

OCCUPATIONAL TRENDS IN A TRANSITIONING ECONOMY

AN OCCUPATIONAL ANALYSIS OF NORTH CAROLINA'S INDUSTRY CLUSTERS

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OCCUPATIONAL ANALYSIS OF A TRANSITIONING ECONOMY

Is the prosperity and opportunity associated with North Carolina's 21st Century knowledge-based economy widely shared for all workers? This question is important for economic development, education, and workforce development decision makers and has implications on policy and program development. An understanding of occupational trends¹ will assist workforce and economic development professionals with 1) the development of programs designed to transition workers from declining industries, 2) the identification of potential occupational opportunities for dislocated workers, and 3) curriculum design at community colleges and universities in North Carolina.

This report attempts to answer the question of whether North Carolina's economy is widely-shared for all workers through an analysis of employment and occupational trends related to North Carolina's 29 target industry clusters. The occupational analysis section of this report analyzes data three ways: 1) trends by cluster, 2) trends by major occupational group, and 3) trends related to specific occupations.

Key findings of this report include:

1. Significant portion of current jobs are in low-paying, low educational attainment² occupations.
2. Substantial projected decline in production-related jobs between 2006 and 2016.
3. Few direct matches between declining cluster occupations and growing/emerging cluster occupations.
4. Disappearance of "middle jobs" in growing and emerging clusters.

ECONOMIC TRANSITION

North Carolina's economy continues to transition from labor-intensive, manufacturing- and agriculture-based industries to knowledge-based industries. This transition has brought many benefits to the state—new jobs and opportunities, international recognition as a business location, and rapid population growth—but it has not been painless or necessarily widely-shared among all of the state's workers. Decline in traditional employment, the loss of "middle jobs", and increased educational attainment requirements adversely affect some workers in North Carolina.

In 2007, the North Carolina Commission on Workforce Development released its *State of the North Carolina Workforce* report. The report brought to light several key findings about the state's workforce that have implications for future economic prosperity. Employment in the state's traditional industries—textiles, furniture, and tobacco—continues to decline. The decline in traditional industry jobs precipitates the loss of North Carolina's "middle jobs"—those that pay a living with minimal formal education and training requirements. Many workers that once filled these "middle jobs" are finding that they do not have the education or skills to compete for jobs in high demand industries. The most marked difference between occupations in traditional industries and those in knowledge-based industries is the dramatic increase in educational attainment requirements. For many transitioning workers, low paying service jobs are the only viable option because these occupations require very little formal education. Well paying jobs in the new economy require higher levels of skill and more formal education, making it difficult for many workers to transition. The loss of traditional "middle jobs" coupled with the growth of high skill, high wage jobs and low skill, low wage jobs creates a polarized workforce and two economies.³

TARGET INDUSTRY CLUSTERS

The occupational analysis in this report focuses *exclusively* on a set of 29 industry clusters⁴ identified in a study published by the University of North Carolina at Chapel Hill for the North Carolina Department of Commerce. The 29 clusters were selected because they demonstrate significant trade linkages (buyer-supplier relationships) within their respective industry value-chains.⁵ The clusters also meet threshold employment and establishment levels and are highly concentrated in North Carolina. The firms and establishments within these 29 clusters have economic advantages related to the production of goods and services that businesses in other sectors do not

have, and hence are considered candidates for economic development targeting. The clusters are segmented into four categories based on employment growth: declining, stable, growing and emerging.

Industry Clusters in North Carolina

Declining	Stable	Growing
-Household Appliances -Furniture & Related Products -Textile Mill Products -Apparel -Forestry & Logging	-Pharmaceuticals -Electronic Instruments -Wood Products -Animal Production -Crop Production	-Surgical & Medical Instruments -Agricultural, Construction, & Mining Equipment -Computer Programming, Systems Design, & Related Services -Heavy Duty Trucks -Health Care Services -Boat Building
Emerging		
-Aircraft Engines & Parts -Miscellaneous Transportation Equipment -Magnetic & Optical Media Manufacturing & Reproduction -Data Processing, Internet Hosting, & Related Services	-Scientific Research & Development Services -Software Publishing -Banking -Internet Publishing & Broadcasting, ISPs & Search Portals, & Other Information Services	-Business, Scientific, & Technical Consulting Services -Advertising -Architectural, Engineering, & Related Services -Specialized Design Services -Environmental & Other Technical Consulting Services

For a more detailed overview of the methodology used to identify the 29 clusters see Appendix A. Appendix Table B provides a list of the “core-industries” that make up each cluster.

OCCUPATIONAL ANALYSIS

The following analysis looks at employment trends and occupational data at the major group level and detailed level exclusive to North Carolina’s 29 target clusters.

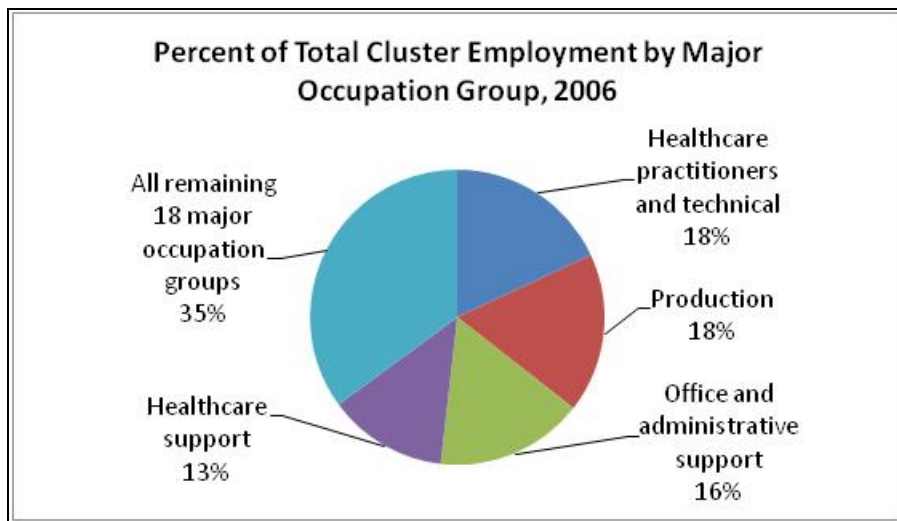
EMPLOYMENT TRENDS BY CLUSTERS

Appendix Table C presents employment data for the four cluster categories (declining, stable, growing and emerging).

- Employment in declining clusters is projected to decrease by 42 percent between 2006 and 2016, from 135,917 to 78,158.
- Stable clusters will experience very little employment growth, increasing 3 percent (104,180 to 107,243) over the same period.
- Growing clusters employment is expected to increase by 31 percent between 2006 and 2016, from 471,194 to 616,540.
- Employment in emerging clusters is projected increase to 219,682 in 2016 from 171,464 in 2006.

ANALYSIS BY MAJOR OCCUPATIONAL GROUP

In 2006, four major occupational groups⁶ accounted for 65 percent of total cluster employment in North Carolina: healthcare practitioners and technical; production; office and administrative support; and healthcare support.⁷ (See Appendix Table C)



Healthcare practitioners and technical occupations is the largest major occupational group when ranked by 2006 employment (159,236 or 18 percent of total). In 2006, more than 99 percent of this group's employment was concentrated in the growing cluster category and it is expected to increase by 30 percent (from 158,256 to 205,375) between 2006 and 2016. Healthcare practitioners and technical occupations have high average annual wages (\$63,000). Comparatively, the average annual wage in North Carolina as of the first quarter of 2008 is \$40,820.⁸ In addition, educational attainment of this occupational group is high, with 48 percent of North Carolina workers possessing a Bachelor's degree or higher and 75 percent an Associate's degree or higher.

The *production* major occupational group best represents North Carolina's transitioning economy. As of 2006, declining clusters in the state employed 90,904 production workers. The other three cluster categories are far less dependent on production-related occupations, with stable clusters employing 45,463 workers, growing 14,117, and 4,178 in emerging. Between 2006 and 2016, production jobs are expected to decline by 38,000 (-42 percent) in declining clusters, while the other cluster categories will create 7,896 production jobs; a net loss of more than 30,000 across all clusters. On average, production jobs are low paying (average annual wage below \$30,000) and require low educational attainment (71 percent of workers possess a high school degree or less).

Employment in the *office and administrative support* major occupational group is heavily concentrated in growing (71,961) and emerging (53,762) clusters. While the number of jobs in this group is expected to increase by 16 percent across all clusters between 2006 and 2016, employment within declining clusters will decrease by 45 percent, from 11,462 to 6,325. The average wage for this occupational group is less than \$30,000, a factor of the low educational attainment levels of workers (39 percent have a high school diploma or less and 73 percent less than an Associate's degree).

As of 2006, the *healthcare support* major occupational group accounted for 13 percent of all cluster employment, but heavily concentrated in the growing cluster category. While this occupational group is expected to grow (36 percent between 2006 and 2016), it is characterized by very low annual wages (less than \$23,000) and low educational attainment (83 percent of workers have less than an Associate's degree).

ANALYSIS BY DETAILED OCCUPATIONS

The U.S. Bureau of Labor Statistics identifies approximately 800 detailed occupations. While data was collected for all 800 occupations, the following analysis focuses on the top 35 for each cluster category. The top 35 occupations in each cluster category represent 68 percent of total cluster employment for 2006.

Are there Opportunities for Declining Cluster Occupations?

A more detailed understanding of declining cluster occupations is a first step in developing policies to assist North Carolina in the transition of workers from traditional industries to growing and emerging knowledge-based industries. Workers employed in declining clusters have the most immediate need to find new job opportunities.⁹ Occupations in each cluster category are ranked by projected employment change between 2006 and 2016.¹⁰ (See Appendix Tables D, E, F and G)

Very few of the top occupations in the declining cluster category are projected to have significant employment opportunities in stable, growing or emerging clusters. However, four occupations have matches in growing and emerging clusters and are projected to experience significant employment growth between 2006 and 2016: 1) general and operations managers; 2) office clerks; 3) customer service representatives; and 4) bookkeeping, accounting and auditing clerks. Employment growth in the stable, growing, and emerging clusters for these four occupations outweighs the anticipated employment losses for the same occupations in the declining clusters.¹¹ The average annual wage for general and operations managers is \$108,323, compared to the state average annual wage of \$40,820. The other three occupations have significantly lower wages (all less than \$31,000).¹² Of the four matching occupations, only general and operations managers emerge prepared for the educational attainment requirements associated with state's knowledge-based economy. Fifty-four percent of general and operations managers have at least a bachelor's degree. Only 22 percent of customer service representatives have a bachelor's degree while less than 12 percent for both office clerks and bookkeeping, accounting and auditing clerks.

What Do Growing and Emerging Cluster Occupations Look Like?

Identifying occupational opportunities, both in the short and medium term, is critical for the transition of workers. Growing and emerging clusters represent the future of occupational employment in North Carolina. (See Appendix Tables F and G)

Sixty-one percent of the growth in growing clusters is projected to occur in healthcare related occupations (major occupational groups: healthcare practitioner and technical and healthcare support). Four of the top five growth occupations are: home health aides (24,350); registered nurses (22,639); nursing aides, orderlies, and attendants (5,329); and medical assistants (4,493). Despite growth trends in healthcare related occupations, there are significant concerns related to the quality of these jobs. Of the four healthcare occupations, three have average annual wages of less than \$23,000. Not surprisingly, more than 50 percent of workers in these occupations have a high school diploma/GED or less. Registered nurses are the one exception. The annual average wage for registered nurses is \$55,920 and 93 percent hold at least an associate's degree while 49 percent hold at least a bachelor's degree. *With few exceptions, occupations in growing clusters tend to fall into two categories: 1) high-wage, high educational attainment, and 2) low-wage, low educational attainment.*

While no one occupational category dominates the emerging clusters, the vast majority of existing jobs and expected growth fall into five major occupational groups: 1) management; 2) business and financial operations; 3) computer and mathematical; 4) architecture and engineering; and 5) office and administrative support (see Appendix Table C). When analyzing detailed occupations, the top two are of concern: tellers and customer service representatives. In 2008, tellers on average earn \$23,703 a year, whereas the average annual wage for customer service representatives is \$30,187. Both occupations have a significant number of workers with less than an Associate's degree. On a more positive note, seven of the top ten and 24 of the top 35 emerging cluster occupations have average annual wages of more than \$50,000. Related, six of the top 10 and 21 of the top 35 have more than 50 percent of workers with at least a bachelor's degree. *In general, the trend among workers in emerging clusters is either high-wage and high educational attainment or low-wage and low educational attainment. Like occupations in growing clusters a lack of "middle jobs" exist.*

SUMMARY OF FINDINGS

Occupational analysis through the lens of North Carolina's 29 target industry clusters yields interesting findings relevant to workforce development and economic development:

1. **Significant portion of current jobs are in low-paying, low educational attainment occupations:** Three of the top four major occupational groups (production; office and administrative support; and healthcare support) are characterized by average annual wages of less than \$30,000 (below the state average annual wage of \$40,820) and low educational attainment (less than an Associate's degree).
2. **Substantial projected decline in production-related jobs between 2006 and 2016:** Between 2006 and 2016, production-related occupations in the 29 clusters are expected to experience a net loss of 30,000 jobs (-20 percent). The decline in production jobs is approximately five-times more than any other major occupation group.
3. **Few direct matches between declining cluster occupations and growing/emerging cluster occupations:** Of the top 35 declining occupations, ranked in terms of expected net job loss between 2006 and 2016, only four match the top 35 growing or emerging occupations (ranked in terms of net job growth). Three of the four occupational matches are characterized by low-wages and low educational attainment.
4. **Disappearance of "middle jobs" in growing and emerging clusters:** In general, occupations in North Carolina's growing and emerging clusters are characterized as either low-wage/low educational attainment or high-wage/high-educational attainment. There is a lack of "middle jobs."

POLICY RECOMMENDATIONS

The findings of this report suggest several key policy implications for economic and workforce development in North Carolina.

Immediately prepare production workers for the transitioning economy. Comprehensive workforce transition planning must be in place to aid workers as they shift from declining cluster occupations to occupations in the growing and emerging clusters. This report demonstrates that transitions will be very difficult for a large portion of the state's workforce. Immediate focus should be placed on transitioning dislocated workers from production occupations since these occupations will experience the largest and most rapid employment decline. Many of these workers will need extensive education and training while still supporting themselves and their families. Workers will face the prospects of underemployment or unemployment during this transition, therefore, transition planning must not only address the training and educational needs of workers but also social supports (tuition assistance, loans, tax credits, scholarships).

Increase the number of workers with post-secondary degrees. Education is a much more important determinant of middle class status today than in the past. Those with a college education are moving up the income ladder while those with a high school degree or less are moving down. This report illustrates that workers with a post-secondary degree are much more prepared to compete for high paying, knowledge-based occupations in growing and emerging cluster industries. The state's public policy must continue to shift its focus beyond high school completion as the capstone of one's educational attainment to Associate's degree, Bachelor's degree and advance degree completion. Also, there must be a coordinated effort between academic institutions and employers to ensure that recent graduates stay in state for employment. This may require the establishment of formal apprenticeships, internships and cooperative education programs.

Increase education and training capacity. As educational attainment and skills requirements continue to increase, the state's workforce and education system will be required to prepare an increasingly larger number of people. The community college and university systems will need the physical and financial infrastructure to

keep pace with increasing enrollment and to address the changing training needs of industries in growing and emerging clusters. The state's training and education system will need to understand the skill requirements of occupations in the growing and emerging clusters to align curricula and degree offerings properly. The goal is not necessarily more degree options, but more people entering and completing the appropriate degree programs to meet state's changing industry mix.

Align clusters and industry targeting with workforce development. North Carolina's target clusters should be used to inform workforce development strategy. The target clusters provide direction as to the types of industries and occupations that are growing and those that are declining. This allows policies and programs to develop, in advance, in order to train workers for future high demand occupations as well as transition workers in declining industries. The economic development system cannot focus solely on target industries. It must also focus on the quality of jobs at multiple educational attainment levels to help mitigate the loss of "middle jobs." Incentive policies should not only be used to promote growing and emerging target clusters, but also to help bridge the transition for workers by incentivizing companies that provide livable wages for the average worker.

Additional occupational and skills related research is needed to better understand these findings and guide public policy decisions. The following are key research proposals to consider:

- This report demonstrates that there are very few direct occupational matches for workers in traditional industries with declining employment. The state's education and workforce development system must have a more detailed understanding of occupational skills so gaps can be identified to design and implement strategies that quickly transition workers.
- Frequently updated occupational employment projections are needed to influence curricula, continuing education, training, and degree program development throughout the education and workforce system. This can also help determine the level of talent gap the state is facing (i.e., there are not enough high skilled workers to meet demand).
- The *State of the North Carolina Workforce* report did an excellent job of bringing the loss of "middle jobs" and the development of new "middle jobs" to light. There is a need to formally define "middle jobs" by wage and educational attainment levels so leaders can specifically design policies, such as business incentives and industrial upgrading around the definition. Once a definition is available, an effort can be led to identify occupations within the 29 target clusters that can serve as the new "middle jobs"—those jobs that pay a family sustaining wage and require more formal education than traditional "middle jobs".

End Notes

¹ All occupation information and projections obtained from North Carolina Employment Security Commission, Division of Labor Market Information. *2006-2016 Occupation/Industry Matrix and Occupational Projections: North Carolina*.

² Calculated distribution of Educational Attainment by Occupation using U.S. Census Bureau. (2007, January 12). ACS Public Use Microdata Sample File (PUMS): *Educational Attainment, North Carolina*, Retrieved October 28, 2008, from <http://www.census.gov/acs/www/Products/PUMS/>.

³ *State of the North Carolina Workforce: An Assessment of the State's Labor Force*; North Carolina Commission on Workforce Development, January 2007, p. iii.

⁴ Industry clusters are defined as groups of industry sectors that are related to each other because they share common or similar value chains.

⁵ Value chains are industries linked via trade flows (buyer-supplier relationships). Linkages are driven directly by product and service markets and therefore provide a useful way to characterize a state's economic specializations in terms of goods and services produced.

⁶ The Standard Occupational Classification (SOC) system is used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of over 820 occupations according to their occupational definition. To facilitate classification, occupations are combined to form 23 major groups, 96 minor groups, and 449 broad occupations. Each broad occupation includes detailed occupation(s) requiring similar job duties, skills, education, or experience.

⁷ See Appendix Table C. $(159,236+153,852+143,376+115,490)/882,852 = 65\%$

⁸ North Carolina Employment Security Commission

⁹ This section does not analyze detailed skill sets or future education requirements. It is a snapshot of the projected occupational landscape in North Carolina and discloses potential workforce challenges that its citizens will face as the state's economy continues to transition. Workers in these DC industry jobs need awareness about whether or not their skill sets and education backgrounds meet any of the occupational demands of new, knowledge-based industries so they can prepare for how they plan to face continued economic shifts and industry changes.

¹⁰ The analysis is limited to the top 35 occupations since they account for 84 percent of the projected employment loss in declining clusters.

¹¹ A caveat should be stated. While it is a fact that employment loss will happen to North Carolina workers it is not guaranteed that the newly created jobs will go to North Carolina workers. The state has been experiencing very high levels of in-migration and these in-migrants will be competing with North Carolinians for these new jobs.

¹² Office Clerks: \$24,180; Customer Service Representatives: \$30,187; Bookkeeping, Accounting & Auditing Clerks: \$30,700

Appendix A: Summary of Cluster Methodology

The University of North Carolina at Chapel Hill (UNC-CH) used the concept of value chains to identify connections among industries. Value chain linkages are driven directly by product and service markets and therefore provide a useful way to characterize a state's economic specializations in terms of goods and services produced. Value chains are groups of industries linked directly and indirectly through purchase and sales flows.

A positive or negative change in demand for a given product in a given industry ripples through that industry's value chain, backward to its suppliers and forward to its purchasers (if it is an intermediate good). In principle, value chains can be defined for each individual industry, though in practice chains for highly detailed industries often overlap significantly. UNC-CH developed value chains for the U.S. as a whole and for the state of North Carolina. The U.S. analysis provides a picture of the complete domestic chain for a given industry. The North Carolina analysis provides a picture of industry connections that exist solely within the state.

Data Sources. Differences in industry categories used by different datasets necessitated the creation of a unique 378 industry classification specifically for the UNC-CH cluster study. The classification concords directly to the North American Industrial Classification System (NAICS vintage 1997 and 2002), for which data on North Carolina and U.S. industry employment and wages are reported; the BEA's input-output industry classification system (vintage 1997 and 2002), for which U.S. input-output data are reported; and IMPLAN's own unique industry classification system (vintage 2003), for which North Carolina input-output data (as well as U.S. and North Carolina output and value added information) are reported. In addition to input-output data from the Bureau of Economic Analysis and IMPLAN, we acquired North Carolina unsuppressed establishment and employment counts by industry from the North Carolina Employment Security Commission (for years 1992, 2000, 2001, and 2007). UNC-CH added comparable data for the U.S. as a whole from the U.S. Bureau of Labor Statistics' published QCEW series.

Value Chain Identification. To identify value chains for the U.S. economy as a whole, UNC-CH calculated two measures of linkage between each pair of industries using a 378 x 378 transactions matrix developed from the 2002 U.S. benchmark input-output accounts. The linkage indicators are known as backward and forward average propagation lengths (APLs). Conceptually, they represent the average number of spending rounds in a multiplier context that it takes for a change in demand in one industry to reach another industry either via purchases (backward) or sales (forward). Forward and backward APLs are used to identify closely linked industries for a given industry i , not just those that are direct suppliers and buyers, but also those that are linked to industry i indirectly through their trade with other sectors. Similarly, UNC-CH constructed average propagation lengths for North Carolina using a 378 x 378 transactions matrix developed from input-output data extracted from IMPLAN's 2006 North Carolina data release.

Combining Value Chains into Clusters. The value chains are not mutually exclusive. Indeed, within broad industry categories (e.g., furniture manufacturing or textiles and apparel), they overlap significantly. To aid the identification of clusters for policy attention, UNC-CH calculated a measure of the overlap between chains as the share of linked industries present in both chains i and j over the universe of linked industries in i and j (the intersection over the union of the two sets). Using the overlap results, UNC-CH combined some industries to produce 105 summary clusters from the 378 detailed industries. Specific criteria were established to identify the 29 "existing" and "emerging" clusters from the 105 summary categories.

The complete UNC-CH cluster study can be found at:

<http://www.nccommerce.com/en/AboutDOC/PublicationsReports/EconomicDevelopmentReports/>

Appendix Table B: Cluster to Core-Industry Matrix

Cluster Category	Cluster	Core Industry(ies)	NAICS Code	
Declining	Forestry & logging	Timber Tract Operations	1131	
		Forest Nurseries and Gathering of Forest Products	1132	
		Logging	1133	
	Textile mills & textile mill product manufacturing	Fiber, Yarn, and Thread Mills	3131	
		Fabric Mills	3132	
		Textile and Fabric Finishing and Fabric Coating Mills	3133	
		Textile Furnishings Mills	3141	
		Other Textile Product Mills	3149	
	Apparel manufacturing	Apparel Knitting Mills	3151	
		Cut and Sew Apparel Manufacturing	3152	
		Apparel Accessories and Other Apparel Manufacturing	3159	
	Household appliance manufacturing	Household Appliance Manufacturing	3352	
	Furniture & related product manufacturing	Household and Institutional Furniture and Kitchen Cabinet Manufacturing	3371	
		Office Furniture (including Fixtures) Manufacturing	3372	
Other Furniture Related Product Manufacturing		3379		
Stable	Crop production	Crop Production	111	
	Animal production & processing	Animal Production	112	
		Animal Slaughtering and Processing	3116	
	Wood product manufacturing	Sawmills and Wood Preservation	3211	
		Veneer, Plywood, and Engineered Wood Product Manufacturing	3212	
		Other Wood Product Manufacturing	3219	
	Pharmaceutical & medicine manufacturing	Pharmaceutical and Medicine Manufacturing	3254	
Electronic instrument manufacturing	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	3345		
Growing	Agricultural, construction, & mining machinery manufacturing	Agriculture, Construction, and Mining Machinery Manufacturing	3331	
		Heavy duty trucks	Motor Vehicle Manufacturing	3361
		Boat building	Ship and Boat Building	3366
		Surgical & medical instruments	Medical Equipment and Supplies Manufacturing	3391
		Computer programming, systems design & computer-related services	Computer Systems Design and Related Services	5415
	Health care services	Offices of Physicians	6211	
		Offices of Dentists	6212	
		Offices of Other Health Practitioners	6213	
		Outpatient Care Centers	6214	
		Medical and Diagnostic Laboratories	6215	
		Home Health Care Services	6216	
		Other Ambulatory Health Care Services	6219	
		General Medical and Surgical Hospitals	6221	
		Psychiatric and Substance Abuse Hospitals	6222	
		Specialty (except psychiatric and substance abuse hospitals) Hospitals	6223	
		Nursing Care Facilities	6231	
		Residential Mental Retardation/Health & Substance Abuse Facility	6232	
		Community Care Facilities for the Elderly	6233	
		Other Residential Care Facilities	6239	
Emerging	Magnetic & optical media manufacturing & reproduction	Manufacturing and Reproducing Magnetic and Optical Media	3346	
	Aircraft engines & parts	Aerospace Product and Parts Manufacturing	3364	
	Miscellaneous transportation equipment manufacturing	Other Transportation Equipment Manufacturing	3369	
	Software publishers	Software Publishers	5112	
	Internet publishing & broadcasting, ISPs & search portals, & other information services	Internet Publishing and Broadcasting	5161	
		Internet Service Providers and Web Search Portals	5181	
	Data processing, hosting, & related services	Other Information Services	5191	
		Data Processing, Hosting, and Related Services	5182	
	Banks	Monetary Authorities - Central Bank	5211	
		Depository Credit Intermediation	5221	
	Architectural, engineering, & related services	Architectural, Engineering, and Related Services	5413	
	Specialized design services	Specialized Design Services	5414	
	Business, scientific, & technical consulting services	Management, Scientific, and Technical Consulting Services	5416	
	Environmental and other technical consulting services	Management, Scientific, and Technical Consulting Services	5416	
	Scientific research & development services	Scientific Research and Development Services	5417	
	Advertising	Advertising and Related Services	5418	

Appendix Table C: Major Group Level Standard Occupational Classifications (SOC Codes)

SOC	Major Occupation Group	Declining Clusters Employment		Stable Clusters Employment		Growing Clusters Employment		Emerging Clusters Employment		Total Clusters Employment		Avg. Ann. Wage 2008	2007 Educational Attainment Distribution by Occupation					
		2006	2016	2006	2016	2006	2016	2006	2016	2006	2016		Less HS/GED	HS/GED	Some College	Assoc Degree	Bach Degree	Grad Degrees
11	Management	4,502	2,410	8,806	8,686	15,662	19,411	20,235	24,920	49,205	55,427	\$93,501	4.8	15.5	21.0	8.1	34.6	16.0
13	Business and financial operations	1,442	829	2,575	3,182	6,398	8,311	24,413	32,562	34,828	44,884	\$57,321	1.6	11.6	17.6	10.5	42.6	16.1
15	Computer and mathematical	396	166	922	1,274	15,857	21,764	16,765	22,944	33,940	46,148	\$70,315	1.1	6.5	20.2	11.0	43.1	18.2
17	Architecture and engineering	957	672	2,810	3,702	2,468	3,052	21,938	27,622	28,173	35,048	\$60,806	1.7	10.7	16.8	14.8	40.6	15.5
19	Life, physical, and social science	269	132	2,719	3,302	2,176	2,739	9,039	13,002	14,203	19,175	\$56,477	2.1	10.5	14.1	3.7	30.2	39.5
21	Community and social services	0	0	0	0	10,546	16,466	138	188	10,684	16,654	\$36,477	2.7	9.2	14.5	8.0	32.0	33.5
23	Legal	0	0	22	28	132	174	656	838	810	1,040	\$70,756	0.2	6.7	9.7	6.8	19.9	56.7
25	Education, training, and library	0	0	0	0	2,355	3,003	134	181	2,489	3,184	\$38,371	7.5	12.7	7.2	41.2	30.0	0.0
27	Arts, design, entertainment, sports, and media	467	260	136	164	912	1,227	5,187	6,760	6,702	8,411	\$42,172	4.9	16.3	23.5	9.9	35.1	10.3
29	Healthcare practitioners and technical	16	10	89	99	158,256	205,375	875	1,142	159,236	206,626	\$62,928	0.9	9.6	15.0	26.9	23.8	23.8
31	Healthcare support	0	0	32	15	115,375	156,701	83	114	115,490	156,830	\$22,943	9.8	34.1	38.9	9.9	6.2	1.2
33	Protective service	64	21	181	165	1,737	2,068	368	511	2,350	2,765	\$32,746	7.4	30.6	30.5	13.2	16.3	2.1
35	Food preparation and serving related	0	0	10	10	15,227	18,108	0	0	15,237	18,118	\$18,012	30.9	35.5	23.9	3.8	5.4	0.5
37	Building and grounds cleaning and maintenance	671	389	864	818	12,300	14,748	446	573	14,281	16,528	\$21,452	32.2	40.7	17.5	4.7	4.2	0.7
39	Personal care and service	24	0	82	42	13,736	23,319	15	21	13,857	23,382	\$21,875	15.8	32.8	31.6	7.8	9.9	2.0
41	Sales and related	1,442	867	1,416	1,533	3,315	4,336	8,558	11,324	14,731	18,060	\$32,147	12.8	29.3	28.1	6.9	19.2	3.8
43	Office and administrative support	11,462	6,325	6,191	6,562	71,961	88,943	53,762	64,659	143,376	166,489	\$29,614	6.7	32.3	33.9	10.8	13.8	2.5
45	Farming, fishing, and forestry	2,120	1,659	12,447	9,560	388	503	24	38	14,979	11,760	\$24,639	49.1	34.3	9.8	2.2	3.5	1.2
47	Construction and extraction	968	645	2,120	2,070	736	885	1,165	1,554	4,989	5,154	\$32,429	34.4	41.6	15.9	3.7	3.9	0.5
49	Installation, maintenance, and repair	7,502	4,658	4,525	5,127	4,552	5,517	2,549	3,668	19,128	18,970	\$38,191	16.6	42.6	25.9	9.5	4.9	0.4
51	Production	90,094	52,011	45,463	49,015	14,117	16,563	4,178	6,076	153,852	123,665	\$29,090	25.6	45.1	19.6	5.2	3.8	0.6
53	Transportation and material moving	13,521	7,104	12,770	11,889	2,988	3,327	1,033	1,090	30,312	23,410	\$27,639	13.0	38.3	26.0	6.5	15.6	0.6
Total Employment		135,917	78,158	104,180	107,243	471,194	616,540	171,561	219,787	882,852	1,021,728							

Appendix Table E: Top 35 Detailed Stable Clusters Occupations; Ranked by 2006-2016 Projected Employment Growth

SOC	Detailed Occupation	Stable (ST) Clusters Employment			Avg. Ann. Wage 2008	2007 Educational Attainment Distribution by Occupation					
		2006	2016	06-16 Change		Less than HS/GED	HS/GED	Some College	Assoc. Degree	Bach. Degree	Grad. Degree
51-3022	Meat, poultry, and fish cutters and trimmers	7,240	7,723	483	\$19,704	35.8	35.8	25.5	0.4	2.4	0.0
51-3023	Slaughterers and meat packers	7,626	8,082	456	\$20,297	35.8	35.8	25.5	0.4	2.4	0.0
51-9198	Helpers--production workers	4,411	4,847	436	\$22,405	42.3	54.5	0.0	3.2	0.0	0.0
11-9041	Engineering managers	1,476	1,835	359	\$112,804	0.0	0.0	8.9	2.3	63.1	25.7
51-7042	Woodworking machine setters, operators, and tenders, except sawing	3,089	3,401	312	\$25,308	59.8	33.1	5.0	0.0	0.0	2.1
51-1011	First-line supervisors/managers of production and operating workers	3,059	3,360	301	\$47,902	15.7	38.2	24.7	10.7	9.0	1.7
43-4051	Customer service representatives	905	1,205	300	\$30,187	7.5	30.2	33.4	8.0	18.9	2.0
51-9011	Chemical equipment operators and tenders	1,040	1,303	263	\$42,513	2.2	48.3	49.4	0.0	0.0	0.0
17-2112	Industrial engineers	573	830	257	\$67,798	0.0	8.2	8.4	10.1	50.4	22.9
49-9042	Maintenance and repair workers, general	2,143	2,390	247	\$33,897	17.5	41.1	31.3	6.1	3.9	0.1
51-9111	Packaging and filling machine operators and tenders	2,955	3,200	245	\$27,110	30.0	51.3	13.5	3.6	1.0	0.6
49-9041	Industrial machinery mechanics	923	1,165	242	\$37,326	9.3	54.7	25.8	6.4	3.0	0.8
15-1031	Computer software engineers, applications	385	578	193	\$85,019	1.3	4.1	13.2	3.5	45.6	32.3
17-3026	Industrial engineering technicians	531	716	185	\$50,644	5.8	26.2	39.3	14.6	12.7	1.4
13-1199	Business operations specialists, all other	452	627	175	\$57,760	2.6	24.8	21.2	10.2	24.6	16.6
51-2092	Team assemblers	4,214	4,388	174	\$26,030	25.9	50.9	16.1	4.3	2.4	0.4
11-3051	Industrial production managers	889	1,050	161	\$78,516	4.9	16.5	31.0	6.5	33.0	8.2
19-4021	Biological technicians	570	723	153	\$40,606	39.7	0.0	26.4	0.0	33.9	0.0
51-7041	Sawing machine setters, operators, and tenders, wood	1,483	1,634	151	\$25,439	46.9	39.7	10.7	2.7	0.0	0.0
51-9023	Mixing and blending machine setters, operators, and tenders	713	858	145	\$30,317	22.8	52.8	18.0	0.0	6.4	0.0
51-9061	Inspectors, testers, sorters, samplers, and weighers	2,154	2,298	144	\$29,007	17.5	45.0	20.2	6.6	9.1	1.7
51-4041	Machinists	430	562	132	\$33,812	16.6	53.1	21.6	7.1	1.2	0.4
51-2023	Electromechanical equipment assemblers	522	649	127	\$26,485	15.7	61.2	13.7	6.5	3.0	0.0
19-2031	Chemists	812	931	119	\$63,949	0.0	3.2	1.9	4.8	52.0	38.1
41-4011	Sales representatives, wholesale and manufacturing, technical and scientific products	407	513	106	\$61,586	4.1	15.8	23.1	9.2	41.9	5.9
17-2031	Biomedical engineers	259	362	103	\$74,841	0.0	0.0	0.0	0.0	73.3	26.7
17-2072	Electronics engineers, except computer	380	474	94	\$80,964	0.0	10.9	9.4	20.2	43.2	16.3
43-6011	Executive secretaries and administrative assistants	743	835	92	\$36,012	3.2	28.2	38.0	13.6	14.5	2.6
13-1041	Compliance officers, except agriculture, construction, health and safety, and transportation	331	420	89	\$48,517	0.0	15.8	12.7	12.0	37.7	21.7
51-9041	Extruding, forming, pressing, and compacting machine setters, operators, and tenders	712	794	82	\$30,211	19.4	31.7	38.1	6.5	4.3	0.0
13-1023	Purchasing agents, except wholesale, retail, and farm products	443	523	80	\$51,487	3.3	17.5	30.7	20.6	24.4	3.4
13-1111	Management analysts	311	390	79	\$78,183	1.2	5.2	10.6	6.0	43.7	33.4
19-1029	Biological scientists, all other	281	357	76	\$73,550	0.0	0.0	2.4	2.9	61.0	33.7
19-4031	Chemical technicians	286	360	74	\$38,557	2.9	52.0	25.6	6.7	10.9	1.9
17-3023	Electrical and electronic engineering technicians	296	369	73	\$49,679	5.8	26.2	39.3	14.6	12.7	1.4
	Total Employment, Top 35 Detailed Stable Cluster Category Occupations	53,044	59,752	6,708							
	Total Employment, All (799) Detailed Stable Cluster Category Occupations	104,180	107,243	3,063							

Appendix Table F: Top 35 Detailed Growing Clusters Occupations; Ranked by 2006-2016 Projected Employment Growth

SOC	Detailed Occupation	Growing (GR) Clusters Employment			Avg. Ann. Wage 2008	2007 Educational Attainment Distribution by Occupation					
		2006	2016	06-16 Diff		Less than HS/GED	HS/GED	Some College	Assoc. Degree	Bach. Degree	Grad. Degree
31-1011	Home health aides	65,384	89,734	24,350	\$19,656	12.0	40.4	37.0	5.2	4.4	1.0
29-1111	Registered nurses	69,136	91,775	22,639	\$55,920	0.3	1.4	5.2	43.8	36.9	12.4
39-9021	Personal and home care aides	10,759	19,589	8,830	\$18,394	19.6	42.3	24.1	4.1	9.7	0.3
31-1012	Nursing aides, orderlies, and attendants	18,343	23,672	5,329	\$22,859	12.0	40.4	37.0	5.2	4.4	1.0
31-9092	Medical assistants	9,063	13,556	4,493	\$26,769	6.0	18.2	45.1	20.1	8.4	2.1
43-4171	Receptionists and information clerks	11,883	16,138	4,255	\$23,353	8.4	35.9	32.5	11.0	11.1	1.2
29-2061	Licensed practical and licensed vocational nurses	13,896	16,744	2,848	\$37,904	0.7	21.7	55.7	18.3	1.9	1.7
31-9091	Dental assistants	6,544	9,057	2,513	\$33,679	0.0	23.4	49.8	17.9	7.5	1.4
31-9099	Healthcare support workers, all other	8,391	10,704	2,313	\$25,758	6.0	18.2	45.1	20.1	8.4	2.1
15-1031	Computer software engineers, applications	3,236	5,166	1,930	\$85,019	1.3	4.1	13.2	3.5	45.6	32.3
43-6013	Medical secretaries	8,108	10,005	1,897	\$26,937	3.2	28.2	38.0	13.6	14.5	2.6
43-6011	Executive secretaries and administrative assistants	6,491	8,386	1,895	\$36,012	3.2	28.2	38.0	13.6	14.5	2.6
29-1069	Physicians and surgeons, all other	5,777	7,572	1,795	\$153,764	0.0	0.0	0.0	0.0	0.0	100.0
29-2021	Dental hygienists	4,606	6,366	1,760	\$60,290	0.0	1.4	3.8	66.3	25.7	2.8
37-2012	Maids and housekeeping cleaners	8,946	10,611	1,665	\$17,610	38.3	43.5	10.6	3.8	1.8	2.0
21-1093	Social and human service assistants	2,574	4,229	1,655	\$26,263	5.4	14.5	21.1	10.7	37.2	11.1
43-1011	First-line supervisors/managers of office and administrative support workers	6,225	7,796	1,571	\$43,637	2.4	27.8	29.1	12.9	21.6	6.2
43-6014	Secretaries, except legal, medical, and executive	8,464	9,989	1,525	\$27,508	3.2	28.2	38.0	13.6	14.5	2.6
29-2034	Radiologic technologists and technicians	6,406	7,895	1,489	\$49,044	0.0	3.7	17.7	54.6	19.7	4.3
43-9061	Office clerks, general	4,926	6,415	1,489	\$24,180	6.5	28.1	42.3	9.8	10.9	2.5
29-1123	Physical therapists	3,418	4,870	1,452	\$71,388	0.0	0.0	0.0	3.7	46.3	49.9
11-9111	Medical and health services managers	4,964	6,389	1,425	\$82,716	1.6	4.2	14.2	14.1	37.3	28.5
21-1023	Mental health and substance abuse social workers	1,676	2,960	1,284	\$40,215	2.0	5.5	12.7	8.7	44.5	26.6
29-2071	Medical records and health information technicians	4,118	5,376	1,258	\$28,501	10.9	24.7	26.1	19.7	15.9	2.7
43-3021	Billing and posting clerks and machine operators	6,234	7,438	1,204	\$29,852	4.2	31.6	33.1	13.8	14.8	2.6
29-1062	Family and general practitioners	4,551	5,676	1,125	\$171,340	0.0	0.0	0.0	0.0	0.0	100.0
29-1071	Physician assistants	2,344	3,425	1,081	\$78,759	0.0	3.6	2.7	23.8	25.3	44.7
21-1022	Medical and public health social workers	2,486	3,557	1,071	\$41,787	2.0	5.5	12.7	8.7	44.5	26.6
15-1032	Computer software engineers, systems software	2,096	3,061	965	\$90,435	1.3	4.1	13.2	3.5	45.6	32.3
29-2055	Surgical technologists	2,790	3,725	935	\$35,731	3.0	28.5	36.1	19.0	10.1	3.2
15-1051	Computer systems analysts	2,291	3,221	930	\$74,714	2.2	5.5	22.1	9.8	42.9	17.5
31-2021	Physical therapist assistants	1,858	2,780	922	\$45,669	2.9	0.2	0.0	70.1	26.9	0.0
43-3031	Bookkeeping, accounting, and auditing clerks	3,132	4,017	885	\$30,700	6.2	32.9	35.5	11.2	11.9	2.3
43-4051	Customer service representatives	2,119	3,001	882	\$30,187	7.5	30.2	33.4	8.0	18.9	2.0
29-1126	Respiratory therapists	2,903	3,784	881	\$47,825	0.0	0.0	9.1	70.4	20.5	0.0
	Total Employment, Top 35 Detailed Growing Cluster Category Occupations	326,138	438,679	112,541							
	Total Employment, All (799) Detailed Growing Cluster Category Occupations	471,194	616,540	145,346							

Appendix Table G: Top 35 Detailed Emerging Clusters Occupations; Ranked by 2006-2016 Projected Employment Growth

SOC	Detailed Occupation	Emerging (EM) Clusters Employment			Avg. Ann. Wage 2008	2007 Educational Attainment Distribution by Occupation					
		2006	2016	06-16 Change		Less than HS/GED	HS/GED	Some College	Assoc. Degree	Bach. Degree	Grad. Degree
43-3071	Tellers	14,676	18,490	3,814	\$23,703	1.4	38.4	35.6	8.3	13.8	2.5
43-4051	Customer service representatives	7,019	9,169	2,150	\$30,187	7.5	30.2	33.4	8.0	18.9	2.0
13-1199	Business operations specialists, all other	3,857	5,738	1,881	\$57,760	2.6	24.8	21.2	10.2	24.6	16.6
15-1031	Computer software engineers, applications	2,921	4,519	1,598	\$85,019	1.3	4.1	13.2	3.5	45.6	32.3
43-6011	Executive secretaries and administrative assistants	4,930	6,482	1,552	\$36,012	3.2	28.2	38.0	13.6	14.5	2.6
13-1111	Management analysts	3,090	4,240	1,150	\$78,183	1.2	5.2	10.6	6.0	43.7	33.4
13-2072	Loan officers	4,335	5,463	1,128	\$52,371	0.0	10.8	24.7	8.7	49.5	6.2
413395	Financial managers	6,380	7,481	1,101	\$100,044	0.5	9.3	23.5	6.4	43.8	16.5
15-1051	Computer systems analysts	2,774	3,862	1,088	\$74,714	2.2	5.5	22.1	9.8	42.9	17.5
15-1081	Network systems and data communications analysts	1,366	2,357	991	\$67,101	0.0	8.9	20.6	13.9	41.1	15.6
19-1042	Medical scientists, except epidemiologists	1,950	2,940	990	\$80,910	0.0	0.0	1.6	0.0	16.2	82.2
17-2051	Civil engineers	3,162	4,088	926	\$68,228	0.0	4.5	3.6	5.4	59.8	26.6
17-3031	Surveying and mapping technicians	3,705	4,588	883	\$32,424	8.3	32.8	30.9	22.2	0.0	5.8
11-1021	General and operations managers	4,890	5,769	879	\$108,323	2.3	15.9	21.4	7.0	42.5	10.7
51-4081	Multiple machine tool setters, operators, and tenders, metal and plastic	747	1,501	754	\$36,023	18.9	51.1	19.8	4.9	5.4	0.0
15-1071	Network and computer systems administrators	1,705	2,437	732	\$64,733	0.0	7.7	25.0	21.9	36.2	9.1
43-3031	Bookkeeping, accounting, and auditing clerks	2,885	3,593	708	\$30,700	6.2	32.9	35.5	11.2	11.9	2.3
13-2051	Financial analysts	2,132	2,781	649	\$71,103	0.0	6.6	7.0	2.5	59.6	24.2
15-1041	Computer support specialists	2,529	3,148	619	\$44,370	0.6	12.6	32.4	15.4	36.4	2.8
43-1011	First-line supervisors/managers of office and administrative support workers	5,306	5,916	610	\$43,637	2.4	27.8	29.1	12.9	21.6	6.2
43-6014	Secretaries, except legal, medical, and executive	3,280	3,868	588	\$27,508	3.2	28.2	38.0	13.6	14.5	2.6
17-1011	Architects, except landscape and naval	2,471	3,047	576	\$72,610	0.0	0.0	1.7	13.1	55.9	29.4
19-2041	Environmental scientists and specialists, including health	1,245	1,800	555	\$53,686	0.0	0.0	12.4	0.0	49.8	37.8
41-3099	Sales representatives, services, all other	1,174	1,725	551	\$55,003	3.7	18.0	27.9	10.7	35.4	4.3
13-2099	Financial specialists, all other	2,853	3,388	535	\$62,935	0.0	27.0	14.0	12.8	44.1	2.1
11-9041	Engineering managers	1,690	2,212	522	\$112,804	0.0	0.0	8.9	2.3	63.1	25.7
41-9011	Demonstrators and product promoters	1,424	1,946	522	\$27,680	15.4	37.5	14.4	21.6	7.9	3.2
19-2031	Chemists	1,119	1,637	518	\$63,949	0.0	3.2	1.9	4.8	52.0	38.1
11-3021	Computer and information systems managers	2,132	2,644	512	\$110,353	0.9	5.8	18.1	13.9	47.8	13.5
15-1032	Computer software engineers, systems software	1,231	1,718	487	\$90,435	1.3	4.1	13.2	3.5	45.6	32.3
41-3031	Securities, commodities, and financial services sales agents	1,513	1,994	481	\$88,551	0.7	14.1	11.4	4.6	52.6	16.5
13-1071	Employment, recruitment, and placement specialists	1,173	1,653	480	\$47,941	2.3	11.2	22.3	10.3	38.7	15.3
13-2011	Accountants and auditors	1,582	2,017	435	\$59,467	0.5	6.5	11.4	13.0	50.7	17.9
13-1072	Compensation, benefits, and job analysis specialists	931	1,362	431	\$51,798	2.3	11.2	22.3	10.3	38.7	15.3
17-2081	Environmental engineers	907	1,316	409	\$71,158	0.0	0.0	0.0	0.0	55.1	44.9
	Total Employment, Top 35 Detailed Emerging Cluster Category Occupations	105,084	136,889	31,805							
	Total Employment, All (799) Detailed Emerging Cluster Category Occupations	171,561	219,787	48,214							