

Lawrence County Skillshed Analysis

Prepared by Center for Economic Development and Community Resilience, the Voinovich

School of Leadership and Public Service

September 2021

Eric Belleville

Christelle Khalaf

Skillshed analysis was a concept first introduced by the Institute for Decision Making at the University of Northern Iowa in 1998 (Scott and Kotlyar, 2014). The goal of the analysis was to provide economic development groups with a better understanding of an area's labor force characteristics. The first step in this type of analysis is to geographically define a skillshed. Studies vary in how they establish skillshed boundaries. However, some common factors include population density, physical geography (e.g., rivers), and transportation infrastructure (e.g., roads and highways). Once a skillshed is defined, data are needed on a region's labor supply and demand.

Reports aiming to examine the skills gap can be classified into two categories depending on their data source: survey-based data or publicly available data. The majority of skillshed analyses use data from a workforce survey and an employer survey. While survey data provides access to information at the skillshed level, which is otherwise not available in publicly available data, information collected from surveys are based on individual perception of the labor market. Sometimes in employer surveys, the individual filling out the survey may not have direct knowledge of the skillset needed on the job. The advantage of using publicly available data is in avoiding the significant costs of large-scale survey data collection and administration (Scott and Kotlyar, 2014). Regardless of data source, the goal of a skillshed analysis is to identify the top occupations that will drive regional economic growth and to determine into which of these emerging occupations the workforce can transition into with ease.

A typical skillshed analysis: (1) identifies occupations in which a region has a comparative advantage, (2) determines if these occupations are exhibiting increasing or declining employment projections, (3) and contrasts the current skillset of declining occupations with the skillset needed for emerging occupations. A shortage of skills can create challenges for local governments in the

form of structural unemployment and slower regional growth. Economic development officials can benefit from skillshed analyses to develop initiatives and policies that ensure the workforce is prepared to fill emerging occupations.

For this task, the researchers mapped occupations into skills to determine which skills overlap between struggling and emerging occupations, and which skills are lacking or need improving. The knowledge required to perform a job as well as work activities, work context, and job zones were derived from the Occupational Information Network (O*NET). O*NET is a joint effort between the U.S. Department of Labor and the North Carolina Employment Security Commission. It provides a database of standardized and occupation-specific descriptions based on the Standard Occupational Classification (SOC) codes that help determine which factors are critical in the performance of an occupation.

Job zone refers to one variable that represents aggregated information on level of education, experience, and training needed to perform a job. O*NET classifies occupation in one of five job zones. Job Zone 1 includes occupations that require little preparation. Job Zone 2 occupations usually require at a minimum a high school diploma, plus some vocational training or job-related coursework. The level of preparation required to perform a job increases by zone, up to Job Zone 5, where occupations require the most specialized knowledge. All O*NET job zones are included in this analysis. Previous skillshed analyses focus on job zones 3, 4, and 5. These occupations require more education and are higher paying so they can drive innovation. However, focusing only on these jobs excludes a significant portion of the available occupations in the Appalachian Ohio region.

Work activities refer to 41 variables representing activities that are common across occupations. Examples of work activities are assisting and caring for others, handling and moving objects, and

interpreting the meaning of information for others. Work context refers to 57 variables representing physical and social factors that influence the nature of work. Examples of context include public speaking, exposure to contaminants, and time spent standing. Knowledge refers to 33 variables. Examples of knowledge variables are computer and electronics, mathematics, as well as production and processing. The value assigned to an occupation for each variable indicates the degree, along a continuum, to which a particular descriptor or variable is required to perform the occupation.

In this skillshed analysis, O*NET data were used to calculate a dissimilarity measure. The dissimilarity measure used in this study is the squared Euclidean distance or 2 squared. Using 132 variables describing occupations' work activities, required capacities, knowledge levels, and job zone, the authors compared emerging occupations to struggling occupations. This effectively calculates the distance from different multidimensional points of emerging occupations to multidimensional points of struggling occupations, and then ranking emerging occupations from closest to furthest for each struggling occupation.

Once a dissimilarity measure was calculated, Ward's agglomerative method (Ward Jr, 1963) was used to cluster emerging and coal supply chain occupations into homogeneous groupings.

Emerging occupations were chosen by examining industry location quotients and employment projections. Coal supply chain occupations were chosen by examining the occupations nested in the coal supply chain industries identified in task 4. This is possible through the usage of industry-occupation matrices for coal supply chain industries.

Growing occupations are the ones identified in the In-Demand Occupations report for Southeast Ohio.¹ These jobs have a sustainable wage and are expected to grow based on the projected number of openings. The following criteria was used to define an “in-demand job” in Ohio: 80% of state median wage, \$14.10 per hour, or more; annual growth in the number of jobs higher than the statewide average of 36; or annual job openings greater than 584. In addition to these state labor statistics and projections, electronic job posting trend data and business responses to Ohio’s In-Demand Jobs Survey are components in defining in-demand jobs. Our analysis includes 49 growing occupations as shown in table 1 below.

Table 1: Growing Occupations in Southeastern Ohio

Occupation Title	Median Wage (in thousand USD)	Annual Openings
Accountants and Auditors	\$58	145
Automotive Service Technicians and Mechanics	\$35	192
Bus & Truck Mechanics & Diesel Engine Spec.	\$43	103
Bus Drivers, School	\$30	125
Business Operations Specialists, All Other	\$68	86
Cabinetmakers and Bench Carpenters	\$33	85
Carpenters	\$43	304
Construction Laborers	\$39	454
Construction Managers	\$95	67
Cost Estimators	\$54	56
Dental Assistants	\$38	85
Electricians	\$61	119
Emergency Medical Technicians and Paramedics	\$26	126
Energy Auditors	\$68	86
Child, Family, and School Social Workers	\$40	72
Financial Managers	\$99	66
First-Line Supervisors of Mechanics, Installers, and Repairers	\$65	95
First-Line Supervisors of Construction Trades and Extraction Workers	\$68	144

¹ Ohio Means Jobs. (2019). *In-Demand Occupations Report*. Retrieved from http://omj.ohio.gov/OMJResources/MasterList_WorkforceProfessionals.stm

Heating, Air Conditioning, and Refrigeration Mechanics and Installers	\$43	129
Heavy and Tractor-Trailer Truck Drivers	\$44	678
Industrial Machinery Mechanics	\$50	132
Industrial Truck and Tractor Operators	\$37	104
Laborers and Freight, Stock, and Material Movers, Hand	\$28	716
Licensed Practical and Licensed Vocational Nurses	\$39	271
Light Truck or Delivery Services Drivers	\$33	321
Machinists	\$39	85
Maintenance and Repair Workers, General	\$38	365
Medical and Health Services Managers	\$91	105
Mental Health and Substance Abuse Social Workers	\$39	73
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$43	54
Nursing Assistants	\$26	682
Operating Engineers and Other Construction Equipment Operators	\$47	266
Packaging and Filling Machine Operators and Tenders	\$30	109
Pharmacy Technicians	\$27	143
Physical Therapist Assistants	\$58	86
Plumbers, Pipefitters, and Steamfitters	\$50	127
Preschool Teachers, Except Special Education	\$28	87
Refuse and Recyclable Material Collectors	\$36	100
Registered Nurses	\$62	534
Security Guards	\$27	113
Welders, Cutters, Solderers, and Brazers	\$39	129

Note. Data available from Ohio Labor Market Information (OLMI).²

Our analysis includes coal supply chain declining occupations as shown in table 2 below.³

Workers within occupations not listed would be able to find another position similar to their current occupation while workers in the listed occupations would need to transition into a different occupation.

² Ohio Means Jobs. (2019). *In-demand occupations report*. Retrieved from http://omj.ohio.gov/OMJResources/MasterList_WorkforceProfessionals.stm.

³ https://www.bls.gov/oes/2018/may/oes_3900004.htm

Table 2: Coal Supply Chain Declining Occupations

Occupation Title	Median Wage (in thousand USD)	Change in Employment
Bill and Account Collectors	\$35	-3.70%
Bookkeeping, Accounting, and Auditing Clerks	\$33	-2.70%
Chemical Equipment Operators and Tenders	\$42	-3.70%
Crane and Tower Operators	\$30	-4.00%
Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	\$27	-6.80%
Data Entry Keyers	\$29	-21.20%
Dispatchers, Except Police, Fire, and Ambulance	\$34	-1.40%
Driver/Sales Workers	\$19	-7.70%
Electrical Power-Line Installers and Repairers	\$71	-5.10%
Executive Secretaries and Executive Administrative Assistants	\$53	-17.40%
Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	\$39	-16.00%
File Clerks	\$40	-11.80%
First-Line Supervisors of Production and Operating Workers	\$62	-1.10%
Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$34	-10.60%
Helpers--Production Workers	\$30	-3.20%
Human Resources Assistants, Except Payroll and Timekeeping	\$36	0.50%
Inspectors, Testers, Sorters, Samplers, and Weighers	\$35	-13.10%
Mail Clerks and Mail Machine Operators, Except Postal Service	\$35	-17.90%
Merchandise Displayers and Window Trimmers	\$33	-4.40%
Mixing and Blending Machine Setters, Operators, and Tenders	\$38	-4.40%
Molders, Shapers, and Casters, Except Metal and Plastic	\$28	-4.50%
Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	\$33	-16.20%
Office Clerks, General	\$29	-0.90%
Order Clerks	\$29	0.20%
Paper Goods Machine Setters, Operators, and Tenders	\$44	-19.10%
Payroll and Timekeeping Clerks	\$41	-2.70%
Power Plant Operators	\$69	-9.80%

Printing Press Operators	\$34	-11.90%
Procurement Clerks	\$36	-2.80%
Production Workers, All Other	\$28	-4.60%
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	\$32	-7.40%
Shipping, Receiving, and Traffic Clerks	\$33	-1.10%
Telecommunications Equipment Installers and Repairers, Except Line Installers	\$30	-2.80%
Tire Repairers and Changers	\$20	-4.20%
Title Examiners, Abstractors, and Searchers	\$33	-4.90%
Tool and Die Makers	\$41	-6.80%
Water and Wastewater Treatment Plant and System Operators	\$40	-6.60%

Clustering is a tool that detects patterns in data and groups observations with similar characteristics. Occupations were grouped into 4 clusters. Comparing the knowledge, capacities, work activities, and work context of the coal supply chain workforce to those needed by growing occupations, we calculated an occupation dissimilarity measure. Employees impacted by coal related closures, and the economic development practitioners helping them, can use the measure as a guide into which new career to transition, thus effectively decreasing their search costs. In this paper, color-coded indicators (based on the dissimilarity measure) were provided, illustrating the level of difficulty associated with a transition as well as wage differentials to better inform displaced worker’s decisions.

In the mapping tables, coal supply chain occupations are broken into four groups: white-collar occupations, electrical and mechanical blue collar occupations as well as challenging transitions occupations. Each figure has a row of coal supply chain occupations and a column of emerging occupations. Each figure presents a different cluster of occupations.

The median yearly wage for the coal supply chain occupation is noted for each occupation along with the yearly hourly wage rate for the transitioning occupation. The matrix contains the difference in yearly wage between each occupation, while the color denotes the ease of

transition. A green to light green color indicates an easier transition, while an orange to red color indicates substantial retraining is required.

By providing a color-coded indicator for the level of difficulty associated with an occupational transition and wage differentials, the occupational mapping guides the coal supply chain workforce into emerging occupations. On average, displaced workers can either transition into occupations that require no skill improvements or new skills but endure a pay cut. The alternative is to spend significant resources on improving skills and obtaining new ones to guarantee similar compensation to the coal supply chain occupations.

Table 3: White Collar Occupations

		Title Examiners, Abstractors, and Searchers	Merchandise Displayers and Window Trimmers	Bill and Account Collectors	Bookkeeping, Accounting, and Auditing Clerks	Payroll and Timekeeping Clerks	Procurement Clerks	File Clerks	Order Clerks	Human Resources Assistants, Except Payroll and Timekeeping	Dispatchers, Except Police, Fire, and Ambulance	Executive Secretaries and Executive Administrative Assistants	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Data Entry Keyers	Office Clerks, General
		\$34	\$36	\$34	\$34	\$57	\$36	\$38	\$35	\$34	\$28	\$42	\$40	\$35	\$44
Preschool Teachers, Except Special Education	\$39	\$ 5	\$ 3	\$ 5	\$ 5	\$18	\$ 3	\$ 1	\$ 4	\$ 5	\$11	-\$3	-\$1	\$ 4	-\$5
Pharmacy Technicians	\$29	-\$5	-\$7	\$ 5	\$ 5	\$28	\$ 7	-\$9	-\$6	-\$5	\$ 1	-\$13	-\$11	-\$6	-\$15
Nursing Assistants	\$31	-\$3	-\$5	\$ 3	\$ 3	-\$26	\$ 5	-\$7	-\$4	-\$3	\$ 3	-\$11	-\$9	-\$4	-\$13
Physical Therapist Assistants	\$67	\$33	\$31	\$33	\$33	\$10	\$31	\$29	\$32	\$33	\$39	\$25	\$27	\$32	\$23
Dental Assistants	\$31	-\$3	\$ 5	\$ 3	-\$3	-\$26	-\$5	-\$7	-\$4	-\$3	\$ 3	-\$11	-\$9	-\$4	\$13
Security Guards	\$37	\$ 3	\$ 1	\$ 3	\$ 3	-\$20	\$ 1	-\$1	\$ 2	\$ 3	\$ 9	-\$5	-\$3	\$ 2	-\$7

Table 4: Electrical Blue Collar Occupations

		Telecommunications Equipment Installers and Repairers, Except Line Installers	Electrical Power-Line Installers and Repairers	First-Line Supervisors of Production and Operating Workers	Water and Wastewater Treatment Plant and System Operators	Chemical Equipment Operators and Tenders
		\$38	\$68	\$64	\$50	\$42
First-Line Supervisors of Construction Trades and Extraction Workers	\$32	\$6	-\$36	-\$32	-\$18	-\$10
Carpenters	\$43	\$5	-\$25	-\$21	-\$7	\$1
Electricians	\$48	\$10	-\$20	-\$16	-\$2	\$6
Plumbers, Pipefitters, and Steamfitters	\$53	\$15	-\$15	-\$11	\$3	\$11
First-Line Supervisors of Mechanics, Installers, and Repairers	\$72	\$34	\$4	\$8	\$22	\$30
Automotive Service Technicians and Mechanics	\$75	\$37	\$7	\$11	\$25	\$33
Bus & Truck Mechanics & Diesel Engine Spec.	\$45	\$7	-\$23	-\$19	-\$5	\$3
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	\$67	\$29	-\$1	\$3	\$17	\$25

Table 5: Mechanical Blue Collar Occupations

		Shipping, Receiving, and Traffic Clerks	Mail Clerks and Mail Machine Operators, Except Postal	Tire Repairers and Changers	Extruding and Drawing Machine Setters, Operators,	Cutting, Punching, and Press Machine Setters, Operators,	Grinding, Lapping, Polishing, and Buffing Machine Tool	Molding, Coremaking, and Casting Machine Setters,	Tool and Die Makers	Printing Press Operators	Power Plant Operators	Mixing and Blending Machine Setters, Operators, and Tenders	Inspectors, Testers, Sorters, Samplers, and Weighers	Molders, Shapers, and Casters, Except Metal and Plastic	Paper Goods Machine Setters, Operators, and Tenders	Helpers--Production Workers	Production Workers, All Other	Driver/Sales Workers	Crane and Tower Operators
		\$30	\$31	\$25	\$36	\$33	\$32	\$39	\$39	\$35	\$29	\$33	\$37	\$80	\$42	\$35	\$30	\$30	\$48
Construction Laborers	\$48	\$18	\$17	\$23	\$12	\$15	\$16	\$9	\$9	\$13	\$19	\$15	\$11	-\$32	\$6	\$13	\$18	\$18	\$0
Operating Engineers and Other Construction Equipment Operators	\$33	\$3	\$2	\$8	\$3	\$0	\$1	-\$6	-\$6	-\$2	\$4	\$0	\$4	-\$47	-\$9	-\$2	\$3	\$3	-\$15
Industrial Machinery Mechanics	\$44	\$14	\$13	\$19	\$8	\$11	\$12	\$5	\$5	\$9	\$15	\$11	\$7	-\$36	\$2	\$9	\$14	\$14	-\$4
Maintenance and Repair Workers, General	\$38	\$8	\$7	\$13	\$2	\$5	\$6	-\$1	-\$1	\$3	\$9	\$5	\$1	-\$42	-\$4	\$3	\$8	\$8	-\$10
Machinists	\$57	\$27	\$26	\$32	\$21	\$24	\$25	\$18	\$18	\$22	\$28	\$24	\$20	-\$23	\$15	\$22	\$27	\$27	\$9
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$40	\$10	\$9	\$15	\$4	\$7	\$8	\$1	\$1	\$5	\$11	\$7	\$3	-\$40	-\$2	\$5	\$10	\$10	-\$8
Welders, Cutters, Solderers, and Brazers	\$32	\$2	\$1	\$7	\$4	-\$1	\$0	-\$7	-\$7	-\$3	\$3	-\$1	\$5	-\$48	-\$10	-\$3	\$2	\$2	-\$16
Cabinetmakers and Bench Carpenters	\$48	\$18	\$17	\$23	\$12	\$15	\$16	\$9	\$9	\$13	\$19	\$15	\$11	-\$32	\$6	\$13	\$18	\$18	\$0
Packaging and Filling Machine Operators and Tenders	\$34	\$4	\$3	\$9	\$2	\$1	\$2	-\$5	-\$5	-\$1	\$5	\$1	\$3	-\$46	-\$8	-\$1	\$4	\$4	-\$14
Bus Drivers, School	\$40	\$10	\$9	\$15	\$4	\$7	\$8	\$1	\$1	\$5	\$11	\$7	\$3	-\$40	-\$2	\$5	\$10	\$10	-\$8
Heavy and Tractor-Trailer Truck Drivers	\$37	\$7	\$6	\$12	\$1	\$4	\$5	-\$2	-\$2	\$2	\$8	\$4	\$0	-\$43	-\$5	\$2	\$7	\$7	-\$11
Light Truck or Delivery Services Drivers	\$55	\$25	\$24	\$30	\$19	\$22	\$23	\$16	\$16	\$20	\$26	\$22	\$18	-\$25	\$13	\$20	\$25	\$25	\$7
Industrial Truck and Tractor Operators	\$34	\$4	\$3	\$9	-\$2	\$1	\$2	-\$5	-\$5	-\$1	\$5	\$1	-\$3	-\$46	-\$8	-\$1	\$4	\$4	-\$14
Laborers and Freight, Stock, and Material Movers, Hand	\$37	\$7	\$6	\$12	\$1	\$4	\$5	-\$2	-\$2	\$2	\$8	\$4	\$0	-\$43	-\$5	\$2	\$7	\$7	-\$11

Table 6: Challenging Transitions

		Bill and Account Collectors	Bookkeeping, Accounting, and Auditing Clerks	Chemical Equipment Operators and Tenders	Crane and Tower Operators	Cutting, Polishing, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	Data Entry Keyers	Dispatchers, Except Police, Fire, and Ambulance	Driver/Sales Workers	Electrical Power-Line Installers and Repairers	Executive Secretaries and Executive Administrative Assistants	Etching and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	File Clerks	Fine-Line Supervisors of Production and Operating Workers	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	Helpers-Production Workers	Human Resources Assistants, Except Payroll and Timekeeping	Inspectors, Testers, Sorters, Samplers, and Weighers	Mail Clerks and Mail Machine Operators, Except Postal Service	Merchandise Displayers and Window Trimmers	Mixing and Blending Machine Setters, Operators, and Tenders	Molders, Shapers, and Casters, Except Metal and Plastic	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	Office Clerks, General	Order Clerks	Paper Goods Machine Setters, Operators, and Tenders	Payroll and Timekeeping Clerks	Power Plant Operators	Printing Press Operators	Procurement Clerks	Production Workers, All Other	Secretaries and Administrative Assistants, Except Legal, Shipping, Receiving, and Traffic Clerks	Telecommunications Equipment Installers and Repairers	Tire Repairs and Changers	Title Examiners, Abstractors, and Searchers	Tool and Die Makers	Water and Wastewater Treatment Plant and System Operators			
Accountants and Auditors	\$64	\$30	\$28	\$30	\$30	\$27	\$28	\$26	\$29	\$30	\$26	\$24	\$24	\$29	\$26	\$26	\$24	\$24	\$22	\$24	\$24	\$25	\$28	\$21	\$22	\$22	\$24	\$25	\$24	\$25	\$23	\$23	\$23	\$22	\$23	\$23	\$24	\$23	\$22	
Business Operations Specialists, All Other	\$66	\$30	\$32	\$32	\$32	\$30	\$30	\$28	\$31	\$32	\$38	\$24	\$26	\$31	\$22	\$28	\$22	\$26	\$16	\$24	\$36	\$35	\$41	\$30	\$33	\$34	\$27	\$27	\$31	\$37	\$33	\$22	\$22	\$22	\$22	\$22	\$22	\$22	\$22	\$22
Child, Family, and School Social Workers	\$43	\$9	\$7	\$9	\$9	(\$14)	\$7	\$5	\$8	\$9	\$15	\$1	\$3	\$8	(\$1)	\$5	(\$2)	\$2	\$6	\$24	\$36	\$5	\$12	\$18	\$7	\$10	\$11	\$4	\$4	\$8	\$14	\$10	\$6	\$3	\$3	\$3	\$3	\$3	\$3	\$3
Construction Managers	\$96	\$62	\$60	\$62	\$62	\$39	\$60	\$58	\$61	\$62	\$68	\$54	\$56	\$61	\$52	\$58	\$28	\$32	\$46	\$54	\$66	\$65	\$71	\$60	\$63	\$64	\$57	\$57	\$61	\$67	\$63	\$4	\$1	\$4	\$4	\$4	\$4	\$4	\$4	
Cost Estimators	\$62	\$28	\$26	\$28	\$28	\$5	\$26	\$24	\$27	\$28	\$34	\$20	\$22	\$27	\$18	\$24	(\$6)	(\$2)	\$12	\$20	\$32	\$31	\$37	\$26	\$29	\$30	\$23	\$23	\$27	\$33	\$29	\$2	\$2	\$2	\$2	\$2	\$2	\$2	\$2	
Emergency Medical Technicians and Paramedics	\$31	\$3	(\$3)	(\$5)	(\$3)	(\$3)	(\$5)	(\$7)	(\$4)	(\$3)	\$3	(\$11)	(\$9)	(\$4)	(\$13)	(\$7)	(\$17)	(\$33)	(\$19)	(\$11)	\$5	\$5	\$5	(\$5)	(\$2)	(\$1)	(\$8)	(\$8)	(\$4)	(\$2)	(\$2)	(\$6)	(\$4)	(\$9)	(\$7)	(\$1)	(\$1)	(\$1)	(\$1)	(\$1)
Financial Managers	\$112	\$78	\$76	\$78	\$78	\$55	\$76	\$74	\$77	\$78	\$84	\$70	\$72	\$77	\$68	\$74	\$44	\$48	\$62	\$70	\$82	\$81	\$87	\$76	\$79	\$80	\$73	\$73	\$77	\$83	\$79	\$7	\$3	\$7	\$7	\$7	\$7	\$7	\$7	
Licensed Practical and Licensed Vocational Nurses	\$42	\$8	\$6	\$8	\$8	(\$15)	\$6	\$4	\$7	\$8	\$14	\$2	\$7	(\$2)	\$4	(\$26)	(\$22)	(\$8)	\$5	\$12	\$11	\$17	\$6	\$9	\$10	\$3	\$3	\$7	\$13	\$9	\$5	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	
Medical and Health Services Managers	\$100	\$66	\$64	\$66	\$66	\$43	\$64	\$62	\$65	\$66	\$72	\$58	\$60	\$65	\$56	\$62	\$32	\$36	\$50	\$58	\$70	\$69	\$75	\$64	\$67	\$68	\$61	\$61	\$65	\$71	\$67	\$6	\$2	\$5	\$3	\$3	\$3	\$3	\$3	
Mental Health and Substance Abuse Social Workers	\$43	\$9	\$7	\$9	\$9	(\$14)	\$7	\$5	\$8	\$9	\$15	\$1	\$3	\$8	(\$1)	\$5	(\$5)	(\$2)	\$7	\$13	\$12	\$18	\$7	\$10	\$11	\$4	\$4	\$8	\$14	\$10	\$6	\$3	\$3	\$3	\$3	\$3	\$3	\$3	\$3	
Registered Nurses	\$65	\$31	\$29	\$31	\$31	\$8	\$29	\$27	\$30	\$31	\$37	\$23	\$25	\$30	\$21	\$27	(\$3)	\$1	\$15	\$23	\$35	\$34	\$40	\$29	\$32	\$33	\$26	\$26	\$30	\$36	\$32	\$8	\$5	\$3	\$3	\$3	\$3	\$3	\$3	\$3

Finally, we include tables similar to tables 3 through 6 but for nearby Appalachian regions outside of southeastern Ohio. These include the Eastern Kentucky nonmetropolitan area (tables 7 through 10) and the Northwestern West Virginia nonmetropolitan area (tables 11 through 14). Rows in each table show growing occupations in the Southeastern Ohio nonmetropolitan area, while columns show declining occupations in West Virginia and Kentucky. Because the 132 occupation-specific variables pull from national survey data, color codes for each table are the same.

Table 7: White Collar Occupations, Kentucky to Ohio

		Title Examiners, Abstractors, and Searchers	Merchandise Displayers and Window Trimmers	Bill and Account Collectors	Bookkeeping, Accounting, and Auditing Clerks	Payroll and Timekeeping Clerks	Procurement Clerks	File Clerks	Order Clerks	Human Resources Assistants, Except Payroll and Timekeeping	Dispatchers, Except Police, Fire, and Ambulance	Executive Secretaries and Executive Administrative Assistants	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Data Entry Keyers	Office Clerks, General
		\$38	\$33	\$34	\$37	\$45	\$26	\$32	\$36	\$28	\$29	\$41	\$40	\$30	\$44
Preschool Teachers, Except Special Education	\$39	\$1	\$6	\$5	\$2	-\$6	\$13	\$7	\$3	\$11	\$10	-\$2	-\$1	\$9	-\$5
Pharmacy Technicians	\$29	-\$9	-\$4	-\$5	-\$8	-\$16	\$3	-\$3	-\$7	\$1	\$0	-\$12	-\$11	-\$1	-\$15
Nursing Assistants	\$31	-\$7	-\$2	-\$3	-\$6	-\$14	\$5	-\$1	-\$5	\$3	\$2	-\$10	-\$9	\$1	-\$13
Physical Therapist Assistants	\$67	\$29	\$34	\$33	\$30	\$22	\$41	\$35	\$31	\$39	\$38	\$26	\$27	\$37	\$23
Dental Assistants	\$31	-\$7	-\$2	-\$3	-\$6	-\$14	\$5	-\$1	-\$5	\$3	\$2	-\$10	-\$9	\$1	-\$13
Security Guards	\$37	-\$1	\$4	\$3	\$0	-\$8	\$11	\$5	\$1	\$9	\$8	-\$4	-\$3	\$7	-\$7

Table 8: Electrical Blue Collar Occupations, Kentucky to Ohio

		Telecommunications Equipment Installers and Repairers, Except Line Installers	Electrical Power-Line Installers and Repairers	First-Line Supervisors of Production and Operating Workers	Water and Wastewater Treatment Plant and System Operators	Chemical Equipment Operators and Tenders
		\$38	\$59	\$48	\$30	\$39
First-Line Supervisors of Construction Trades and Extraction Workers	\$32	-\$6	-\$27	-\$16	\$2	-\$7
Carpenters	\$43	\$5	-\$16	-\$5	\$13	\$4
Electricians	\$48	\$10	-\$11	\$0	\$18	\$9
Plumbers, Pipefitters, and Steamfitters	\$53	\$15	-\$6	\$5	\$23	\$14
First-Line Supervisors of Mechanics, Installers, and Repairers	\$72	\$34	\$13	\$24	\$42	\$33
Automotive Service Technicians and Mechanics	\$75	\$37	\$16	\$27	\$45	\$36
Bus & Truck Mechanics & Diesel Engine Spec.	\$45	\$7	-\$14	-\$3	\$15	\$6
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	\$67	\$29	\$8	\$19	\$37	\$28

Table 9: Mechanical Blue Collar Occupations, Kentucky to Ohio

		Shipping, Receiving, and Traffic Clerks	Mail Clerks and Mail Machine Operators, Except Postal	Tire Repairers and Changers	Extending and Drawing Machine Setters, Operators,	Cutting, Punching, and Press Machine Setters, Operators,	Grinding, Lapping, Polishing, and Buffing Machine Tool	Molding, Coremaking, and Casting Machine Setters,	Tool and Die Makers	Printing Press Operators	Power Plant Operators	Mixing and Blending Machine Setters, Operators, and Tenders	Inspectors, Testers, Sorters, Samplers, and Weighers	Molders, Shapers, and Casters, Except Metal and Plastic	Paper Goods Machine Setters, Operators, and Tenders	Helpers—Production Workers	Production Workers, All Other	Driver/Sales Workers	Crane and Tower Operators
		\$61	\$31	\$25	\$36	\$33	\$32	\$39	\$39	\$35	\$29	\$33	\$37	\$80	\$42	\$35	\$30	\$48	
Construction Laborers	\$48	-\$13	\$17	\$23	\$12	\$15	\$16	\$9	\$9	\$13	\$19	\$15	\$11	-\$32	\$6	\$13	\$18	\$0	\$48
Operating Engineers and Other Construction Equipment Operators	\$33	-\$28	\$2	\$8	-\$3	\$0	\$1	-\$6	-\$6	-\$2	\$4	\$0	-\$4	-\$47	-\$9	-\$2	\$3	-\$15	\$33
Industrial Machinery Mechanics	\$44	-\$17	\$13	\$19	\$8	\$11	\$12	\$5	\$5	\$9	\$15	\$11	\$7	-\$36	\$2	\$9	\$14	-\$4	\$44
Maintenance and Repair Workers, General	\$38	-\$23	\$7	\$13	\$2	\$5	\$6	-\$1	-\$1	\$3	\$9	\$5	\$1	-\$42	-\$4	\$3	\$8	-\$10	\$38
Machinists	\$57	-\$4	\$26	\$32	\$21	\$24	\$25	\$18	\$18	\$22	\$28	\$24	\$20	-\$23	\$15	\$22	\$27	\$9	\$57
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$40	-\$21	\$9	\$15	\$4	\$7	\$8	\$1	\$1	\$5	\$11	\$7	\$3	-\$40	-\$2	\$5	\$10	-\$8	\$40
Welders, Cutters, Solderers, and Brazers	\$32	-\$29	\$1	\$7	-\$4	-\$1	\$0	-\$7	-\$7	-\$3	\$3	-\$1	-\$5	-\$48	-\$10	-\$3	\$2	-\$16	\$32
Cabinetmakers and Bench Carpenters	\$48	-\$13	\$17	\$23	\$12	\$15	\$16	\$9	\$9	\$13	\$19	\$15	\$11	-\$32	\$6	\$13	\$18	\$0	\$48
Packaging and Filling Machine Operators and Tenders	\$34	-\$27	\$3	\$9	-\$2	\$1	\$2	-\$5	-\$5	-\$1	\$5	\$1	-\$3	-\$46	-\$8	-\$1	\$4	-\$14	\$34
Bus Drivers, School	\$40	-\$21	\$9	\$15	\$4	\$7	\$8	\$1	\$1	\$5	\$11	\$7	\$3	-\$40	-\$2	\$5	\$10	-\$8	\$40
Heavy and Tractor-Trailer Truck Drivers	\$37	-\$24	\$6	\$12	\$1	\$4	\$5	-\$2	-\$2	\$2	\$8	\$4	\$0	-\$43	-\$5	\$2	\$7	-\$11	\$37
Light Truck or Delivery Services Drivers	\$55	-\$6	\$24	\$30	\$19	\$22	\$23	\$16	\$16	\$20	\$26	\$22	\$18	-\$25	\$13	\$20	\$25	\$7	\$55
Industrial Truck and Tractor Operators	\$34	-\$27	\$3	\$9	-\$2	\$1	\$2	-\$5	-\$5	-\$1	\$5	\$1	-\$3	-\$46	-\$8	-\$1	\$4	-\$14	\$34
Laborers and Freight, Stock, and Material Movers, Hand	\$37	-\$24	\$6	\$12	\$1	\$4	\$5	-\$2	-\$2	\$2	\$8	\$4	\$0	-\$43	-\$5	\$2	\$7	-\$11	\$37

Table 11: While Collar Occupations, West Virginia to Ohio

		Title Examiners, Abstractors, and Searchers	Merchandise Displayers and Window Trimmers	Bill and Account Collectors	Bookkeeping, Accounting, and Auditing Clerks	Payroll and Timekeeping Clerks	Procurement Clerks	File Clerks	Order Clerks	Human Resources Assistants, Except Payroll and Timekeeping	Dispatchers, Except Police, Fire, and Ambulance	Executive Secretaries and Executive Administrative Assistants	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Data Entry Keyers	Office Clerks, General
		\$42	\$35	\$38	\$38	\$55	\$26	\$32	\$31	\$33	\$36	\$34	\$40	\$36	\$32
Preschool Teachers, Except Special Education	\$39	-\$3	\$4	\$1	\$1	-\$16	\$13	\$7	\$8	\$6	\$3	\$5	-\$1	\$3	\$7
Pharmacy Technicians	\$29	-\$13	-\$6	-\$9	-\$9	-\$26	\$3	-\$3	-\$2	-\$4	-\$7	-\$5	-\$11	-\$7	-\$3
Nursing Assistants	\$31	-\$11	-\$4	-\$7	-\$7	-\$24	\$5	-\$1	\$0	-\$2	-\$5	-\$3	-\$9	-\$5	-\$1
Physical Therapist Assistants	\$67	\$25	\$32	\$29	\$29	\$12	\$41	\$35	\$36	\$34	\$31	\$33	\$27	\$31	\$35
Dental Assistants	\$31	-\$11	-\$4	-\$7	-\$7	-\$24	\$5	-\$1	\$0	-\$2	-\$5	-\$3	-\$9	-\$5	-\$1
Security Guards	\$37	-\$5	\$2	-\$1	-\$1	-\$18	\$11	\$5	\$6	\$4	\$1	\$3	-\$3	\$1	\$5

Table 12: Electrical Blue Collar Occupations, West Virginia to Ohio

		Telecommunications Equipment Installers and Repairers, Except Line Installers	Electrical Power-Line Installers and Repairers	First-Line Supervisors of Production and Operating Workers	Water and Wastewater Treatment Plant and System Operators	Chemical Equipment Operators and Tenders
		\$38	\$60	\$72	\$58	\$42
First-Line Supervisors of Construction Trades and Extraction Workers	\$32	-\$6	-\$28	-\$40	-\$26	-\$10
Carpenters	\$43	\$5	-\$17	-\$29	-\$15	\$1
Electricians	\$48	\$10	-\$12	-\$24	-\$10	\$6
Plumbers, Pipefitters, and Steamfitters	\$53	\$15	-\$7	-\$19	-\$5	\$11
First-Line Supervisors of Mechanics, Installers, and Repairers	\$72	\$34	\$12	\$0	\$14	\$30
Automotive Service Technicians and Mechanics	\$75	\$37	\$15	\$3	\$17	\$33
Bus & Truck Mechanics & Diesel Engine Spec.	\$45	\$7	-\$15	-\$27	-\$13	\$3
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	\$67	\$29	\$7	-\$5	\$9	\$25

Table 13: Mechanical Blue Collar Occupations, West Virginia to Ohio

		Shipping, Receiving, and Traffic Clerks	Mail Clerks and Mail Machine Operators, Except Postal	Tire Repairers and Changers	Extruding and Drawing Machine Setters, Operators,	Cutting, Punching, and Press Machine Setters, Operators,	Grinding, Lapping, Polishing, and Buffing Machine Tool	Molding, Coremaking, and Casting Machine Setters,	Tool and Die Makers	Printing Press Operators	Power Plant Operators	Mixing and Blending Machine Setters, Operators, and Tenders	Inspectors, Testers, Sorters, Samplers, and Weighers	Molders, Shapers, and Casters, Except Metal and Plastic	Paper Goods Machine Setters, Operators, and Tenders	Helpers-- Production Workers	Production Workers, All Other	Driver/Sales Workers	Crane and Tower Operators
		\$61	\$39	\$23	\$33	\$33	\$35	\$40	\$39	\$51	\$29	\$33	\$48	\$80	\$42	\$31	\$30	\$34	
Construction Laborers	\$48	-\$13	\$9	\$25	\$15	\$15	\$13	\$8	\$9	-\$3	\$19	\$15	\$0	-\$32	\$6	\$17	\$18	\$14	\$48
Operating Engineers and Other Construction Equipment Operators	\$33	-\$28	-\$6	\$10	\$0	\$0	-\$2	-\$7	-\$6	-\$18	\$4	\$0	-\$15	-\$47	-\$9	\$2	\$3	-\$1	\$33
Industrial Machinery Mechanics	\$44	-\$17	\$5	\$21	\$11	\$11	\$9	\$4	\$5	-\$7	\$15	\$11	-\$4	-\$36	\$2	\$13	\$14	\$10	\$44
Maintenance and Repair Workers, General	\$38	-\$23	-\$1	\$15	\$5	\$5	\$3	-\$2	-\$1	-\$13	\$9	\$5	-\$10	-\$42	-\$4	\$7	\$8	\$4	\$38
Machinists	\$57	-\$4	\$18	\$34	\$24	\$24	\$22	\$17	\$18	\$6	\$28	\$24	\$9	-\$23	\$15	\$26	\$27	\$23	\$57
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	\$40	-\$21	\$1	\$17	\$7	\$7	\$5	\$0	\$1	-\$11	\$11	\$7	-\$8	-\$40	-\$2	\$9	\$10	\$6	\$40
Welders, Cutters, Solderers, and Brazers	\$32	-\$29	-\$7	\$9	-\$1	-\$1	-\$3	-\$8	-\$7	-\$19	\$3	-\$1	-\$16	-\$48	-\$10	\$1	\$2	-\$2	\$32
Cabinetmakers and Bench Carpenters	\$48	-\$13	\$9	\$25	\$15	\$15	\$13	\$8	\$9	-\$3	\$19	\$15	\$0	-\$32	\$6	\$17	\$18	\$14	\$48
Packaging and Filling Machine Operators and Tenders	\$34	-\$27	-\$5	\$11	\$1	\$1	-\$1	-\$6	-\$5	-\$17	\$5	\$1	-\$14	-\$46	-\$8	\$3	\$4	\$0	\$34
Bus Drivers, School	\$40	-\$21	\$1	\$17	\$7	\$7	\$5	\$0	\$1	-\$11	\$11	\$7	-\$8	-\$40	-\$2	\$9	\$10	\$6	\$40
Heavy and Tractor-Trailer Truck Drivers	\$37	-\$24	-\$2	\$14	\$4	\$4	\$2	-\$3	-\$2	-\$14	\$8	\$4	-\$11	-\$43	-\$5	\$6	\$7	\$3	\$37
Light Truck or Delivery Services Drivers	\$55	-\$6	\$16	\$32	\$22	\$22	\$20	\$15	\$16	\$4	\$26	\$22	\$7	-\$25	\$13	\$24	\$25	\$21	\$55
Industrial Truck and Tractor Operators	\$34	-\$27	-\$5	\$11	\$1	\$1	-\$1	-\$6	-\$5	-\$17	\$5	\$1	-\$14	-\$46	-\$8	\$3	\$4	\$0	\$34
Laborers and Freight, Stock, and Material Movers, Hand	\$37	-\$24	-\$2	\$14	\$4	\$4	\$2	-\$3	-\$2	-\$14	\$8	\$4	-\$11	-\$43	-\$5	\$6	\$7	\$3	\$37

Appendix

Table A.1.

	NAICS code	SIC code
Mining equipment manufacturers	333131 – Mining Machinery and Equipment Manufacturing	3532—Mining Machinery and Equipment, Except Oil and Gas Field Machinery and Equipment
oil and gas field machinery manufacturing	333132 - Oil and Gas Field Machinery and Equipment Manufacturing	3533—Oil and Gas Field Machinery and Equipment
Construction machinery manufacturing	333120 - Construction Machinery Manufacturing	3531—Construction Machinery and Equipment
Coal chutes	332322 - Sheet Metal Work Manufacturing	3444—Sheet Metal Work
Coal conveyors	333922 - Conveyor and Conveying Equipment Manufacturing	3535—Conveyors and Conveying Equipment
Rubber and plastics hoses and belting manufacturing	326220 - Rubber and Plastics Hoses and Belting Manufacturing	3052—Rubber and Plastics Hose and Belting
Exploration	213113 - Support Activities for Coal Mining	1241—Coal Mining Services
Stone mining and quarrying	212319 - Other Crushed and Broken Stone Mining and Quarrying 212311 - Dimension Stone Mining and Quarrying 212313 - Crushed and Broken Granite Mining and Quarrying 212312 - Crushed and Broken Limestone Mining and Quarrying	1429—Crushed and Broken Stone, Not Elsewhere Classified 1499—Miscellaneous Nonmetallic Minerals, Except Fuels 1411—Dimension Stone 1423—Crushed and Broken Granite 1422—Crushed and Broken Limestone
Natural gas extraction	211130 - Natural Gas Extraction	1321—Natural Gas Liquids 2819—Industrial Inorganic Chemicals, Not Elsewhere Classified
Coal mining	2121 - Coal Mining	1221—Bituminous Coal and Lignite Surface Mining 1222—Bituminous Coal Underground Mining 1231—Anthracite Mining

wholesalers	454310 - Fuel Dealers	5171—Petroleum Bulk stations and Terminals 5983—Fuel Oil Dealers 5984—Liquefied Petroleum Gas (Bottled Gas) Dealers 5989—Fuel Dealers, Not Elsewhere Classified
Coal wholesalers	423520 - Coal and Other Mineral and Ore Merchant Wholesalers	5052—Coal and Other Minerals and Ores
Coal tar wholesalers	423320 - Brick, Stone, and Related Construction Material Merchant Wholesalers	5032—Brick, Stone, and Related Construction Materials
wholesalers	424690 - Other Chemical and Allied Products Merchant Wholesalers	5169—Chemicals and Allied Products, Not Elsewhere Classified
Transportation	484220 - Specialized Freight (except Used Goods) Trucking, Local	4212—Local Trucking Without Storage
Water transportation	483211 - Inland Water Freight Transportation	4449—Water Transportation of Freight, Not Elsewhere Classified 4499—Water Transportation Services, Not Elsewhere Classified
Pipeline transportation	486990 - All Other Pipeline Transportation	4619—Pipelines, Not Elsewhere Classified
refineries	324121 - Asphalt Paving Mixture and Block Manufacturing	2951—Asphalt Paving Mixtures and Blocks
refineries	325194 - Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	2861—Gum and Wood Chemicals 2865—Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments 2869—Industrial Organic Chemicals, Not Elsewhere Classified
Primary smelting and refining of copper	331410 - Nonferrous Metal (except Aluminum) Smelting and Refining	3331—Primary Smelting and Refining of Copper 3339—Primary Smelting and Refining of Nonferrous Metals, Except Copper and Aluminum

Manufacturing	324199 - All Other Petroleum and Coal Products Manufacturing	2999—Products of Petroleum and Coal, Not Elsewhere Classified 3312—Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills
Manufacturing	325211 - Plastics Material and Resin Manufacturing	2821—Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers
Ground or treated mineral and earth manufacturing	327992 - Ground or Treated Mineral and Earth Manufacturing	3295—Minerals and Earths, Ground or Otherwise Treated
utilities	221112 - Fossil Fuel Electric Power Generation	4911—Electric Services 4931—Electric and Other Services Combined 4939—Combination Utilities, Not Elsewhere Classified