Jobs

There are many occupations requiring long-term, moderate-term, or short-term training among the occupations listed by greatest amount of job growth in 2006 through 2016

(Table 6, page 16). Twelve of the top 25 require short-term training. Customer service representatives, truck drivers (of heavy trucks and tractor-trailers), bookkeepers, security guards, team assemblers, and construction laborers require moderate-term training. Registered nurses need an associate's degree.

Occupations expected to have the largest amount of job growth Table 6, page 16) generally are paid lower- than -average wages, but they also require less training. Typical among these jobs is combined food preparation and serving worker, with a $14,500 median annual salary and requiring short-term training. These workers will benefit from increases in the minimum wage. Jobs that require moderate-term training, however, command a greater salary. Customer service representatives, at $27,300, are an example.

Some occupations with high pay are also listed among those with a high number of jobs (Table 6, page 16). Registered nurses earn a median annual salary of $54,000. Elementary school teachers require a bachelor's degree and receive $42,000. Jobs for drivers of heavy trucks and tractor-trailers, with a median salary of $36,800 and requiring moderate-term training, pay relatively well for the training required.

Skill and Knowledge Requirements for Job Openings in the Long Term

Today's workforce professionals--assessment, training, and placement staff--want to know the types of skills, knowledge, and work values most in demand by today's employers (see Table 12, page 40, for skills; Table 13, page 41, for knowledge; for work styles, Table 14, page 42). Skill and knowledge needs are shown for total expected openings for 2006-2016. Long-term data are essential for skill and knowledge assessment, since training and educational attainment are multiple year projects.[2] Specific skills and knowledge scores for detailed occupations are available on the O*Net data site (Occupational Information Network, http://online.onetcenter.org).

[2] Skill and knowledge needs for the 2016 period are averaged from the O*NET (Occupational Information Network) importance scores using the number of openings. The O*NET project is a multi-year data collection program, with approval from the Office of Management and Budget. Scores range from 1.00 (lowest) to 5.00 (highest). Workers are selected by random sampling in questionnaires asking them to rate the requirements of their own jobs.

Table 12. Average Skills Scores, Tennessee, 2006-2016

Knowledge Category	2006 Employment	All Total Openings to 2016	All Growth Openings to 2016	10 Year Skill Growth*
Active Listening	4.1	4.1	4.2	2.5%
Reading Comprehension	3.8	3.8	3.9	2.4%
Speaking	3.7	3.8	3.8	3.3%
Time Management	3.5	3.5	3.6	2.8%
Critical Thinking	3.5	3.5	3.6	3.0%
Instructing	3.4	3.4	3.5	2.4%
Active Learning	3.4	3.4	3.5	2.9%
Social Perceptiveness	3.3	3.4	3.5	3.7%
Coordination	3.3	3.3	3.4	1.9%
Learning Strategies	3.3	3.3	3.4	1.4%
Writing	3.2	3.3	3.4	4.5%
Service Orientation	3.2	3.3	3.3	3.8%
Monitoring	3.2	3.2	3.3	2.6%
Judgment and Decision Making	3.2	3.2	3.3	1.8%
Mathematics	3.2	3.2	3.2	-0.3%
Complex Problem Solving	2.8	2.8	2.9	2.8%
Persuasion	2.7	2.8	2.9	4.1%
Negotiation	2.8	2.8	2.8	2.7%
Equipment Selection	2.8	2.7	2.8	-0.3%
Troubleshooting	2.7	2.6	2.6	-0.9%
Management of Personnel Resources	2.6	2.6	2.6	-0.1%
Operation and Control	2.5	2.4	2.4	-3.1%
Equipment Maintenance	2.5	2.4	2.4	-3.7%
Quality Control Analysis	2.5	2.4	2.4	-3.8%
Management of Material Resources	2.3	2.3	2.3	0.3%
Operations Analysis	2.3	2.3	2.3	0.4%
Operation Monitoring	2.3	2.3	2.3	-2.2%
Systems Evaluation	2.2	2.2	2.3	0.4%
Systems Analysis	2.2	2.2	2.2	0.1%
Management of Financial Resources	2.2	2.2	2.2	-0.5%
Technology Design	2.1	2.1	2.1	1.4%
Repairing	2.1	2.1	2.1	-3.0%
Science	2.0	2.0	2.1	5.6%
Installation	2.0	2.0	2.0	-1.3%
Programming	1.5	1.5	1.5	-0.6%

*The rounded skill scores do not always show the precision necessary to calculate skill growth percentages.

Table 13. Average Knowledge Scores, Tennessee, 2006-2016

Knowledge Category	2006 Employment	All Total Openings to 2016	All Growth Openings to 2016	10 Year Skill Growth*
Customer and Personal Service	3.5	3.6	3.6	3.9%
English Language	3.4	3.4	3.5	2.6%
Mathematics	3.0	3.0	3.0	-0.3%
Administration and Management	2.9	2.9	2.9	-0.8%
Education and Training	2.8	2.8	2.9	3.2%
Public Safety and Security	2.7	2.7	2.7	0.2%
Clerical	2.6	2.6	2.7	2.3%
Computers and Electronics	2.5	2.5	2.5	0.6%
Personnel and Human Resources	2.3	2.3	2.4	1.1%
Psychology	2.3	2.4	2.5	7.9%
Production and Processing	2.3	2.2	2.1	-8.0%
Law and Government	2.3	2.3	2.4	5.0%
Sales and Marketing	2.2	2.3	2.2	-0.5%
Mechanical	2.1	2.1	2.0	-5.4%
Economics and Accounting	2.1	2.1	2.1	-0.4%
Transportation	2.1	2.1	2.1	-1.9%
Communications and Media	2.1	2.1	2.1	1.3%
Telecommunications	2.0	2.0	2.0	2.6%
Engineering and Technology	1.8	1.8	1.8	-2.2%
Chemistry	1.8	1.8	1.8	2.4%
Design	1.8	1.7	1.7	-2.9%
Sociology and Anthropology	1.7	1.8	1.9	7.0%
Therapy and Counseling	1.7	1.7	1.9	9.7%
Medicine and Dentistry	1.7	1.7	1.9	11.8%
Geography	1.6	1.6	1.7	2.4%
Building and Construction	1.6	1.6	1.6	-1.3%
Foreign Language	1.6	1.6	1.6	3.1%
Physics	1.6	1.6	1.6	0.4%
Philosophy and Theology	1.5	1.5	1.6	4.7%
Food Production	1.5	1.6	1.5	0.3%
Biology	1.5	1.5	1.6	9.1%
History and Archeology	1.3	1.4	1.4	3.3%
Fine Arts	1.3	1.3	1.3	0.9%

*The rounded skill scores do not always show the precision necessary to calculate skill growth percentages.

Table 14. Average Work Style Scores, Tennessee, 2006-2016

Knowledge Category	2006 Employment	All Total Openings to 2016	All Growth Openings to 2016	10 Year Skill Growth*
Dependability	4.4	4.4	4.5	1.0%
Attention to Detail	4.3	4.3	4.3	0.3%
Integrity	4.2	4.3	4.3	1.6%
Cooperation	4.2	4.2	4.3	1.5%
Self Control	4.2	4.2	4.2	2.1%
Stress Tolerance	4.0	4.1	4.1	2.2%
Concern for Others	3.9	4.0	4.0	2.6%
Adaptability/Flexibility	3.9	3.9	4.0	2.1%
Initiative	3.9	3.9	4.0	1.8%
Independence	3.9	3.9	3.9	1.1%
Persistence	3.7	3.7	3.8	2.4%
Achievement/Effort	3.6	3.6	3.7	1.6%
Leadership	3.6	3.6	3.7	2.3%
Social Orientation	3.6	3.6	3.6	2.6%

*The rounded skill scores do not always show the precision necessary to calculate skill growth percentages.

- *Skills* are abilities needed to accomplish job tasks.
- *Knowledge* is attained by prior training experiences, on-the-job experience, and educational accomplishments.
- *Work Styles* are values that are conducive to the type of behavior necessary for job success.

Educators, trainers, and business managers use importance and ranking of skills and knowledge to place qualified workers. Skill and knowledge levels are averaged for all openings statewide in Table 13 (page 41) and Table 12 (page 40), showing their relative importance.

Results reflect the general need for various skills across occupations and industries. The most needed skills have the higher scores, and are likely to be important across a variety of industries and occupations. Skills with lower scores are likely associated with declining occupations, or they may be specific—very important to some occupations but relatively unneeded in others.

Skill and knowledge needs are general to the workforce and sometimes specific to given occupations. The greatest needs can be widespread across occupations, rather than in specific high growth occupations. Some needs are inherent to top job growth occupations. Employment projections for major groups of occupations sorted by growth rate for the short term (Table 9, page 21) and long term (Table 4, page 14) suggest the kinds of skills and knowledge needed. Table 2 and Table 3 (page 11) contain the projections for the major industry groups. Skill and knowledge requirements that relate to the occupations and industries with the leading growth rates, such as services, education, and health care and social assistance will be in demand for the short and the long term.

Higher Importance Knowledge Scores. The average knowledge scores are shown in Table 13 (page 41). Customer and personal service is highest in importance. English language, mathematics, and administration and management are highly important. In growing jobs, increased knowledge will be needed in the education and training, public safety and security, clerical, and computer and electronics areas.

Below Average Importance Scores. Decreasing knowledge needs are in production and processing and mechanical occupations. The declining need for these knowledge skills is related to the decline in the employment of industries staffing these occupations.

Skill Needs

Higher Importance Skill Scores. The average skill scores for various characteristics are shown in Table 12 (page 41). Active listening and reading comprehension are the highest in importance. Speaking, time management, critical thinking, active learning, and writing are of high importance in the occupations growing at above average rates. These skills

are most important in the emerging service industries. Other skills are needed in such industries as education and healthcare.

- Skill needs are great for coordination, social perceptiveness, time management, and critical thinking.
- Skills that will increasingly be needed by 2016 include persuasion, negotiation, social perceptiveness, and critical thinking.

Lower Importance. Skills of lower average importance are those skills more likely to be found in declining occupations. Sharpening skills in declining occupations has the promise of strengthening these occupations, however.

- Skills that will be decreasing in importance include quality control analysis, equipment maintenance, operation and control, and repairing.

Work Styles

Good work styles create a good platform for increased performance in skills and knowledge. Dependability is the quality most wanted (Table 14, page 42). Other work styles needed are the following: attention to detail, integrity, and cooperation.

Roundtable Suggestions

The Business Roundtable suggests major federal investments in mathematics and science education, recruitment and training of teachers, and science and engineering research. They suggest immigration reform such that highly trained personnel who receive their training in this country and are contributing substantially to the American economy be allowed to continue their residence in the United States. Upgrading mathematics and science teaching in grades K-12, with pay scales differentiated for these professions, is among the recommendations.

O*Net and Tennessee data suggest that with the complexity of the workplace a wide range of values, skills, and knowledge are needed. Focusing on reducing skill, knowledge, and work style gaps is a first step for remedy of the shortfall.

Career Cluster Analyses of Supply and Demand

Occupations are grouped into clusters with their related training programs. Comparing the occupational demand with the number of people trained to fill the job openings is supply and demand analysis.

The definitions for supply and demand are important:

- Supply for an occupation is the number of job seekers qualified for the position (and who have completed training).
- Demand for an occupation is the number of job openings expected.

Educational, Industrial, and Placement Considerations of the Supply/Demand Ratio

The clusters with low supply-demand ratios, with little supply but much demand, are ranked as "excellent." Supply/demand ratios are critical considerations for healthy industrial and educational systems, especially for a first world country. High ratios and low ratios of supply to demand are especially notable.

A high ratio can mean that significant numbers of workers are unable to acquire a job in that occupation. This situation can contribute to unemployment. On the other hand, especially for occupations requiring advanced training, a high supply can contribute to a workforce with enhanced qualifications, or to an "over-qualified" status. High supply can indicate misapplication of educational resources.

A low ratio usually means there is a training or education shortfall. This can lead to slower industrial growth, and an advantaged competition. An occupation staffed with "under-qualified" workers, can lead to quality problems. A training or education system that is not "leading edge" can fail to train for current and future jobs.

A workforce diversified by education and ability is a good answer to workforce supply problems. Figure 15 (page 46) shows that educational attainment is effective in reducing the unemployment rate, as suggested by data on Local Workforce Investment Areas (LWIA; see Tennessee State Government, 2007a, in the references section for additional information on LWIAs). A diversified workforce can more easily position itself from occupations of high supply/demand ratios to those with low supply/demand. Educational programs featuring learning applicable to a broad range of occupations are an answer to some of these considerations. The evaluation of mathematics as desired knowledge (Table 13, page 41), and a low supply of mathematicians (Table 19, page 53), indicates the additional attention may be necessary to integrate a minimal level of mathematics uniformly across the educational system.

Placement of workers from over-supplied occupations into other occupations requiring similar training can help alleviate supply/demand imbalances. Departments of Human Resources can become more adept at providing more general definitions of occupational work requirements to facilitate the hiring of more diversified, yet qualified, workers. The use of skills, knowledge, and work values in a previous section presents some clues as to how this can be done using O*NET-like categories (skills in Table 12, page 40; knowledge in Table 13, page 41; work values in Table 14, page 42). Hiring is not a simple process, with many considerations necessary for the perfect "fit."

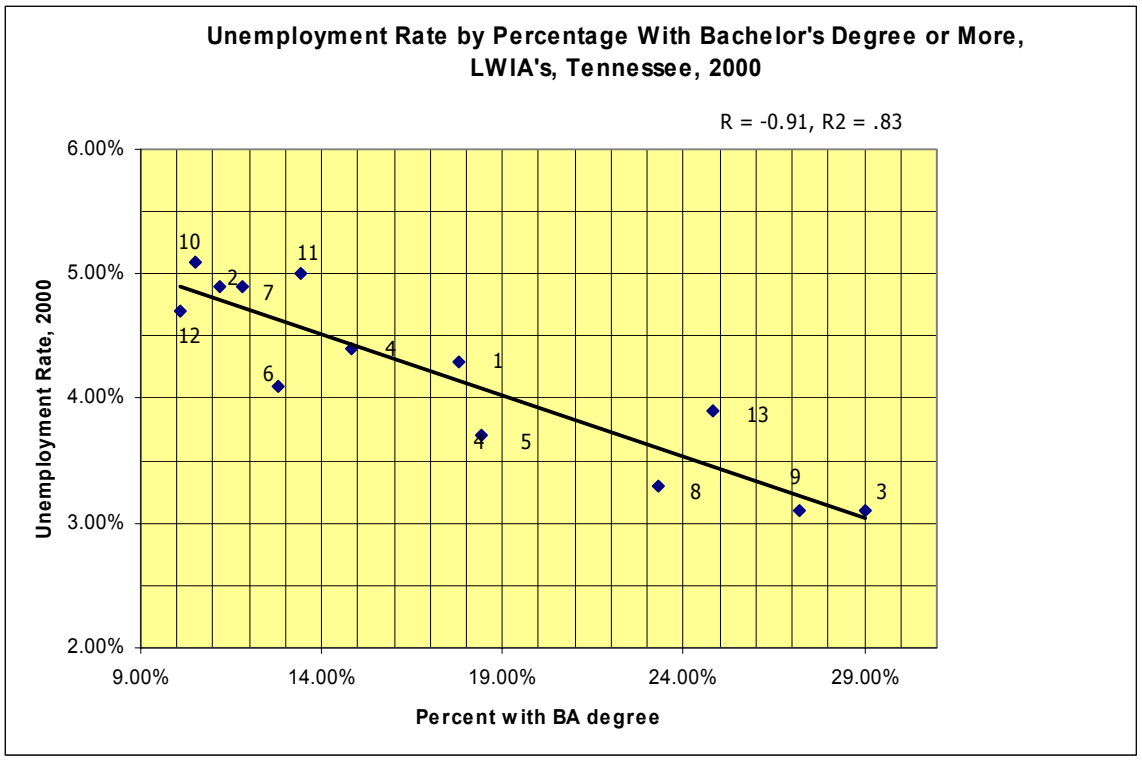

Figure 15. Unemployment Rate by Percentage With Bachelor's Degree or More, LWIAs, Tennessee, 2000

Supply/Demand Ratio Ordering

Rankings are ordered alphabetically from "a" to "p", as a measure of the supply/demand ratio. Clusters ranked "a" have occupations with a healthy demand; as rankings fall down the alphabet ladder, they increasingly have more supply, or more trained workers for their occupations. Unranked occupations fall into the "u" category. Rankings are:

- Excellent supply/demand ratio ("a"). The growth rates of these occupations are above average for the state. Job openings are greater than the number qualified to fill those jobs.

- Very good supply/demand ratio ("b"). Their growth rates are positive but not above average. There are more job openings than there are training completers in a recent year.
- Favorable supply/demand ratio ("c"). The growth rates of these occupations are positive. There are more training completers than job openings in a recent year, but not more than 1.5 times as many training completers as job openings.
- Competitive supply/demand ratio ("d"). There are more training completers in a recent year than job openings. There are from 1.5 to 3 times as many training completers as job openings.
- Very competitive supply/demand ratio ("e"). The growth rate is positive for these occupations. There are 3 or more times as many training completers as job openings.
- Favorable adjusted supply/demand ratios ("p"). These occupations have a low number of job openings (demand) for the supply. Available placement rates, however, show that the number of training completers working in jobs related to their training has been high.
- Unclassified occupations with supply/demand ratios not estimated ("u"). No training program is required, training programs are not available, or there are less than 10 openings.

Supply/Demand Tables

Tennessee's career clusters are in seven categories, as shown by the first digit of the cluster code. The seven career cluster groupings are:

1. Arts/Communication
2. Business/Marketing
3. Health Care
4. Hospitality/Tourism
5. Human Services
6. Manufacturing/Construction/Transportation
7. Science/Technology (includes Agriculture)

Clusters are listed with ratios scores in Table 15 through Table 19 (pages 49 through 53). These tables are sorted by the career cluster categories and cluster titles.

Excellent Supply/Demand. Occupational clusters with excellent job opportunities represent numerous categories including medical, human services (including social work), construction, electrical applications, and various technologies (Table 15, page 49). Training codes are given for the clusters. The codes represent the modal education or training category for the occupations in the cluster. The codes are:

- 1: 1 Prof (First Professional Degree)
- 2: Ph.D.
- 3: MA
- 4: BA+Work
- 5:BA
- 6: AA
- 7: Post Secondary
- 8: Related Work Experience
- 9: Long Term Training
- 10: Moderate Term
- 11: Short Term.

Table 15. Occupational Clusters with Excellent (a) Supply/Demand Ratio.

Cluster Title	Supply	Demand	SD Ratio	Shortage/ Surplus(-)	Train-ing	Cluster Code
Accounting & Financial Management	1460	1540	0.9	80	5	2115
Personnel Occupations	550	770	0.7	210	4	2130
Sales & Merchandising	90	9170	0	9080	11	2240
Alternative Medical Systems	0	30	0	30	5	3599
Dental Assisting	150	210	0.7	60	10	3506
Dental Hygiene	120	140	0.9	20	6	3507
Nursing Assistant	520	1540	0.3	1020	7	3541
Optometric Technology	10	60	0.2	40	9	3545
Pharmacists	120	330	0.4	210	1	3584
Pharmacy Assisting	350	720	0.5	370	10	3570
Physical Therapy Assisting	100	110	0.9	10	6	3553
Physicians & Surgeons	370	410	0.9	40	1	3582
Ultrasonic Technology	40	50	1	0	6	3557
Food Preparation & Services	280	6120	0	5840	11	4600
Adult And Continuing Education	20	140	0.2	110	8	5185
Care Of Children And Youth	400	2120	0.2	1720	11	5575
Elementary Teaching	620	1400	0.4	770	5	5168
Fire Control & Safety Technology	40	360	0.1	330	9	5635
Human Services	380	470	0.8	80	3	5628
Interpreters And Translators	20	30	0.8	10	9	5182
Preschool/Kindergarten Teaching	170	590	0.3	420	7	5166
Religious Activities & Education	50	200	0.2	150	5	5176
Security Services	130	1840	0.1	1720	11	5631
Social Work	280	620	0.5	340	5	5160
Special Education Teaching	360	400	0.9	40	5	5170
Appliance & Equipment Repair	30	150	0.2	120	7	6413
Biomedical Equipment Technology	0	50	0	50	6	6731
Brick, Block, and Masonry	20	190	0.1	170	9	6705
Construction Technology	40	400	0.1	360	5	6455
Electrician Occupations	250	800	0.3	550	9	6725
Heavy Equipment Repair	30	220	0.1	190	9	6754
Misc. Construction Trades	70	1630	0	1560	10	6715
Optical Technology	0	40	0	40	10	6547
Orthotics/Prosthetics	0	20	0	20	5	6573
Plumbing And Pipefitting	10	540	0	530	9	6720
Sheet Metal	0	190	0	190	9	6840
Small Engine Repair	40	90	0.4	50	9	6762
Truck	890	3430	0.3	2540	10	6995
Welding Technology	300	480	0.6	180	7	6850
Agricultural Production	160	870	0.2	710	11	7015
Animal Technology	50	220	0.2	170	11	7580
Computer Systems	1450	1500	1	40	5	7325
Electrical/Computer Engineering	320	440	0.7	130	5	7466
Horticulture And Landscaping	160	730	0.2	580	11	7020
Laboratory Technicians	130	150	0.9	20	6	7520

Very Good Supply/Demand. These clusters include administrative support, accommodation services, electronic applications, various crafts, and technologies (Table 16, page 8).

Favorable and Favorably Adjusted Supply/Demand. These clusters are have favorable supply and demand (Table 17, page 51). Clusters that are adjusted to favorable are also included. Some favorable clusters include communications technology, diesel engine repair, and heating and air conditioning. Favorably adjusted clusters include dental laboratory technology and radiation therapy.

Table 16. Occupational Clusters with Very Good (b) Supply/Demand Ratio.

Cluster Title	Supply	Demand	Supp/Dem Ratio	Shortage/ Surplus(-)	Train-ing	Cluster Code
Administrative Support: Accounting	280	1600	0.2	1320	10	2116
Administrative Support: General	2270	9560	0.2	7280	10	2125
Public Administration	400	900	0.4	500	4	2102
Hotel/Restaurant Management	60	380	0.2	320	8	4625
Travel Services	0	190	0	190	8	4869
Library Science	90	130	0.7	40	3	5172
Agriculture Power & Machinery	120	130	1	0	10	6010
Airplane Pilot & Navigation	0	80	0	80	5	6871
Building Maintenance	0	470	0	470	10	6627
Carpentry	150	460	0.3	300	9	6710
Communications Electronics	80	120	0.7	40	7	6412
Electrical & Power Transmission Installation	40	190	0.2	150	9	6730
Electromechanical Instrument Production/Repair	10	150	0	140	11	6415
Machine Tool Technology	390	960	0.4	570	10	6450
Miscellaneous Mining And Construction Workers	0	40	0	40	10	6895
Tailoring/Dressmaking	0	30	0	30	9	6606
Agriculture & Food Science Technicians	0	50	0	50	5	7054
Industrial Engineering	50	150	0.3	100	5	7470
Laboratory Technology	50	100	0.5	50	5	7519
Quantitative Business Analysis	10	20	0.5	10	3	7312
Science Technologies	0	100	0	100	6	7458
Surveying & Civil Technology	30	110	0.2	90	5	7806

Table 17. Occupational Clusters with Favorable (c) and Favorably Adjusted (p) Supply/Demand Ratio.

Cluster Title	Supply	Demand	Supp/ Dem Ratio	Shortage/ Surplus(-)	Train-ing	Cluster Code
Favorable						
Communications Technology	150	100	1.5	-50	9	1252
Dramatic Arts	170	140	1.2	-30	3	1153
Marketing/Advertisement/Public Relations	880	620	1.4	-260	4	2235
Medical Records Technology	260	170	1.5	-90	6	2572
Health Education	70	50	1.4	-20	5	3558
Medical Assisting	720	570	1.3	-150	10	3571
Medical Imaging - Radiography	200	180	1.1	-20	6	3555
Nursing (Registered Nurses)	3220	2240	1.4	-980	6	3560
Occupational Therapy	60	60	1.1	-10	3	3592
Physical Therapy	140	120	1.2	-20	3	3594
Physician Assisting	60	40	1.4	-20	3	3565
Practical Nursing	1300	970	1.3	-330	7	3542
Respiratory Therapy	130	120	1.1	-10	6	3551
Law	480	380	1.3	-110	1	5150
Law Enforcement	920	760	1.2	-170	9	5630
Legal Assisting	230	220	1.1	-20	6	5140
Secondary And Vocational Education	1580	1470	1.1	-110	5	5169
Urban & Regional Planning	20	20	1	0	3	5148
Diesel Engine Repair	270	250	1.1	-20	7	6752
Heating And Air Conditioning	400	280	1.4	-120	9	6420
Industrial Maintenance Technology	430	330	1.3	-110	9	6735
Physics And Astronomy	40	30	1.3	-10	5	7306
Veterinary Medicine	70	70	1	0	1	7050
Favorably Adjusted						
Emergency Medical Technology	410	220	1.9	-190	7	3515
Nuclear Medicine Technology/Technician	30	20	1.9	-10	6	3556
Occupational Therapy Assisting	40	20	2.7	-30	6	3552
Radiation Therapy	220	20	14.8	-210	6	3554
Dental Laboratory Technology	40	30	1.6	-20	9	6521

Competitive Supply/Demand. General business and management, audiology and speech pathology, social sciences, religion, automotive service, and a number of other clusters are included here (Table 18, page 52).

Very Competitive Supply/Demand. Among the most competitive clusters are communications and broadcasting, optometry, dentistry, massage therapy, cosmetology, psychology, economics, and postsecondary English (Table 19, page 53).

Table 18. Occupational Clusters with Competitive (d) Supply/Demand Ratio.

Cluster Title	Supply	Demand	Supp/Dem Ratio	Shortage/ Surplus(-)	Train-ing	Cluster Code
General Business & Management	5290	1910	2.8	-3390	4	2100
Audiology And Speech Pathology	200	70	2.8	-130	3	3588
Dietician Assistance	60	40	1.7	-20	7	3587
Dieticians And Nutritionists	60	40	1.7	-30	5	3586
Surgical Technology	360	170	2.1	-190	7	3512
Educational Counseling	280	150	1.8	-130	3	5164
Foreign Language Education, Postsecondary	40	20	2.7	-30	3	5180
Religion	620	310	2	-310	3	5174
Social Sciences	160	70	2.3	-90	2	5154
Automotive Body Repair	600	260	2.3	-340	9	6745
Automotive Service Technology	1350	550	2.5	-800	7	6751
Water And Wastewater Technology	200	110	1.9	-100	9	6425
Architectural Design	60	40	1.6	-20	5	7158
Biological And Life Sciences	200	80	2.5	-120	2	7304
Conservation & Environmental Science	200	80	2.5	-120	3	7025
Engineering Technology	570	210	2.8	-360	5	7457
General Engineering	380	230	1.7	-150	5	7478

Table 19. Occupational Clusters with Very Competitive (e) Supply/Demand Ratio.

Cluster Title	Supply	Demand	Supp/Dem Ratio	Shortage/ Surplus(-)	Train-ing	Cluster Code
Arts And Crafts	510	80	6.4	-430	4	1815
Communications/Journalism/Broadcast	1330	210	6.3	-1120	5	1250
Dentistry	120	20	6.2	-100	1	3598
Massage Therapy	230	40	6.6	-200	7	3595
Optometry	130	20	8.3	-110	1	3596
Barbering And Cosmetology	1650	200	8.2	-1450	7	5345
Curriculum And Instruction	940	90	10.5	-850	3	5186
Economics	460	100	4.6	-360	3	5156
Education Administration	2340	370	6.4	-1980	4	5101
English Education Postsecondary	280	50	6.3	-240	3	5178
Psychology	370	110	3.5	-260	2	5152
Teacher Education Postsecondary	900	60	15	-840	2	5184
Aircraft Mechanics	470	60	8.5	-410	7	6765
Chemistry	280	70	4	-210	2	7310
Civil Engineering	310	90	3.7	-230	5	7464
Computer Systems Support	410	20	20.3	-390	7	7323
Forest Maintenance/Conservation	70	20	3.3	-50	10	7024
Interior Designers	90	30	3.1	-60	6	7156
Mathematics	380	70	5.4	-310	3	7302

Occupations with Shortages

As Baby Boomers reach retirement age between 2011 and 2029, occupational shortages could place a large burden on the workforce and hamper economic growth. The labor shortage could affect some industries and higher-skilled occupations. A plurality of jobs require short or moderate term training, and this is not a formidable requirement on training systems (Figure 13, page 37). Robust growth (above 1.5 percent per year) is expected for jobs with credentials of higher professional degrees (First Professional, PhD, MA, BA, and AA; Figure 14, page 37).

Even if Tennessee education is supplying sufficient graduates to fill the needs for Tennessee, these graduates may not stay in the state, but be attracted to jobs with greater pay elsewhere. Even if there are enough doctoral degrees to fill the state's needs, the number of those with "First Professional" degrees such as medical doctors, pharmacists, and engineers could fall short. See Yanagiura (2008) for much more detail on the supply of graduate education completers in Tennessee.

Tennessee Favorability. Some 37.0 percent of all workers in the nation were 18 to 64 years of age in 2006.[3] This figure is slightly lower in Tennessee, with 36.6 percent of the employed aged 18 to 64 years. Tennessee's labor force ratios are likely to vary little relative to the nation through 2030.

The labor shortage will affect some industries and higher-skilled occupations. Individual businesses and consortiums are beginning to implement plans to retain younger workers as well as older workers. Offering flexible hours to older workers and developing mentoring programs that ensure cultivation of skills, experience and institutional knowledge can slow down or even reverse job turnover. As early as 1983, Congress increased the age at which certain retirees can receive Social Security benefits, intending to inspire workers to stay in the labor force longer. Efforts in both the public and private sectors can mitigate the negative effects of the Baby Boomers leaving the workforce too early.

The Challenge. Should labor shortages develop around the U.S., then businesses may have an incentive to locate in Tennessee where the labor supply is more favorable. Tennessee workers, however, can be enticed to leave the state and locate in other states should wages, training, and job opportunities not be available here.

Occupations with high growth/replacement ratios in Tennessee through the year 2016 are listed in Table 20 (page 56). These include occupations in health services, other services, agriculture, computer systems, management, education, professions, and construction. The high growth, if not offset by replacement, can result in a shortfall of qualified candidates for the positions. Filling many of these shortages will require continued attention to improving high school and college graduation rates, improving the transition

[3] http://quickfacts.census.gov/qfd/states/47000.html

from high school to postsecondary education, and focusing on shortage areas to encourage programs of talent development and retention.

Nursing and Other Health Care Shortages. One area of significant concern has been the shortage of registered nurses (Table 20, page 56). An expected national shortfall of 340,000 nurses by 2020 is expected (Rivers, 2007, Vanderbilt Reporter). The shortfall is lowered from a previous expected shortfall of 760,000, according to a recent study, with a large number of individuals in their late 20s and early 30s entering the profession. The need for trained nursing personnel in Tennessee will likely continue with the shortage of nursing instructors and space for operating nurse education programs (Griffith, 2007). Medical assistants, pharmacy assistants, pharmacy technicians, and dental assistants are among the high growth and low replacement occupations (Table 20, page 56).

Clusters of occupations and their related training programs, are grouped by their long term employment outlook (Table 15, page 49, through Table 19, page 53). Those with supply/demand ratios of excellent, very good, favorable, and favorable adjusted (Table 15, Table 16, and Table 17) have the best long term outlook for job seekers, students, and employees most likely to change careers through 2016, based on current training levels. Registered nursing receives a favorable outlook and is in demand, although Tennessee has more registered nurse completers than estimated long term demand (1.4 times as many).

Teacher Shortages. Teacher shortages nationally are concentrated by subject, geography, and the special needs of students. Subject area areas lacking teachers include science, math, special education (especially visual and hearing disabilities), and foreign languages. Teachers in social studies are needed in urban areas. Tennessee has shortages of elementary, preschool, and kindergarten teachers (see Table 15, page 49). Secondary and vocational education teachers have a favorable outlook (see Table 17, page 51). Special education teachers in preschool, kindergarten, and elementary school are in demand (Table 20, page 56). Shortages are best corrected by increasing supply in these particular subject areas (The Southern Regional Education Board, SREB). Reduction of teacher turnover is important to alleviate shortages (Jackson, 2006, SREB). Teacher turnover can perhaps be reduced by teacher programs and pay. Unlike most states in SREB that require teachers to participate in state supported mentor programs, Tennessee has a voluntary program for participation. The state raised pay for beginning teachers in 2007.

Transportation Shortages. Passengers of public transportation have increased with the rise in gas prices. Passenger trips in the Metropolitan Transit Authority in Nashville increased 16 percent from the previous year, and they faced driver shortages, specifically of operators with effective people skills (Harless, 2007).

Table 20. Occupations with High Growth/Replacement Ratios, 125 or more Growth Openings, Long Term Training (TR) or More, with Cluster Grade (CC), Ranked by Ratio

SOC	Title	2006 Employ-ment	Growth Rate	Annual Growth Openings	Annual Replace-ment Openings	Ra-tio	CC	Median Salary	TR
49-9042	Maintenance and Repair Workers, General	33,170	1.0%	365	80	4.6	b	$31,100	9
11-9011	Farm, Ranch, and Other Agricultural Managers	5,370	2.8%	170	40	4.3	b	$56,200	4
21-1093	Social and Human Service Assistants	3,190	2.9%	105	35	3.0	a	$25,300	3
31-9092	Medical Assistants	9,220	3.2%	335	115	2.9	c	$25,700	7
23-2011	Paralegals and Legal Assistants	3,730	3.3%	145	50	2.9	c	$36,900	6
15-1081	Network Systems and Data Communications Analysts	2,810	4.4%	155	55	2.8	a	$62,600	5
15-1031	Computer Software Engineers, Applications	3,310	3.4%	130	50	2.6	a	$69,900	5
29-1051	Pharmacists	5,640	3.5%	230	100	2.3	a	$107,800	1
35-1012	First-Line Supervisors/Managers of Food Preparation and Servers	18,270	1.5%	285	135	2.1	a	$24,500	7
29-2052	Pharmacy Technicians	7,970	4.6%	455	245	1.9	a	$26,100	6
29-2041	Emergency Medical Technicians and Paramedics	6,290	1.8%	125	70	1.8	p	$28,400	7
21-1023	Mental Health and Substance Abuse Social Workers	2,830	3.2%	105	60	1.8	a	$28,900	3
29-1111	Registered Nurses	51,960	2.3%	1345	860	1.6	c	$54,000	6
25-2011	Preschool Teachers, Except Special Education	10,170	2.3%	260	170	1.5	a	$17,700	5
31-9091	Dental Assistants	5,020	2.2%	125	85	1.5	a	$30,100	7
29-2034	Radiologic Technologists and Technicians	5,560	1.7%	105	75	1.4	c	$46,700	6
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	6,490	2.2%	160	115	1.4	c	$30,200	9
25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary	4,330	2.6%	130	95	1.4	a	$39,200	5
49-9041	Industrial Machinery Mechanics	5,880	2.1%	135	100	1.4	c	$37,300	9
23-1011	Lawyers	7,980	2.3%	200	150	1.3	c	$93,400	1
21-2011	Clergy	9,620	1.6%	170	130	1.3	d	$44,300	3
47-2152	Plumbers, Pipefitters, and Steamfitters	9,090	2.4%	245	190	1.3	a	$36,400	9
15-1071	Network and Computer Systems Administrators	4,560	2.5%	130	105	1.2	a	$62,400	5
11-9021	Construction Managers	9,610	1.7%	180	150	1.2	a	$55,400	5
13-2011	Accountants and Auditors	17,200	1.9%	355	305	1.2	a	$49,700	5

Construction Shortages. Alongside regional growth and utility company expansion in the last few years, maintenance requirements and labor needs increased dramatically. The supply of industrial craft labor in the Southeast weakened (Haskew, 2007). Southeastern Manpower Tripartite Alliance was formed in 2005. The industrial construction sector, which was close to full employment in October 2006, was expected to increase 25 percent in the next two years and remain high through 2010. Shortages of painters, ironworkers, pipefitters (Table 20, page 56), and insulators were forecast. New power generation capacity was expected to create shortages of electricians, insulators, and boilermakers. Other workers that are in demand include maintenance and repair workers; heating, air conditioning, and refrigeration mechanics, and installers; and industrial machinery mechanics (Table 20, page 56).

Conclusion

The writers would be remiss without suggesting some general applications of the information previously presented. Analysis of Tennessee's employment trends yields some important conclusions.

Unemployment has increased in the last few months in Tennessee. Projections show that for the next two years, employment will grow but at a slower rate. However, long term employment is likely to return to growth rates only slightly less than growth rates of the past decade.

- Employment from 2006 to 2016 is expected to resume previous growth patterns.

Goods-producing industries will show below average employment growth for 2006 to 2016, and manufacturing may actually decrease. Nevertheless, niche manufacturing is likely to grow. Emerging industries, including the renewable industry sector, show even more promise of bringing employment benefits to Tennesseans.

- Employment from 2006 to 2016 can be strengthened by emphasis on emerging and revitalized industries, including industries improving energy efficiency.

Contemporary challenges include high energy prices and the sub-prime mortgage and spreading financial industry crisis including tightening of business and personal credit. A positive response to high energy prices would be investment in the research and production of energy efficient vehicles, appliances, and building practices. Tightening credit will require more savings on the part of consumers to acquire assets.

To increase student graduation rates and grow Tennessee's workforce, reduction in the population currently living in poverty will be required. A comprehensive, workable program to reduce poverty would include assistance for rising food and energy prices, increases in the minimum wage, more universal benefits such as health care and sick leave, expanded job opportunities and educational enrollment, reduction of debt and

asset building strategies, and greater financial literacy. Many of these resources need to be federal, and provide incentives for those in poverty to advance economically.

Transitional programs for veterans, those receiving human services assistance, ex-felons and the long term unemployed will continue to receive available federal and state funding dollars.

- Poverty reduction is a key to increasing graduation rates and building Tennessee's workforce.
- Increasing graduation rates of high school and college students will increase the supply of workers for growing industries, including those with advanced technology.

Recognition of the need for advanced skills, knowledge, and improved work styles can influence training in our schools and industries.

- Teachers who review the findings of this paper can enhance their course offerings and/or develop new courses with emphases on needed skills, knowledge and work styles.

Supply/demand analysis provides guidance on the alignment of course offerings with job demand. Expansions could be considered in high wage, high skill shortage categories, with program reductions in areas of significant surplus.

Appendix A

Table 21, Appendix A. Age Distribution for Tennessee and the United States, 2000, 2010, 2030

	Tennessee			United States		
Age Cohort	2000	2010	2030	2000	2010	2030
Under 18	24.6	23.7	24.3	25.7	24.1	23.6
18-65	63.0	63.0	56.5	61.9	62.9	56.7
65 and Over	12.4	13.3	19.2	12.4	13.0	19.7

Table derived from http://www.census.gov/population/www/projections/projectionsagesex.html

Table 22, Appendix A. Industry Growth in Tennessee 2006-2016

NAICS	Title	2006 Estimated Employ-ment	2016 Projected Employ-ment	Annual Growth Rate	10 Year Growth
110000	Agriculture, Forestry, Fishing and Hunting	32850	36250	1.0%	3400
111000	Crop Production	21370	23590	1.0%	2220
112000	Animal Production	5490	7430	3.1%	1940
115000	Support Activities for Agriculture and Forestry	5180	4630	-1.1%	-550
210000	Mining	2610	2720	0.4%	100
211000	Oil and Gas Extraction	40	40	-0.3%	0
212000	Mining (except Oil and Gas)	2160	2300	0.7%	150
213000	Support Activities for Mining	420	380	-1.1%	-40
220000	Utilities	3530	3260	-0.8%	-270
230000	Construction	130270	157660	1.9%	27390
236000	Construction of Buildings	32390	33200	0.2%	820
237000	Heavy and Civil Engineering Construction	16930	18210	0.7%	1280
238000	Specialty Trade Contractors	80950	106250	2.8%	25290
310000	Manufacturing	399400	375810	-0.6%	-23600
311000	Food Manufacturing	33980	31890	-0.6%	-2090
312000	Beverage and Tobacco Product Manufacturing	5190	5570	0.7%	370
313000	Textile Mills	5080	3120	-4.8%	-1970
314000	Textile Product Mills	3590	3050	-1.6%	-540
315000	Apparel Manufacturing	7430	3690	-6.8%	-3750
316000	Leather and Allied Product Manufacturing	1290	600	-7.3%	-690
321000	Wood Product Manufacturing	17920	17840	0.0%	-80
322000	Paper Manufacturing	18330	17840	-0.3%	-480
323000	Printing and Related Support Activities	17740	12350	-3.6%	-5400
324000	Petroleum and Coal Products Manufacturing	1050	830	-2.3%	-220
325000	Chemical Manufacturing	26300	22420	-1.6%	-3880
326000	Plastics and Rubber Products Manufacturing	27630	26990	-0.2%	-630
327000	Nonmetallic Mineral Product Manufacturing	16120	17140	0.6%	1030
331000	Primary Metal Manufacturing	11830	10340	-1.3%	-1480
332000	Fabricated Metal Product Manufacturing	43470	47370	0.9%	3900
333000	Machinery Manufacturing	33230	31740	-0.5%	-1490
334000	Computer and Electronic Product Manufacturing	9250	4060	-7.9%	-5200
335000	Electrical Equipment, Appliance, and Component Manufacturing	23180	27530	1.7%	4360
336000	Transportation Equipment Manufacturing	63730	66130	0.4%	2400
337000	Furniture and Related Product Manufacturing	17740	12060	-3.8%	-5690
339000	Miscellaneous Manufacturing	15330	13260	-1.4%	-2080

Table 22, Continued

NAICS	Title	2006 Estimated Employ-ment	2016 Projected Employ-ment	Annual Growth Rate	10 Year Growth
420000	Wholesale Trade	132030	147420	1.1%	15390
423000	Merchant Wholesalers, Durable Goods	68710	84380	2.1%	15670
424000	Merchant Wholesalers, Nondurable Goods	46870	45450	-0.3%	-1420
425000	Wholesale Electronic Markets and Agents and Brokers	16460	17600	0.7%	1140
440000	Retail Trade	327870	361950	1.0%	34080
441000	Motor Vehicle and Parts Dealers	43710	47080	0.7%	3370
442000	Furniture and Home Furnishings Stores	10380	10600	0.2%	210
443000	Electronics and Appliance Stores	9120	9750	0.7%	630
444000	Building Material and Garden Equipment and Supplies Dealers	28130	33890	1.9%	5760
445000	Food and Beverage Stores	46500	40810	-1.3%	-5690
446000	Health and Personal Care Stores	22670	32760	3.8%	10090
447000	Gasoline Stations	24100	21080	-1.3%	-3020
448000	Clothing and Clothing Accessories Stores	30180	33660	1.1%	3480
451000	Sporting Goods, Hobby, Book, and Music Stores	12580	16210	2.6%	3630
452000	General Merchandise Stores	71480	84250	1.7%	12770
453000	Miscellaneous Store Retailers	17780	18620	0.5%	840
454000	Nonstore Retailers	11240	13240	1.6%	2000
480000	Transportation and Warehousing	146380	166420	1.3%	20040
481000	Air Transportation	6450	6290	-0.2%	-160
483000	Water Transportation	2350	3410	3.8%	1060
484000	Truck Transportation	64180	71760	1.1%	7590
485000	Transit and Ground Passenger Transport	5720	7320	2.5%	1600
487000	Scenic and Sightseeing Transportation	390	490	2.4%	110
488000	Support Activities for Transportation	10630	13290	2.3%	2660
492000	Couriers and Messengers	38790	42350	0.9%	3560
493000	Warehousing and Storage	13520	17870	2.8%	4350
510000	Information	49460	50310	0.2%	850
511000	Publishing Industries	13900	13970	0.1%	70
512000	Motion Picture and Sound Recording Industries	7820	7230	-0.8%	-590
515000	Broadcasting (except Internet)	7490	7300	-0.2%	-180
516000	Internet Publishing and Broadcasting	150	210	3.7%	60
517000	Telecommunications	16290	17040	0.4%	740
518000	Internet Service Providers, Web Search Portals, and Data Pro	3520	4170	1.7%	650
519000	Other Information Services	300	390	2.8%	100

Table 22, Continued

NAICS	Title	2006 Estimated Employ-ment	2016 Projected Employ-ment	Annual Growth Rate	10 Year Growth
520000	Finance and Insurance	106790	120070	1.2%	13280
521000	Monetary Authorities - Central Bank	770	860	1.2%	100
522000	Credit Intermediation and Related Activities	57930	62880	0.8%	4950
523000	Securities, Commodity Contracts, and Other Financial Investm	8460	12320	3.8%	3870
524000	Insurance Carriers and Related Activities	38870	42610	0.9%	3740
525000	Funds, Trusts, and Other Financial Vehicles	760	1400	6.3%	640
530000	Real Estate and Rental and Leasing	34640	38010	0.9%	3380
531000	Real Estate	21770	23910	0.9%	2150
532000	Rental and Leasing Services	11920	12950	0.8%	1030
533000	Lessors of Nonfinancial Intangible Assets (except Copyrighte	950	1150	1.9%	200
541000	Professional, Scientific, and Technical Services	105420	126070	1.8%	20650
550000	Management of Companies and Enterprises	23440	32150	3.2%	8710
560000	Administrative and Support and Waste Management and Remediat	188380	228070	1.9%	39680
561000	Administrative and Support Services	180800	217080	1.8%	36290
562000	Waste Management and Remediation Service	7590	10990	3.8%	3400
610000	Educational Services	231430	266470	1.4%	35040
620000	Health Care and Social Assistance	316670	396380	2.3%	79710
621000	Ambulatory Health Care Services	108880	135740	2.2%	26860
622000	Hospitals	114070	133150	1.6%	19080
623000	Nursing and Residential Care Facilities	52380	67230	2.5%	14860
624000	Social Assistance	41350	60270	3.8%	18920
710000	Arts, Entertainment, and Recreation	30140	33820	1.2%	3680
711000	Performing Arts, Spectator Sports, and Related Industries	8940	9430	0.5%	490
712000	Museums, Historical Sites, and Similar Institution	3030	3940	2.7%	910
713000	Amusement, Gambling, and Recreation Industries	18170	20460	1.2%	2290
720000	Accommodation and Food Services	238340	276870	1.5%	38530
721000	Accommodation	35010	39190	1.1%	4190
722000	Food Services and Drinking Places	203340	237680	1.6%	34340

Table 22, Continued

NAICS	Title	2006 Estimated Employ-ment	2016 Projected Employ-ment	Annual Growth Rate	10 Year Growth
810000	Other Services (Except Government)	124980	135850	0.8%	10870
811000	Repair and Maintenance	22160	27000	2.0%	4840
812000	Personal and Laundry Services	24380	22710	-0.7%	-1670
813000	Religious, Grantmaking, Civic, Professional, and Similar Org	56640	66210	1.6%	9570
814000	Private Households	21800	19930	-0.9%	-1870
900000	Government	187250	213570	1.3%	26320
910000	Total Federal Government Employment	31330	35180	1.2%	3850
920000	State, Excluding Education and Hospitals	45270	47490	0.5%	2220
930000	Local, Excluding Education and Hospitals	110650	130900	1.7%	20250

Table 23, Appendix A. Industry by Educational Level, Tennessee, 2006-2016

Educational Level	Estimate 2006	Projection 2016	Growth 2006-2016	Annual Growth Rate
Self-Employed Workers, Primary Job	193290	207650	14360	0.7%
First professional degree	4490	5100	610	1.3%
Doctoral degree	930	1090	150	1.5%
Master's degree	1520	1600	80	0.5%
Bachelor's or higher degree, plus work experience	11510	11870	360	0.3%
Bachelor's degree	21570	23450	1880	0.8%
Associate degree	1770	1820	50	0.3%
Postsecondary vocational training	15000	16450	1450	0.9%
Work experience in a related occupation	45140	48580	3450	0.7%
Long-term on-the-job training	22800	24190	1390	0.6%
Moderate-term on-the-job training	32020	35310	3290	1.0%
Short-term on-the-job training	36540	38190	1650	0.4%
Unpaid Family Workers, Primary Job	2630	2210	-420	-1.7%
Bachelor's or higher degree, plus work experience	40	30	-10	-3.3%
Bachelor's degree	50	40	-10	-2.2%
Associate degree	40	30	-10	-1.8%
Postsecondary vocational training	50	50	0	0.2%
Work experience in a related occupation	240	190	-50	-2.4%
Long-term on-the-job training	140	100	-40	-3.5%
Moderate-term on-the-job training	730	600	-140	-2.1%
Short-term on-the-job training	1350	1190	-160	-1.3%
Natural Resources and Mining	35040	38500	3470	0.9%
First professional degree	10	10	0	2.7%
Doctoral degree	0	0	0	0.0%
Master's degree	30	30	0	-1.2%
Bachelor's or higher degree, plus work experience	6060	7620	1560	2.3%
Bachelor's degree	480	440	-40	-0.9%
Associate degree	160	160	0	-0.2%
Postsecondary vocational training	180	190	10	0.3%
Work experience in a related occupation	2610	2400	-200	-0.8%
Long-term on-the-job training	550	540	-10	-0.2%
Moderate-term on-the-job training	7530	7410	-120	-0.2%
Short-term on-the-job training	17420	19700	2280	1.2%
Construction	128480	155520	27040	1.9%
Bachelor's or higher degree, plus work experience	7370	8020	650	0.9%

Table 23, continued

Educational Level	Estimate 2006	Projection 2016	Growth 2006-2016	Annual Growth Rate
Bachelor's degree	6520	7960	1440	2.0%
Associate degree	130	160	30	2.0%
Postsecondary vocational training	4150	5430	1290	2.7%
Work experience in a related occupation	12260	14240	1980	1.5%
Long-term on-the-job training	37560	46960	9390	2.3%
Moderate-term on-the-job training	44720	53750	9030	1.9%
Short-term on-the-job training	15780	19010	3230	1.9%
Manufacturing	397730	374170	-23560	-0.6%
First professional degree	30	30	0	0.0%
Doctoral degree	180	100	-70	-5.1%
Master's degree	240	210	-30	-1.5%
Bachelor's or higher degree, plus work experience	17160	15370	-1800	-1.1%
Bachelor's degree	16300	15760	-540	-0.3%
Associate degree	4510	4170	-340	-0.8%
Postsecondary vocational training	13350	13850	500	0.4%
Work experience in a related occupation	33380	31820	-1560	-0.5%
Long-term on-the-job training	37720	36830	-890	-0.2%
Moderate-term on-the-job training	191870	183430	-8440	-0.4%
Short-term on-the-job training	83000	72600	-10400	-1.3%
Trade, Transportation, and Utilities	604210	672850	68650	1.1%
First professional degree	4580	6650	2070	3.8%
Doctoral degree	30	30	0	1.3%
Master's degree	150	170	20	1.1%
Bachelor's or higher degree, plus work experience	22110	23810	1710	0.7%
Bachelor's degree	19410	23230	3820	1.8%
Associate degree	3430	4150	710	1.9%
Postsecondary vocational training	19190	22010	2810	1.4%
Work experience in a related occupation	74700	84650	9950	1.3%
Long-term on-the-job training	19180	21840	2660	1.3%
Moderate-term on-the-job training	127440	147460	20020	1.5%
Short-term on-the-job training	313980	338860	24880	0.8%
Information	47000	47780	780	0.2%
First professional degree	20	20	0	0.0%
Doctoral degree	50	70	20	3.9%
Master's degree	160	190	30	1.7%
Bachelor's or higher degree, plus work experience	5040	5070	30	0.1%
Bachelor's degree	6700	6990	290	0.4%
Associate degree	2270	2200	-80	-0.3%
Postsecondary vocational training	4070	3460	-610	-1.6%
Work experience in a related occupation	3720	3710	-20	0.0%

Table 23, continued

Educational Level	Estimate 2006	Projection 2016	Growth 2006-2016	Annual Growth Rate
Long-term on-the-job training	2960	2740	-230	-0.8%
Moderate-term on-the-job training	11730	13210	1480	1.2%
Short-term on-the-job training	10270	10130	-150	-0.1%
Financial Activities	140800	157330	16530	1.1%
First professional degree	350	390	40	1.1%
Master's degree	320	350	30	0.9%
Bachelor's or higher degree, plus work experience	14740	15740	1000	0.7%
Bachelor's degree	27150	32260	5110	1.7%
Associate degree	1780	2040	260	1.4%
Postsecondary vocational training	1780	1950	180	1.0%
Work experience in a related occupation	13620	14460	840	0.6%
Long-term on-the-job training	4430	5200	770	1.6%
Moderate-term on-the-job training	38150	43550	5400	1.3%
Short-term on-the-job training	38490	41410	2920	0.7%
Professional and Business Services	313270	381460	68190	2.0%
First professional degree	5140	6750	1610	2.8%
Doctoral degree	420	450	30	0.7%
Master's degree	1730	2170	430	2.3%
Bachelor's or higher degree, plus work experience	21860	26860	5000	2.1%
Bachelor's degree	37540	48190	10650	2.5%
Associate degree	16630	20680	4040	2.2%
Postsecondary vocational training	7990	9080	1090	1.3%
Work experience in a related occupation	19890	24660	4770	2.2%
Long-term on-the-job training	6990	8030	1040	1.4%
Moderate-term on-the-job training	77880	95590	17710	2.1%
Short-term on-the-job training	117190	139020	21830	1.7%
Education and Health Services	539480	652490	113010	1.9%
First professional degree	11780	14130	2350	1.8%
Doctoral degree	15080	17670	2590	1.6%
Master's degree	29950	36640	6690	2.0%
Bachelor's or higher degree, plus work experience	26740	30480	3740	1.3%
Bachelor's degree	97570	118610	21040	2.0%
Associate degree	70760	88270	17510	2.2%
Postsecondary vocational training	64430	77340	12910	1.8%
Work experience in a related occupation	23400	26960	3560	1.4%
Long-term on-the-job training	4390	5020	630	1.4%
Moderate-term on-the-job training	70900	83630	12730	1.7%
Short-term on-the-job training	124480	153740	29260	2.1%
Leisure and Hospitality	267810	309840	42030	1.5%

Table 23, continued

Educational Level	Estimate 2006	Projection 2016	Growth 2006-2016	Annual Growth Rate
Doctoral degree	10	10	0	3.4%
Master's degree	80	110	30	2.7%
Bachelor's or higher degree, plus work experience	6830	7380	560	0.8%
Bachelor's degree	1130	1340	210	1.7%
Associate degree	40	50	10	1.4%
Postsecondary vocational training	1940	2300	360	1.7%
Work experience in a related occupation	25700	29270	3580	1.3%
Long-term on-the-job training	21690	24710	3020	1.3%
Moderate-term on-the-job training	10090	11550	1460	1.4%
Short-term on-the-job training	200290	233120	32820	1.5%
Other Services (Except Government)	121260	131440	10180	0.8%
First professional degree	30	30	0	0.6%
Doctoral degree	60	70	10	2.0%
Master's degree	10130	11970	1840	1.7%
Bachelor's or higher degree, plus work experience	6460	7030	570	0.8%
Bachelor's degree	9520	11140	1630	1.6%
Associate degree	1530	1510	-20	-0.1%
Postsecondary vocational training	14710	16550	1850	1.2%
Work experience in a related occupation	7440	8510	1070	1.4%
Long-term on-the-job training	7280	8940	1660	2.1%
Moderate-term on-the-job training	14020	14950	930	0.6%
Short-term on-the-job training	50080	50730	650	0.1%
Government	183820	209740	25920	1.3%
First professional degree	1520	1860	340	2.0%
Doctoral degree	280	300	20	0.6%
Master's degree	4580	5110	530	1.1%
Bachelor's or higher degree, plus work experience	10070	11130	1070	1.0%
Bachelor's degree	19360	22060	2710	1.3%
Associate degree	6750	7610	870	1.2%
Postsecondary vocational training	10840	12410	1580	1.4%
Work experience in a related occupation	18260	20950	2690	1.4%
Long-term on-the-job training	25660	30330	4660	1.7%
Moderate-term on-the-job training	42950	49320	6370	1.4%
Short-term on-the-job training	43550	48650	5090	1.1%
Total	2974820	3341000	366170	1.2%
First professional degree	27960	34970	7010	2.3%
Doctoral degree	17050	19800	2760	1.5%
Master's degree	48910	58550	9640	1.8%
Bachelor's or higher degree, plus work experience	155960	170390	14430	0.9%

Table 23, continued

Educational Level	Estimate 2006	Projection 2016	Growth 2006-2016	Annual Growth Rate
Bachelor's degree	263290	311460	48170	1.7%
Associate degree	109800	132840	23030	1.9%
Postsecondary vocational training	157660	181070	23410	1.4%
Work experience in a related occupation	280350	310410	30060	1.0%
Long-term on-the-job training	191370	215410	24050	1.2%
Moderate-term on-the-job training	670040	739760	69720	1.0%

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