Appalachian Ohio Skillshed Analysis

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Executive Summary

In September 2016, the U.S. Economic Development Administration (EDA) awarded Ohio University's Voinovich School of Leadership and Public Affairs with an investment to conduct an Appalachian Ohio Skillshed Analysis. This project focuses on identifying the occupational skills of coal mining and coal-fired power plant workers in the 32-county Appalachian Ohio region subject to job loss as a result of layoffs or closures in the coal economy. This research provides economic development stakeholders with a better understanding of the region's labor force characteristics and contributes to regional workforce development by providing a roadmap to ease career transitions for the Appalachian workforce negatively impacted by the decline of the coal industry.

A skillshed is the geographic area from which a region pulls its workforce, and the skills, education, and experience that the workforce possesses. A skillshed does not have to adhere to established boundaries corresponding to counties or metropolitan/non-metropolitan areas. Instead, the geographic definition of the area has to be meaningful to employers/employees and regional economies. For this project, we consider each of the four Economic Development Districts (EDDs) within the Appalachian Ohio region as its own skillshed. As such, we identify a major coal economy related closure or prospective closure within each EDD as follows:

1. Ohio Valley Regional Development Commission (OVRDC)
    a. Upcoming decommissioning of two Dayton Power & Light (DP&L) coal-fired power plants in Adams County and the closure of a related training facility

2. Buckeye Hills Regional Council (hereafter referred to as 'Buckeye Hills')
    a. Muskingum River Plant coal-fired power plant closure in Washington County in 2015

3. Eastgate Regional Council of Governments (ERCG)
    a. FirstEnergy Generation Corp closure of a coal-fired power plant in Ashtabula County in 2015

4. Ohio Mid-Eastern Governments Association (OMEGA).
    a. Murray Energy Corporation and Ohio Valley Coal Company coal mine closure (Powhatan No. 6 Mine) in Belmont County in late 2016.

EDDs are appropriate proxies for a skillshed region for multiple reasons. First, the organizations work as planning and development organizations guided by the Appalachian Regional Commission and the U.S. Economic Development Administration (EDA). Second, each EDD produces a Comprehensive Economic Development Strategy (CEDS) that outlines the economic development plan for the region, including targeted industry clusters. Lastly, EDDs serve as regional organizations best positioned to act on regional initiatives, such as reemployment and recovery efforts in the face of coal economy closures.

The goals of a skillshed analysis are to identify the top occupations that will drive regional economic growth and to determine which of these emerging occupations the existing workforce can transition into with relative ease. In this report, determining emerging occupations is specific to each of the four skillsheds (e.g. EDDs). We classify an occupation as emerging if it is nested in a growing industry with a regional location quotient higher than 1.1 or if an industry classified as a regional economic driver in an EDD's CEDS or identified as a targeted industry/industry cluster by a JobsOhio partner. Struggling occupations are those concentrated in the mining and fossil fuel electric power generation industries and exhibiting below average employment projections.

A key step in matching declining occupations to emerging occupations is to map occupations into skills. We can then determine which skills are overlapping and which are lacking or need improving. We present a mapping of struggling occupations into emerging occupations by occupational cluster. An occupation can be present in multiple industries. Instead of grouping occupational matches by industry, we cluster or group occupations based on skills. Cell colors within the map tables indicate the difficulty level of a transition. A dark green color represents an easy transition while a red color indicates considerable retraining or educational attainment will be required for the new occupation. Lighter shades of green to yellow indicate some retraining is needed but the transition remains relatively easy. Yellow to orange shades indicate more educational attainment or retraining is required. Inside the colored cell, we include wage differentials to inform displaced workers' decisions when choosing a new career. Figure 1 and 2 in the executive summary are examples of the tables for coal-fired power plants found in the report.

For example, in Figure 1, a power plant operator makes an average of $33/hr. This worker could transition with relative ease to a computer-controlled machine tool operator position with an average hourly wage of $18. Yet, this would represent an average hour wage decrease of $16 per hour (note: hourly wages may not sum due to rounding).

Executive Summary Figure 1: Blue Collar Occupations into Occupations Requiring Mechanical Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material	Meter readers, utilities	Control and valve installers and repairers,	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Automotive service technicians and mechanics	$17	$4	$0	$5	-$3	-$14	-$12	-$17	-$15	-$9	-$2	-$16	-$1	-$6	-$2	-$1	-$6	-$16	-$9
Bus and truck mechanics and diesel engine specialists	$21	$9	$4	$9	$1	-$10	-$8	-$13	-$11	-$5	$2	-$12	$3	-$1	$2	$3	-$2	-$12	-$4
Carpenters	$21	$8	$4	$9	$1	-$10	-$8	-$13	-$11	-$5	$2	-$12	$3	-$2	$2	$3	-$2	-$12	-$4
Computer-controlled machine tool operators, metal and plastic	$18	$5	$0	$6	-$2	-$14	-$11	-$16	-$15	-$8	-$2	-$15	-$1	-$5	-$1	$0	-$5	-$16	-$8
Construction laborers	$18	$5	$0	$6	-$3	-$14	-$11	-$16	-$15	-$9	-$2	-$15	-$1	-$5	-$1	$0	-$6	-$16	-$8
Electricians	$24	$11	$6	$12	$4	-$7	-$5	-$10	-$8	-$2	$4	-$9	$6	$1	$5	$6	$1	-$10	-$2
Heavy and tractor-trailer truck drivers	$20	$7	$2	$8	-$1	-$12	-$9	-$14	-$13	-$7	$0	-$13	$1	-$3	$1	$2	-$4	-$14	-$6
Operating engineers and other construction equipment operators	$23	$11	$6	$12	$3	-$8	-$5	-$10	-$9	-$3	$4	-$9	$5	$1	$4	$5	$0	-$10	-$2
Painters, construction and maintenance	$18	$5	$1	$6	-$2	-$13	-$11	-$16	-$14	-$8	-$2	-$15	$0	-$5	-$1	$0	-$5	-$16	-$8
Plumbers, pipefitters, and steamfitters	$25	$12	$8	$13	$5	-$6	-$4	-$9	-$7	-$1	$5	-$8	$7	$2	$6	$7	$2	-$9	-$1

We group occupations in this report into five clusters based on the skills in which occupations within a cluster need to be the most proficient: (1) computer and electronics/administration and management, (2) psychology/education and training/medicine and dentistry, (3) clerical, (4) customer and personal service, (5) mechanical. We find that the easiest transitions for power plant workers (minimal need for training or additional education) can be found within the mechanical cluster. However, the tradeoff is in a decrease in median hourly wage. Emerging occupations within the mechanical cluster are associated with $4 less on average than their power plant counterparts' hourly wages. The wage differential may be even greater when overtime earned by power plant workers is considered.

A subset of coal-fired power plant occupations, white-collar occupations, can find their least challenging matches within the computer and electronics/administration and management cluster. These transitions are more challenging than the mechanical cluster transitions and would require additional human capital investments. Similarly, blue-collar mine workers have the least challenging transitions into occupations within the mechanical cluster, and white-collar mine workers have their best matches within the computer and electronics/administration and management cluster.

Transitions into occupations within the "psychology/education and training/medicine and dentistry" cluster require the most skill development and acquisition. These occupations require years of formal education and their work activities (assisting and caring for others, performing for or working directly with the public, etc.) do not overlap with the coal reliant workforce' work activities.

Executive Summary Figure 2: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating workers	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm products	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative assistants	Human resources assistants, except payroll and timekeeping	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Accountants and auditors	$30	-$54	-$2	-$9	-$7	-$12	$3	-$3	$4	-$11	-$22	-$6	$1	$11	$7	$15	$13	$7	$13	$12
Computer and information systems managers	$57	-$27	$24	$17	$20	$14	$29	$23	$30	$16	$4	$21	$28	$37	$33	$41	$40	$33	$39	$38
Computer user support specialists	$21	-$64	-$12	-$19	-$16	-$22	-$7	-$13	-$6	-$20	-$32	-$15	-$9	$1	-$3	$5	$3	-$3	$3	$2
Cost estimators	$27	-$57	-$6	-$12	-$10	-$16	$0	-$7	$1	-$14	-$25	-$9	-$2	$7	$4	$12	$10	$4	$9	$9
Financial managers	$51	-$33	$18	$11	$14	$8	$24	$17	$24	$10	-$2	$15	$22	$31	$27	$36	$34	$28	$33	$33
First-line supervisors of construction trades and extraction workers	$29	-$55	-$4	-$11	-$8	-$14	$1	-$5	$2	-$12	-$24	-$7	-$1	$9	$5	$13	$12	$5	$11	$10
First-line supervisors of food preparation and serving workers	$14	-$70	-$19	-$26	-$23	-$29	-$14	-$20	-$13	-$27	-$39	-$22	-$15	-$6	-$10	-$1	-$3	-$10	-$4	-$5
First-line supervisors of mechanics, installers, and repairers	$29	-$55	-$4	-$11	-$8	-$14	$1	-$5	$2	-$12	-$24	-$7	$0	$9	$5	$14	$12	$5	$11	$10
First-line supervisors of office and administrative support workers	$24	-$60	-$9	-$16	-$13	-$19	-$4	-$10	-$3	-$17	-$29	-$12	-$6	$4	$0	$8	$7	$0	$6	$5
General and operations managers	$43	-$41	$10	$4	$6	$0	$16	$10	$17	$2	-$9	$7	$14	$23	$20	$28	$26	$20	$25	$25
Management analysts	$36	-$48	$3	-$4	-$1	-$7	$8	$2	$9	-$5	-$17	$0	$6	$16	$12	$20	$19	$12	$18	$17
Managers, all other	$45	-$39	$12	$5	$8	$2	$17	$11	$18	$4	-$8	$9	$16	$25	$21	$29	$28	$21	$27	$26
Market research analysts and marketing specialists	$29	-$56	-$4	-$11	-$9	-$14	$1	-$5	$2	-$12	-$24	-$7	-$1	$9	$5	$13	$11	$5	$11	$10
Medical and health services managers	$42	-$42	$9	$2	$5	-$1	$14	$8	$15	$1	-$11	$6	$13	$22	$18	$27	$25	$18	$24	$24
Sales representatives, services, all other	$24	-$61	-$9	-$16	-$14	-$19	-$4	-$10	-$3	-$17	-$29	-$13	-$6	$4	$0	$8	$6	$0	$6	$5
Software developers, applications	$41	-$43	$8	$1	$4	-$2	$13	$7	$14	$0	-$12	$5	$11	$21	$17	$25	$24	$17	$23	$22

In addition to completing the skillshed analysis, the decommissioning of the Dayton Power & Light in Adams County received additional focus as part of this research effort given the emergent efforts of local, regional, and state officials to mitigate the impacts of this closure. To assist in this effort, we conducted an economic impact assessment of the closure of the Killen Station (Manchester, Ohio) and Stuart Station (Aberdeen, Ohio) power plants and a training facility on Adams County and surrounding counties in Ohio and Kentucky. We identified the number of jobs and amount of labor income lost as a direct consequence of the impending Killen and Stuart power plant closures. Moreover, the report includes estimates of the indirect and induced effects of the closures on the broader, regional economy.

The Killen and Stuart power plant closures and the closure of an associated training facility in Manchester, Ohio will lead to the direct loss of 370 jobs. These 370 jobs generated an estimated $56 million in employee compensation. An additional 760 jobs will be lost in a variety of industries as an ancillary consequence of the closures. In total, the closure of these facilities will result in 1,131 lost jobs, $82 million in lost labor income, and a reduction in regional economic output of nearly $700 million. Additionally, Adams County and local governments/school districts in the County will lose a collective $8.5 million in property taxes annually.

Assistance from economic development organizations is essential to help the regional workforce recover from the economic downturn impacting the Appalachian Ohio economy. In addition to help with retraining, skill improvement, or obtaining additional education, displaced workers might also require help with transportation and access to information. Technical centers or community colleges are sparse in Appalachian counties, which introduces transportation costs that can complicate workers' occupational transitions. Access to information in this report, resources by the Department of Labor aimed to help in career transitions, or even job postings are often contingent on access to online sources and the ability to navigate the digital world.

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1. Introduction

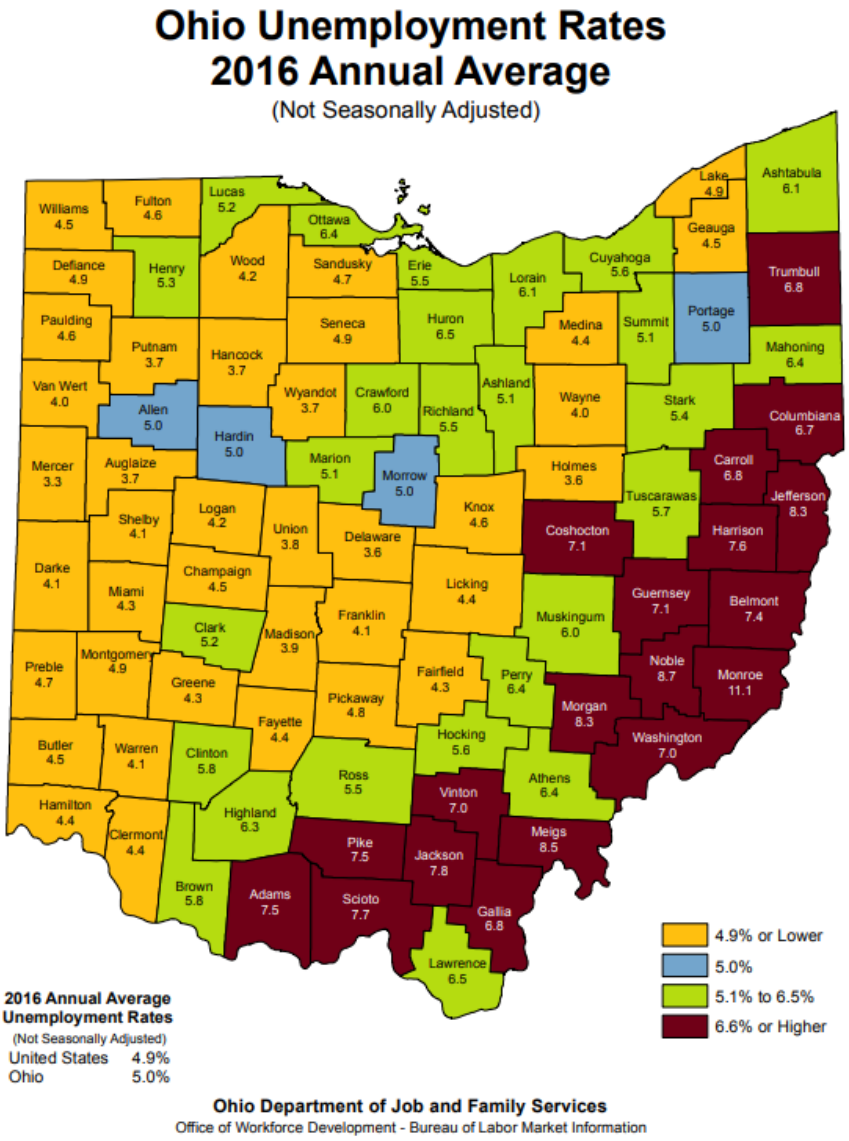
A typical skillshed analysis (1) identifies occupations in which a region has a comparative advantage, (2) determines if these occupations are exhibiting increasing or declining employment projections, (3) and contrasts the current skillset of declining occupations with the skillset needed for emerging 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 to develop policies that ensure the workforce is prepared to support emerging occupations.

The focus of this skillshed analysis is the displaced workers in the Appalachian region following the decline in the coal economy and the consequent closure of mines and coal-fired power plants. We identify the occupations adversely affected in the Appalachian region, translate those occupations into skills, and compare the coal economy skills to the skills required in occupations within regionally concentrated industries that are exhibiting above-average growth. In addition, we provide color-coded indicators for the level of difficulty associated with a transition as well as wage differentials to better inform displaced worker's decisions.

This report presents findings on occupational transitions in the Appalachian region using multiple data sources: the Quarterly Census of Employment and Wages (QCEW), the Bureau of Labor Statistics (BLS) industry-occupation matrix, information from the Occupational Information Network (O*NET), and detailed occupational data from the Utility Workers Union of America. Comparing the knowledge, capacities, work activities, and job zone of the coal-dependent workforce to those needed by growing regionally concentrated industries, we calculate an occupation dissimilarity measure. Employees impacted by coal-fired power plant and coal mine closures and economic development specialists helping them can use the measure as a guide into which new career to transition, thus effectively decreasing their search costs.

Figure 1.1 is a map of all 88 Ohio counties with the corresponding unemployment rate in 2016. The Appalachian region, the focus of this report, is comprised of 32 counties. In 2016, 19 of the Appalachian counties had the highest unemployment rates in Ohio as illustrated in figure 1.1. While the state of Ohio has a 4.9 percent unemployment rate, the average Appalachian unemployment rate is 6.8 percent.

Figure 1.1: Unemployment Rate by Ohio Counties



Note: The map illustrates Ohio annual average unemployment rates for 2016 from the Ohio Department of Job and Family Services, Office of Workforce Development-Bureau of Labor Market Information.

There are three types of unemployment: frictional, structural, and cyclical. Frictional unemployment is unavoidable. It occurs as a consequence of people searching for a better job or new entrants to the labor force, e.g., new graduates. Structural unemployment follows from a mismatch in the skills held by those searching for work and the skills demanded by employers. Cyclical unemployment reflects the business cycle; it increases with periods of recession. The impact of cyclical unemployment is heterogeneous across regions and employees. During the most

recent recession, unemployment for people without a high school diploma or only a high school diploma was accelerated (Engemann and Wall, 2010). The lagging nature of the Appalachian unemployment rate suggests that it is structural unemployment that is exacerbated by the most recent recession. Communities' economic recovery and resilience depend on the skills of their workforce. This report aims to contribute to workforce development by proving a roadmap to ease career transitions for the Appalachian workforce negatively impacted by the decrease in demand for coal.

A typical skillshed analysis allows a region to prepare for future occupational needs and to efficiently allocate their labor resources while placing minimal educational demands on its workforce. This is possible because the analysis matches the skills of the current workforce with the most similar emerging occupations. Our goal is slightly different, but this type of analysis still applies. Ensuring future occupational needs can be a byproduct of our work but what we are mostly interested in is matching the skills of a subset of the workforce, specifically those adversely impacted by mine and coal-fired power plant closures, to the most similar emerging occupations.

Therefore, instead of only presenting aggregated results on which skills need improving, we additionally provide occupation level comparisons based on the occupation dissimilarity measure. Mine and power plant workers can use those measures to identify substitute careers given their current human capital investments.

2. Review of Relevant Skillshed Reports

Skillshed analysis was a concept first introduced by the Institute for Decision Making at the University of Northern Iowa in 1998 (Scott and Kotlyar, 2013). The goal of the analysis was to provide economic development groups with a better understanding of the area's labor force characteristics. The first step in this type of analysis is to define a skillshed geographically. Studies vary in how they establish skillshed boundaries. However, some common factors include population density, local geography (e.g., rivers), and transportation infrastructure (e.g., roads and highways). Once a skillshed is defined, we need data 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. The workforce survey is used to measure the supply of available workers within a region while documenting the skillsets, work

activities, and tasks of workers. The employer survey is used to measure the demand for workers within an area, as well as detailing what education, training, and skills are needed.

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, 2013).

Regardless of data source, the goals of a skillshed analysis are to identify the top occupations that will drive regional economic growth and to determine into which of these emerging occupations can the workforce transition with ease. While specific results from non-Ohio skillsheds would not be generalizable to Appalachian counties, examining recent skillshed analyses from Ohio counties can add to our understanding of the current structural changes in the economy, and it can serve as a benchmark for our findings.

Ohio University produced in 2015 a series of regional occupation needs reports in counties where its campuses are located (LaFayette, B. Regionomics, LLC., 2015). The first report focused on the occupational needs around the Ohio University Lancaster campus. This campus is not located in one of the 32 designated Appalachian counties in the state. Focused specifically on Fairfield, Franklin, Hocking, and Licking Counties, this report found, using location quotients as the metric of analysis, that healthcare, advanced manufacturing, and logistics and distribution were the key driver industries in the region. For healthcare, the report displayed strong industry growth projections, and noted that registered nurses and home health aides would be in great future need, and outlined that a college education, medicine and dentistry knowledge, and problem sensitivity skills were of utmost importance. Plastics and fabricated metal manufacturing were the subsectors with the largest 10-year employment needs projections, respectively, necessitating, on average, some post-secondary vocational training and various levels of knowledge and skills based on occupational category (i.e., managers, accountants, engineers, and salespeople). Finally, logistics and distribution emerged as a critical industry for the future of the area, requiring a high school diploma or less, and administration, personnel, and business knowledge/skills, particularly within the most in-demand subsectors.

The Ohio University regional campus occupational needs studies differed greatly for those located in the Appalachian region, as highlighted below. Ohio University Chillicothe is located in the Ohio Valley Regional Development Commission (OVRDC) region, one of the four central Economic Development Districts (EDDs) that exist within Ohio's Appalachian region. This report analyzed Pickaway, Pike, Ross, and Vinton Counties in South-Central Ohio and discovered healthcare, safety and security, and corporate management to be the key driver industries in the region. Making up 17% of the region's employment, healthcare was very concentrated in the region, especially for ambulatory care industries, hospitals, and residential care facilities (with 35.8%, 14.5%, and 16.5% 10-year local growth projections, respectively). Again, relevant education and training requirements included a college education, medicine and dentistry knowledge, and problem sensitivity skills. Safety and security was another prominent, as well as future high labor demand, industry in the area, particularly due to the four regional correctional facilities. High school diploma or equivalent education levels were noted as standard for this occupation, while safety, security, and legal knowledge, and response and oral communication skills were deemed as most important. Corporate management and administration surfaced as the third driver industry in the region, which, by nature, encompasses a much larger suite of host industries (e.g., manufacturing, social assistance, transportation, etc.). Generally, these positions require a college education, and business, customer service, and computer skills, among others.

The Southern Campus of Ohio University, in Ironton, is also in the OVRDC region, near the borders of West Virginia and Kentucky. Using the same methodologies as the other regional occupational needs reports, this report found health care, manufacturing, and logistics and distribution to be the prominent industries within eight counties over the three-state region. While these driver industries generally coincide with those studied in the Lancaster report, several differences emerged. For instance, the healthcare sector surrounding the Southern campus was projected to grow at a much slower rate – in gross number and regional percentage – than both the areas surrounding the Lancaster campus and the national projections. Further, logistics and distribution placed second – not third – in terms of regional prominence, in part due to Heartland Corridor, part of the Norfolk Southern rail line, as well as several ports along the Ohio River. Put another way, the Zanesville campus analysis for logistics and distribution focused mostly on trucking, whereas the unique geography of the Southern campus provides a comparative advantage in boat and rail logistics and distribution employment. Lastly, the Southern Campus'

manufacturing analysis centered on transportation equipment and furniture manufacturing as the two key subsectors of projected employment growth, due to regional advantages in wood resources and versatile transportation means.

Situated in the EDD region known as the Ohio Mid-Eastern Governments Association (OMEGA), the Ohio University Zanesville region encompasses Guernsey, Muskingum, Noble, and Perry Counties. According to the report, key industry drivers in this region were healthcare, agribusiness, and energy. The healthcare industry sector required formal college training, and medicine, service, and problem sensitivity knowledge/skills. Agribusiness appeared as a vital regional industry due to the large farming industry and supply chain; in 2012, farmland occupied roughly 42% of the region's total land area. Farmworkers and laborers, as well as landscaping and grounds keeping workers, emerged as the subsectors with the largest future need, typically requiring high school diploma or equivalent education, food and management knowledge, and comprehension and operation and control skills. Driven primarily by shale oil and gas development in the eastern part of the state, energy was found to be another key industry in the four-county region, and the analysis included coal mining activities in addition to extraction and transportation of oil and gas. Jobs in this energy cluster require two- or four-year college degrees, engineering and mathematics knowledge, and written and oral comprehension skills.

The Eastern Campus of Ohio University, located in St. Clairsville, is also in the OMEGA region, near the borders of West Virginia and Pennsylvania. The smallest Ohio University regional campus in terms of enrollment, the Eastern study looked at Belmont, Harrison, Jefferson, and Monroe Counties, finding healthcare, manufacturing, and transportation to be the area's key industries. Ten-year growth projections for healthcare industries in the region were in line with other regions, as were the education levels and necessary knowledge and skills. This study also found manufacturing to be a key stimulus to the region, both historically and in projections, principally in the wood products and metals subsectors. Most of these occupations required some college-level education. Finally, transportation, particularly transportation related to the area's prominent shale oil and gas extraction activity, arose as a driver industry. With 10-year projections over 11% in this sector, including strong projections in truck transportation and warehousing and storage specifically, these occupations include a mix of required education based on specific job (e.g., managers versus freight forwarders), management and customer & personal service knowledge, and attention and computer skills.

3. Defining a Skillshed

A Skillshed is a geographic area from which a region pulls its workforce and the skills, education, and experience that the workforce possesses. A skillshed does not have to adhere to established boundaries corresponding to counties or metropolitan and non-metropolitan areas as defined by the Office of Management and Budget (OMB). The geographic definition of the area has to be meaningful to employers and employees or Economic Development Districts.

In this report, we examine four skillsheds congruent with the four Economic Development Districts (EDDs) that exist within Ohio's Appalachian region. The Appalachian Ohio region has been historically dependent on coal. In recent years, the decrease in the cost of natural gas, environmental regulations, and the decrease in international demand have all contributed to a decrease in coal demand. Coal production fell by nearly 45% in Appalachian between 2005 and 2015 (ARC, 2018). Consequently, these events have created a need for interventions targeting the displaced workforce and aiming to prepare them for re-employment.

The following EDDs work as planning and development organizations guided by the Appalachian Regional Commission and the U.S. Economic Development Administration: Ohio Valley Regional Development Commission (OVRDC), the Buckeye Hills-Hocking Valley Regional Development District (hereafter referred to as 'Buckeye Hills'), Eastgate Regional Council of Governments (ERCG), and Ohio Mid-Eastern Governments Association (OMEGA). These four multi-county regions provide the geographic framework that we use to conduct this analysis. Figure 3.1 maps the fours skillsheds included in this analysis: OVRDC counties are in red, Buckeye Hills counties are in blue, ERCG counties are in green, and OMEGA counties are in yellow. Motivated by recent closures, we focus on coal-fired power plants workers for OVRDC, Buckeye Hills, and ERCG regions. These regions have a high concentration of the utilities industry which is experiencing structural changes.

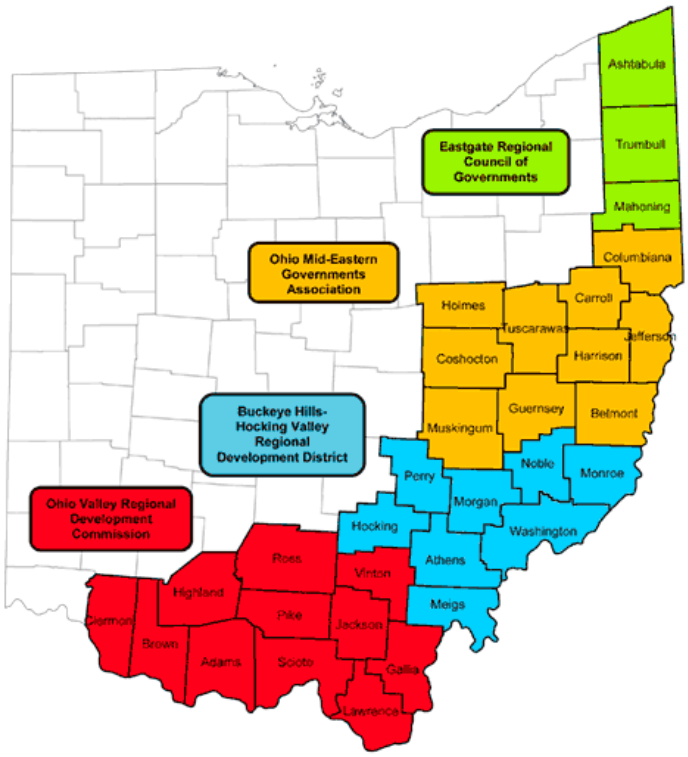
OVRDC Region

The OVRDC region covers 11 counties: Adams, Brown, Clermont, Gallia, Highland, Jackson, Lawrence, Pike, Ross, Scioto, and Vinton. Recent examples of the coal-fired power plant closures in this region are the Killen and Stuart power plants. We expect at least 370 employees working in these electricity generating plants to look for new employment as a result.[1] Killen

[1] The WARN was filed on March 21, 2018 with Ohio Department of Job and Family Services.

Station has been operational since 1982, and J.M. Stuart has been operational since 1969. Combined they have capacity for 2,908 megawatts of coal-fired generation. Duke Energy Ohio has also closed coal-fired generators in the Walter C. Beckjord plant in Clermont in recent years (2012, 2013, and 2014). In the OVRDC region, four coal-fired power plants are still operational: W. H. Zimmer in Clermont operational since 1991, General James M. Gavin in Gallia County operational since 1974, Kyger Creek in Gallia County operational since 1955, and P. H. Glatfelter Co-Chillicothe Facility has one conventional steam coal generator in Ross County operational since 1978.

Figure 3.1: Ohio Appalachian Skillsheds



Note: The map presents the four skillsheds included in the analysis and the corresponding counties.

Buckeye Hills Region

Buckeye Hills region is comprised of 8 counties: Athens, Hocking, Meigs, Morgan, Monroe, Noble, Perry, and Washington. A recent example of coal-fired power plant closures in this region is the Muskingum River Plant. It was located in Washington County and was operational from 1953 to 2015 with a 1,400 megawatts capacity. Another closure in recent year is

the Richard Gorsuch plant, also located in Washington County, operational from 1988 to 2010. The Buckeye Hills region does not have any remaining coal-fired power plants.

ERCG Region

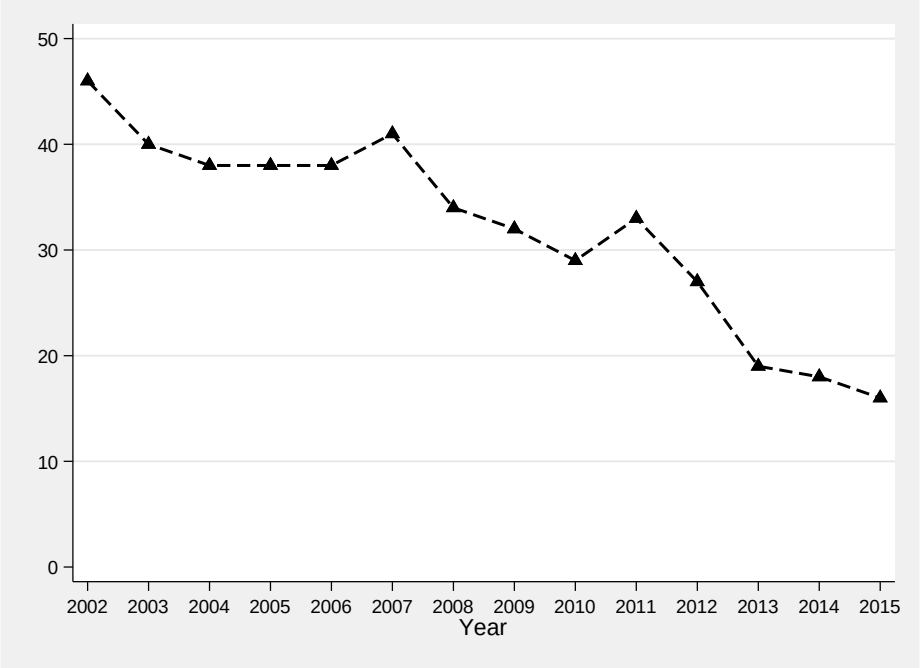
ERCG region is made up of 3 counties: Ashtabula, Mahoning, and Trumbull. A recent example of coal-fired power plant closures in this region is FirstEnergy Generation Corp closing their coal-fired generator in Ashtabula County. The generator was operational from 1958 to 2015 with 244 megawatts capacity. Another recent closure was in 2012. The Niles power plant was operational since 1954. The ERCG region does not have any remaining coal-fired power plants.

OMEGA Region

The focus for the OMEGA region is on mines since the mining industry is highly concentrated in the region. OMEGA is made up of 10 counties: Belmont, Carroll, Columbiana, Coshocton, Guernsey, Harrison, Holmes, Jefferson, Muskingum, and Tuscarawas. Recent mine closures in the OMEGA region include Powhatan No. 6 Mine. Murray Energy Corporation and the Ohio Valley Coal Company operated a mine, referred to as Powhatan No. 6 Mine, in Belmont County. Powhatan No. 6 has been operating since 1988, but as of the end of 2016, had closed. Approximately 492 individuals were expected to lose their jobs.[2] Figure 3.2 tracks the number of mines in the OMEGA region from 2002 to 2015. In 2002, 46 mines were operational, that number has decreased to 16 mines in 2015.

[2] The WARN was filed on October 17, 2016 with Ohio Department of Job and Family Services.

Figure 3.2: Number of Mines in OMEGA Region



Note: The graph illustrates the decrease in the number of mines operating in the OMEGA region. Data is from the Energy Information Administration (EIA)'s annual coal reports.

4. Evaluating the Economic Impact of the Killen Station and Stuart Station Plant Closures

This section presents an assessment of the economic impact of the closure of the Killen Station (Manchester, Ohio) and Stuart Station (Aberdeen, Ohio) power plants, as well as the associated training center (Manchester, Ohio), which are all located in Adams County, Ohio. The study area for this analysis includes Adams County, Brown County, and Scioto County in Ohio, and Mason County in Kentucky. These four counties comprise the residential location of the vast majority (i.e., 80%) of workers at the power plants. The report identifies the number of jobs and labor income lost due to the power plant closures, and the total effect on the local economy which includes indirect and induced effects.

Economic Impact Project Methodology

This study employed the Impact Analysis for Planning (IMPLAN) economic modeling software, version 3.1, and 2016 datasets created by IMPLAN Group, LLC. Data on the number of

employees at the power plants are from the letter AES Ohio Generation, LLC (of which Dayton Power & Light is a subsidiary) issued in accordance with the Worker Adjustment and Retraining Notification Act (WARN).

The total effect on the local economy by each industrial sector can be calculated through an economic model known as a 'multiplier.' The multiplier expresses the number of additional jobs or amount of additional income created by each new job or each extra dollar earned. In this context, the multiplier expresses the number of additional jobs or amount of additional income *lost* for each job lost due to the power plants closures. For example, if a business closes, effectively removing ten direct jobs from the region, which subsequently leads to the loss of an additional seven jobs in the local economy through indirect and induced effects, the multiplier would be 1.7. For each job lost in the region, an additional 0.7 jobs (1 + 0.7 = 1.7) would be lost in existing industries in the local economy.

The IMPLAN model generates the multipliers that are used to calculate indirect and induced effects for each industrial sector. A multiplier known as the Type Social Accounting Matrix (SAM) multiplier was used in this study. The Type SAM multiplier estimates the indirect and induced effects on each industrial sector in the local economy as well as business, household, and government transactions.

The understanding of several terms is important for interpreting economic impact analyses.

- *Direct effect*: The series of initial changes in production.
- *Employment*: The annual average of monthly jobs in that industry (this is the same definition used by QCEW, BLS, and BEA nationally). Thus, one job lasting 12 months = two jobs lasting six months each = three jobs lasting four months each. A job can be either full-time or part-time.
- *Indirect effect*: The impact of local industries buying goods and services from other local industries.
- *Induced effect*: The response by an economy to an initial change (i.e., direct effect) that occurs through re-spending of income received by a component of value-added.
- *Labor income*: All forms of employment income, including employee compensation (i.e., wages and benefits) and proprietor income.

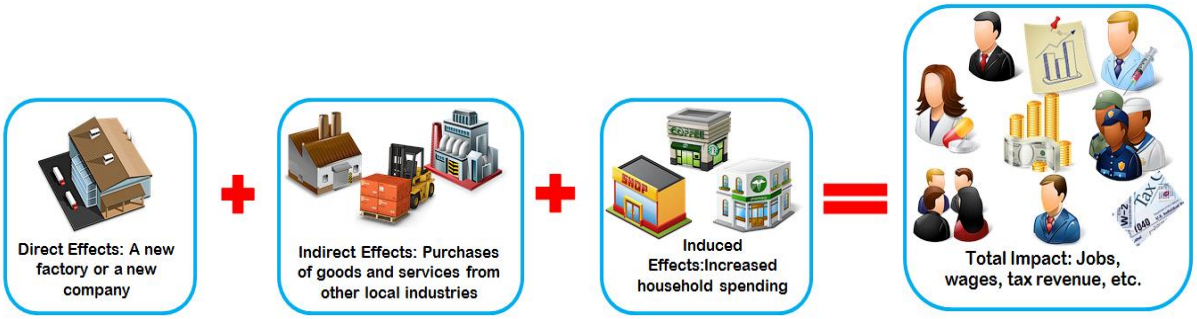
- *Multiplier*: Total production requirements within the study area for every unit of production sold to final demand. In this study, Type SAM (Social Accounting Matrix) multipliers are used.
- *Output*: The value of industry production. In IMPLAN, these are annual production estimates for the year of the data set and are in producer prices. For manufacturers, this would be sales plus or minus the change in inventory. For service sectors production, it is sales. For retail and wholesale trade, output is gross margin and not gross sales.
- *Value-added*: The difference between an industry's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value-added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus.

All businesses have a 'direct,' 'indirect,' and 'induced' effect on the economy. In this context, direct effects refer to the actual jobs and income lost in the local economy due to business closures. Indirect effects refer to the decrease in inter-industry transactions (e.g., the supply chain), since supplying industries will respond to the decrease in demand following the power plant shutdowns. Induced effects refer to the associated decrease in sales of goods and services in the local economy due to power plant employees losing their income.

Another way of expressing these effects is that a dollar not being spent in any sector of a local economy will lead to additional dollars not spent in other sectors. For example, an employee that just lost their job is less likely to go shopping for clothes at a local clothing store compared to the previous year when their job was secure, therefore generating less income for the clothing store's owner. Faced with this decrease in income, the owner is also less likely to spend, thereby providing less income for another local resident. The third person decreases his spending as well, which becomes less income for a fourth person, and so forth.

The sum of the total direct, indirect, and induced income is the total income lost in the local economy as a result of this activity. Employment works in much the same manner, and, hence, a business closing, effectively removing jobs from the region, results in additional job losses throughout the local economy. Figure 4.1 provides an overview of how the total economic impact is a function of direct, indirect, and induced impacts.

Figure 4.1: Description of Total Economic Impact3



Results

This study estimates the direct, indirect, and induced employment, as well as labor income impact, of the Killen Station, Stuart Station, and training center closures on the regional economy. Data on the number of employees' subject to layoff were acquired from the letter AES Ohio Generation, LLC (of which Dayton Power & Light is a subsidiary) issued in accordance with the Worker Adjustment and Retraining Notification Act (WARN), which reported 370 direct jobs would be lost at these facilities. As shown in Table 4.1, the Killen and Stuart power plant closures and the closure of an associated training facility in Manchester, Ohio will lead to the direct loss of 370 jobs. These 370 jobs generated an estimated $56 million in employee compensation. An additional 760 jobs will be lost in a variety of industries as an indirect consequence of the power plant closures. In total, the closure of these facilities will result in 1,131 lost jobs, over $82 million in lost labor income, and a reduction in economic output of nearly $700 million. A multiplier of 3.06 indicates that, for every job lost at the facilities, another 2.06 jobs are lost in the regional economy. In this case, that region is Adams, Brown, and Scioto Counties in Ohio, and Mason County in Kentucky.

[3] IMPLAN Group LLC. (2015). *Glossary*. Retrieved from http://www.implan.com/index.php?option=com_glossary&view=glossary&glossid=13&Itemid=1866

Table 4.1: Summary of Impact Results Based on WARN Report

Impact Type	*Employment*[4]	*Labor Income*	*Value Added*	*Output*
Direct Effect	*-370*	*-$56,008,657*	*-$269,519,825*	*-$608,363,072*
Indirect Effect	*-423*	*-$15,326,387*	*-$23,918,932*	*-$52,335,275*
Induced Effect	*-337*	*-$10,876,287*	*-$20,941,699*	*-$37,446,881*
Total Effect	*-1,131*	*-$82,211,331*	*-$314,380,456*	*-$698,145,227*
Multiplier	***3.06***	***1.47***	***1.17***	***1.15***

Next, Table 4.2 provides a detailed breakdown of the top 10 industries impacted by the job loss as a result of these closures. Most of these impacted industries are part of the power plant closure supply chain (i.e., indirect effects) or part of the economy impacted by the loss in labor income (e.g., restaurants and hospitals).

The WARN report represents the official impact of the closure with respect to direct job loss as reported to Ohio Department of Job and Family Services. However, various media reports (e.g., newspaper articles) have consistently reported higher job loss. A commonly reported figure is the loss of 690 jobs, comprising of 490 direct jobs and another 200 contractor jobs at the facilities.[5]

This study was unable to independently verify the 690 jobs loss report. Yet, in an effort to provide additional and comprehensive analysis, Tables 4.3 and 4.4 provide summary and detailed impacts *if* 690 jobs were, in fact, lost as a result of the closures. A loss of 690 direct jobs at these facilities would lead to an additional 1,418 jobs lost in the local economy. In total, these 2,108 jobs lost would lead to $153 million in lost labor income and a reduction in economic output of $1.3 billion. Again, the media reported estimates are higher than the official job loss reported in the WARN notice.

[4] Note: totals may not sum due to rounding.
[5] For example, see: https://www.daytondailynews.com/business/ohio-community-fights-proposed-dpl-coal-plant-closures/GQJRoZDrFoNYpEId3LLpYN/

Table 4.2: Top Ten Industries Impacted by Job Loss Based on WARN Report

Description	***Employment***	***Labor Income***	***Value Added***	***Output***
Electric power generation - Fossil fuel	*-370*	*-$56,825,275*	*-$273,449,479*	*-$617,387,595*
Extraction of natural gas and crude petroleum	*-143*	*-$604,306*	*-$1,188,410*	*-$10,655,973*
Maintenance and repair construction of nonresidential structures	*-47*	*-$1,670,224*	*-$2,084,335*	*-$5,683,044*
Full-service restaurants	*-42*	*-$688,131*	*-$767,569*	*-$1,763,699*
Limited-service restaurants	*-28*	*-$482,205*	*-$1,133,848*	*-$2,175,464*
Hospitals	*-23*	*-$1,403,393*	*-$1,608,954*	*-$3,151,160*
Real estate	*-20*	*-$193,532*	*-$1,272,800*	*-$2,425,873*
Employment services	*-20*	*-$680,560*	*-$997,870*	*-$1,379,477*
Monetary authorities and depository credit intermediation	*-17*	*-$836,786*	*-$3,812,150*	*-$5,349,149*
Legal services	*-17*	*-$445,904*	*-$691,802*	*-$1,423,650*

Table 4.3: Summary of Impact Results Based on Media Reports

Impact Type	***Employment***	***Labor Income***	***Value Added***	***Output***
Direct Effect	-690	-$104,448,579	-$502,618,064	-$1,134,514,944
Indirect Effect	-789	-$28,581,642	-$44,605,576	-$97,598,217
Induced Effect	-629	-$20,282,806	-$39,053,439	-$69,833,373
Total Effect	-2,108	-$153,313,027	-$586,277,080	-$1,301,946,534
Multiplier	**3.06**	**1.47**	**1.17**	**1.15**

Table 4.4: Top Ten Industries Impacted by Job Loss Based on Media Reports

Description	*Employment*	*Labor Income*	*Value Added*	*Output*
Electric power generation - Fossil fuel	-690	-$104,656,940	-$503,620,718	-$1,136,778,145
Extraction of natural gas and crude petroleum	-267	-$1,112,970	-$2,188,733	-$19,147,222
Maintenance and repair construction of nonresidential structures	-87	-$3,076,105	-$3,838,788	-$10,398,754
Full-service restaurants	-78	-$1,267,352	-$1,413,657	-$3,240,804
Limited-service restaurants	-53	-$888,093	-$2,088,244	-$3,997,423
Hospitals	-43	-$2,584,674	-$2,963,262	-$5,853,018
Real estate	-37	-$356,435	-$2,344,156	-$4,449,047
Employment services	-37	-$1,253,410	-$1,837,809	-$2,541,261
Monetary authorities and depository credit intermediation	-32	-$1,541,136	-$7,020,959	-$9,920,964
Legal services	-31	-$821,236	-$1,274,113	-$2,598,024

5. Data and Methodology

Data Sources

One of the challenges facing a skillshed analysis using publicly available data is the lack of information on employment distribution by occupation at the county level. Our approach is to derive that information from the available county-level data on employment distribution by industry. The industry-occupation matrix provided by the Bureau of Labor Statistics allows us to impute an estimate of county-level employment by occupation. Data on employment distribution by industry are from the Quarterly Census of Employment and Wages (QCEW).[6]

[6] Source: https://www.bls.gov/cew/datatoc.htm

The Quarterly Census of Employment and Wages (QCEW) program publishes a quarterly count of employment and wages reported by employers covering more than 95% of U.S. jobs. [7] Employees included in the QCEW are those covered by State unemployment insurance (UI) and Unemployment Compensation for Federal Employees (UCFE) programs. The data is available at the county, Metropolitan Statistical Area (MSA), state, and national levels by detailed industry. QCEW also includes information on the number of establishments operating within a specific geography. Employment data are available monthly and annually. We use the annual average of monthly employment levels for 2016.

Employment and wage data available through the QCEW program are classified by industry following the North American Industry Classification System (NAICS). This classification system groups establishments into industries based on the similarity of their production processes. There are 20 sectors and over 1,000 industries. We use information on employment by industry sector or two-digit NAICS level. Although we are using higher-level industry aggregations, employment counts for some counties are suppressed. Data suppression occurs when there are fewer than three establishments in a given industry for a geographic area or when one firm constitutes more than 80 percent of area employment in a given industry. For counties with suppressed data, we estimate the number of employees by industry using reported number of establishments and average number of employees per establishment. We calculate the average number of employees per establishment separately for Appalachian counties and non-Appalachian counties. The average number of employees per establishment is calculated by using data from the QCEW for counties where employment counts are not suppressed.[8]

[7] QCEW excludes certain national security agencies (for security reasons), proprietors, the unincorporated self-employed, unpaid family members, certain farm and domestic workers, and railroad workers covered by the railroad unemployment insurance system. Excluded as well are workers who earned no wages during the entire applicable pay period because of work stoppages, temporary layoffs, illness, or unpaid vacations. Excluded from QCEW federal government employment are elected officials in the executive or legislative branch, members of the armed forces or the Commissioned Corps of the National Oceanic and Atmospheric Administration, individuals serving on a temporary basis in case of fire, storm, earthquake, or other similar emergency, and individuals employed under a Federal relief program to relieve them from unemployment. Excluded from QCEW state and local government employment are elected officials, members of a legislative body or members of the judiciary, members of the state National Guard or Air National Guard, and employees serving on a temporary basis in case of fire, storm, snow, earthquake, flood or similar declared emergency.

[8] The average number of employees per establishment is calculated at the industry level by dividing the total number of employees over the total number of establishments for counties where both counts are reported.

Once we impute county-level employment distribution by industry, we sum those counts by region.[9] We produce an estimate of employment by industry sectors for the four regions of interest (OVRDC, Buckeye Hills, OMEGA, and ERCG). The next step is to map the industry level information into employment distribution by occupation. The Bureau of Labor Statistics has developed a national industry-occupation employment matrix.[10] The occupational structure of the matrix is based on the 2010 Standard Occupational Classification (SOC) system. SOC is a federal statistical standard used to classify workers into occupational categories. All workers are classified into one of 867 detailed occupations. This classification system groups jobs into occupations based on job duties, skills, education, and/or training.

We multiply the 867x20 occupation-industry employment matrix from the BLS data by the 20x4 industry-region employment matrix that we calculate from the QCEW data. This results in an 867x4 matrix of occupations and their corresponding estimated regional employment counts. To determine what skills are becoming obsolete and what skills will face an increase in demand, we supplement our data with information on industry and occupation employment projections from the Ohio Department of Job and Family Services, Bureau of Labor Market Information.

The Bureau completes 10-year employment projections or estimates of future employment. These forecasts reflect structural changes in the economy. The Ohio economy is expected to add over 300,000 jobs between 2014 and 2024. The health care and social assistance sector and the construction sector will account for 148,000 and 23,000 jobs respectively. Expected industry and occupation growth combined with the current industry concentration mapping allows us to predict changes in regional labor demand.

Determining emerging occupations is specific to each of the four regions. Classifying an occupation as emerging depends on it being nested in an industry with a regional location quotient higher than 1.1 or an industry classified as a regional economic driver by the region's Development Commission, as well as having positive labor employment projections.[11] Struggling occupations are occupations within the coal mining industry and the fossil fuel electric power generation industry that are exhibiting below average employment projections.

[9] Refer to table A.1 in the appendix for a comparison of the regional imputed total employment and the QCEW total employment.
[10] https://www.bls.gov/emp/ep_table_109.htm
[11] We estimate the number of openings per occupations at the regional level. We classify an occupation as emerging if it's expected to have openings over the 2014-2024 time period.

We map occupations into skills to determine which skills are overlapping between struggling and emerging occupations and which ones are lacking or need improving. The capacities and knowledge required to perform a job as well as work activities and job zone are from the Occupational Information Network (O*NET).[12] O*NET is a joint effort between the US 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.

We note that O*NET classifies occupation in one of five job zones. A job zone is a group of occupations that are similar in terms of the education, experience and on-the-job training that people need to do the job. 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. Job Zone 5 occupations require the most specialized knowledge. We include all O*NET job zones in our analysis. Previous skillshed analyses focus on job zone 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 region

The O*NET data includes measures of the level (from 0 to 7) of various capability dimensions associated with an occupation and the importance (from 1 to 5) of that capability within the occupation. While the same skill can be important for a variety of occupations, the amount or level of the skill needed in those occupations can differ dramatically. For example, the skill "speaking" is important for both lawyers and paralegals. However, lawyers (who frequently argue cases before judges and juries) are required to have a higher level of speaking skill, while paralegals only need an average level of this skill.

We use the O*NET data to calculate a dissimilarity measure. The dissimilarity measure used in this report is the squared Euclidean distance or L2 squared. Using 110 variables describing occupations' work activities, required capacities, knowledge levels, and job zone, we compare

[12] O*NET classifies occupational information in categories. We use information classified under three categories: work activities, knowledge, and skills. In the text, we refer to the O*NET skills category as capacities to avoid confusion with our broader definition of skills used throughout the report.

emerging occupations to struggling occupations. We are effectively calculating 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. We only include level values in this analysis since they provide more variation that the importance values. Adding the importance values does not provide additional information and would be redundant.

Matching and Clustering

Once we calculate a dissimilarity measure, we use Ward's agglomerative method to cluster 126 emerging occupations and 53 coal-dependent occupations into homogeneous groupings. Clustering is a tool that detects patterns in data and groups observations with similar characteristics. We group occupations into 5 clusters. [13]

Group 1 includes occupations requiring a high level of proficiency on the "computers and electronics" skill (4.4 on average) and the "administration and management" skill (4.1 on average). Occupations within this cluster are occupations that require an associate degree and 1-2 years of on the job training on average (Job Zone 3.7). Group 2 includes occupations requiring a high level of proficiency on the "psychology" skill (5.1 on average) and the "education and training" skill (4.6 on average) and the "medicine and dentistry" skill (3.5 on average). Occupations within this cluster are occupations that require a bachelor's degree on average (Job Zone 4.3). Group 3 includes occupations requiring a high level of proficiency on the "clerical" skill (3.8 on average). Occupations within this cluster are occupations that require a high school degree and months of on the job training on average (Job Zone 2.8). Group 4 includes occupations requiring a high level of proficiency on the "customer and personal service" skill (3.2 on average). Occupations within this cluster are occupations that may require a high school degree and days of on the job training on average (Job Zone 1.7). Group 5 includes occupations requiring a high level of proficiency on the "mechanical" skill (4.6 on average). Occupations within this cluster are occupations that require a high school degree and months of on the job training on average (Job Zone 2.5).

While a level of 3.2 on the customer and personal service skill, for example, does not indicate a high level of proficiency in absolute terms. Levels range from 0 to 7. This skill for this

[13] Examining the Je(2)/Je(1) ratio and the pseudo T-squared and following the Duda-Hart rule of thumb, the choice of 5 clusters is reasonable. The chosen number of clusters is associated with the highest the Je(2)/Je(1) ratio and one of the lowest pseudo T-squared.

group is the knowledge skill in which the grouped occupations require the highest level. Compared to other skills on which these occupations require a lower level, the customer and personal service skill emerges as the skill in which this group needs to be most proficient.

In section 7, we present a mapping of the coal reliant occupations into these five clusters. In the mapping tables, motivated by aesthetics, we divide coal reliant occupations into two groups: blue-collar occupations and white-collar occupations. White collar occupations are occupations that belong to the following clusters: (1) computers and electronics, (2) psychology/education and training/medicine and dentistry, (3) clerical. Blue collar occupations are occupations that belong to the following clusters: (4) customer and personal service, (5) mechanical. Including all coal occupations in one table creates large intractable tables. Finally, we note that coal occupations that belong to a cluster are enclosed with a red border in the mapping tables to indicate that less challenging transitions are to be found in that cluster for the occupation within the red border.

6. Coal fired power plant occupations

The decline in coal-fired electricity generation and the retiring of aging coal plants are responsible for a regional spike in unemployment. In this report, we aim to ease worker transitions from obsolete coal occupations into growing occupations. Using detailed occupational data from the Utility Workers Union of America that we match by description to the nearest Standard Occupational Classification (SOC) code, we identify the power plant occupations most impacted by these recent events. We list the eleven occupations in bold in table 6.1.

We augment the data from the Utility Workers Union of American with a list of 26 struggling occupations nested within the fossil fuel electric power generation industry that exhibit below average expected growth. The occupations are from the industry-occupation matrix available through the Bureau of Labor Statistics. We list the occupations in table 6.1 sorted by percent of occupation. Percent of occupation indicates the percent of employees in an occupation that work within an industry. Power plant operators, for example, is an occupation highly concentrated in the fossil fuel electric power generation industry with 44 percent of employees working in that industry.

A higher occupation percentage for an occupation in a shrinking industry implies it is harder for workers to transition into a different industry keeping the same job. Therefore, an occupational transition is required. On the other hand, if a small percentage of employees in a

given occupation worked in a shrinking industry, there would be no need to transition into a different occupation, they can keep the same occupation and simply transition into a different industry.

Additionally, employees in occupations with above average projected growth rate would probably be able to find a new job with a low search cost. We provide no mapping for those occupations. Employees in occupations already facing a below average projected growth rate will probably need more help to recover from economic shocks, e.g., power plant and mine closures. The average occupation employment growth rate at the Ohio level for 2014-2024 is 5.3 percent. Table 6.1 also includes percent of industry, median hourly wage and typical education associated with the listed occupations.

Some of the occupations identified through the Utility Workers Union of America data were expected to exhibit double digit growth over the 2014-2024 period (industrial machinery mechanics, computer system analysts, and machinists). We include mapping of these occupations in the tables. However, workers within these occupations will probably be able to find new employment without having to transition into a new occupation. They will probably need to relocate within the state of Ohio.

We also note that most of the coal-fired power plant occupations require very little formal education. Only 9 of the 37 coal-fired power plant occupations we include in this report require a bachelor's degree. Educated workers tend to have shorter duration of unemployment and they tend to be more efficient in acquiring and processing job search information (Mincer, 1991).

Table 6.1: Declining Fossil Fuel Electric Power Generation Occupations

Occupational title	Percent of occupation	Percent of industry	Employment projections 2014-2024	Median hourly wage	Typical education
Power plant operators	**43.6%**	**16.5%**	**-15.3%**	**$33.4**	**High school diploma or equivalent**
Electrical and electronics repairers, powerhouse, substation, and relay	22.5%	5.5%	-14.5%	$33.9	Postsecondary non-degree award
Power distributors and dispatchers	16.8%	2.1%	-7.8%	$36.1	High school diploma or equivalent
Electrical power-line installers and repairers	5.8%	7.3%	4.3%	$32.2	High school diploma or equivalent
Hoist and winch operators	5.0%	0.2%	-9.1%	$18.3	No formal educational credential
Control and valve installers and repairers, except mechanical door	**4.3%**	**2.1%**	**-7.6%**	**$31.2**	**High school diploma or equivalent**
Gas plant operators	2.2%	0.4%	-8.3%	$32.6	High school diploma or equivalent
Electrical engineers	1.9%	3.8%	1.6%	$37.1	Bachelor's degree
Meter readers, utilities	1.9%	0.7%	-22.9%	$20.2	High school diploma or equivalent
Stationary engineers and boiler operators	1.8%	0.7%	1.6%	$25.5	High school diploma or equivalent
Plant and system operators, all other	1.1%	0.1%	-4.4%	$23.2	High school diploma or equivalent
Industrial machinery mechanics	**0.9%**	**3.4%**	**18.0%**	**$22.6**	**High school diploma or equivalent**
Electrical and electronics engineering technicians	0.8%	1.2%	-1.7%	$28.7	Associate's degree
Electro-mechanical technicians	0.6%	0.1%	-3.3%	$26.2	Associate's degree
First-line supervisors of production and operating workers	0.6%	3.9%	-2.1%	$26.7	High school diploma or equivalent
Industrial production managers	0.5%	0.8%	-1.8%	$41.0	Bachelor's degree
Laborers and freight, stock, and material movers, hand	**0.4%**	**0.5%**	**5.7%**	**$11.7**	**No formal education credential**
Environmental engineering technicians	0.3%	0.1%	0.0%	$27.6	Associate's degree
Excavating and loading machine and dragline operators	0.3%	0.2%	0.0%	$19.4	High school diploma or equivalent
Petroleum engineers	0.2%	0.1%	0.0%	$52.7	Bachelor's degree
Mechanical drafters*	**0.2%**	**0.6%**	**-7.8%**	**$20.2**	**Associate's degree**
Purchasing agents, except wholesale, retail, and farm products	0.2%	**0.6%**	**-1.7%**	**$29.4**	**Bachelor's degree**

Occupational title	Percent of occupation	Percent of industry	Employment projections 2014-2024	Median hourly wage	Typical education
Electronics engineers, except computer	0.1%	0.1%	-3.2%	$42.9	Bachelor's degree
Executive secretaries and executive administrative assistants	0.1%	0.7%	-3.4%	$23.6	High school diploma or equivalent
Financial specialists, all other	0.1%	0.1%	0.0%	$33.7	Bachelor's degree
Maintenance and repair workers, general	**0.1**%	**2.0%**	**4.7%**	**$18.0**	**High school diploma or equivalent**
Surveying and mapping technicians	0.1%	0.1%	-7.5%	$19.9	High school diploma or equivalent
Computer system analysts	**0.1%**	**0.9%**	**20.4%**	**$39.7**	**Bachelor's degree**
Machinists	**0.1%**	**0.3%**	**10.4%**	**$19.1**	**High school diploma or equivalent**
Procurement clerks	0.1%	0.1%	-7.1%	$18.5	High school diploma or equivalent
Bill and account collectors	0.0%	0.1%	-5.5%	$15.4	High school diploma or equivalent
Bookkeeping, accounting, and auditing clerks	**0.0**%	**0.4%**	**-8.9%**	**$17.2**	**Some college, no degree**
Chief executives	0.0%	0.1%	-2.5%	$84.2	Bachelor's degree
Computer programmers	0.0%	0.1%	-8.7%	$32.8	Bachelor's degree
Helpers--production workers	0.0%	0.1%	-2.8%	$12.6	No formal educational credential
Human resources assistants, except payroll and timekeeping	0.0%	0.1%	-3.6%	$17.8	Associate's degree
Inspectors, testers, sorters, samplers, and weighers	**0.0%**	**0.2%**	**-1.0%**	**$17.4**	**High school diploma or equivalent**

Notes: Information in the table is a combination of data from the industry-occupation matrix, O*NET data, and the Ohio Department of Job and Family Services, Bureau of Labor Market Information employment projections. + U.S. occupation and median hourly wage is reported from O*NET since state level information is not available for these occupations

7. Mining occupations

The increase in mine closures as illustrated in figure 3.2 creates a need to map skills of coal occupations into emerging occupations. Mine occupations are listed in table 7.1. The occupations are from the industry-occupation matrix available through the Bureau of Labor Statistics. We list the occupations in table 7.1 sorted by percent of occupation. Percent of occupation indicates the percent of employees in an occupation that work within an industry. Roof bolters, for example, is an occupation highly concentrated in the mining industry with 89 percent of employees working in that industry.

A higher occupation percentage for an occupation in a shrinking industry implies it is harder for workers to transition into a different industry keeping the same job. Therefore, an occupational transition is required. On the other hand, if a small percentage of employees in a given occupation worked in a shrinking industry, there would be no need to transition into a different occupation, they can keep the same occupation and simply transition into a different industry.

Additionally, employees in occupations with above average projected growth rate would probably be able to find a new job with a low search cost. We provide no mapping for those occupations. Employees in occupations already facing a below average projected growth rate will probably need more help to recover from economic shocks, e.g., power plant and mine closures. The average occupation employment growth rate at the Ohio level for 2014-2024 is 5.3 percent. Table 7.1 also includes percent of industry, median hourly wage and typical education associated with the listed occupations. The occupations listed include 16 occupations that are specific to the mining industry and eight occupations that are also present in the fossil fuel electric power generation industry. We also note that most of the coal mining occupations require very little formal education. Only 4 of the 24 coal mining occupations we include in this report require a bachelor's degree.

Having identified struggling coal reliant occupations, in section 8, we examine regional industry concentration and determine growing industries by skillshed. Mapping of coal-fired power plant occupations into emerging occupation in the OVRDC, ERCG, and Buckeye-Hills regions and the mapping of mining occupations into emerging occupations in the OMEGA region is presented in section 9.

Table 7.1: Declining Mine Occupations

Occupational title	Percent of occupation	Percent of industry	Employment projections 2014-2024	Median hourly wage	Typical education
Roof bolters, mining	88.7%	6.6%	-9.1%	$26.4	High school diploma or equivalent
Mine shuttle car operators	86.9%	2.6%	-22%+	$27.4+	High school diploma or equivalent
Loading machine operators, underground mining	47.2%	2.4%	-6.7%	$25.2	No formal educational credential
Mine cutting and channeling machine operators	26.8%	3.2%	-2.6%	$20.2	High school diploma or equivalent
Continuous mining machine operators	26.7%	6.5%	-3.9%	$20.1	No formal educational credential
Mining and geological engineers, including mining safety engineers	9.2%	1.3%	0.0%	$31.6	Bachelor's degree
Helpers--extraction workers	8.4%	2.8%	-6.0%	$19.5	High school diploma or equivalent
Excavating and loading machine and dragline operators	5.9%	5.9%	0.0%	$19.4	High school diploma or equivalent
Conveyor operators and tenders	2.7%	1.5%	0.0%	$14.5	No formal educational credential
Mobile heavy equipment mechanics, except engines	2.0%	4.9%	3.9%	$22.8	High school diploma or equivalent
Hoist and winch operators	1.8%	0.1%	-9.1%	$18.3	No formal educational credential
Rail yard engineers, dinkey operators, and hostlers	1.8%	0.2%	0.0%	$26.9	High school diploma or equivalent
Crushing, grinding, and polishing machine setters, operators, and tenders	1.0%	0.6%	-3.5%	$15.9	High school diploma or equivalent
Pump operators, except wellhead pumpers	0.8%	0.2%	0.0%	$20.6	High school diploma or equivalent
Environmental engineering technicians	0.4%	0.1%	0.0%	$27.6	Associate's degree
Surveyors	0.4%	0.3%	-1.9%	$27.6	Bachelor's degree
First-line supervisors of production and operating workers	0.1%	0.7%	-2.1%	$26.7	High school diploma or equivalent
Helpers--production workers	0.1%	0.9%	-2.8%	$12.6	No formal educational credential
Industrial production managers	0.1%	0.3%	-1.8%	$41.0	Bachelor's degree
Inspectors, testers, sorters, samplers, and weighers	0.1%	0.8%	-1.0%	$17.4	High school diploma or equivalent
Weighers, measurers, checkers, and samplers, recordkeeping	0.1%	0.2%	-2.8%	$14.5	High school diploma or equivalent
Bookkeeping, accounting, and auditing clerks	0.0%	0.5%	-8.9%	$17.2	Some college, no degree
Payroll and timekeeping clerks	0.0%	0.1%	-4.9%	$19.1	High school diploma or equivalent
Purchasing agents, except wholesale, retail, and farm products	0.0%	0.3%	-1.7%	$29.4	Bachelor's degree

Note: Information in the table is from O*NET and the Ohio Department of Job and Family Services, Bureau of Labor Market Information. + National level data because state level information is not available for these occupations.

8. Regional industry concentration

Table 8.1 lists the 20 industry sectors and the corresponding location quotient by region. Location quotients measure the concentration of industry in the region compared to the concentration of the industry statewide in 2016. It is calculated by dividing the regional industry share of employment over the industry statewide share of employment. Industries that enjoy greater-than-average concentration within an area probably benefit from a set of environmental and or economic characteristics making firms within these industries more competitive than similar firms located elsewhere. By examining the industries in which these four regions have a large pool of workers, we can understand the regions' skillset and how they compare to each other and the statewide workforce. Table 8.1 also includes industry-specific statewide projected employment growth rate. Looking at the statewide projected growth rate, we can infer which occupations will face a decline in demand and which will need an influx of workers to keep up with expected growth.

The construction industry and the health care and social assistance industry are concentrated regionally in the Appalachian region. These industries are expected to grow significantly over the next few years. It is evident from table 8.1 that these industries are regional economic drivers. In the OVRDC region, the location quotient for health care and social assistance is 1.17 suggesting that employment in this industry is 17 percent above the Ohio average. The health and social assistance industry employment is projected to grow by 18.7 percent over 2014-2024. The Ohio average projected increase in employment across all industries is 5.3 percent.

In the Buckeye Hills region, the location quotient for health care and social assistance is 1.27 suggesting that employment in this industry is 27 percent above the Ohio average. In the ERCG region, the location quotient for health care and social assistance is 1.14 suggesting that employment in this industry is 14 percent above the Ohio average. The industry is not as concentrated in the OMEGA region where the location quotient is 1.01 suggesting that industry employment is what would be expected for an economy of the area's size. The location quotients for construction suggest that employment in this industry is 11 percent, 25 percent, 28 percent, and 9 percent above the Ohio average for the OVRDC, Buckeye Hills, OMEGA, and ERCG regions respectively. The construction industry employment is projected to grow by 12.2 percent over 2014-2024.

Table 8.1: Industry Location Quotient

Industry title [2-digit NAICS code]	OVRDC	Buckeye Hills	OMEGA	ERCG	Employment projections 2014-2024
Agriculture, forestry, fishing, and hunting	0.86	1.07	1.15	0.69	-10.5%
Mining	0.77	8.71	9.82	0.77	-4.1%
Construction	1.11	1.25	1.28	1.09	12.2%
Manufacturing	0.92	0.75	1.30	1.14	-4.2%
Wholesale trade	0.56	0.62	0.70	0.80	4.6%
Retail trade	1.39	1.17	1.32	1.25	2.8%
Transportation and warehousing	0.89	0.78	1.09	1.00	3.7%
Utilities	2.43	1.96	2.53	1.10	-17.3%
Information	0.86	0.64	0.78	0.74	-7.6%
Finance and insurance	0.81	0.75	0.50	0.48	4.3%
Real estate and rental and leasing	0.83	0.86	0.74	0.87	4.7%
Professional, scientific and technical services	0.51	0.54	0.39	0.50	11.5%
Management of companies and enterprises	0.26	0.31	0.12	0.41	3.9%
Administrative and waste services	0.82	0.52	0.64	1.09	8.3%
Educational services	1.19	1.27	0.98	0.82	5.6%
Health care and social assistance	1.17	1.27	1.01	1.14	18.7%
Arts, entertainment, and recreation	0.51	0.38	0.67	0.86	6.3%
Accommodation and food services	1.15	1.28	1.07	1.17	5.7%
Other services (Except government)	0.89	0.93	1.03	1.09	3.2%
Government	1.07	1.46	0.98	1.00	-2.5%

Notes: Location quotient is the concentration of occupation in the region compared to the concentration of occupation statewide for 2016 and it is calculated using data on employment from the QCEW. The Ohio industry employment forecast is from the Ohio Department of Job and Family Services, Bureau of Labor Market Information.

The utilities industry is concentrated regionally across all four development districts. This industry is expected to shrink significantly over the next few years. The location quotient for utilities suggests that employment in this industry is 143 percent, 96 percent, 153 percent, and 10 percent above the Ohio average for the OVRDC, Buckeye Hills, OMEGA, and ERCG regions respectively. Total estimated regional employment in the OVRDC is 176,612 employees, about 1.32 percent of which work in the utilities industry compared to 0.54 percent of the total Ohio estimated workforce (5,309,488 employees). Total estimated regional employment in Buckeye hill is 67,927 employees, about 1.06 percent of which work in the utilities industry. Total estimated regional employment in OMEGA is 195,170 employees, 1.37 percent of which work in the utilities industry. The utilities industry employment is projected to shrink by 17.3 percent over 2014-2024.

Total estimated regional employment in ERCG is 192,777 employees, 0.59 percent of which work in the utilities industry. The utilities industry employment is projected to shrink by 17.3 percent over 2014-2024.

The mining industry is concentrated in the Buckeye Hills and OMEGA regions. The location quotient for mining suggests that employment in this industry is 771 percent and 882 percent above the Ohio average for the Buckeye Hills and OMEGA regions respectively. The share of mining employment in Buckeye hill is about 1.82 percent compared to 0.21 percent, the share of mining employment statewide. The share of mining employment in OMEGA is 2.05 percent. The mining industry employment is projected to shrink by 4.1 percent over 2014-2024.

Table 8.2 presents the 22 occupational categories and the estimated employment count for all four development districts as well as the statewide occupational category projected growth rate. The counts are estimated using the BLS industry-occupation matrix as detailed in section 5. Examining the distribution of employment across occupational categories and the forecasted employment change, the findings mirror the previous table's results. The following occupational categories are expected to experience a significant increase in employment: computer and mathematical occupations (12.84%), community and social service occupations (8.04%), healthcare practitioners and technical occupations (15.16%), healthcare support occupations (25.39%), personal care and social service occupations (9.01%), and construction and extraction occupations (8.68%).

An individual preparing to enter the labor force or make a career change would be better off planning to work in one of the occupational categories experiencing high projected employment growth. Comparing high growth occupations' needs with the occupational experience of the coal-dependent workforce in the region, we are able to determine where an overlap exists and what improvements are required through possible targeted regional initiatives. Occupations can become obsolete, but skills do not. Employees can repurpose their skills sometimes immediately, but in other instances, additional training or education is needed.

When selecting target occupations or emerging occupations for which we examine the required skillset, we include occupations nested in growing industries with a regional location quotient above 1.1. In the OVRDC region, we consider occupation nested within the following industries: health care and social assistance and construction. We also include occupations in traditional and emerging industry clusters that were designated by the Ohio Valley Regional

Development Commission as regional economic drivers due to their employment concentration factor, economic prosperity factor, and being export-oriented industries. The development commission designated as target industries the following: agriculture, forestry, fishing and hunting; health care and social assistance; manufacturing; and transportation and warehousing.[14]

Table 8.2: Estimated Employment Count

Occupational category	OVRDC	Buckeye Hills	OMEGA	ERCG	Employment projections 2014-2024
Management	8,054	3,157	8,968	8,825	1.91%
Business and Financial Operations	7,037	2,761	7,242	7,358	6.49%
Computer and Mathematical	3,629	1,352	3,690	3,873	12.84%
Architecture and Engineering	2,616	999	3,593	3,108	1.67%
Life, Physical, and Social Science	1,156	506	1,344	1,200	7.12%
Community and Social Service	3,036	1,287	2,997	3,191	8.04%
Legal	667	296	647	707	4.43%
Education, Training, and Library	11,245	4,606	10,344	8,910	5.76%
Arts, Design, Entertainment, Sports, and Media	1,887	675	2,033	2,063	2.44%
Healthcare Practitioners and Technical	13,297	5,443	12,741	13,969	15.16%
Healthcare Support	6,713	2,771	6,377	7,147	25.39%
Protective Service	3,009	1,240	2,987	3,451	3.68%
Food Preparation and Serving Related	17,608	7,390	18,153	19,441	6.34%
Building and Grounds Cleaning and Maintenance	5,386	1,883	5,327	6,520	4.75%
Personal Care and Service	6,418	2,587	6,633	7,339	9.01%
Sales and Related	19,946	6,747	21,352	20,799	2.90%
Office and Administrative Support	25,832	9,722	27,069	27,628	1.16%
Farming, fishing, and forestry	436	188	614	453	-7.24%
Construction and Extraction	6,165	2,991	9,006	6,721	8.68%
Installation, Maintenance, and Repair	6,683	2,514	8,275	7,383	5.91%
Production	13,789	4,487	20,399	18,073	-2.66%
Transportation and Material Moving	11,710	4,204	15,052	14,312	4.83%

Note: Percent of region employment is calculated using the QCEW. The Ohio employment forecast is from the Ohio Department of Job and Family Services, Bureau of Labor Market Information.

In the Buckeye-Hills region, we consider occupations nested within the following industries: health care and social assistance and construction. We also include occupations in traditional and emerging industry clusters that were designated by the Buckeye Hills-Hocking

[14] OVRDC designates agriculture related business; healthcare related business; wood industry and related businesses; total manufacturing sector; and freight and transportation related business as regional economic drivers.

Regional Development District as drivers of the regional economy: Manufacturing, Educational services, and mining.[15] In the ERCG region, we consider occupation nested within the following industry: health care and social assistance. We also include occupations in traditional and emerging industry clusters that were designated by the Eastgate Regional Council of Governments as drivers of the regional economy: Agriculture, forestry, fishing, and hunting and manufacturing.[16]

In the OMEGA region, we consider occupation nested within the following industries: construction. We also include occupations in traditional and emerging industry clusters that were designated by the Ohio Mid-Eastern Governments Association as drivers of the regional economy: Agriculture, forestry, fishing, and hunting; mining; manufacturing.[17] In the following section, we compare skills of workers in struggling occupations to the skills required for occupations within emerging economic drivers by skillshed (OVRDC, Buckeye Hills, OMEGA, ERCG).

When mapping coal-dependent occupations into emerging occupations, we choose emerging occupations nested within either growing regional industries or industries that are of interest to an EDD. However, we apply an additional condition to guarantee that we are examining occupations that make the most strategic sense for a skillshed. We map into emerging occupations with projected openings above the mean of projected openings for growing occupations within a skillshed.[18]

9. Mapping

We map the skillset of struggling coal occupations into the skillset of emerging occupations in the Appalachian region using the methodology explained in section 5. The heat map colors, presented below, are based on the occupation dissimilarity measure. The lowest dissimilarity measures are coded dark green and are the easiest to transition into while the largest dissimilarity measures are coded bright red. A large dissimilarity measure implies that additional human capital investments are needed in order to perform the tasks the emerging occupation requires.

[15] Buckeye Hills designates manufacturing; health care; education; metals/polymers; and natural resource production as regional economic drivers.
[16] ERCG designates advanced manufacturing; automotive; healthcare; and agriculture as regional economic drivers.
[17] OMEGA designates primary metal manufacturing; glass and ceramics; fabricated metals product manufacturing; mining; forest and wood products; electrical equipment, appliance, and component manufacturing; chemicals and chemical based products; machinery manufacturing; advanced materials; agribusiness, food processing, and technology; and manufacturing super cluster as regional economic drivers.
[18] Projected openings are imputed using QCEW and the industry-occupation matrix.

In the heat map tables, we use a 3-color scale that changes from green (lowest dissimilarity value) to yellow (median dissimilarity value) to red (highest dissimilarity value). The heat maps with dissimilarity measure reported are available in Appendix F. Instead of the dissimilarity measure, in table 9.1-9.4 and appendices B-E, inside the colored cells we include median hourly wage differentials. Median hourly wage differentials are the difference between the declining occupation and emerging occupation median hourly wages. An individual examining the tables can make an informed decision on a new career using both a color indicator describing the level of challenge associated with an occupational transition and the wage differential.

Power Plant Occupations to Emerging Occupations

In tables 9.1-9.2 and appendix B, we present heat maps for coal-fired power plant occupations by cluster for emerging occupations in all three skillsheds (OVRDC, ERCG, Buckeye-Hills). In Appendix C, we present heat maps by cluster for emerging occupations in two skillsheds (OVRDC and Buckeye Hills). In Appendix D, we present heat maps by cluster for emerging occupations only in the Buckeye Hills skillshed.

In section 6 and section 7, we discuss occupations' propensity to be a part of multiple industries. In addition, the majority of growing regionally concentrated industries overlap for all three skillsheds. We present growing occupations that overlap for all three skillsheds first and then occupations that are skillshed specific. Two reasons exist for an occupation to be considered a growing occupation in one skillshed and not the other. Either it is not an occupation robustly required by one of the non-overlapping growing industries, or it is an occupation with projected openings below the mean of projected openings for growing occupations within a skillshed. For formatting purposes, we divide power plant occupations into a white/blue collar classification to avoid overextended tables.

All tables in this section include emerging occupations available in the three skillsheds (OVRDC, ERCG, AND Buckeye Hills). Table 9.1 illustrates mapping of white-collar power plant workers into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill. Table B.1 illustrates the mapping of blue-collar power plant workers into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill. Contrasting the two tables, white-collar workers will have a relatively easier time transitioning into this grouping of occupations than blue collar workers.

Table B.2 and table B.3 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the psychology skill and the education and training skill and the medicine and dentistry skill. Contrasting these two tables, we find similarly to the previous set of tables, that white collar workers will have a relatively easier time transitioning into these occupations than blue collar workers. However, we note that the white collar matches in this cluster are coded with a light green while the white color matches in the previous cluster were coded with dark green. Therefore, white-collar transitions into the computer and electronics/administration and management cluster are more accessible than transitions into psychology/education and training/medicine and dentistry cluster.

Table B.4 and table B.5 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the clerical skill. Both types of power plant workers seem to have relatively easy matches in this cluster. Table B.6 and table B.7 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the customer and personal service skill. Contrasting these two tables, we find that blue collar workers will have a relatively easier time transitioning into these occupations than white collar workers.

The last set of tables, table 9.2 and table B.8 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the mechanical skill. Here, it is clear that transitions into the mechanical cluster for blue-collar power plant workers present fewer challenges.

White collar occupational transitions are the least challenging in the computer and electronics/administration and management cluster on average. The average median hourly wage for white-collar power plant occupations is $33. The average median hourly wage for computer and electronics/administration and management occupations is $34. These less challenging transitions still require time and resources spent to prepare these workers for their new careers, but the upside is that they will maintain a wage similar to their previous occupation.

Blue-collar power plant occupations are able to transition easier than white-collar transitions to occupations in the mechanical cluster. Significantly less training is required on average. However, these relatively easy transitions are associated with a decrease in hourly median wage by $4 on average.

All tables in appendix C include emerging occupations available in two skillsheds (OVRDC and Buckeye Hills). Two reasons exist for an occupation to be considered a growing occupation in one skillshed and not the other. Either it is not an occupation robustly required by one of the non-overlapping growing industries, or it is an occupation with projected openings below the mean of projected openings for growing occupations within a skillshed.

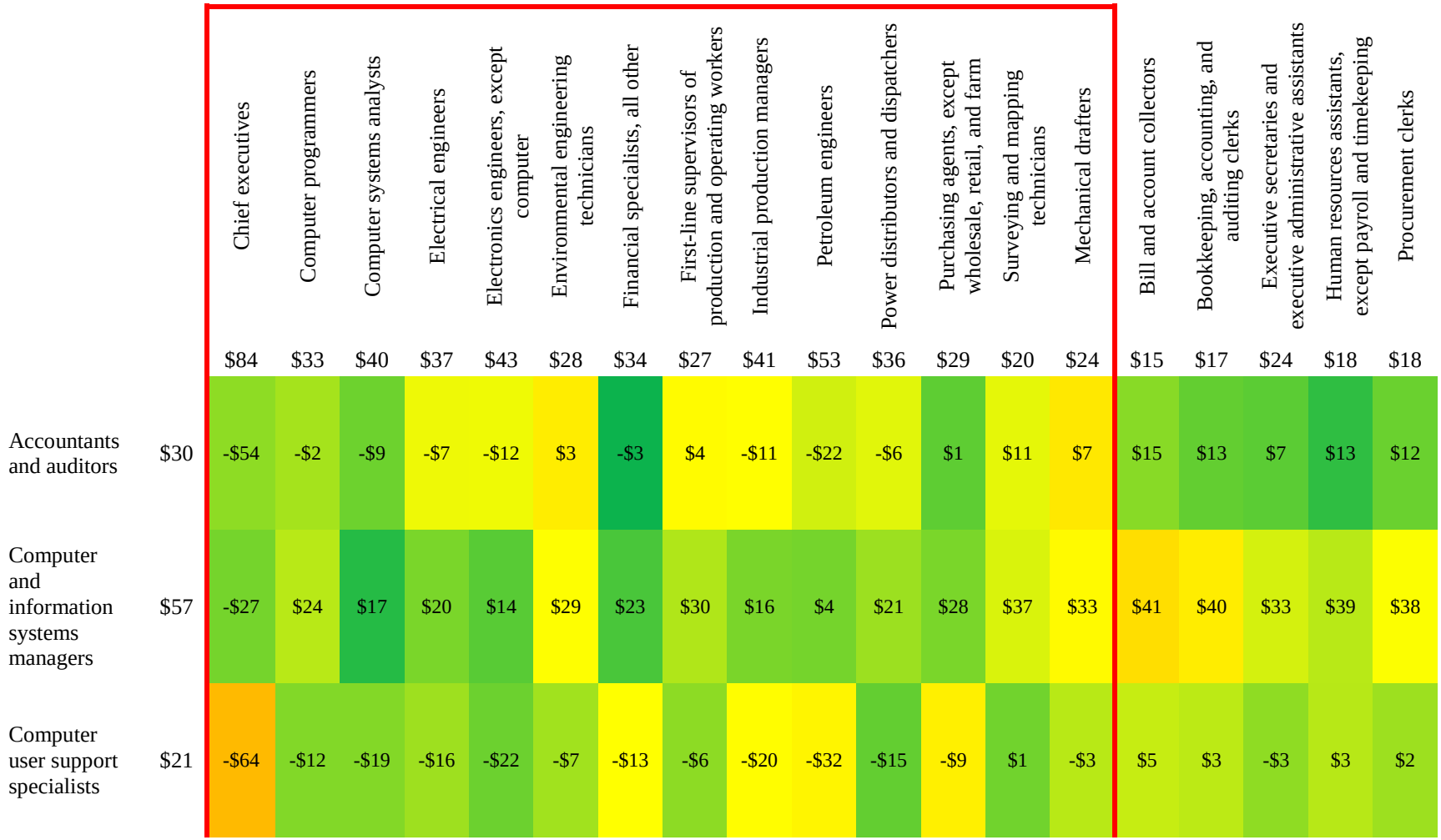
Table C.1 illustrates mapping of blue-collar power plant workers into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill. Table C.2 illustrates mapping of white-collar power plant workers into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill.

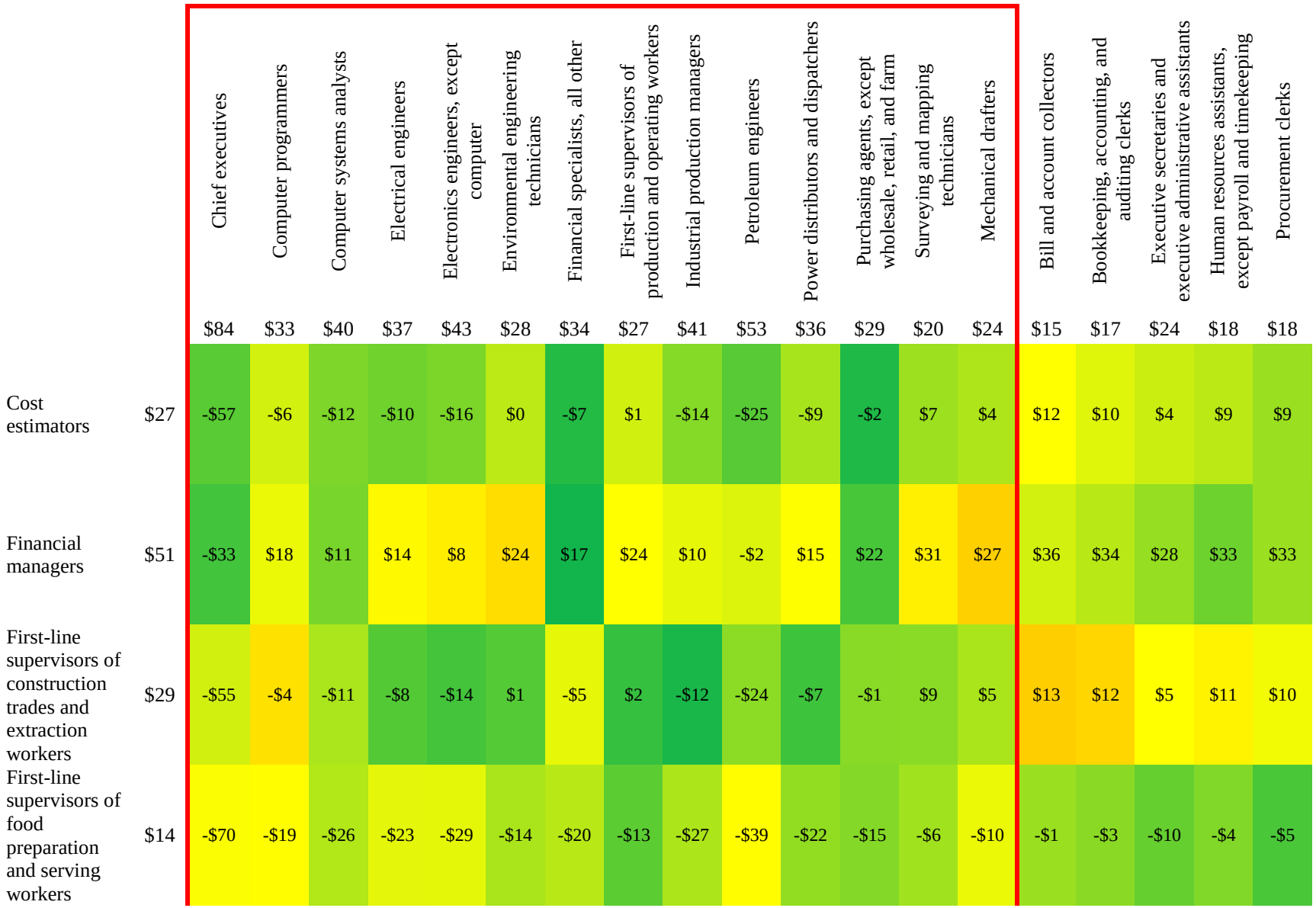
Table C.3 and table C.4 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the psychology skill and the education and training skill and the medicine and dentistry skill. Table C.5 and table C.6 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the mechanical skill.

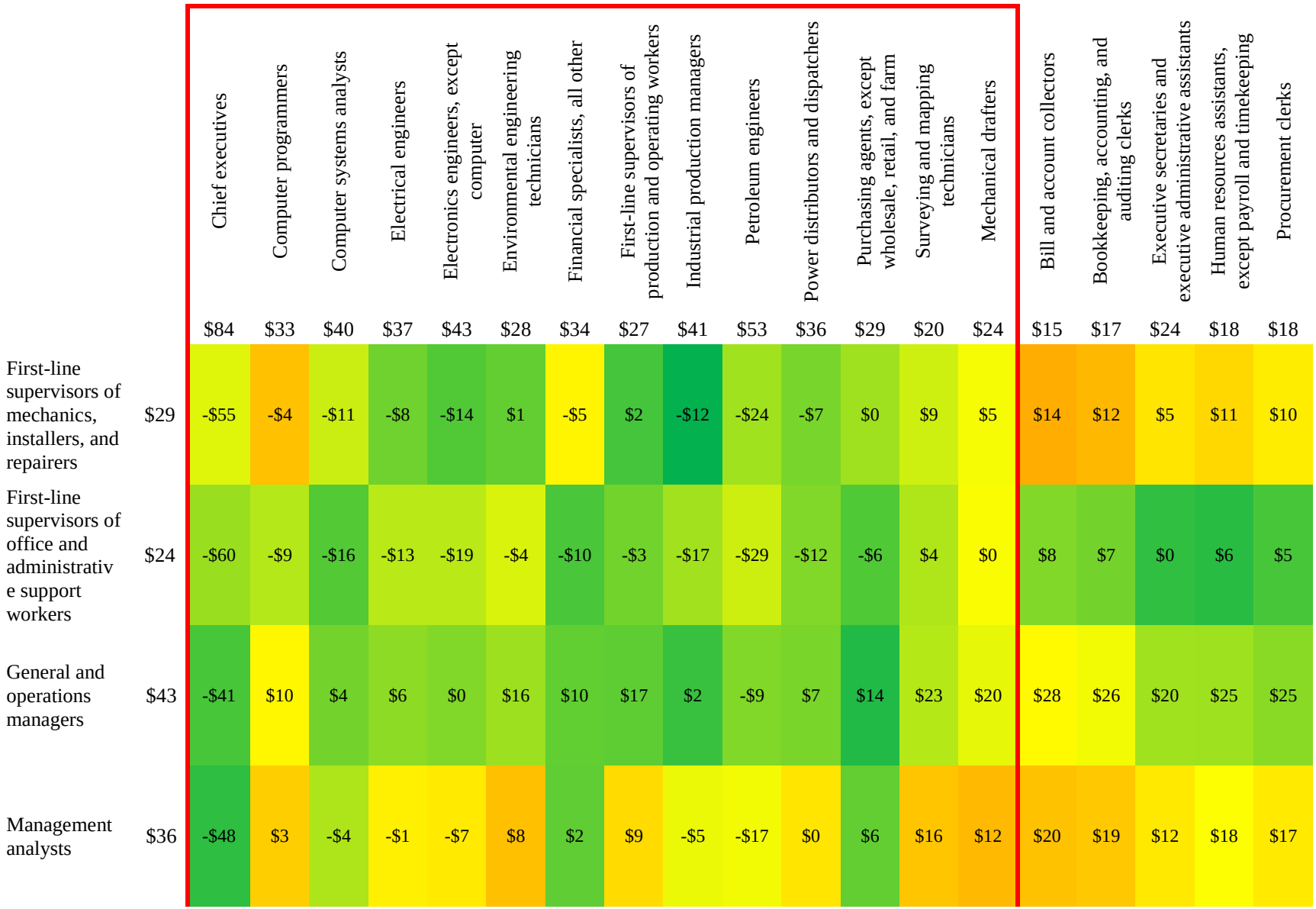
All tables in Appendix D include emerging occupations available in the Buckeye Hills skillshed. Table D.1 illustrates mapping of blue-collar power plant workers into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill. Table D.2 illustrates mapping of white-collar power plant workers into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill.

Table D.3 and table D.4 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the psychology skill and/or the education and training skill and/or the medicine and dentistry skill. Table D.5 and table D.6 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the mechanical skill.

Table 9.1: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills




Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating workers
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative assistants
Human resources assistants, except payroll and timekeeping
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Cost estimators $27 -$57 -$6 -$12 -$10 -$16 $0 -$7 $1 -$14 -$25 -$9 -$2 $7 $4 $12 $10 $4 $9 $9
Financial managers $51 -$33 $18 $11 $14 $8 $24 $17 $24 $10 -$2 $15 $22 $31 $27 $36 $34 $28 $33 $33
First-line supervisors of construction trades and extraction workers $29 -$55 -$4 -$11 -$8 -$14 $1 -$5 $2 -$12 -$24 -$7 -$1 $9 $5 $13 $12 $5 $11 $10
First-line supervisors of food preparation and serving workers $14 -$70 -$19 -$26 -$23 -$29 -$14 -$20 -$13 -$27 -$39 -$22 -$15 -$6 -$10 -$1 -$3 -$10 -$4 -$5


Chief executives
Computer programmers
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Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating workers
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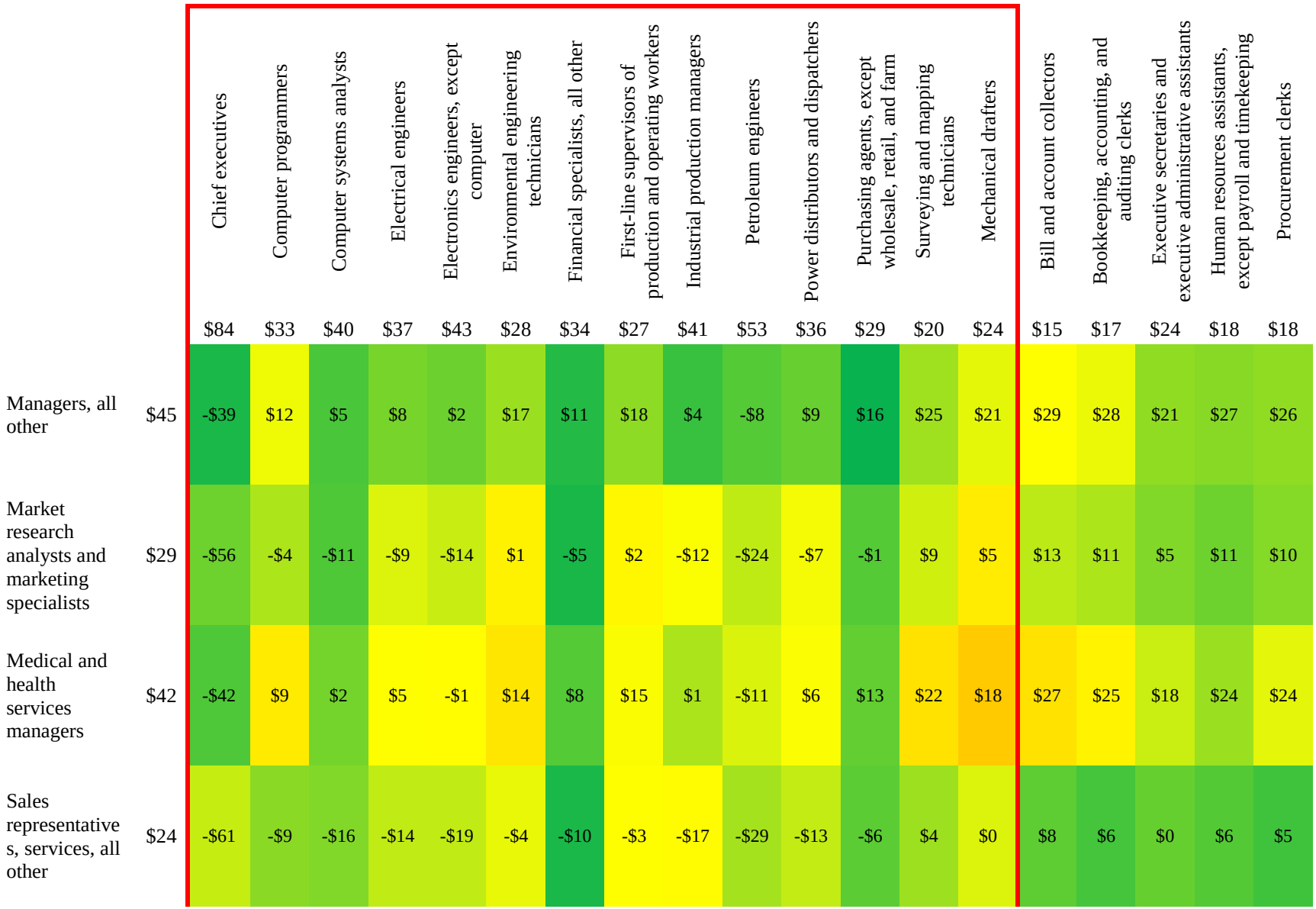
Human resources assistants, except payroll and timekeeping
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
First-line supervisors of mechanics, installers, and repairers
$29 -$55 -$4 -$11 -$8 -$14 $1 -$5 $2 -$12 -$24 -$7 $0 $9 $5 $14 $12 $5 $11 $10
First-line supervisors of office and administrative support workers
$24 -$60 -$9 -$16 -$13 -$19 -$4 -$10 -$3 -$17 -$29 -$12 -$6 $4 $0 $8 $7 $0 $6 $5
General and operations managers
$43 -$41 $10 $4 $6 $0 $16 $10 $17 $2 -$9 $7 $14 $23 $20 $28 $26 $20 $25 $25
Management analysts
$36 -$48 $3 -$4 -$1 -$7 $8 $2 $9 -$5 -$17 $0 $6 $16 $12 $20 $19 $12 $18 $17


Chief executives
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Executive secretaries and executive administrative assistants
Human resources assistants, except payroll and timekeeping
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Managers, all other $45 -$39 $12 $5 $8 $2 $17 $11 $18 $4 -$8 $9 $16 $25 $21 $29 $28 $21 $27 $26
Market research analysts and marketing specialists $29 -$56 -$4 -$11 -$9 -$14 $1 -$5 $2 -$12 -$24 -$7 -$1 $9 $5 $13 $11 $5 $11 $10
Medical and health services managers $42 -$42 $9 $2 $5 -$1 $14 $8 $15 $1 -$11 $6 $13 $22 $18 $27 $25 $18 $24 $24
Sales representatives, services, all other $24 -$61 -$9 -$16 -$14 -$19 -$4 -$10 -$3 -$17 -$29 -$13 -$6 $4 $0 $8 $6 $0 $6 $5

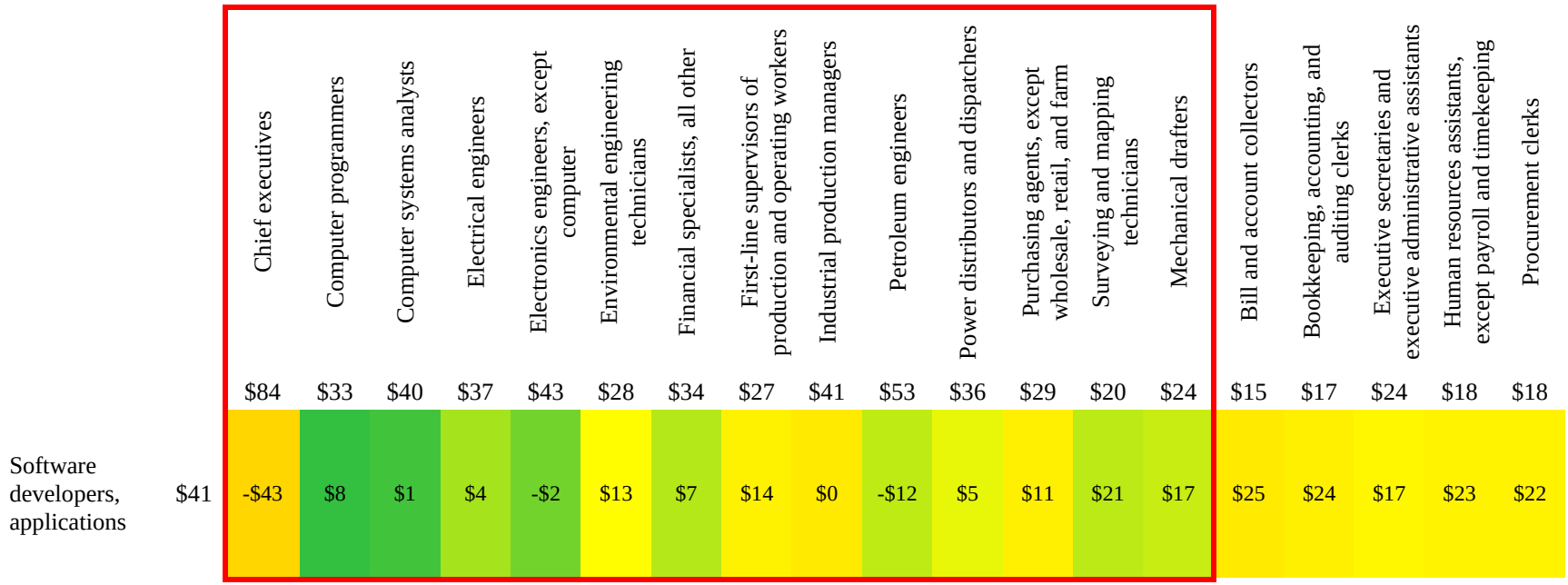
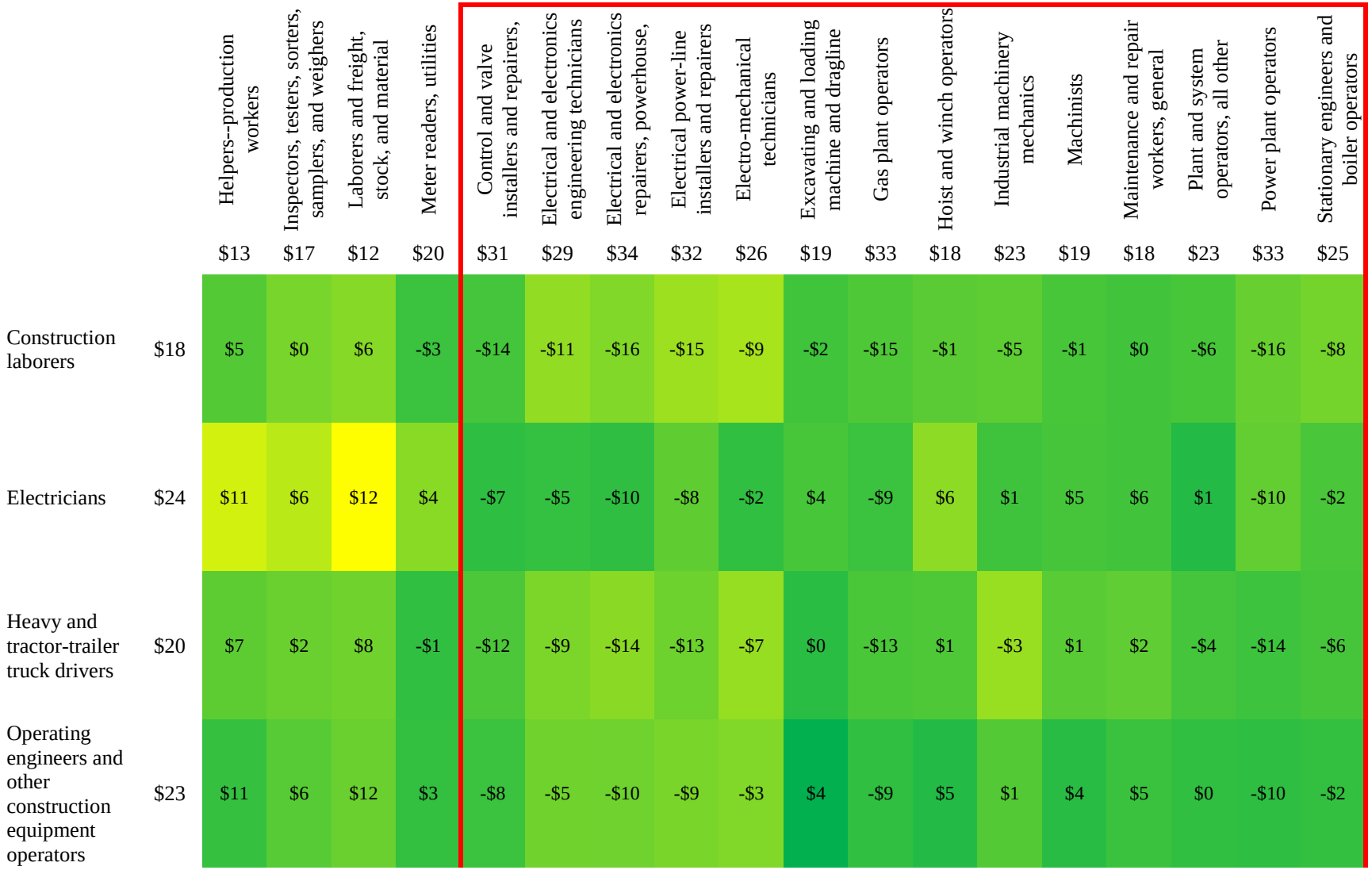
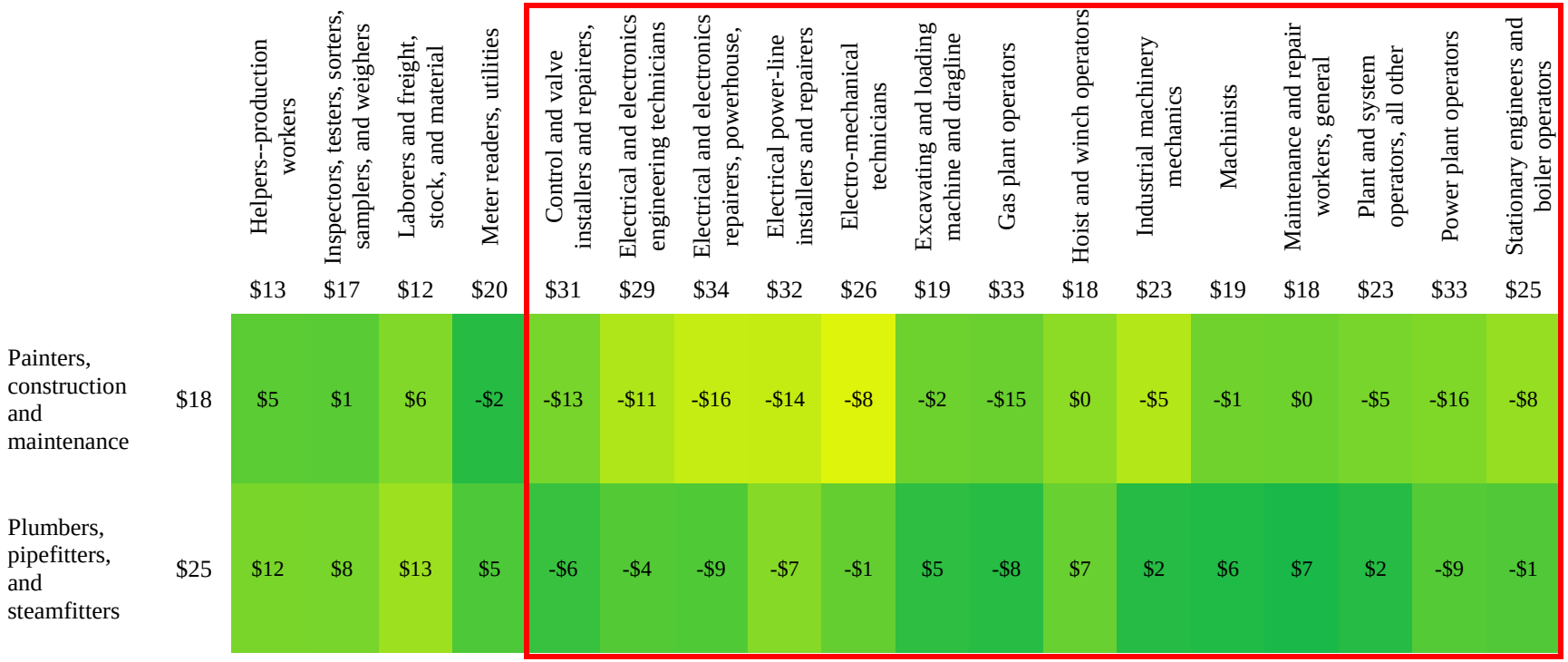

Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating workers
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative assistants
Human resources assistants, except payroll and timekeeping
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Software developers, applications
$41
-$43 $8 $1 $4 -$2 $13 $7 $14 $0 -$12 $5 $11 $21 $17 $25 $24 $17 $23 $22

Table 9.2: Blue Collar Occupations into Occupations Requiring Mechanical Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material	Meter readers, utilities	Control and valve installers and repairers,	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Automotive service technicians and mechanics	$17	$4	$0	$5	-$3	-$14	-$12	-$17	-$15	-$9	-$2	-$16	-$1	-$6	-$2	-$1	-$6	-$16	-$9
Bus and truck mechanics and diesel engine specialists	$21	$9	$4	$9	$1	-$10	-$8	-$13	-$11	-$5	$2	-$12	$3	-$1	$2	$3	-$2	-$12	-$4
Carpenters	$21	$8	$4	$9	$1	-$10	-$8	-$13	-$11	-$5	$2	-$12	$3	-$2	$2	$3	-$2	-$12	-$4
Computer-controlled machine tool operators, metal and plastic	$18	$5	$0	$6	-$2	-$14	-$11	-$16	-$15	-$8	-$2	-$15	-$1	-$5	-$1	$0	-$5	-$16	-$8


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material
Meter readers, utilities
Control and valve installers and repairers,
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Construction laborers $18 $5 $0 $6 -$3 -$14 -$11 -$16 -$15 -$9 -$2 -$15 -$1 -$5 -$1 $0 -$6 -$16 -$8
Electricians $24 $11 $6 $12 $4 -$7 -$5 -$10 -$8 -$2 $4 -$9 $6 $1 $5 $6 $1 -$10 -$2
Heavy and tractor-trailer truck drivers $20 $7 $2 $8 -$1 -$12 -$9 -$14 -$13 -$7 $0 -$13 $1 -$3 $1 $2 -$4 -$14 -$6
Operating engineers and other construction equipment operators $23 $11 $6 $12 $3 -$8 -$5 -$10 -$9 -$3 $4 -$9 $5 $1 $4 $5 $0 -$10 -$2


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material
Meter readers, utilities
Control and valve installers and repairers,
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Painters, construction and maintenance
$18
$5 $1 $6 -$2 -$13 -$11 -$16 -$14 -$8 -$2 -$15 $0 -$5 -$1 $0 -$5 -$16 -$8
Plumbers, pipefitters, and steamfitters
$25
$12 $8 $13 $5 -$6 -$4 -$9 -$7 -$1 $5 -$8 $7 $2 $6 $7 $2 -$9 -$1

Mine Occupations to Emerging Occupations in the OMEGA Region

In tables 9.3-9.4 and appendix E, we present heat maps for mine occupations by cluster for emerging occupations in the OMEGA skillshed. For formatting purposes, we divide power plant occupations into a white/blue collar classification to avoid overextended tables. Table E.1 and table 9.3 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the computer and electronics skill and the administration and management skill. Contrasting the two tables, it is clear that white collar workers will have a relatively easier time transitioning into these occupations than blue collar workers. We do not map the skills of mine workers into occupations that require a high proficiency on the psychology skill and the education and training skill and the medicine and dentistry skill. These occupations are not nested within emerging industries for the OMEGA region.

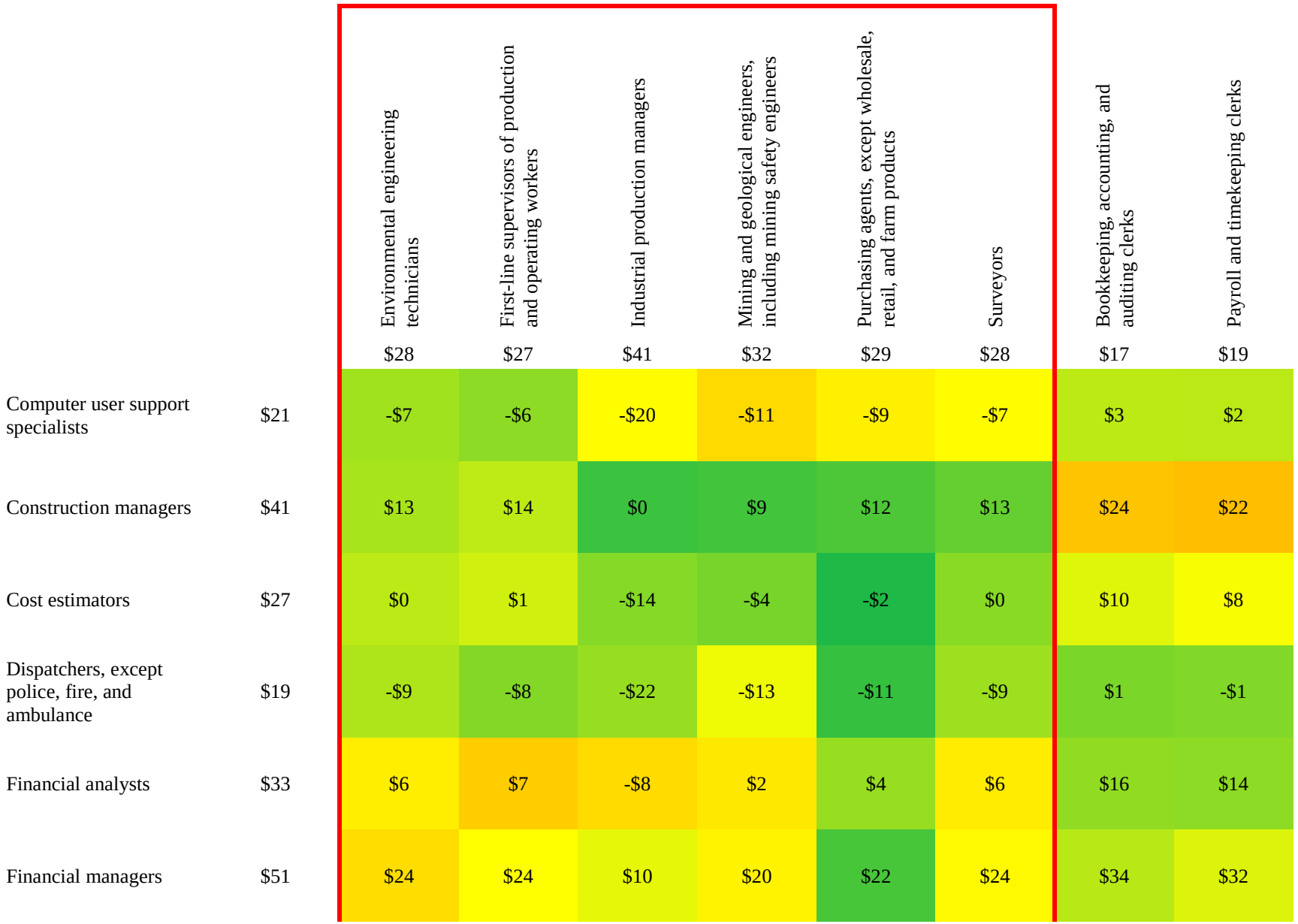
Table E.2 and table E.3 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the clerical skill. Both types of power plant workers seem to have a small number of relatively easy matches in this cluster. Table E.4 and table E.5 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the customer and personal service skill. Contrasting these two tables, we find that blue-collar workers will have a relatively easier time transitioning into these occupations than white-collar workers.

The last set of tables in this section, table 9.4 and table E.6 illustrate the mapping of blue-collar and white-collar power plant workers respectively into emerging occupations that require a high proficiency on the mechanical skill. Here, transitions into the mechanical cluster for blue-collar power plant workers present fewer challenges.

White collar occupational transitions are the least challenging in the computer and electronics/administration and management cluster on average. The average median hourly wage for white-collar mine occupations is $27. The average median hourly wage for computer and electronics/administration and management occupations is $34. These less challenging transitions still require time and resources spent to prepare these workers for their new careers, but the upside is that they will earn a larger wage compared to their previous occupation. Blue-collar mine occupations can transition easier than white-collar workers to occupations in the mechanical cluster. Significantly less training is required on average.

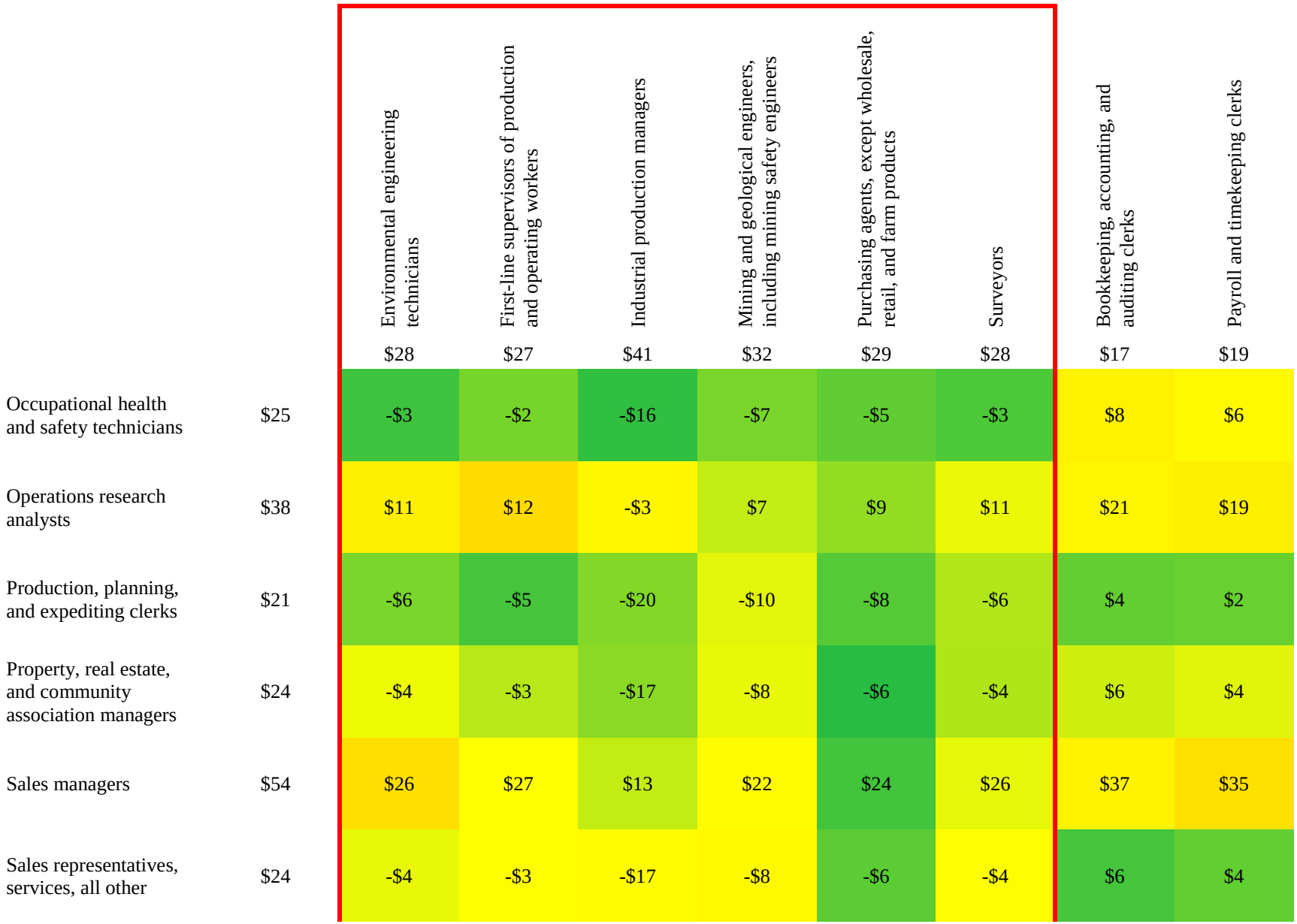
Table 9.3: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Accountants and auditors	$30	$3	$4	-$11	-$1	$1	$3	$13	$11
Administrative services managers	$37	$10	$11	-$4	$6	$8	$10	$20	$18
Business operations specialists, all other	$30	$2	$3	-$11	-$2	$1	$2	$13	$11
Civil engineers	$37	$9	$10	-$4	$5	$7	$9	$19	$17
Computer and information systems managers	$57	$29	$30	$16	$25	$28	$29	$40	$38


Environmental engineering technicians
First-line supervisors of production and operating workers
Industrial production managers
Mining and geological engineers, including mining safety engineers
Purchasing agents, except wholesale, retail, and farm products
Surveyors
Bookkeeping, accounting, and auditing clerks
Payroll and timekeeping clerks
$28 $27 $41 $32 $29 $28 $17 $19
Computer user support specialists $21 -$7 -$6 -$20 -$11 -$9 -$7 $3 $2
Construction managers $41 $13 $14 $0 $9 $12 $13 $24 $22
Cost estimators $27 $0 $1 -$14 -$4 -$2 $0 $10 $8
Dispatchers, except police, fire, and ambulance $19 -$9 -$8 -$22 -$13 -$11 -$9 $1 -$1
Financial analysts $33 $6 $7 -$8 $2 $4 $6 $16 $14
Financial managers $51 $24 $24 $10 $20 $22 $24 $34 $32

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
First-line supervisors of construction trades and extraction workers	$29	$1	$2	-$12	-$3	-$1	$1	$12	$10
First-line supervisors of mechanics, installers, and repairers	$29	$1	$2	-$12	-$3	$0	$1	$12	$10
First-line supervisors of non-retail sales workers	$34	$7	$8	-$7	$3	$5	$7	$17	$15
First-line supervisors of office and administrative support workers	$24	-$4	-$3	-$17	-$8	-$6	-$4	$7	$5
General and operations managers	$43	$16	$17	$2	$12	$14	$16	$26	$24
Lawyers	$46	$19	$20	$5	$15	$17	$19	$29	$27

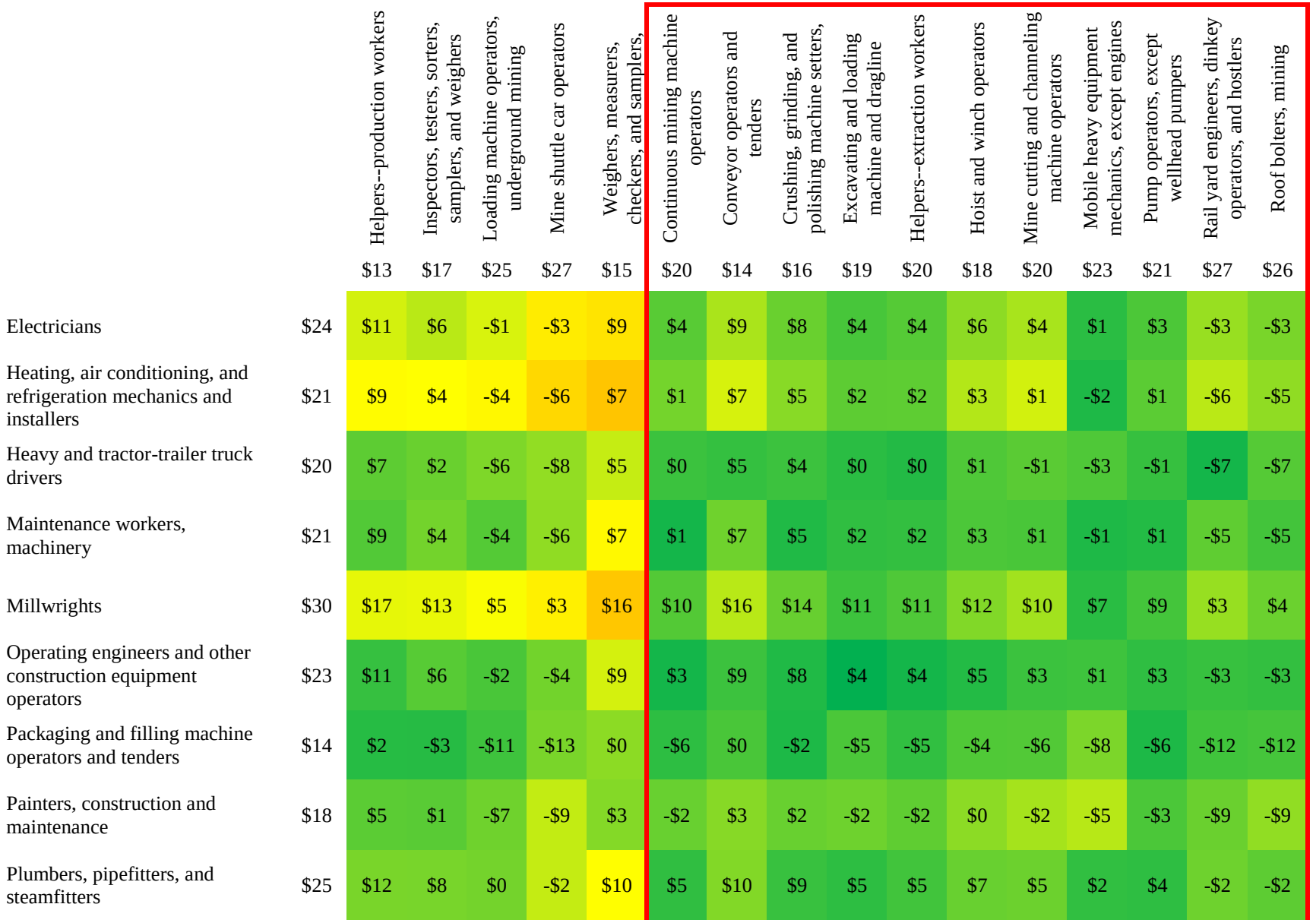
		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Management analysts	$36	$8	$9	-$5	$4	$6	$8	$19	$17
Managers, all other	$45	$17	$18	$4	$13	$16	$17	$28	$26
Market research analysts and marketing specialists	$29	$1	$2	-$12	-$3	-$1	$1	$11	$9
Mechanical engineers	$35	$7	$8	-$6	$4	$6	$8	$18	$16
Medical and health services managers	$42	$14	$15	$1	$10	$13	$14	$25	$23
Network and computer systems administrators	$33	$6	$7	-$8	$2	$4	$6	$16	$14


Environmental engineering technicians
First-line supervisors of production and operating workers
Industrial production managers
Mining and geological engineers, including mining safety engineers
Purchasing agents, except wholesale, retail, and farm products
Surveyors
Bookkeeping, accounting, and auditing clerks
Payroll and timekeeping clerks
$28
$27
$41
$32
$29
$28
$17
$19
Occupational health and safety technicians
$25
-$3
-$2
-$16
-$7
-$5
-$3
$8
$6
Operations research analysts
$38
$11
$12
-$3
$7
$9
$11
$21
$19
Production, planning, and expediting clerks
$21
-$6
-$5
-$20
-$10
-$8
-$6
$4
$2
Property, real estate, and community association managers
$24
-$4
-$3
-$17
-$8
-$6
-$4
$6
$4
Sales managers
$54
$26
$27
$13
$22
$24
$26
$37
$35
Sales representatives, services, all other
$24
-$4
-$3
-$17
-$8
-$6
-$4
$6
$4

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Software developers, applications	$41	$13	$14	$0	$9	$11	$13	$24	$22
Training and development specialists	$27	-$1	$0	-$14	-$5	-$3	-$1	$10	$8

Table 9.4: Blue Collar Occupations into Occupations Requiring Mechanical Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers,	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters,	Excavating and loading machine and dragline	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
		$13	$17	$25	$27	$15	$20	$14	$16	$19	$20	$18	$20	$23	$21	$27	$26
Automotive service technicians and mechanics	$17	$4	$0	-$8	-$10	$2	-$3	$3	$1	-$2	-$3	-$1	-$3	-$6	-$4	-$10	-$9
Brickmasons and blockmasons	$25	$12	$7	$0	-$3	$10	$5	$10	$9	$5	$5	$7	$5	$2	$4	-$2	-$2
Bus and truck mechanics and diesel engine specialists	$21	$9	$4	-$4	-$6	$7	$1	$7	$5	$2	$2	$3	$1	-$2	$1	-$6	-$5
Cabinetmakers and bench carpenters	$15	$3	-$2	-$10	-$12	$1	-$5	$1	-$1	-$4	-$4	-$3	-$5	-$7	-$5	-$11	-$11
Carpenters	$21	$8	$4	-$4	-$6	$7	$1	$7	$5	$2	$2	$3	$1	-$2	$0	-$6	-$5
Cement masons and concrete finishers	$20	$7	$2	-$5	-$8	$5	$0	$5	$4	$0	$0	$1	$0	-$3	-$1	-$7	-$7
Computer-controlled machine tool operators, metal and plastic	$18	$5	$0	-$7	-$10	$3	-$2	$3	$2	-$2	-$2	-$1	-$2	-$5	-$3	-$9	-$9
Construction laborers	$18	$5	$0	-$7	-$10	$3	-$2	$3	$2	-$2	-$2	-$1	-$3	-$5	-$3	-$9	-$9


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers,
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters,
Excavating and loading machine and dragline
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
$13 $17 $25 $27 $15 $20 $14 $16 $19 $20 $18 $20 $23 $21 $27 $26
Electricians $24 $11 $6 -$1 -$3 $9 $4 $9 $8 $4 $4 $6 $4 $1 $3 -$3 -$3
Heating, air conditioning, and refrigeration mechanics and installers $21 $9 $4 -$4 -$6 $7 $1 $7 $5 $2 $2 $3 $1 -$2 $1 -$6 -$5
Heavy and tractor-trailer truck drivers $20 $7 $2 -$6 -$8 $5 $0 $5 $4 $0 $0 $1 -$1 -$3 -$1 -$7 -$7
Maintenance workers, machinery $21 $9 $4 -$4 -$6 $7 $1 $7 $5 $2 $2 $3 $1 -$1 $1 -$5 -$5
Millwrights $30 $17 $13 $5 $3 $16 $10 $16 $14 $11 $11 $12 $10 $7 $9 $3 $4
Operating engineers and other construction equipment operators $23 $11 $6 -$2 -$4 $9 $3 $9 $8 $4 $4 $5 $3 $1 $3 -$3 -$3
Packaging and filling machine operators and tenders $14 $2 -$3 -$11 -$13 $0 -$6 $0 -$2 -$5 -$5 -$4 -$6 -$8 -$6 -$12 -$12
Painters, construction and maintenance $18 $5 $1 -$7 -$9 $3 -$2 $3 $2 -$2 -$2 $0 -$2 -$5 -$3 -$9 -$9
Plumbers, pipefitters, and steamfitters $25 $12 $8 $0 -$2 $10 $5 $10 $9 $5 $5 $7 $5 $2 $4 -$2 -$2

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers,	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters,	Excavating and loading machine and dragline	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
		$13	$17	$25	$27	$15	$20	$14	$16	$19	$20	$18	$20	$23	$21	$27	$26
Production workers, all other	$15	$3	-$2	-$10	-$12	$1	-$5	$1	-$1	-$4	-$4	-$3	-$5	-$8	-$5	-$12	-$11

10. Discussion

The Appalachian Ohio economy has been historically dependent on the coal industry. As mines and coal powered power plants adjust to changes in demand and regulations by downsizing or closing, it becomes important to better understand the impact of these closures and to guide communities into recovery.

The Killen and Stuart power plant closures in the OVRDC region, and the closure of an associated training facility in Manchester, Ohio, will lead to the direct loss of 370 jobs according to the WARN report. These 370 jobs generated an estimated $56 million in employee compensation. An additional 760 jobs will be lost in a variety of industries as an ancillary consequence of the power plants closures. In total, the closure of these facilities will result in 1,131 lost jobs, $82 million in lost labor income, and a reduction in economic output to the region of nearly $700 million. The Adams County Auditor estimates that Adams County and local governments/schools in the county will lose an estimated $8.5 million in annual tax revenue.

Other Appalachian Ohio areas have also experienced similar closures: Muskingum River plant in the Buckeye Hills region, FirstEnergy Generation Corp. coal-fired generator in the ERCG region, and the Powhatan No.6 mine in the OMEGA region. Providing displaced workers with information on possible career substitutes can decrease time spent in unemployment and can contribute to creating more efficient transitions.

By providing a color-coded indicator for the level of difficulty associated with an occupational transition and wage differentials, we aim to guide the coal-dependent Appalachian workforce into emerging occupations. We choose emerging occupations that are regionally concentrated and are exhibiting robust employment projections. 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-reliant occupations.

White collar occupational transitions are the least challenging in the “computer and electronics/administration and management” cluster on average. Blue-collar power plant occupations are able to transition easier than white collar occupations to occupations in the “mechanical” cluster. Transitions into occupations within the “psychology/education and training/medicine and dentistry” cluster require the most skill development and acquisition. These occupations require years of formal education and their work activities (assisting and caring for

others, performing for or working directly with the public, etc.) do not overlap with the coal reliant workforce' work activities.

Workforce training for individuals who have been displaced may be a necessary strategy to re-introduce these workers into the labor market in other fields. Technical assistance and leadership from key regional partners and relevant economic development organizations is vital to help mitigate the impact of this negative economic shock on the region. Further, access to information comes up as one of the main challenges that Appalachian displaced workers face. Outside of workers within the "computer and electronics/administration and management" cluster, the coal reliant workforce has low digital literacy which would complicate both occupational transitions and the search for job openings. Access to information in this report or resources by the department of labor aiming to help in career transitions is contingent on access to online sources and the ability to navigate the digital world. In addition, transportation to technical centers or community colleges where displaced workers can bridge their skills gaps also comes up as one of the possible challenges that complicate occupational transitions and that would need to be mitigated by relevant economic development organizations.

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Appendices

Appendix A: Data

Table A.1: Comparing QCEW total and imputed total

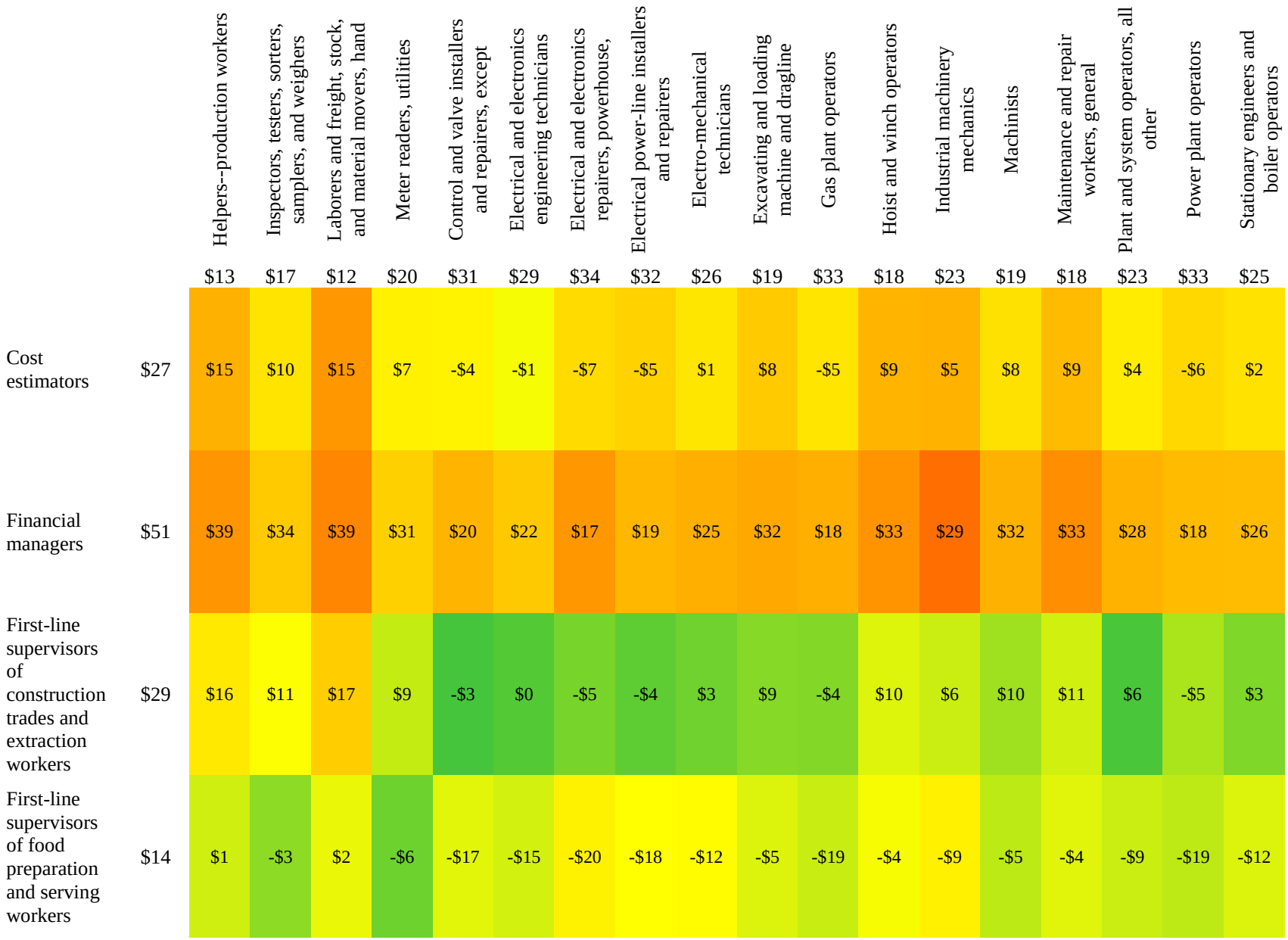
Region	Total employment	Estimated total employment	Percent difference
OVRDC	179,690	176,612	-1.71%
Buckeye Hills	64,431	67,927	5.43%
OMEGA	198,257	195,170	-1.56%
ERCG	196,915	192,777	-2.10%
Ohio	5,319,679	5,309,488	-0.19%

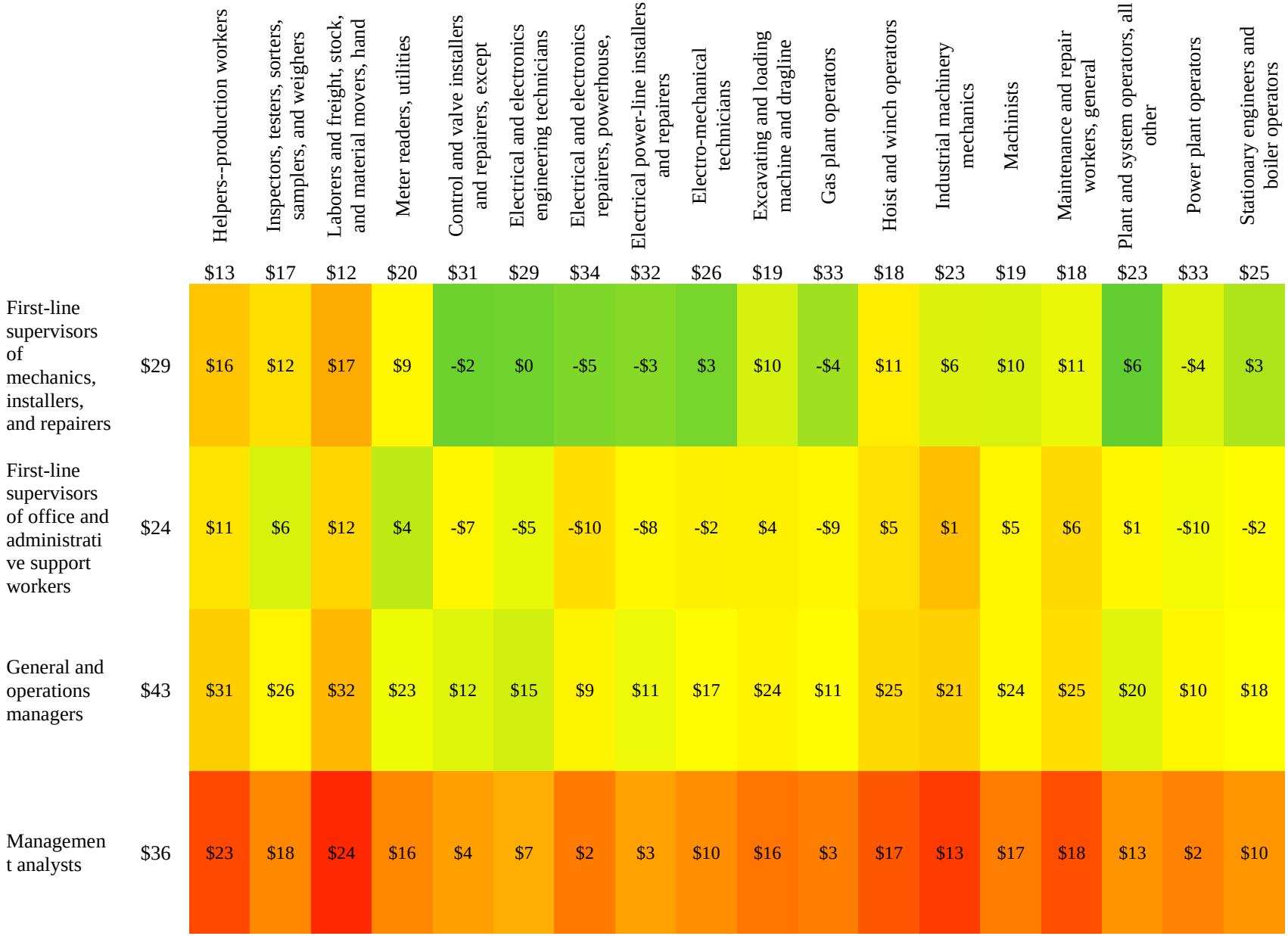
Notes: In this table we compare the sum of the QCEW total employment across all industries to the sum of imputed county-level employment by industry. We underestimate the total number of employees for Ohio, OVRDC, OMEGA, and ERCG regions by 0.2 to 2.1 percent. We overestimate the number of employees in the Buckeye Hills region by 5.4 percent. Although the imputed total number of employment is different than the QCEW total number of employment, the error is small enough for us to consider the breakdown of employment by industry as a useful exercise that provides insight into the regional employment distribution by industry.

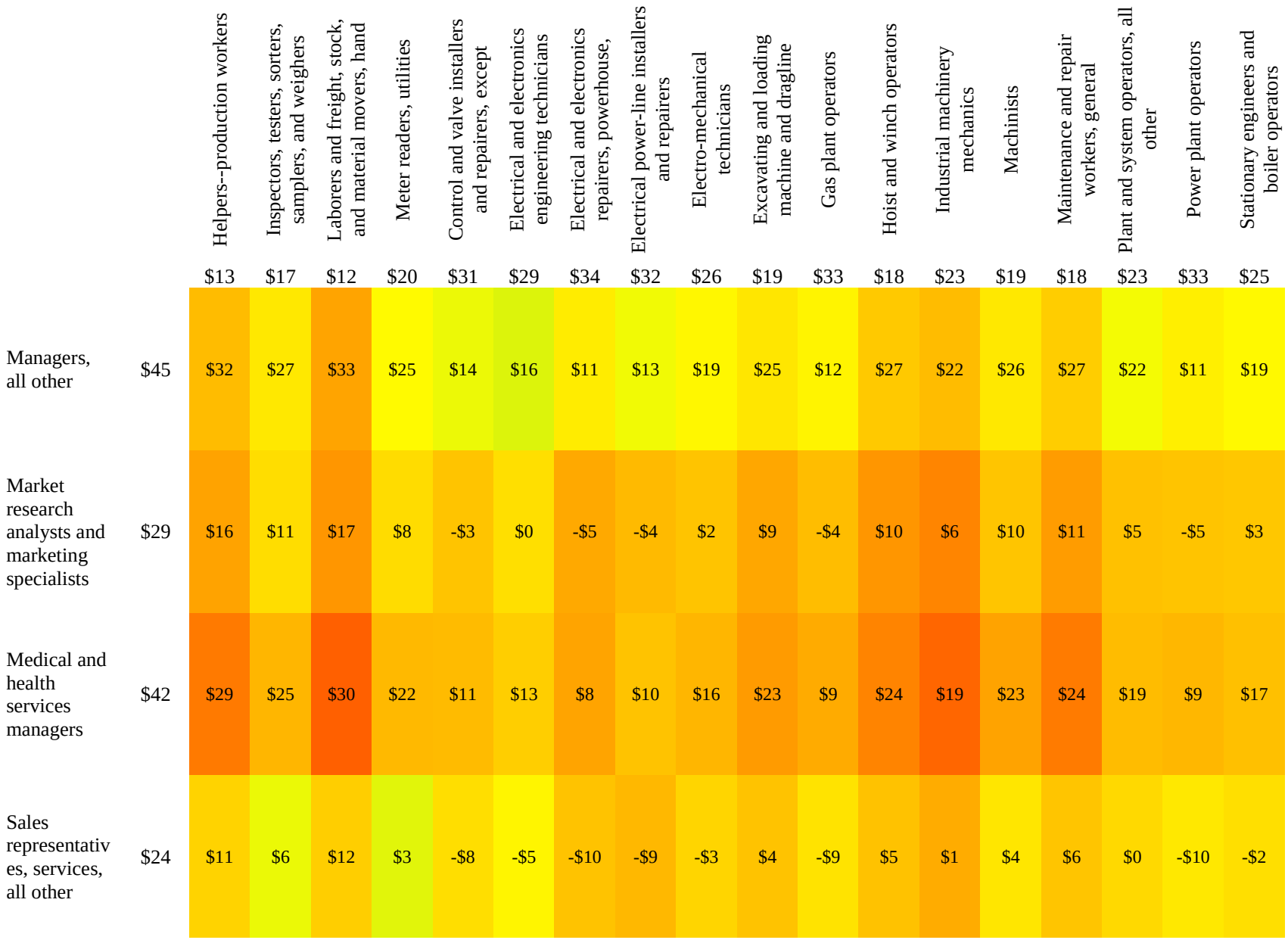
Appendix B: Power Plant Occupations to Emerging Occupations in OVRDC, ECG, and Buckeye Hills Regions

Table B.1: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Accountants and auditors	$30	$18	$13	$19	$10	-$1	$2	-$3	-$2	$4	$11	-$2	$12	$8	$11	$12	$7	-$3	$5
Computer and information systems managers	$57	$44	$39	$45	$37	$26	$28	$23	$25	$31	$37	$24	$39	$34	$38	$39	$34	$23	$31
Computer user support specialists	$21	$8	$3	$9	$0	-$11	-$8	-$13	-$12	-$6	$1	-$12	$2	-$2	$2	$3	-$3	-$13	-$5


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Cost estimators $27 $15 $10 $15 $7 -$4 -$1 -$7 -$5 $1 $8 -$5 $9 $5 $8 $9 $4 -$6 $2
Financial managers $51 $39 $34 $39 $31 $20 $22 $17 $19 $25 $32 $18 $33 $29 $32 $33 $28 $18 $26
First-line supervisors of construction trades and extraction workers $29 $16 $11 $17 $9 -$3 $0 -$5 -$4 $3 $9 -$4 $10 $6 $10 $11 $6 -$5 $3
First-line supervisors of food preparation and serving workers $14 $1 -$3 $2 -$6 -$17 -$15 -$20 -$18 -$12 -$5 -$19 -$4 -$9 -$5 -$4 -$9 -$19 -$12

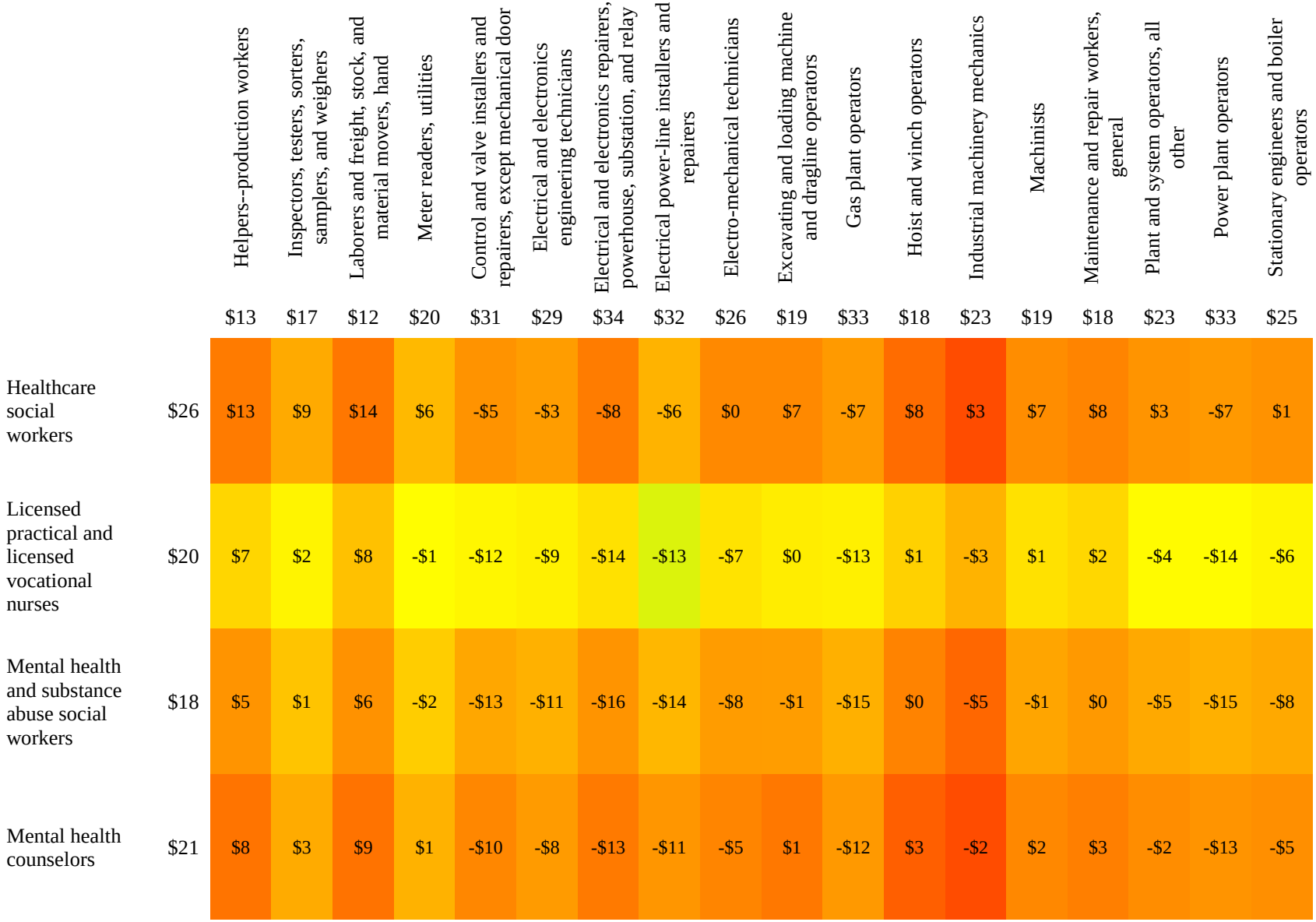

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
First-line supervisors of mechanics, installers, and repairers
$29
$16 $12 $17 $9 -$2 $0 -$5 -$3 $3 $10 -$4 $11 $6 $10 $11 $6 -$4 $3
First-line supervisors of office and administrative support workers
$24
$11 $6 $12 $4 -$7 -$5 -$10 -$8 -$2 $4 -$9 $5 $1 $5 $6 $1 -$10 -$2
General and operations managers
$43
$31 $26 $32 $23 $12 $15 $9 $11 $17 $24 $11 $25 $21 $24 $25 $20 $10 $18
Management analysts
$36
$23 $18 $24 $16 $4 $7 $2 $3 $10 $16 $3 $17 $13 $17 $18 $13 $2 $10

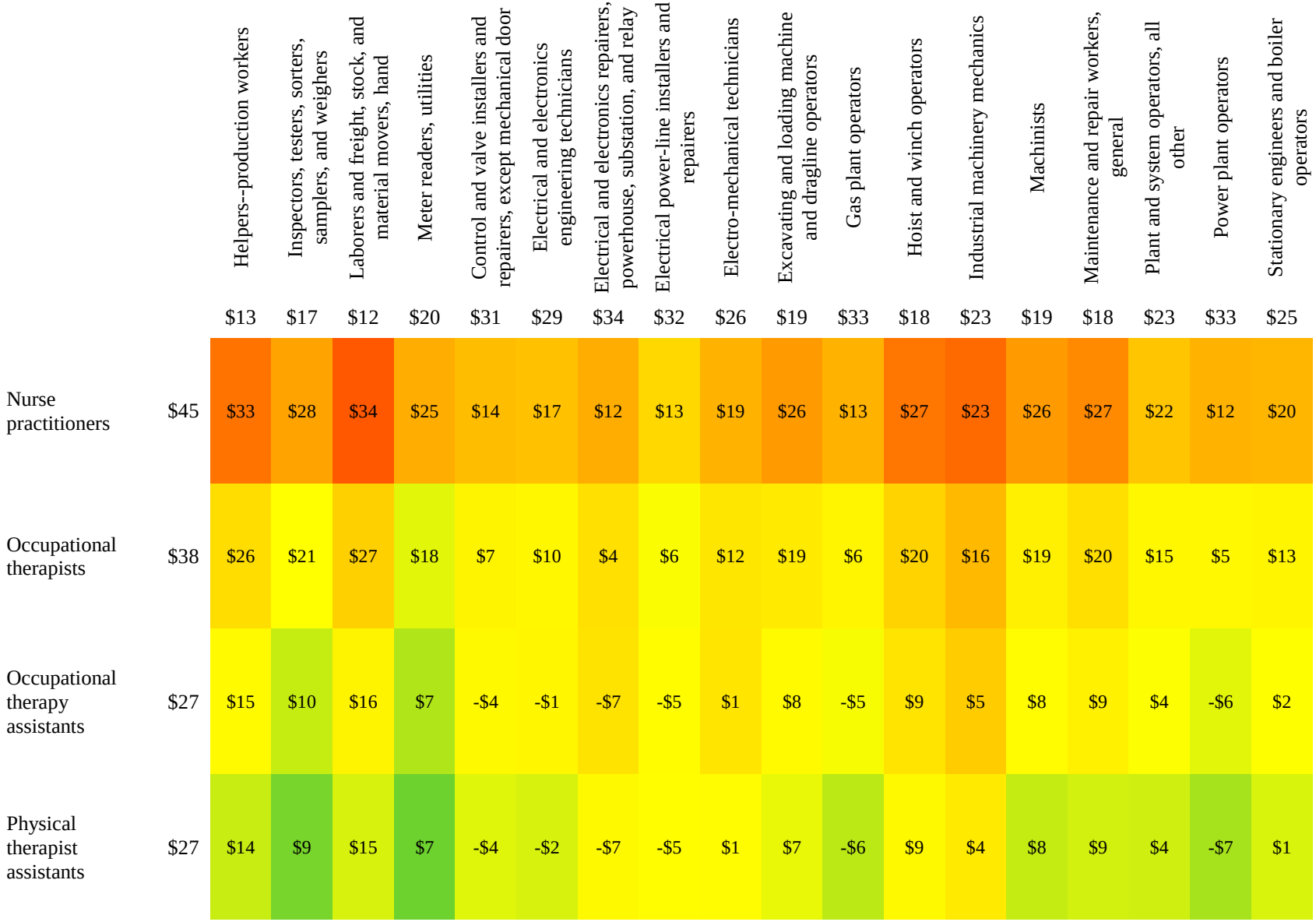

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Managers, all other
$45
$32 $27 $33 $25 $14 $16 $11 $13 $19 $25 $12 $27 $22 $26 $27 $22 $11 $19
Market research analysts and marketing specialists
$29
$16 $11 $17 $8 -$3 $0 -$5 -$4 $2 $9 -$4 $10 $6 $10 $11 $5 -$5 $3
Medical and health services managers
$42
$29 $25 $30 $22 $11 $13 $8 $10 $16 $23 $9 $24 $19 $23 $24 $19 $9 $17
Sales representatives, services, all other
$24
$11 $6 $12 $3 -$8 -$5 -$10 -$9 -$3 $4 -$9 $5 $1 $4 $6 $0 -$10 -$2

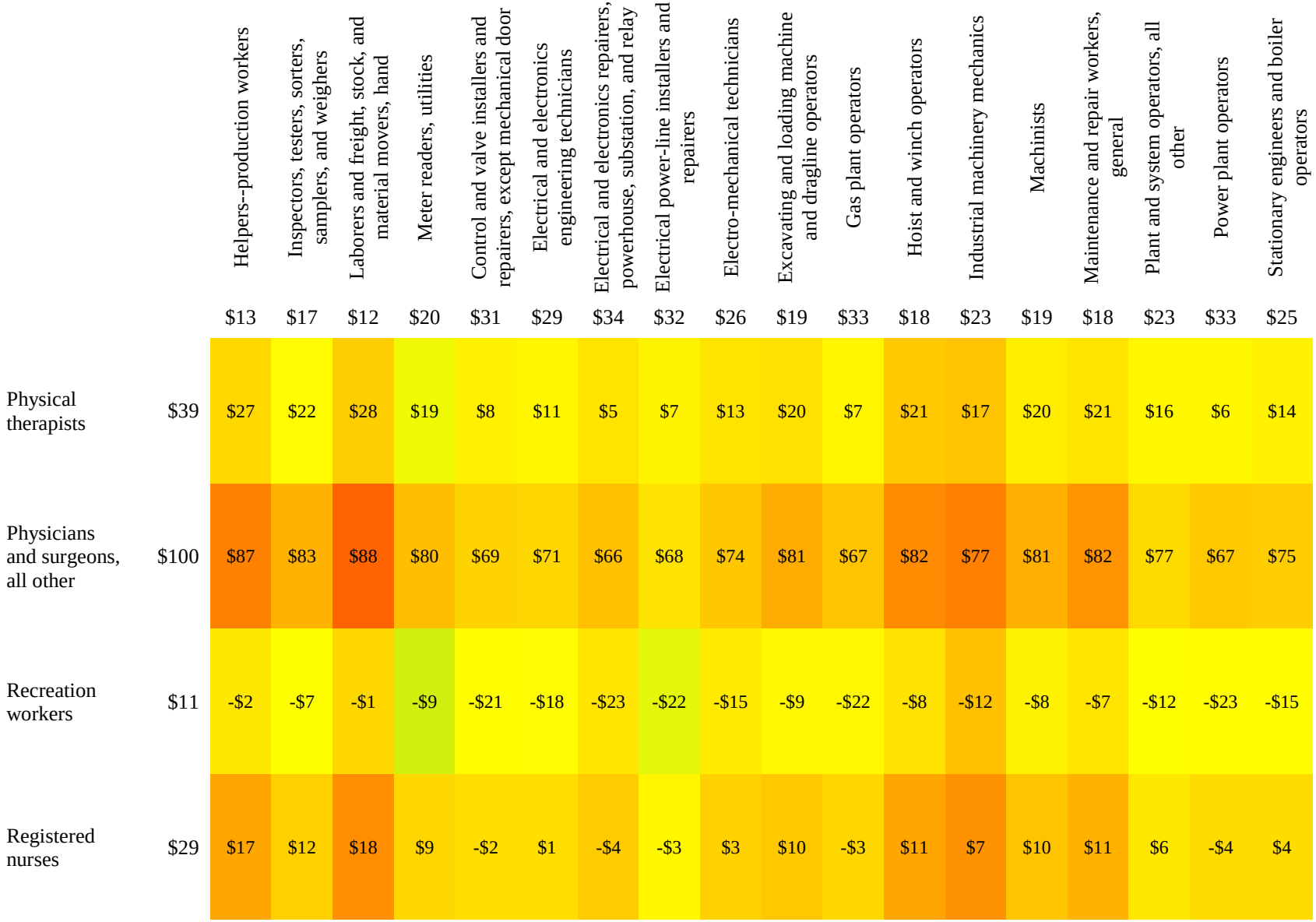

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Software developers, applications
$41
$28 $23 $29 $21 $10 $12 $7 $9 $15 $21 $8 $23 $18 $22 $23 $18 $7 $15

Table B.2: Blue Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation, and relay	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Clinical, counseling, and school psychologists	$34	$22	$17	$22	$14	$3	$5	$0	$2	$8	$15	$2	$16	$12	$15	$16	$11	$1	$9
Dentists, general	$82	$70	$65	$71	$62	$51	$54	$48	$50	$56	$63	$50	$64	$60	$63	$64	$59	$49	$57
Emergency medical technicians and paramedics	$14	$1	-$4	$2	-$6	-$17	-$15	-$20	-$18	-$12	-$6	-$19	-$4	-$9	-$5	-$4	-$9	-$20	-$12


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Healthcare social workers $26 $13 $9 $14 $6 -$5 -$3 -$8 -$6 $0 $7 -$7 $8 $3 $7 $8 $3 -$7 $1
Licensed practical and licensed vocational nurses $20 $7 $2 $8 -$1 -$12 -$9 -$14 -$13 -$7 $0 -$13 $1 -$3 $1 $2 -$4 -$14 -$6
Mental health and substance abuse social workers $18 $5 $1 $6 -$2 -$13 -$11 -$16 -$14 -$8 -$1 -$15 $0 -$5 -$1 $0 -$5 -$15 -$8
Mental health counselors $21 $8 $3 $9 $1 -$10 -$8 -$13 -$11 -$5 $1 -$12 $3 -$2 $2 $3 -$2 -$13 -$5


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Nurse practitioners $45 $33 $28 $34 $25 $14 $17 $12 $13 $19 $26 $13 $27 $23 $26 $27 $22 $12 $20
Occupational therapists $38 $26 $21 $27 $18 $7 $10 $4 $6 $12 $19 $6 $20 $16 $19 $20 $15 $5 $13
Occupational therapy assistants $27 $15 $10 $16 $7 -$4 -$1 -$7 -$5 $1 $8 -$5 $9 $5 $8 $9 $4 -$6 $2
Physical therapist assistants $27 $14 $9 $15 $7 -$4 -$2 -$7 -$5 $1 $7 -$6 $9 $4 $8 $9 $4 -$7 $1


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Physical therapists $39 $27 $22 $28 $19 $8 $11 $5 $7 $13 $20 $7 $21 $17 $20 $21 $16 $6 $14
Physicians and surgeons, all other $100 $87 $83 $88 $80 $69 $71 $66 $68 $74 $81 $67 $82 $77 $81 $82 $77 $67 $75
Recreation workers $11 -$2 -$7 -$1 -$9 -$21 -$18 -$23 -$22 -$15 -$9 -$22 -$8 -$12 -$8 -$7 -$12 -$23 -$15
Registered nurses $29 $17 $12 $18 $9 -$2 $1 -$4 -$3 $3 $10 -$3 $11 $7 $10 $11 $6 -$4 $4

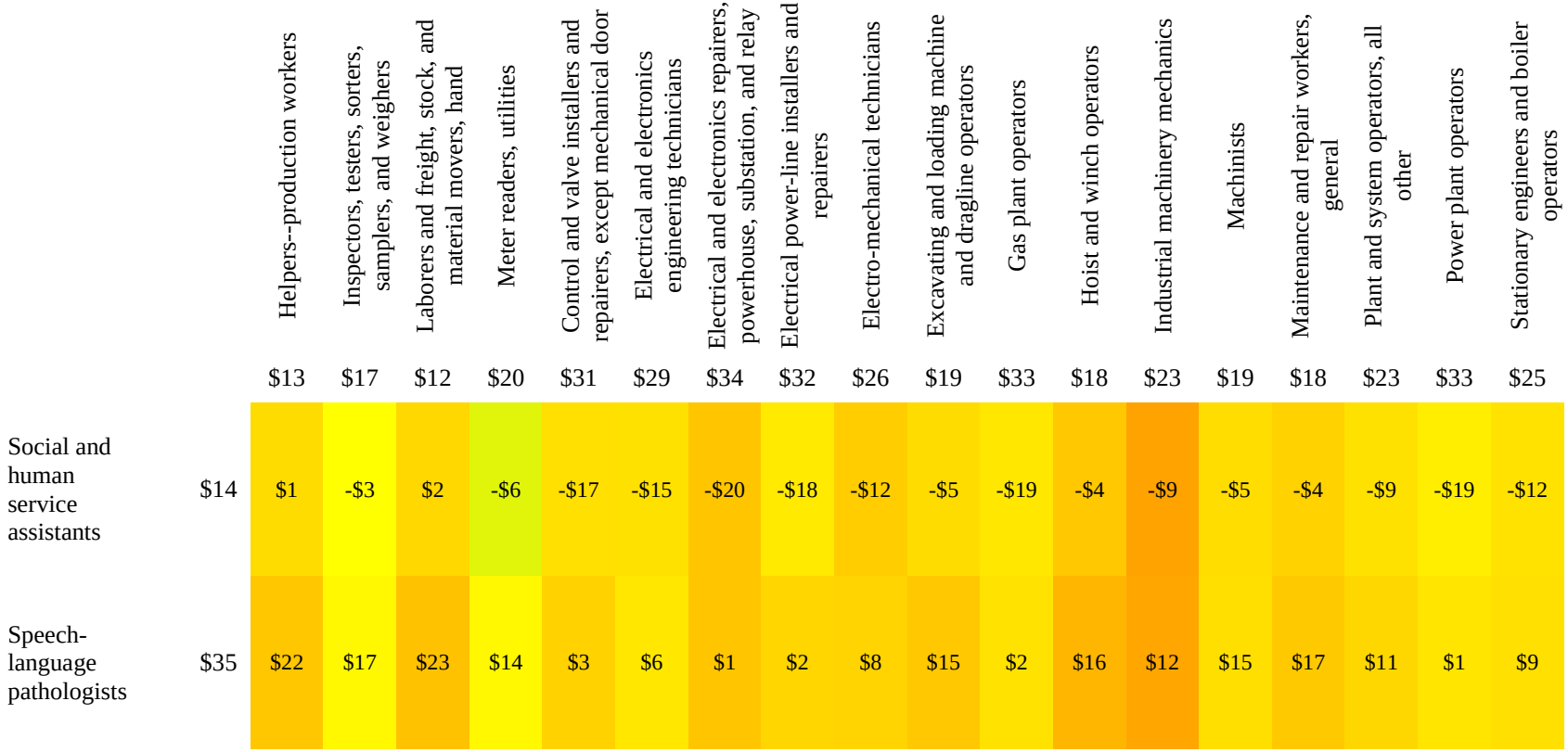
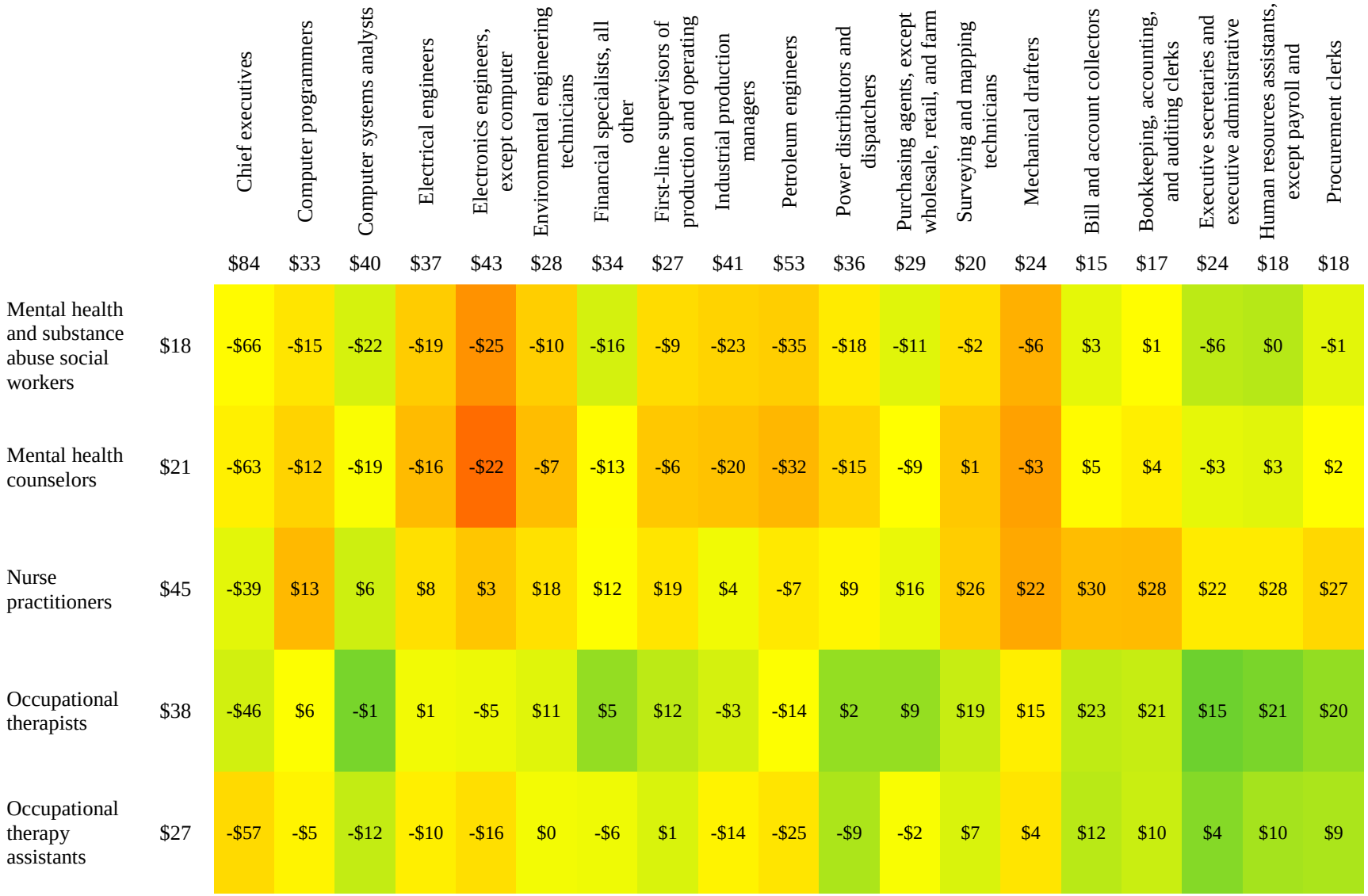
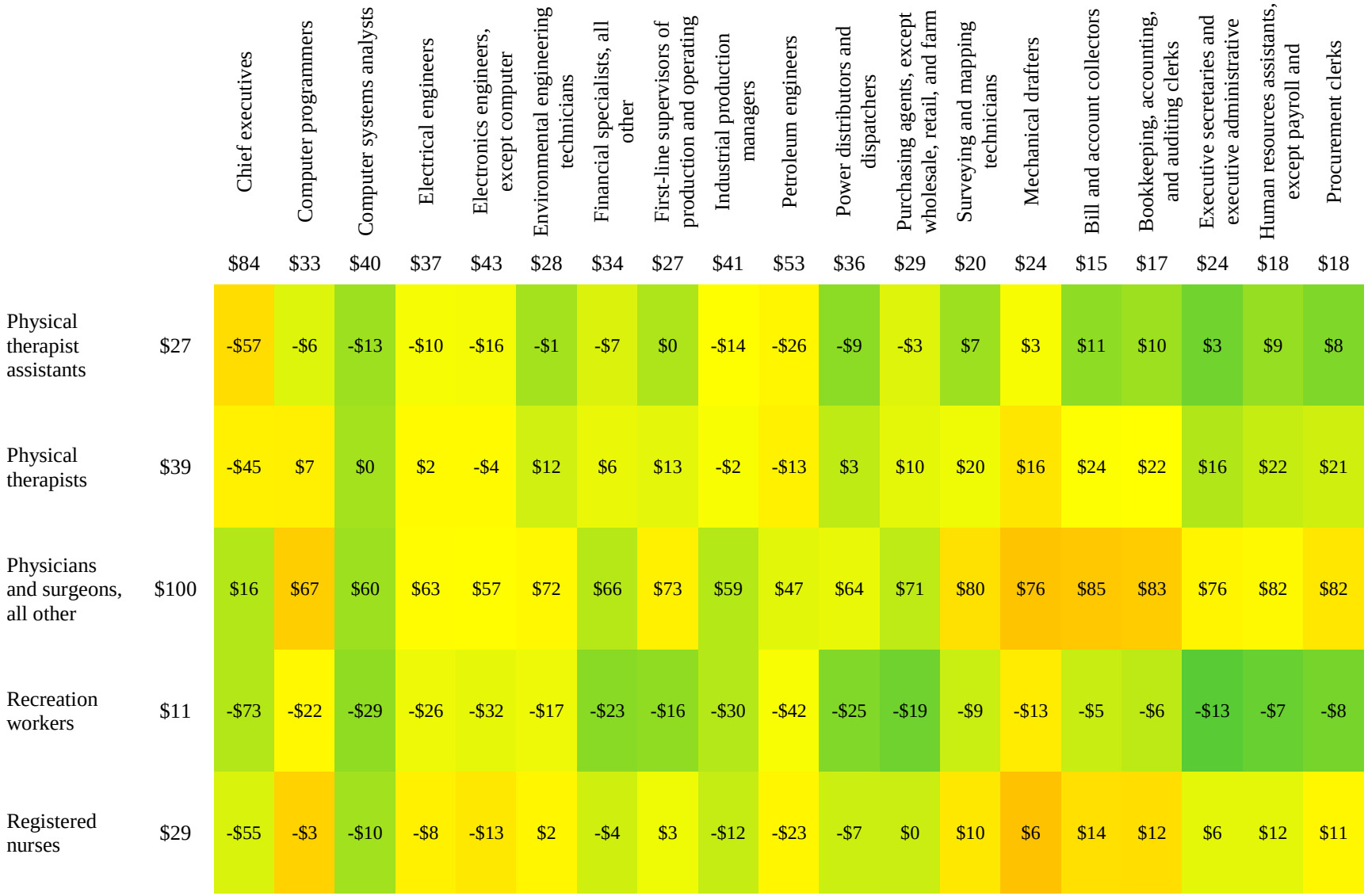

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Social and human service assistants
$14
$1 -$3 $2 -$6 -$17 -$15 -$20 -$18 -$12 -$5 -$19 -$4 -$9 -$5 -$4 -$9 -$19 -$12
Speech-language pathologists
$35
$22 $17 $23 $14 $3 $6 $1 $2 $8 $15 $2 $16 $12 $15 $17 $11 $1 $9

Table B.3: White Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Clinical, counseling, and school psychologists	$34	-$50	$1	-$6	-$3	-$9	$7	$0	$7	-$7	-$19	-$2	$5	$14	$10	$19	$17	$11	$16	$16
Dentists, general	$82	-$2	$50	$43	$45	$39	$55	$49	$56	$41	$30	$46	$53	$62	$59	$67	$65	$59	$65	$64
Emergency medical technicians and paramedics	$14	-$70	-$19	-$26	-$23	-$29	-$14	-$20	-$13	-$27	-$39	-$22	-$16	-$6	-$10	-$2	-$3	-$10	-$4	-$5
Healthcare social workers	$26	-$58	-$7	-$14	-$11	-$17	-$2	-$8	-$1	-$15	-$27	-$10	-$3	$6	$2	$11	$9	$2	$8	$8
Licensed practical and licensed vocational nurses	$20	-$65	-$13	-$20	-$18	-$23	-$8	-$14	-$7	-$21	-$33	-$16	-$10	$0	-$4	$4	$2	-$4	$2	$1


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll and
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Mental health and substance abuse social workers $18 -$66 -$15 -$22 -$19 -$25 -$10 -$16 -$9 -$23 -$35 -$18 -$11 -$2 -$6 $3 $1 -$6 $0 -$1
Mental health counselors $21 -$63 -$12 -$19 -$16 -$22 -$7 -$13 -$6 -$20 -$32 -$15 -$9 $1 -$3 $5 $4 -$3 $3 $2
Nurse practitioners $45 -$39 $13 $6 $8 $3 $18 $12 $19 $4 -$7 $9 $16 $26 $22 $30 $28 $22 $28 $27
Occupational therapists $38 -$46 $6 -$1 $1 -$5 $11 $5 $12 -$3 -$14 $2 $9 $19 $15 $23 $21 $15 $21 $20
Occupational therapy assistants $27 -$57 -$5 -$12 -$10 -$16 $0 -$6 $1 -$14 -$25 -$9 -$2 $7 $4 $12 $10 $4 $10 $9


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll and
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Physical therapist assistants $27 -$57 -$6 -$13 -$10 -$16 -$1 -$7 $0 -$14 -$26 -$9 -$3 $7 $3 $11 $10 $3 $9 $8
Physical therapists $39 -$45 $7 $0 $2 -$4 $12 $6 $13 -$2 -$13 $3 $10 $20 $16 $24 $22 $16 $22 $21
Physicians and surgeons, all other $100 $16 $67 $60 $63 $57 $72 $66 $73 $59 $47 $64 $71 $80 $76 $85 $83 $76 $82 $82
Recreation workers $11 -$73 -$22 -$29 -$26 -$32 -$17 -$23 -$16 -$30 -$42 -$25 -$19 -$9 -$13 -$5 -$6 -$13 -$7 -$8
Registered nurses $29 -$55 -$3 -$10 -$8 -$13 $2 -$4 $3 -$12 -$23 -$7 $0 $10 $6 $14 $12 $6 $12 $11

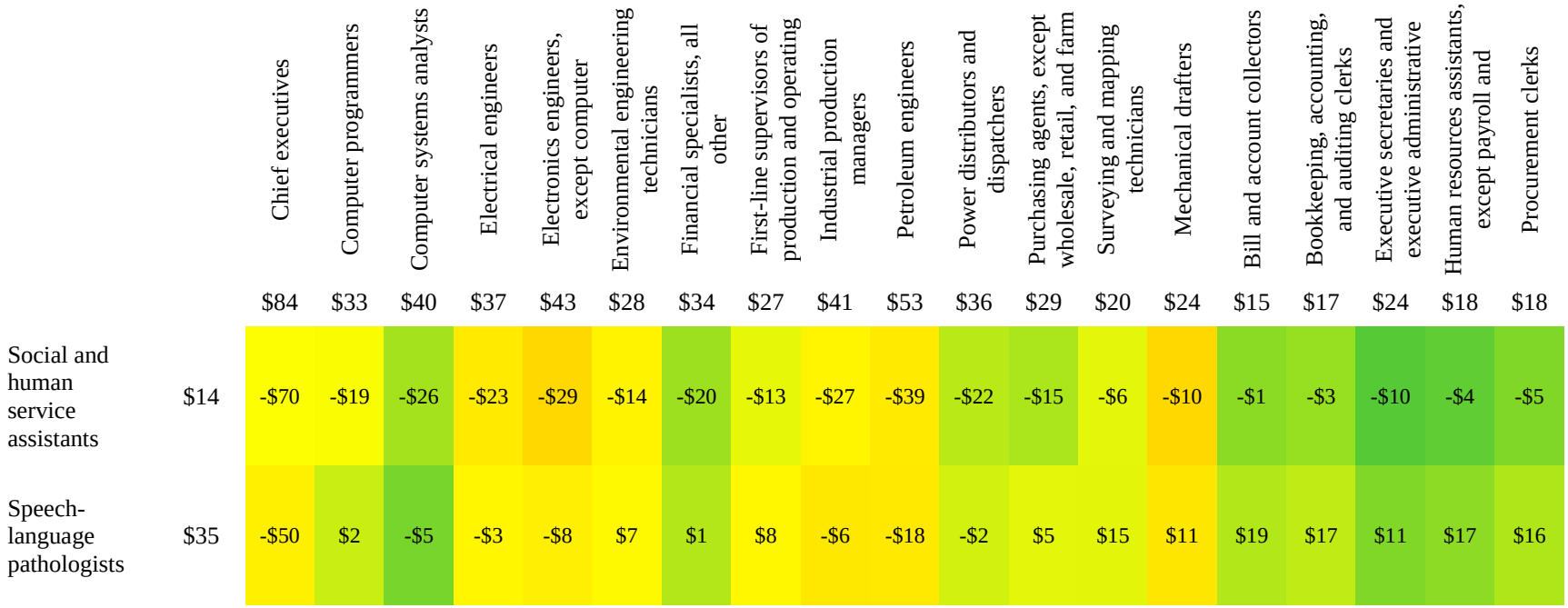
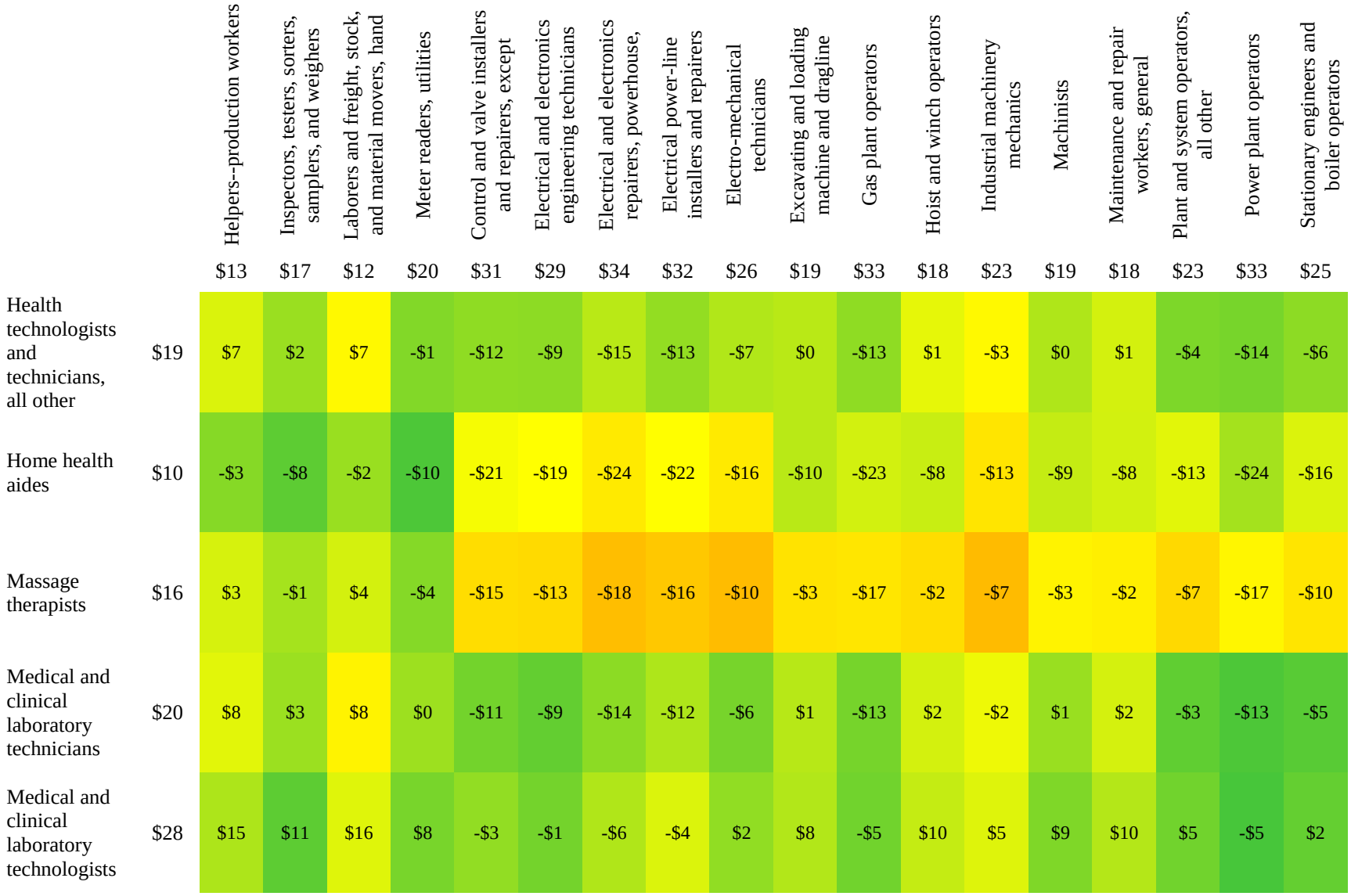
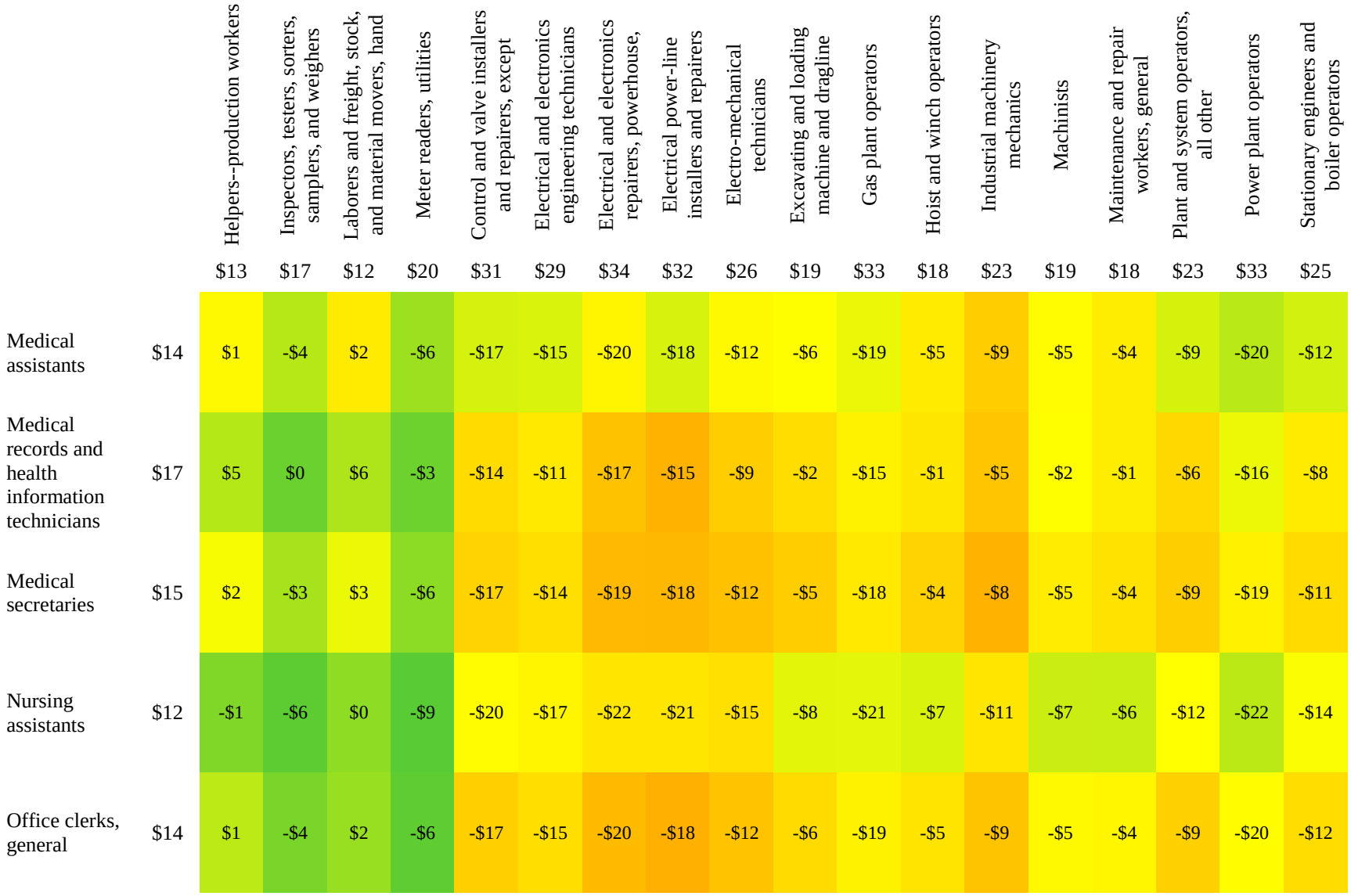
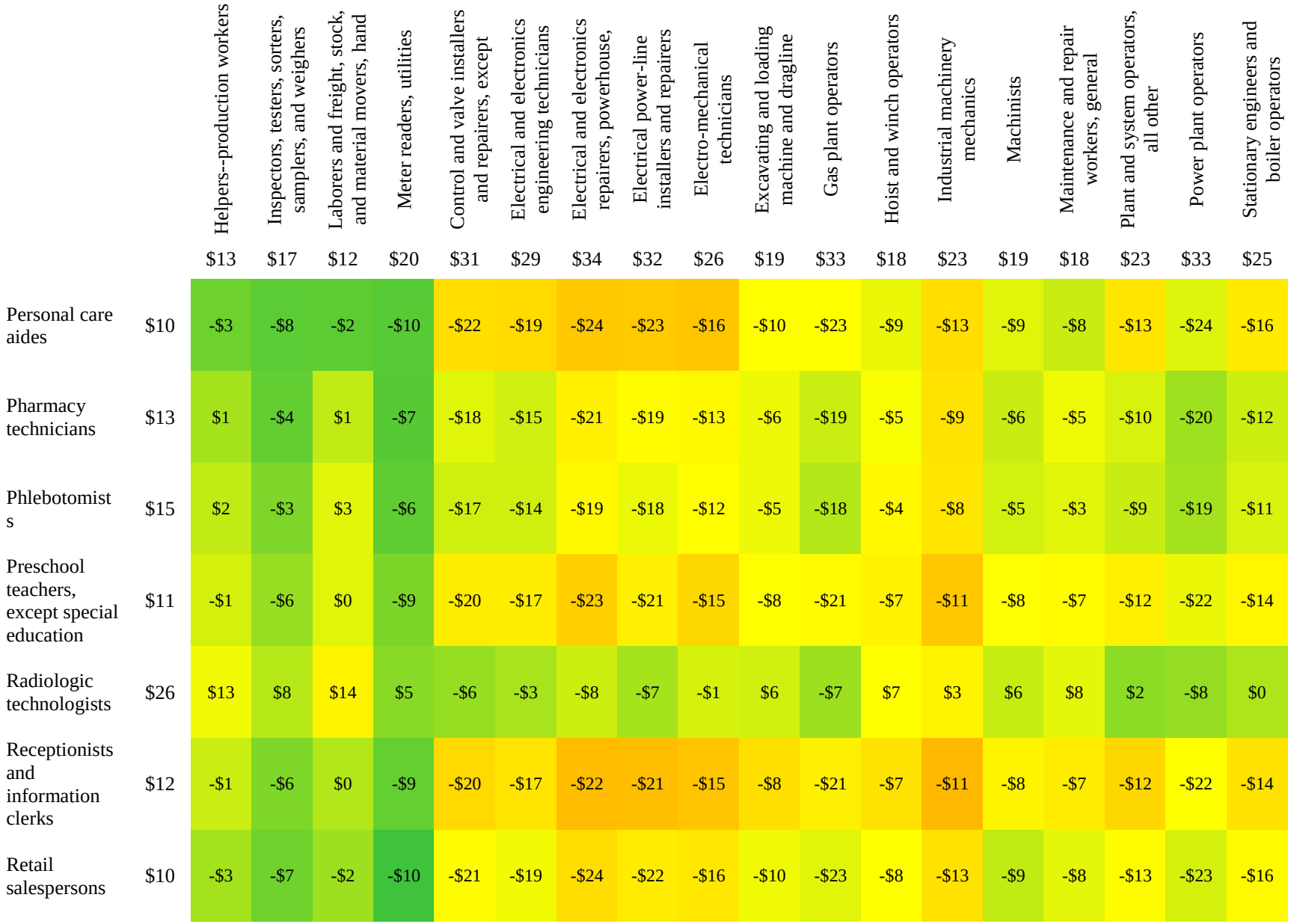

Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll and
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Social and human service assistants
$14
-$70 -$19 -$26 -$23 -$29 -$14 -$20 -$13 -$27 -$39 -$22 -$15 -$6 -$10 -$1 -$3 -$10 -$4 -$5
Speech-language pathologists
$35
-$50 $2 -$5 -$3 -$8 $7 $1 $8 -$6 -$18 -$2 $5 $15 $11 $19 $17 $11 $17 $16

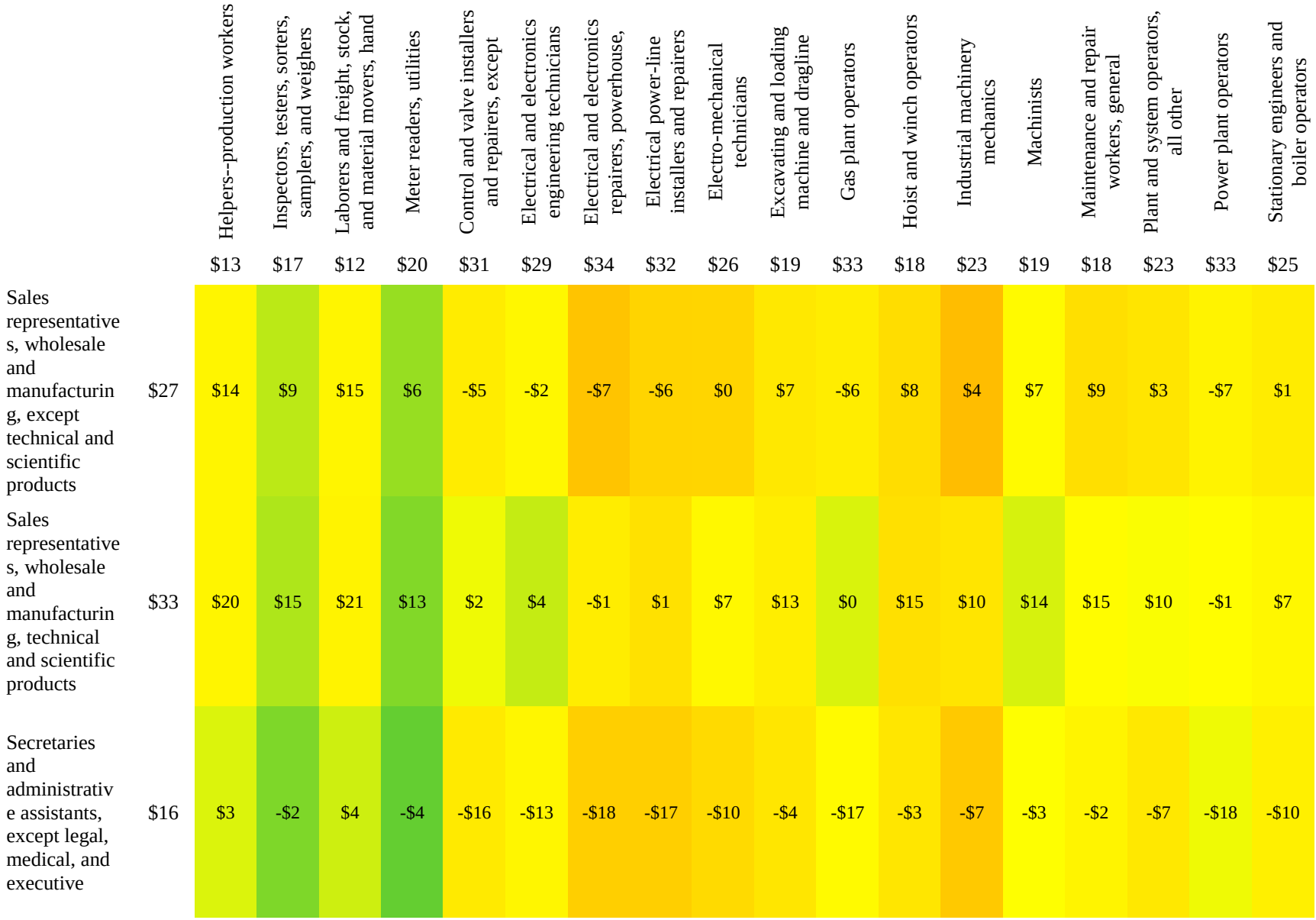
Table B.4: Blue Collar Occupations into Occupations Requiring Clerical Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Billing and posting clerks	$16	$4	-$1	$5	-$4	-$15	-$12	-$17	-$16	-$10	-$3	-$16	-$2	-$6	-$3	-$2	-$7	-$17	-$9
Childcare workers	$10	-$3	-$8	-$2	-$11	-$22	-$19	-$24	-$23	-$17	-$10	-$23	-$9	-$13	-$10	-$8	-$14	-$24	-$16
Customer service representatives	$15	$2	-$3	$3	-$5	-$17	-$14	-$19	-$18	-$12	-$5	-$18	-$4	-$8	-$4	-$3	-$9	-$19	-$11
Dental assistants	$17	$4	$0	$5	-$3	-$14	-$12	-$17	-$15	-$9	-$2	-$16	-$1	-$6	-$2	-$1	-$6	-$16	-$8
Dental hygienists	$32	$20	$15	$21	$12	$1	$4	-$1	$0	$6	$13	$0	$14	$10	$13	$14	$9	-$1	$7


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Health technologists and technicians, all other $19 $7 $2 $7 -$1 -$12 -$9 -$15 -$13 -$7 $0 -$13 $1 -$3 $0 $1 -$4 -$14 -$6
Home health aides $10 -$3 -$8 -$2 -$10 -$21 -$19 -$24 -$22 -$16 -$10 -$23 -$8 -$13 -$9 -$8 -$13 -$24 -$16
Massage therapists $16 $3 -$1 $4 -$4 -$15 -$13 -$18 -$16 -$10 -$3 -$17 -$2 -$7 -$3 -$2 -$7 -$17 -$10
Medical and clinical laboratory technicians $20 $8 $3 $8 $0 -$11 -$9 -$14 -$12 -$6 $1 -$13 $2 -$2 $1 $2 -$3 -$13 -$5
Medical and clinical laboratory technologists $28 $15 $11 $16 $8 -$3 -$1 -$6 -$4 $2 $8 -$5 $10 $5 $9 $10 $5 -$5 $2


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Medical assistants $14 $1 -$4 $2 -$6 -$17 -$15 -$20 -$18 -$12 -$6 -$19 -$5 -$9 -$5 -$4 -$9 -$20 -$12
Medical records and health information technicians $17 $5 $0 $6 -$3 -$14 -$11 -$17 -$15 -$9 -$2 -$15 -$1 -$5 -$2 -$1 -$6 -$16 -$8
Medical secretaries $15 $2 -$3 $3 -$6 -$17 -$14 -$19 -$18 -$12 -$5 -$18 -$4 -$8 -$5 -$4 -$9 -$19 -$11
Nursing assistants $12 -$1 -$6 $0 -$9 -$20 -$17 -$22 -$21 -$15 -$8 -$21 -$7 -$11 -$7 -$6 -$12 -$22 -$14
Office clerks, general $14 $1 -$4 $2 -$6 -$17 -$15 -$20 -$18 -$12 -$6 -$19 -$5 -$9 -$5 -$4 -$9 -$20 -$12


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Personal care aides $10 -$3 -$8 -$2 -$10 -$22 -$19 -$24 -$23 -$16 -$10 -$23 -$9 -$13 -$9 -$8 -$13 -$24 -$16
Pharmacy technicians $13 $1 -$4 $1 -$7 -$18 -$15 -$21 -$19 -$13 -$6 -$19 -$5 -$9 -$6 -$5 -$10 -$20 -$12
Phlebotomists $15 $2 -$3 $3 -$6 -$17 -$14 -$19 -$18 -$12 -$5 -$18 -$4 -$8 -$5 -$3 -$9 -$19 -$11
Preschool teachers, except special education $11 -$1 -$6 $0 -$9 -$20 -$17 -$23 -$21 -$15 -$8 -$21 -$7 -$11 -$8 -$7 -$12 -$22 -$14
Radiologic technologists $26 $13 $8 $14 $5 -$6 -$3 -$8 -$7 -$1 $6 -$7 $7 $3 $6 $8 $2 -$8 $0
Receptionists and information clerks $12 -$1 -$6 $0 -$9 -$20 -$17 -$22 -$21 -$15 -$8 -$21 -$7 -$11 -$8 -$7 -$12 -$22 -$14
Retail salespersons $10 -$3 -$7 -$2 -$10 -$21 -$19 -$24 -$22 -$16 -$10 -$23 -$8 -$13 -$9 -$8 -$13 -$23 -$16


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Sales representatives, wholesale and manufacturing, except technical and scientific products
$27
$14 $9 $15 $6 -$5 -$2 -$7 -$6 $0 $7 -$6 $8 $4 $7 $9 $3 -$7 $1
Sales representatives, wholesale and manufacturing, technical and scientific products
$33
$20 $15 $21 $13 $2 $4 -$1 $1 $7 $13 $0 $15 $10 $14 $15 $10 -$1 $7
Secretaries and administrative assistants, except legal, medical, and executive
$16
$3 -$2 $4 -$4 -$16 -$13 -$18 -$17 -$10 -$4 -$17 -$3 -$7 -$3 -$2 -$7 -$18 -$10

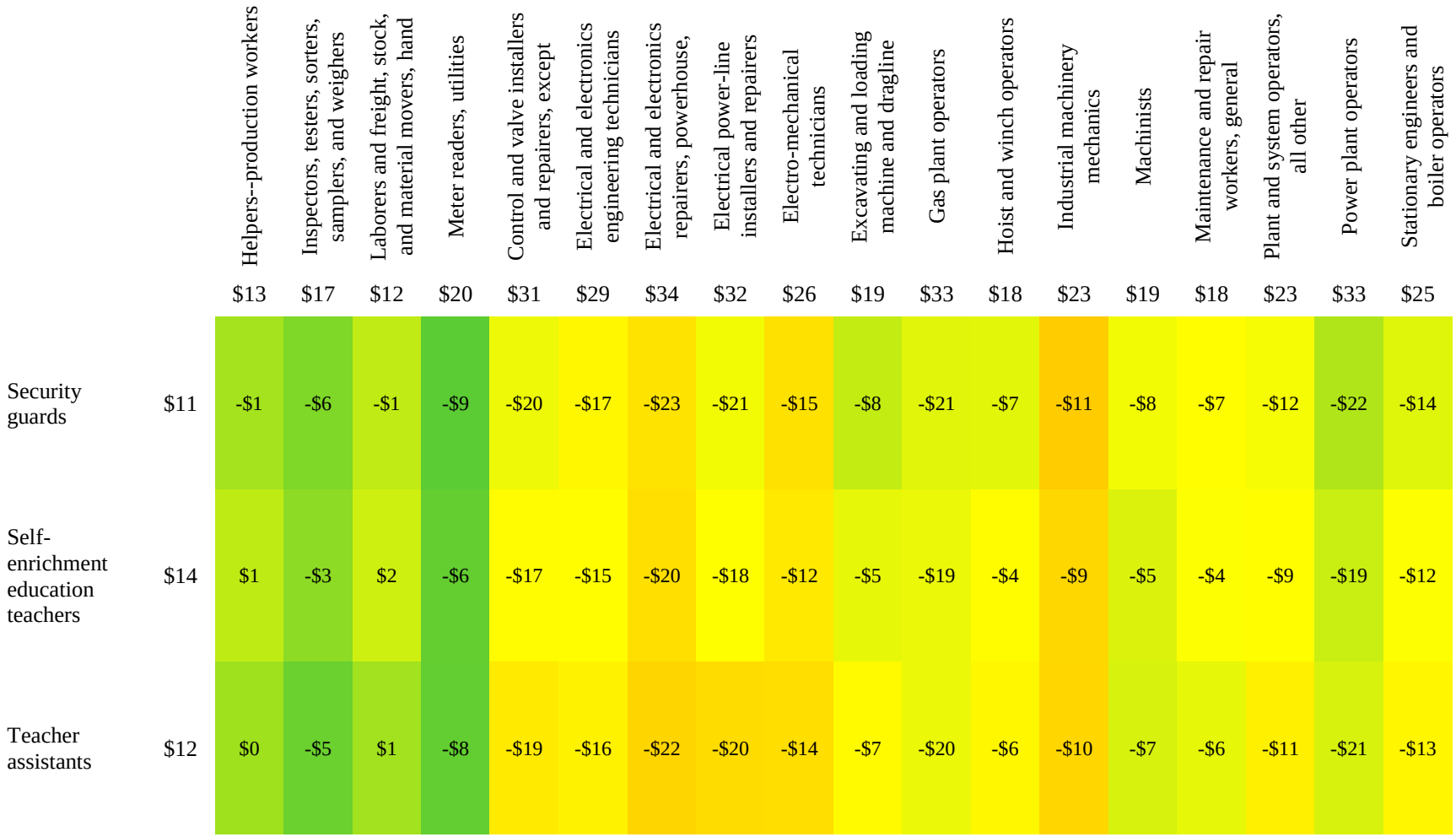
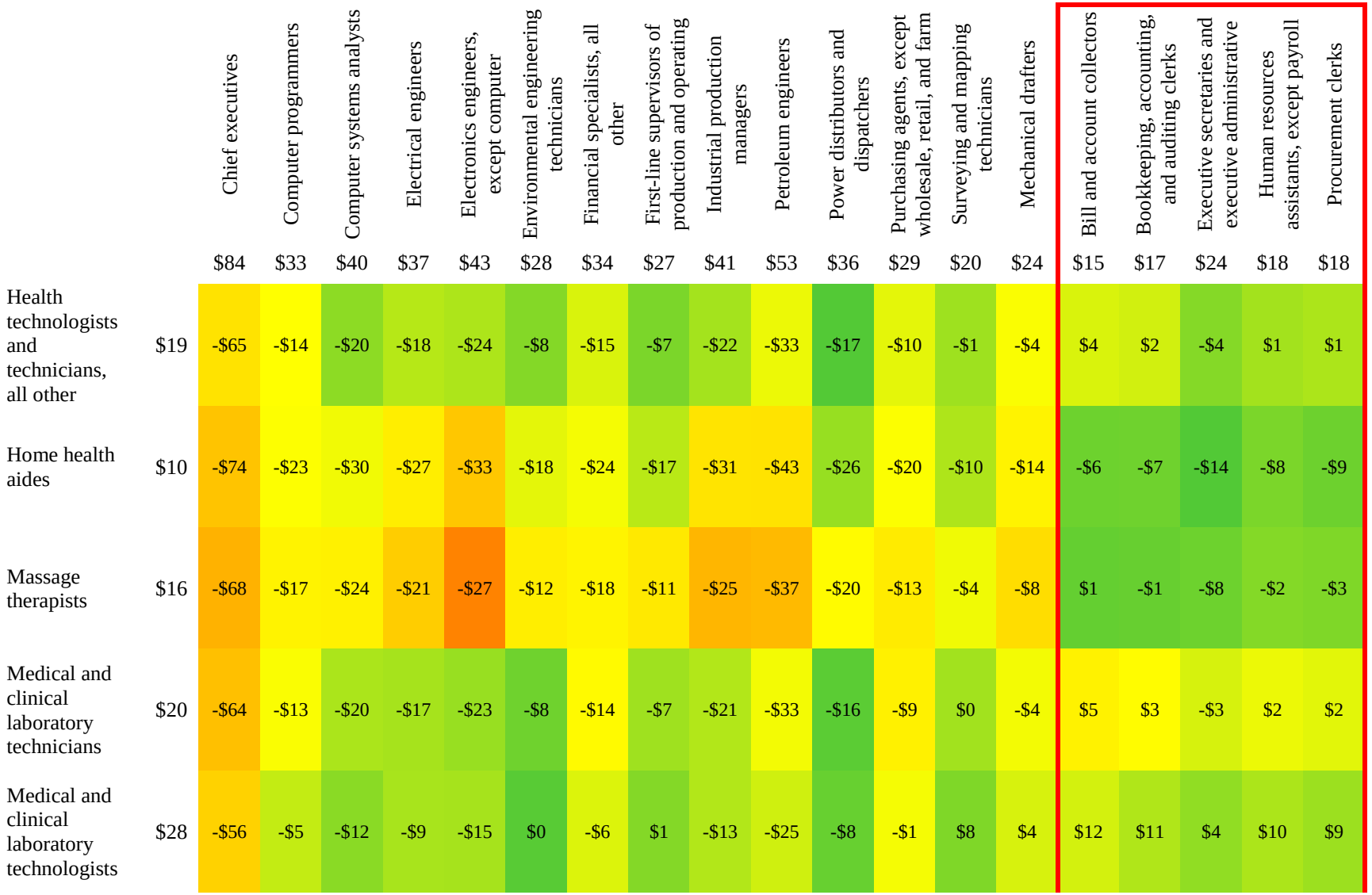
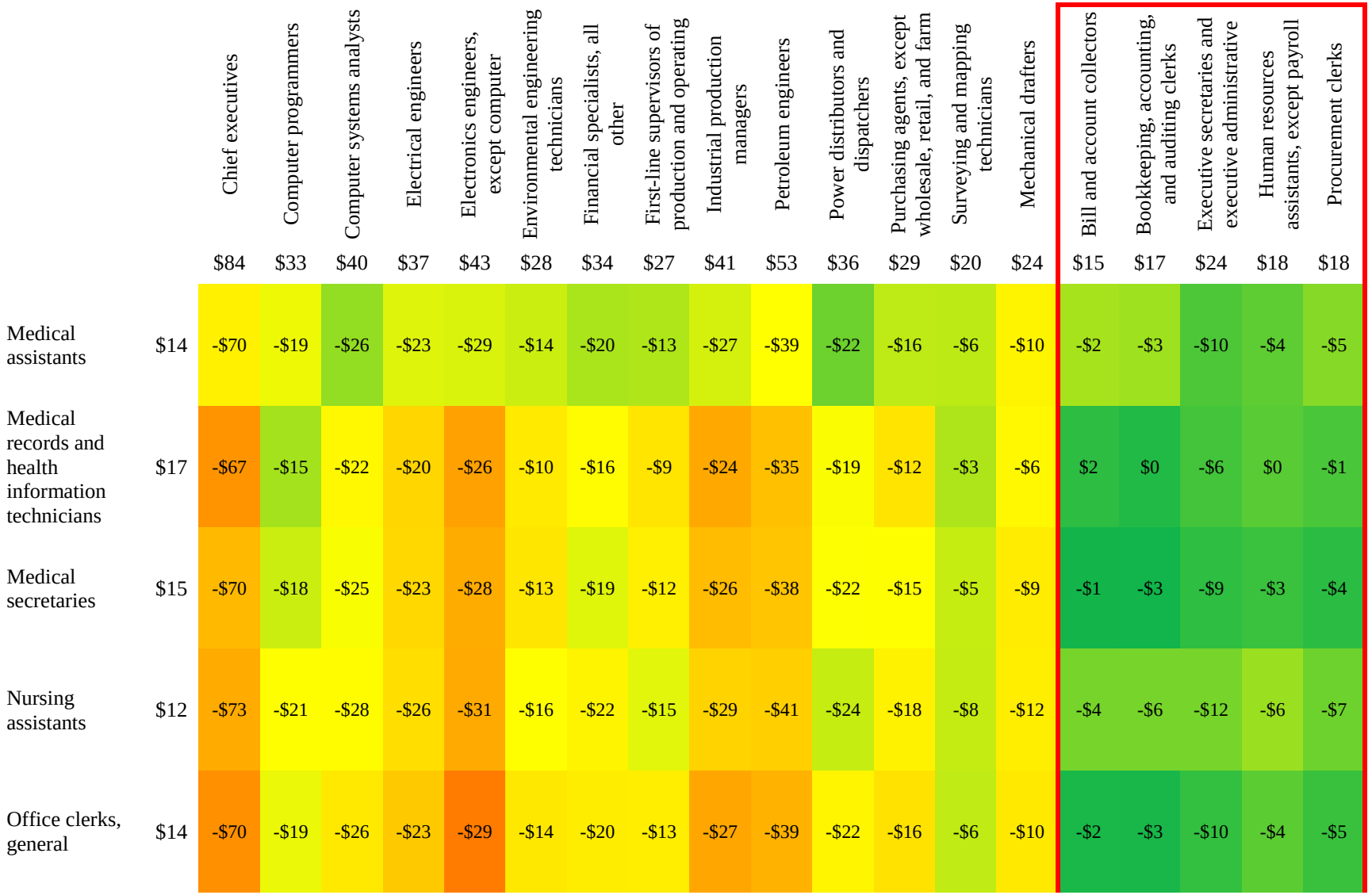
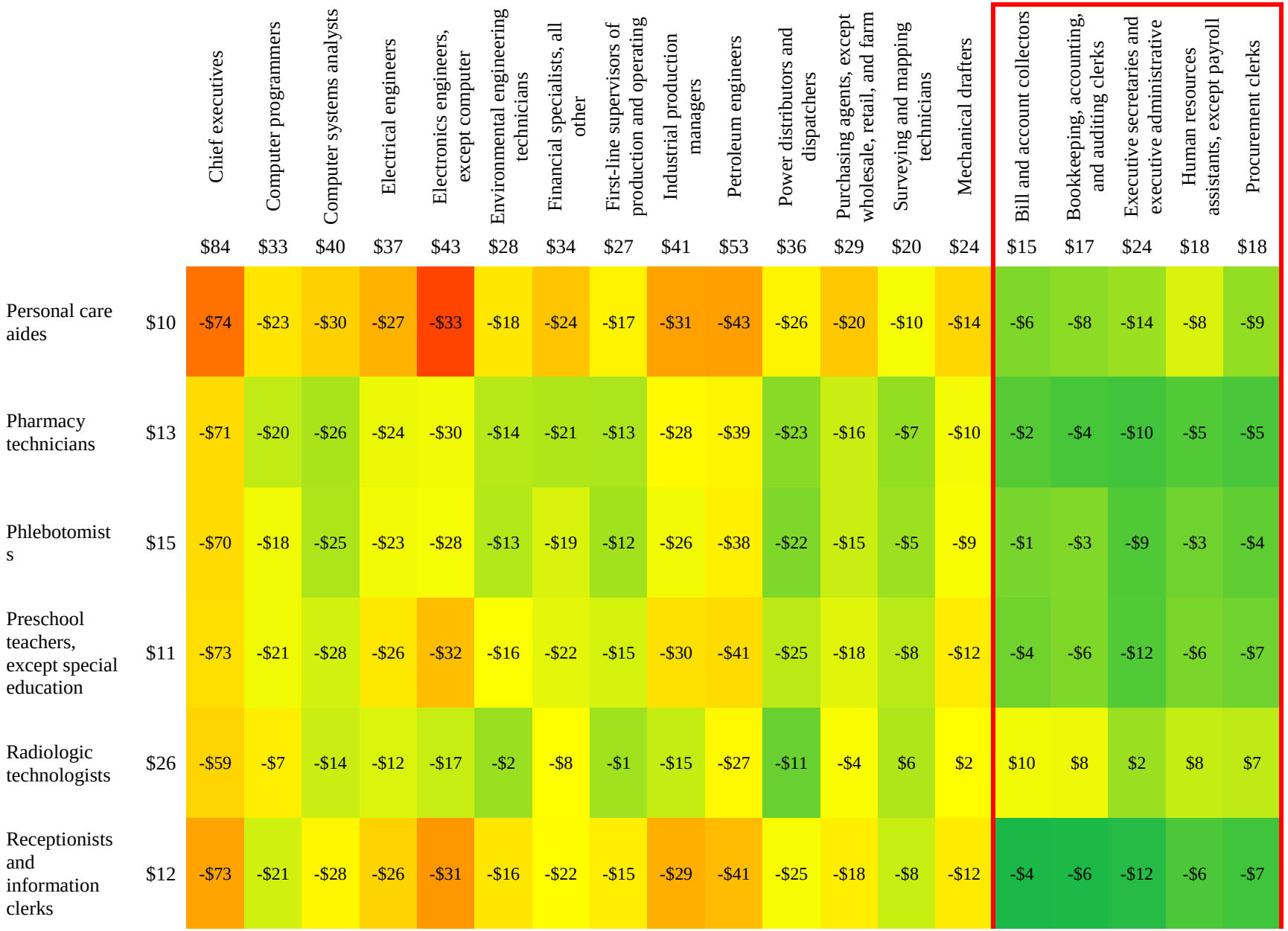

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Security guards $11 -$1 -$6 -$1 -$9 -$20 -$17 -$23 -$21 -$15 -$8 -$21 -$7 -$11 -$8 -$7 -$12 -$22 -$14
Self-enrichment education teachers $14 $1 -$3 $2 -$6 -$17 -$15 -$20 -$18 -$12 -$5 -$19 -$4 -$9 -$5 -$4 -$9 -$19 -$12
Teacher assistants $12 $0 -$5 $1 -$8 -$19 -$16 -$22 -$20 -$14 -$7 -$20 -$6 -$10 -$7 -$6 -$11 -$21 -$13

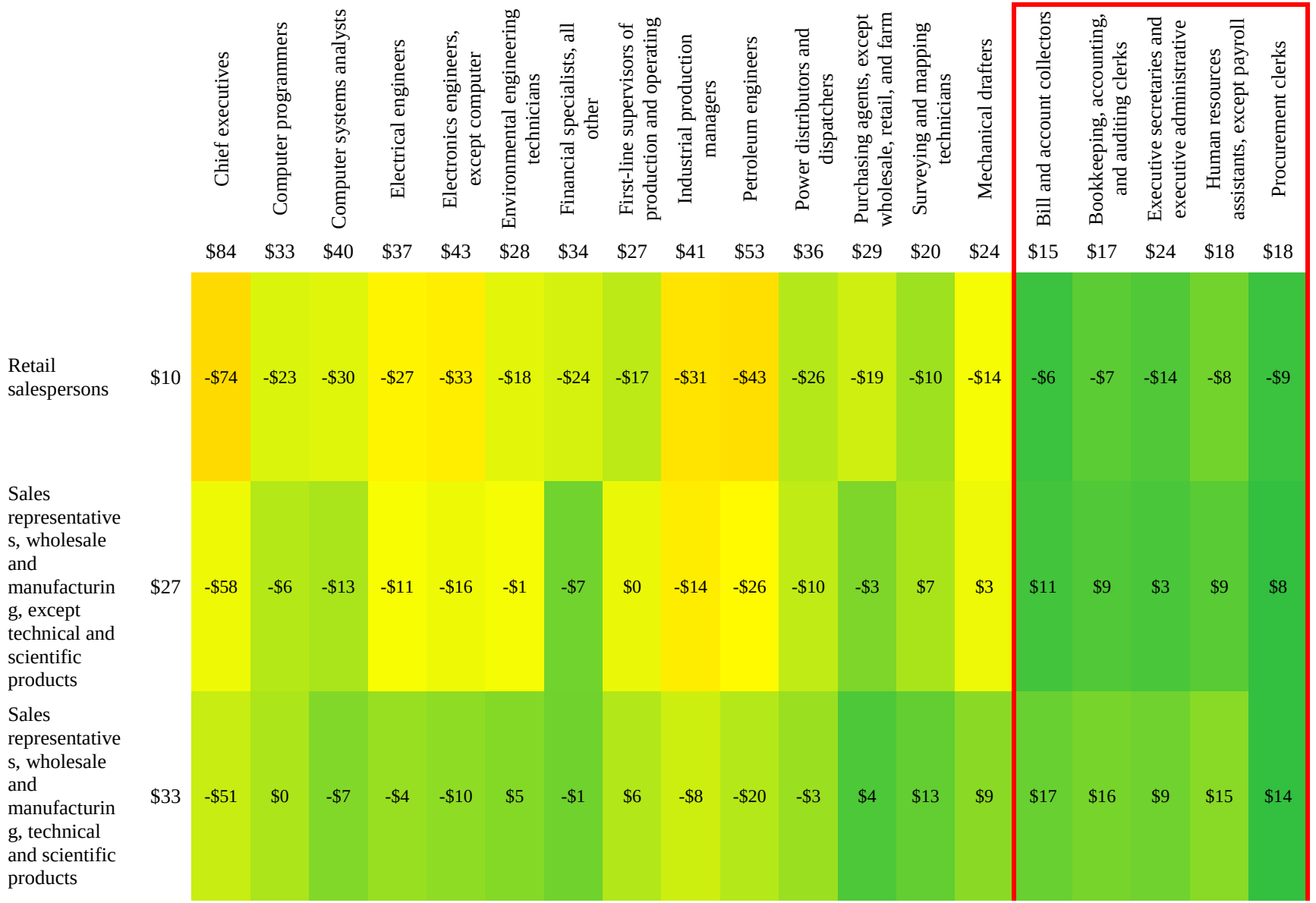
Table B.5: White Collar Occupations into Occupations Requiring Clerical Skill

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Billing and posting clerks	$16	-$68	-$16	-$23	-$21	-$26	-$11	-$17	-$10	-$25	-$36	-$20	-$13	-$3	-$7	$1	-$1	-$7	-$1	-$2
Childcare workers	$10	-$75	-$23	-$30	-$28	-$33	-$18	-$24	-$17	-$31	-$43	-$27	-$20	-$10	-$14	-$6	-$8	-$14	-$8	-$9
Customer service representatives	$15	-$70	-$18	-$25	-$22	-$28	-$13	-$19	-$12	-$26	-$38	-$21	-$15	-$5	-$9	-$1	-$3	-$9	-$3	-$4
Dental assistants	$17	-$67	-$16	-$23	-$20	-$26	-$11	-$17	-$10	-$24	-$36	-$19	-$12	-$3	-$7	$2	$0	-$7	-$1	-$1
Dental hygienists	$32	-$52	$0	-$7	-$5	-$10	$5	-$1	$6	-$9	-$20	-$4	$3	$13	$9	$17	$15	$9	$15	$14


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Health technologists and technicians, all other $19 -$65 -$14 -$20 -$18 -$24 -$8 -$15 -$7 -$22 -$33 -$17 -$10 -$1 -$4 $4 $2 -$4 $1 $1
Home health aides $10 -$74 -$23 -$30 -$27 -$33 -$18 -$24 -$17 -$31 -$43 -$26 -$20 -$10 -$14 -$6 -$7 -$14 -$8 -$9
Massage therapists $16 -$68 -$17 -$24 -$21 -$27 -$12 -$18 -$11 -$25 -$37 -$20 -$13 -$4 -$8 $1 -$1 -$8 -$2 -$3
Medical and clinical laboratory technicians $20 -$64 -$13 -$20 -$17 -$23 -$8 -$14 -$7 -$21 -$33 -$16 -$9 $0 -$4 $5 $3 -$3 $2 $2
Medical and clinical laboratory technologists $28 -$56 -$5 -$12 -$9 -$15 $0 -$6 $1 -$13 -$25 -$8 -$1 $8 $4 $12 $11 $4 $10 $9


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Medical assistants $14 -$70 -$19 -$26 -$23 -$29 -$14 -$20 -$13 -$27 -$39 -$22 -$16 -$6 -$10 -$2 -$3 -$10 -$4 -$5
Medical records and health information technicians $17 -$67 -$15 -$22 -$20 -$26 -$10 -$16 -$9 -$24 -$35 -$19 -$12 -$3 -$6 $2 $0 -$6 $0 -$1
Medical secretaries $15 -$70 -$18 -$25 -$23 -$28 -$13 -$19 -$12 -$26 -$38 -$22 -$15 -$5 -$9 -$1 -$3 -$9 -$3 -$4
Nursing assistants $12 -$73 -$21 -$28 -$26 -$31 -$16 -$22 -$15 -$29 -$41 -$24 -$18 -$8 -$12 -$4 -$6 -$12 -$6 -$7
Office clerks, general $14 -$70 -$19 -$26 -$23 -$29 -$14 -$20 -$13 -$27 -$39 -$22 -$16 -$6 -$10 -$2 -$3 -$10 -$4 -$5


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Personal care aides $10 -$74 -$23 -$30 -$27 -$33 -$18 -$24 -$17 -$31 -$43 -$26 -$20 -$10 -$14 -$6 -$8 -$14 -$8 -$9
Pharmacy technicians $13 -$71 -$20 -$26 -$24 -$30 -$14 -$21 -$13 -$28 -$39 -$23 -$16 -$7 -$10 -$2 -$4 -$10 -$5 -$5
Phlebotomists $15 -$70 -$18 -$25 -$23 -$28 -$13 -$19 -$12 -$26 -$38 -$22 -$15 -$5 -$9 -$1 -$3 -$9 -$3 -$4
Preschool teachers, except special education $11 -$73 -$21 -$28 -$26 -$32 -$16 -$22 -$15 -$30 -$41 -$25 -$18 -$8 -$12 -$4 -$6 -$12 -$6 -$7
Radiologic technologists $26 -$59 -$7 -$14 -$12 -$17 -$2 -$8 -$1 -$15 -$27 -$11 -$4 $6 $2 $10 $8 $2 $8 $7
Receptionists and information clerks $12 -$73 -$21 -$28 -$26 -$31 -$16 -$22 -$15 -$29 -$41 -$25 -$18 -$8 -$12 -$4 -$6 -$12 -$6 -$7


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Retail salespersons $10 -$74 -$23 -$30 -$27 -$33 -$18 -$24 -$17 -$31 -$43 -$26 -$19 -$10 -$14 -$6 -$7 -$14 -$8 -$9
Sales representatives, wholesale and manufacturing, except technical and scientific products $27 -$58 -$6 -$13 -$11 -$16 -$1 -$7 $0 -$14 -$26 -$10 -$3 $7 $3 $11 $9 $3 $9 $8
Sales representatives, wholesale and manufacturing, technical and scientific products $33 -$51 $0 -$7 -$4 -$10 $5 -$1 $6 -$8 -$20 -$3 $4 $13 $9 $17 $16 $9 $15 $14

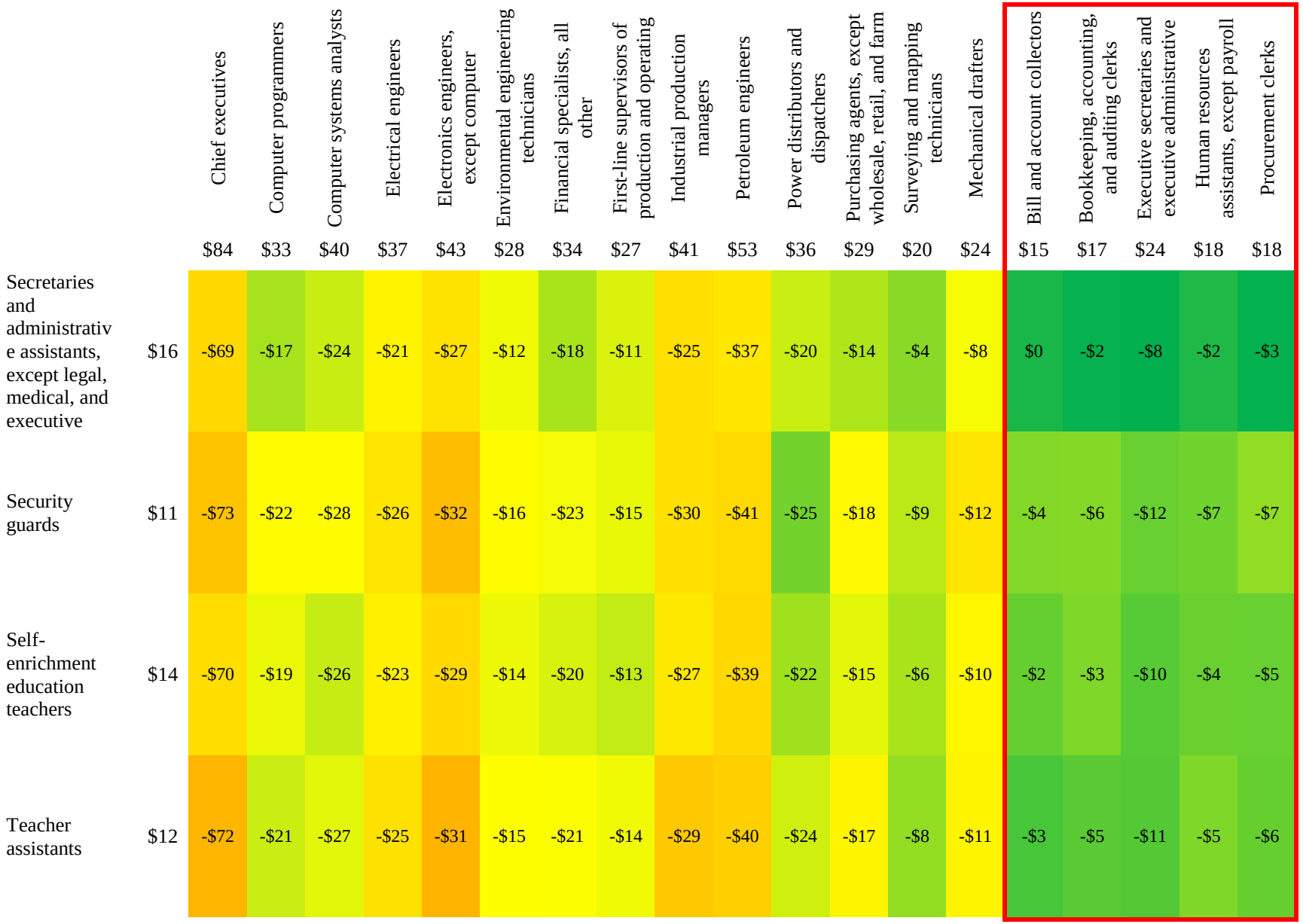
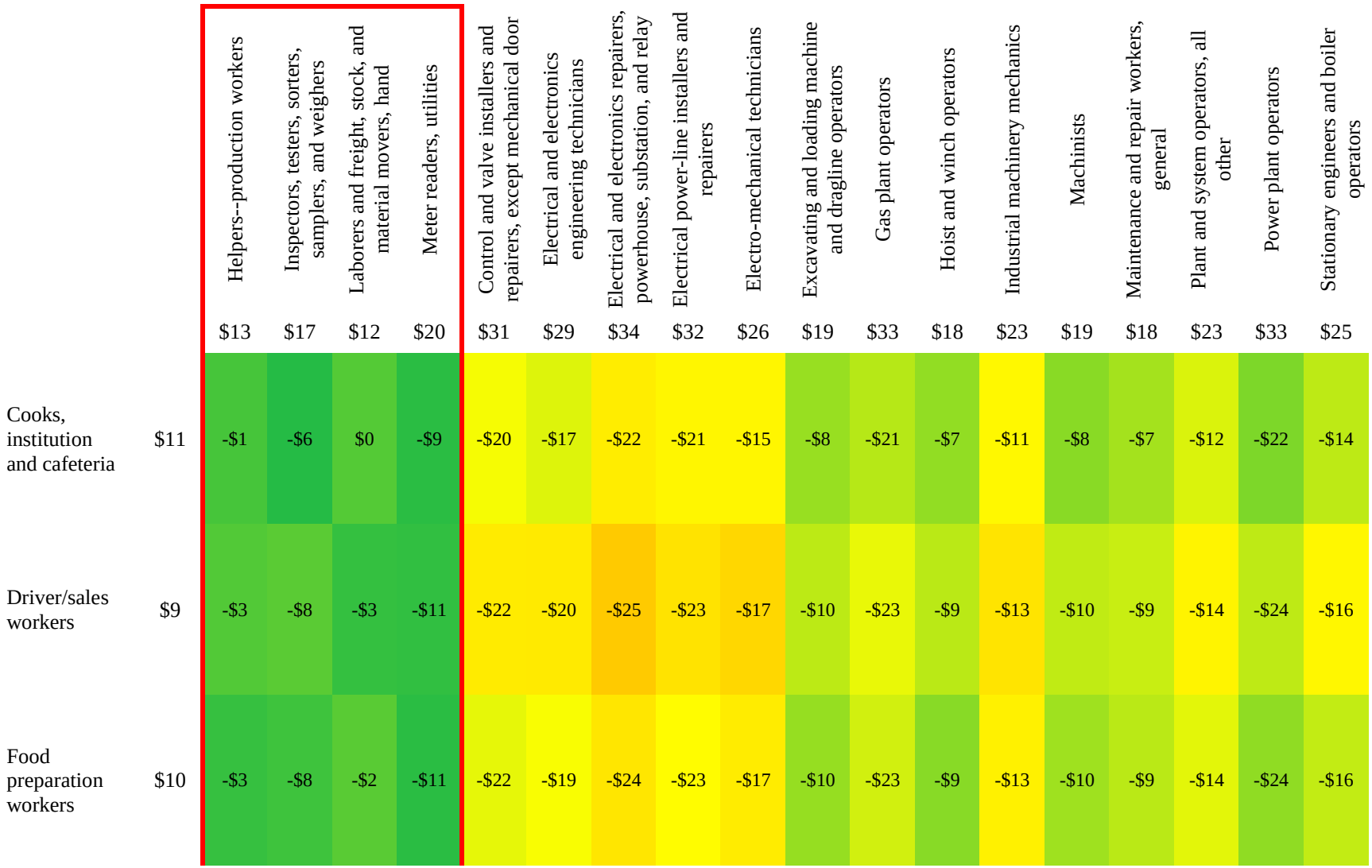
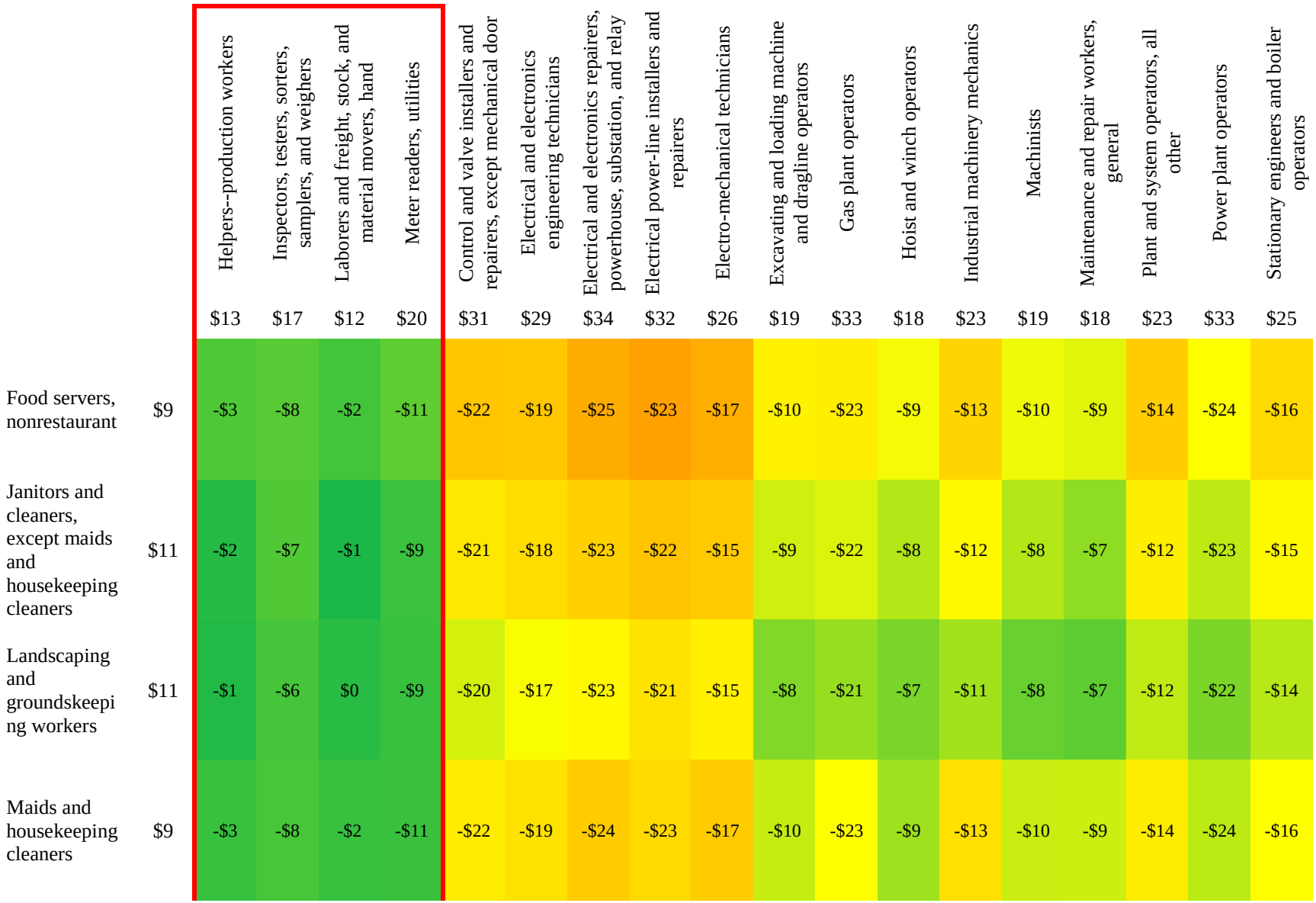

Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Secretaries and administrative assistants, except legal, medical, and executive
$16
-$69 -$17 -$24 -$21 -$27 -$12 -$18 -$11 -$25 -$37 -$20 -$14 -$4 -$8 $0 -$2 -$8 -$2 -$3
Security guards
$11
-$73 -$22 -$28 -$26 -$32 -$16 -$23 -$15 -$30 -$41 -$25 -$18 -$9 -$12 -$4 -$6 -$12 -$7 -$7
Self-enrichment education teachers
$14
-$70 -$19 -$26 -$23 -$29 -$14 -$20 -$13 -$27 -$39 -$22 -$15 -$6 -$10 -$2 -$3 -$10 -$4 -$5
Teacher assistants
$12
-$72 -$21 -$27 -$25 -$31 -$15 -$21 -$14 -$29 -$40 -$24 -$17 -$8 -$11 -$3 -$5 -$11 -$5 -$6

Table B.6: Blue Collar Occupations into Occupations Requiring Customer and Personal Service Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation, and relay	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Bus drivers, school or special client	$16	$3	-$2	$4	-$5	-$16	-$13	-$18	-$17	-$11	-$4	-$17	-$3	-$7	-$4	-$2	-$8	-$18	-$10
Cleaners of vehicles and equipment	$10	-$2	-$7	-$1	-$10	-$21	-$18	-$23	-$22	-$16	-$9	-$22	-$8	-$12	-$9	-$8	-$13	-$23	-$15
Combined food preparation and serving workers, including fast food	$9	-$4	-$8	-$3	-$11	-$22	-$20	-$25	-$23	-$17	-$10	-$24	-$9	-$14	-$10	-$9	-$14	-$24	-$17


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Cooks, institution and cafeteria $11 -$1 -$6 $0 -$9 -$20 -$17 -$22 -$21 -$15 -$8 -$21 -$7 -$11 -$8 -$7 -$12 -$22 -$14
Driver/sales workers $9 -$3 -$8 -$3 -$11 -$22 -$20 -$25 -$23 -$17 -$10 -$23 -$9 -$13 -$10 -$9 -$14 -$24 -$16
Food preparation workers $10 -$3 -$8 -$2 -$11 -$22 -$19 -$24 -$23 -$17 -$10 -$23 -$9 -$13 -$10 -$9 -$14 -$24 -$16


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Food servers, nonrestaurant $9 -$3 -$8 -$2 -$11 -$22 -$19 -$25 -$23 -$17 -$10 -$23 -$9 -$13 -$10 -$9 -$14 -$24 -$16
Janitors and cleaners, except maids and housekeeping cleaners $11 -$2 -$7 -$1 -$9 -$21 -$18 -$23 -$22 -$15 -$9 -$22 -$8 -$12 -$8 -$7 -$12 -$23 -$15
Landscaping and groundskeeping workers $11 -$1 -$6 $0 -$9 -$20 -$17 -$23 -$21 -$15 -$8 -$21 -$7 -$11 -$8 -$7 -$12 -$22 -$14
Maids and housekeeping cleaners $9 -$3 -$8 -$2 -$11 -$22 -$19 -$24 -$23 -$17 -$10 -$23 -$9 -$13 -$10 -$9 -$14 -$24 -$16

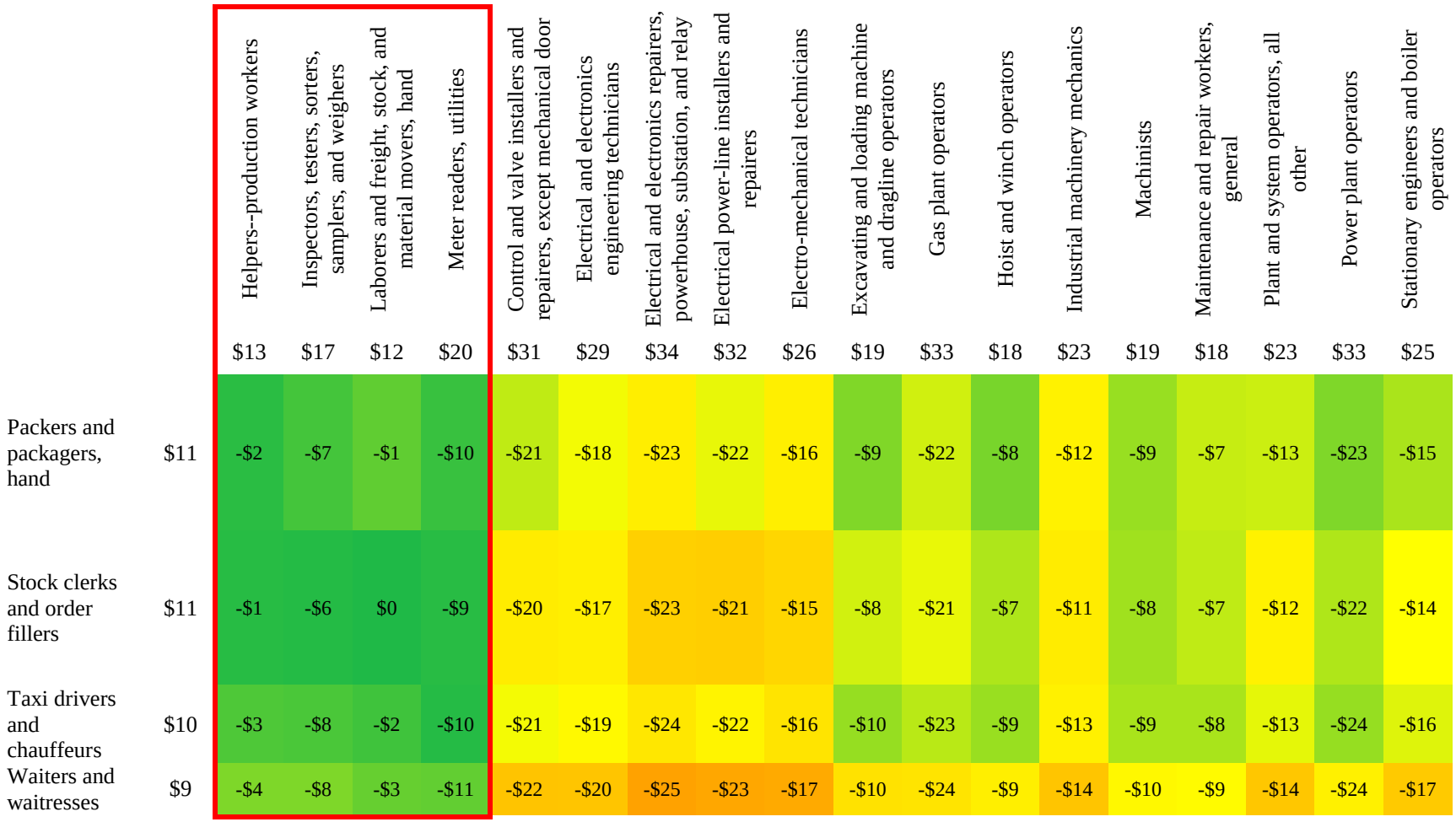
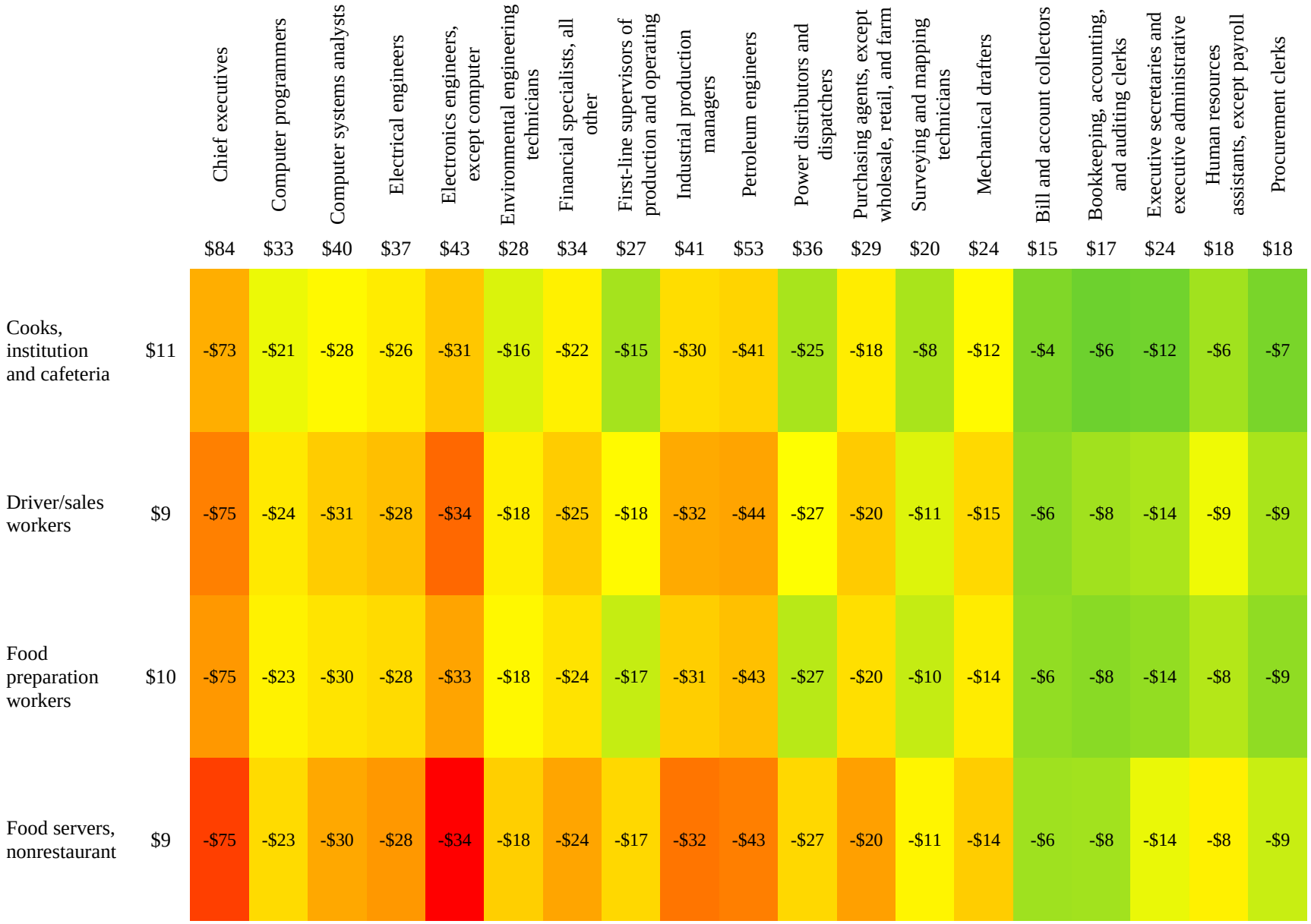
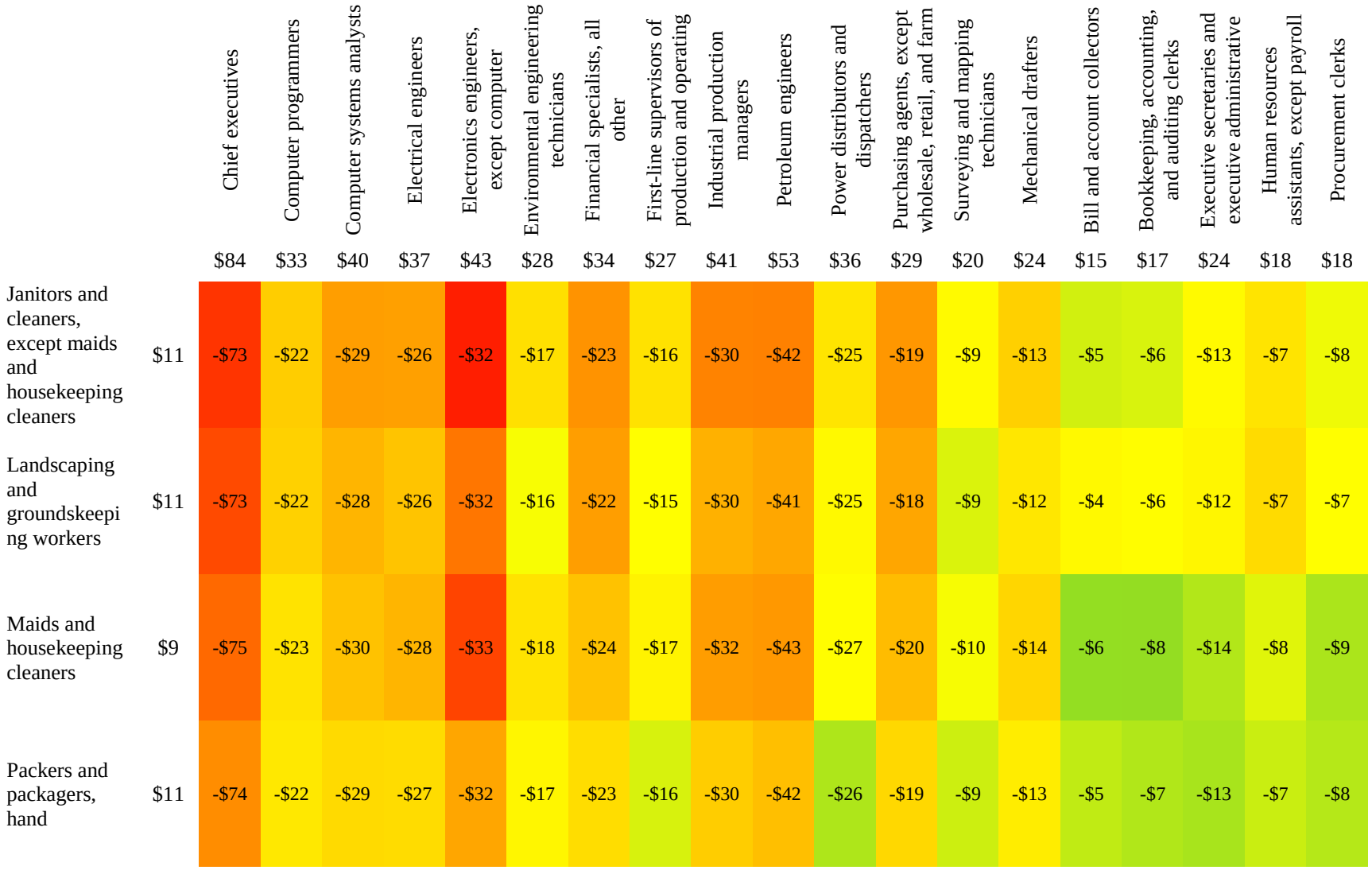

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material movers, hand
Meter readers, utilities
Control and valve installers and repairers, except mechanical door
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline operators
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Packers and packagers, hand $11 -$2 -$7 -$1 -$10 -$21 -$18 -$23 -$22 -$16 -$9 -$22 -$8 -$12 -$9 -$7 -$13 -$23 -$15
Stock clerks and order fillers $11 -$1 -$6 $0 -$9 -$20 -$17 -$23 -$21 -$15 -$8 -$21 -$7 -$11 -$8 -$7 -$12 -$22 -$14
Taxi drivers and chauffeurs $10 -$3 -$8 -$2 -$10 -$21 -$19 -$24 -$22 -$16 -$10 -$23 -$9 -$13 -$9 -$8 -$13 -$24 -$16
Waiters and waitresses $9 -$4 -$8 -$3 -$11 -$22 -$20 -$25 -$23 -$17 -$10 -$24 -$9 -$14 -$10 -$9 -$14 -$24 -$17

Table B.7: White Collar Occupations into Occupations Requiring Customer and Personal Service Skill

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Bus drivers, school or special client	$16	-$69	-$17	-$24	-$22	-$27	-$12	-$18	-$11	-$25	-$37	-$21	-$14	-$4	-$8	$0	-$2	-$8	-$2	-$3
Cleaners of vehicles and equipment	$10	-$74	-$22	-$29	-$27	-$33	-$17	-$23	-$16	-$31	-$42	-$26	-$19	-$9	-$13	-$5	-$7	-$13	-$7	-$8
Combined food preparation and serving workers, including fast food	$9	-$75	-$24	-$31	-$28	-$34	-$19	-$25	-$18	-$32	-$44	-$27	-$20	-$11	-$15	-$7	-$8	-$15	-$9	-$10


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Cooks, institution and cafeteria $11 -$73 -$21 -$28 -$26 -$31 -$16 -$22 -$15 -$30 -$41 -$25 -$18 -$8 -$12 -$4 -$6 -$12 -$6 -$7
Driver/sales workers $9 -$75 -$24 -$31 -$28 -$34 -$18 -$25 -$18 -$32 -$44 -$27 -$20 -$11 -$15 -$6 -$8 -$14 -$9 -$9
Food preparation workers $10 -$75 -$23 -$30 -$28 -$33 -$18 -$24 -$17 -$31 -$43 -$27 -$20 -$10 -$14 -$6 -$8 -$14 -$8 -$9
Food servers, nonrestaurant $9 -$75 -$23 -$30 -$28 -$34 -$18 -$24 -$17 -$32 -$43 -$27 -$20 -$11 -$14 -$6 -$8 -$14 -$8 -$9


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Janitors and cleaners, except maids and housekeeping cleaners
$11
-$73 -$22 -$29 -$26 -$32 -$17 -$23 -$16 -$30 -$42 -$25 -$19 -$9 -$13 -$5 -$6 -$13 -$7 -$8
Landscaping and groundskeeping workers
$11
-$73 -$22 -$28 -$26 -$32 -$16 -$22 -$15 -$30 -$41 -$25 -$18 -$9 -$12 -$4 -$6 -$12 -$7 -$7
Maids and housekeeping cleaners
$9
-$75 -$23 -$30 -$28 -$33 -$18 -$24 -$17 -$32 -$43 -$27 -$20 -$10 -$14 -$6 -$8 -$14 -$8 -$9
Packers and packagers, hand
$11
-$74 -$22 -$29 -$27 -$32 -$17 -$23 -$16 -$30 -$42 -$26 -$19 -$9 -$13 -$5 -$7 -$13 -$7 -$8

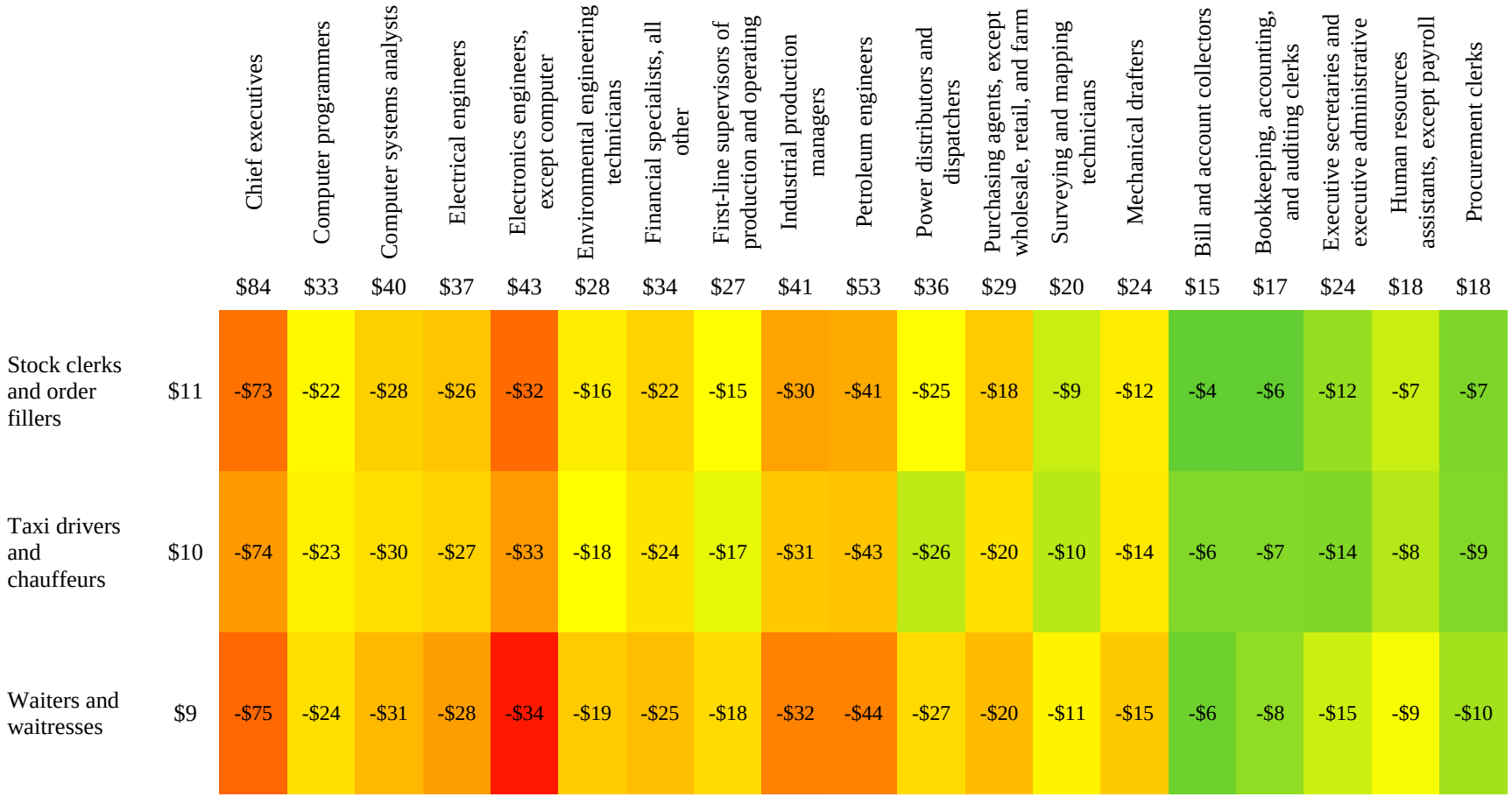
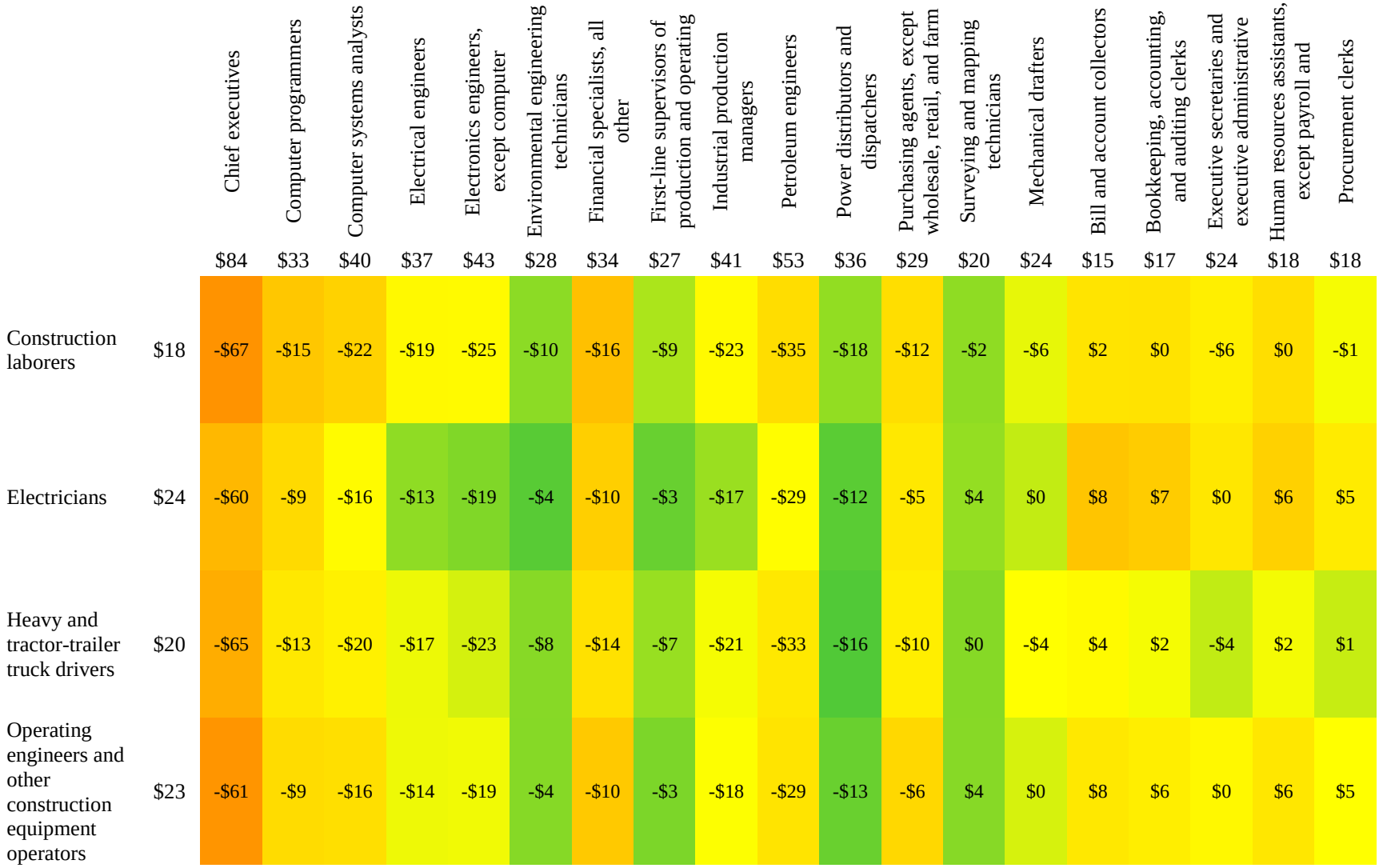
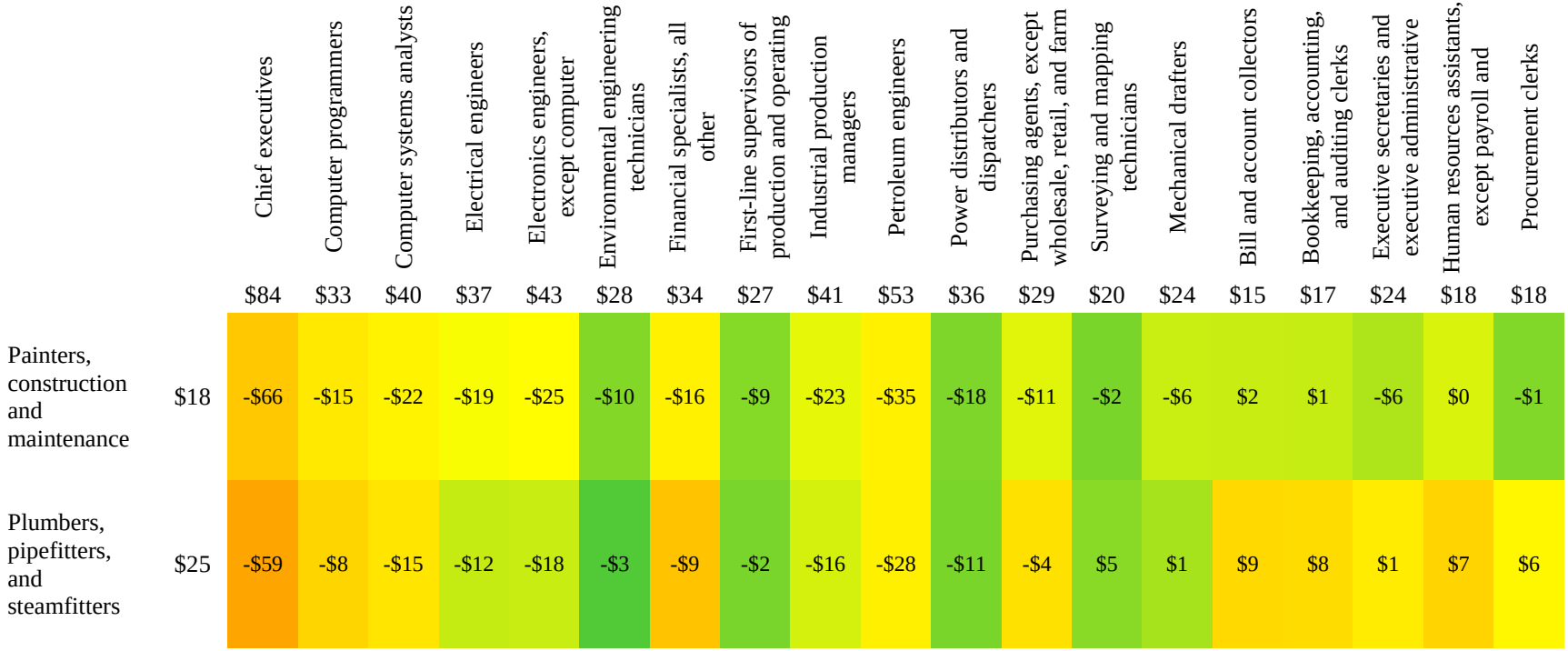

Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Stock clerks and order fillers $11 -$73 -$22 -$28 -$26 -$32 -$16 -$22 -$15 -$30 -$41 -$25 -$18 -$9 -$12 -$4 -$6 -$12 -$7 -$7
Taxi drivers and chauffeurs $10 -$74 -$23 -$30 -$27 -$33 -$18 -$24 -$17 -$31 -$43 -$26 -$20 -$10 -$14 -$6 -$7 -$14 -$8 -$9
Waiters and waitresses $9 -$75 -$24 -$31 -$28 -$34 -$19 -$25 -$18 -$32 -$44 -$27 -$20 -$11 -$15 -$6 -$8 -$15 -$9 -$10

Table B.8: White Collar Occupations into Occupations Requiring Mechanical Skill

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Automotive service technicians and mechanics	$17	-$67	-$16	-$23	-$20	-$26	-$11	-$17	-$10	-$24	-$36	-$19	-$12	-$3	-$7	$2	$0	-$7	-$1	-$2
Bus and truck mechanics and diesel engine specialists	$21	-$63	-$12	-$19	-$16	-$22	-$7	-$13	-$6	-$20	-$32	-$15	-$8	$1	-$3	$6	$4	-$2	$3	$3
Carpenters	$21	-$63	-$12	-$19	-$16	-$22	-$7	-$13	-$6	-$20	-$32	-$15	-$8	$1	-$3	$6	$4	-$3	$3	$3
Computer-controlled machine tool operators, metal and plastic	$18	-$66	-$15	-$22	-$19	-$25	-$10	-$16	-$9	-$23	-$35	-$18	-$12	-$2	-$6	$2	$1	-$6	$0	-$1


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll and
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Construction laborers $18 -$67 -$15 -$22 -$19 -$25 -$10 -$16 -$9 -$23 -$35 -$18 -$12 -$2 -$6 $2 $0 -$6 $0 -$1
Electricians $24 -$60 -$9 -$16 -$13 -$19 -$4 -$10 -$3 -$17 -$29 -$12 -$5 $4 $0 $8 $7 $0 $6 $5
Heavy and tractor-trailer truck drivers $20 -$65 -$13 -$20 -$17 -$23 -$8 -$14 -$7 -$21 -$33 -$16 -$10 $0 -$4 $4 $2 -$4 $2 $1
Operating engineers and other construction equipment operators $23 -$61 -$9 -$16 -$14 -$19 -$4 -$10 -$3 -$18 -$29 -$13 -$6 $4 $0 $8 $6 $0 $6 $5


Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll and
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Painters, construction and maintenance
$18
-$66 -$15 -$22 -$19 -$25 -$10 -$16 -$9 -$23 -$35 -$18 -$11 -$2 -$6 $2 $1 -$6 $0 -$1
Plumbers, pipefitters, and steamfitters
$25
-$59 -$8 -$15 -$12 -$18 -$3 -$9 -$2 -$16 -$28 -$11 -$4 $5 $1 $9 $8 $1 $7 $6

Appendix C: Power Plant Occupations to Emerging Occupations in OVRDC and Buckeye Hills Regions

Table C.1: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Construction managers	$41	$28	$23	$29	$21	$10	$12	$7	$9	$15	$21	$8	$23	$18	$22	$23	$18	$7	$15
Opticians, dispensing	$17	$5	$0	$6	-$3	-$14	-$11	-$16	-$15	-$9	-$2	-$15	-$1	-$5	-$2	-$1	-$6	-$16	-$8

Table C.2: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Construction managers	$41	-$43	$8	$1	$4	-$2	$13	$7	$14	$0	-$12	$5	$12	$21	$17	$25	$24	$17	$23	$22
Opticians, dispensing	$17	-$67	-$15	-$22	-$20	-$25	-$10	-$16	-$9	-$24	-$35	-$19	-$12	-$2	-$6	$2	$0	-$6	$0	-$1

Table C.3: Blue Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material	Meter readers, utilities	Control and valve installers and repairers,	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Child, family, and school social workers	$19	$6	$1	$7	-$1	-$12	-$10	-$15	-$13	-$7	-$1	-$14	$0	-$4	$0	$1	-$4	-$15	-$7
Health specialties teachers, postsecondary	$39	$26	$21	$27	$19	$8	$10	$5	$7	$13	$19	$6	$20	$16	$20	$21	$16	$5	$13

Table C.4: White Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Child, family, and school social workers	$19	-$65	-$14	-$21	-$18	-$24	-$9	-$15	-$8	-$22	-$34	-$17	-$11	-$1	-$5	$3	$2	-$5	$1	$0
Health specialties teachers, postsecondary	$39	-$45	$6	-$1	$2	-$4	$11	$5	$12	-$2	-$14	$3	$9	$19	$15	$23	$22	$15	$21	$20

Table C.5: Blue Collar Occupations into Occupations Requiring Mechanical Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material	Meter readers, utilities	Control and valve installers and repairers,	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Heating, air conditioning, and refrigeration mechanics and installers	$21	$9	$4	$10	$1	-$10	-$7	-$13	-$11	-$5	$2	-$11	$3	-$1	$2	$3	-$2	-$12	-$4

Table C.6: White Collar Occupations into Occupations Requiring Mechanical Skill

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Heating, air conditioning, and refrigeration mechanics and installers	$21	-$63	-$12	-$18	-$16	-$22	-$6	-$12	-$5	-$20	-$31	-$15	-$8	$1	-$2	$6	$4	-$2	$3	$3

Appendix D: Power Plant Occupations to Emerging Occupations in the Buckeye Hills Region

Table D.1: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Lawyers	$46	$34	$29	$35	$26	$15	$18	$12	$14	$20	$27	$14	$28	$24	$27	$28	$23	$13	$21
Network and computer systems administrators	$33	$21	$16	$22	$13	$2	$5	$0	$1	$7	$14	$1	$15	$11	$14	$15	$10	$0	$8
Web developers	$28	$16	$11	$17	$8	-$3	$0	-$6	-$4	$2	$9	-$4	$10	$6	$9	$10	$5	-$5	$3

Table D.2: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Lawyers	$46	-$38	$13	$7	$9	$3	$19	$13	$20	$5	-$6	$10	$17	$26	$23	$31	$29	$23	$28	$28
Network and computer systems administrators	$33	-$51	$1	-$6	-$4	-$9	$6	$0	$7	-$8	-$19	-$3	$4	$14	$10	$18	$16	$10	$16	$15
Web developers	$28	-$56	-$5	-$11	-$9	-$15	$1	-$5	$2	-$13	-$24	-$8	-$1	$8	$5	$13	$11	$5	$10	$10

Table D.3: Blue Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material	Meter readers, utilities	Control and valve installers and repairers,	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Elementary school teachers, except special education	$29	$16	$11	$17	$8	-$3	$0	-$5	-$4	$2	$9	-$4	$10	$6	$10	$11	$5	-$5	$3
Family and general practitioners	$87	$74	$69	$75	$66	$55	$58	$53	$54	$60	$67	$54	$68	$64	$68	$69	$63	$53	$61
Middle school teachers, except special and career/technical education	$28	$16	$11	$16	$8	-$3	-$1	-$6	-$4	$2	$9	-$4	$10	$6	$9	$10	$5	-$5	$3
Physician assistants	$49	$36	$31	$37	$28	$17	$20	$15	$16	$22	$29	$16	$30	$26	$30	$31	$25	$15	$23
Police and sheriff's patrol officers	$28	$15	$10	$16	$7	-$4	-$1	-$6	-$5	$1	$8	-$5	$9	$5	$9	$10	$4	-$6	$2


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Laborers and freight, stock, and material
Meter readers, utilities
Control and valve installers and repairers,
Electrical and electronics engineering technicians
Electrical and electronics repairers, powerhouse,
Electrical power-line installers and repairers
Electro-mechanical technicians
Excavating and loading machine and dragline
Gas plant operators
Hoist and winch operators
Industrial machinery mechanics
Machinists
Maintenance and repair workers, general
Plant and system operators, all other
Power plant operators
Stationary engineers and boiler operators
$13 $17 $12 $20 $31 $29 $34 $32 $26 $19 $33 $18 $23 $19 $18 $23 $33 $25
Respiratory therapists $26 $13 $9 $14 $6 -$5 -$3 -$8 -$6 $0 $6 -$7 $8 $3 $7 $8 $3 -$8 $0
Secondary school teachers, except special and career/technical education $28 $16 $11 $17 $8 -$3 $0 -$6 -$4 $2 $9 -$4 $10 $6 $9 $10 $5 -$5 $3

Table D.4: White Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering	Financial specialists, all other	First-line supervisors of production and	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale,	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and	Executive secretaries and executive	Human resources assistants, except	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Elementary school teachers, except special education	$29	-$56	-$4	-$11	-$9	-$14	$1	-$5	$2	-$12	-$24	-$7	-$1	$9	$5	$13	$11	$5	$11	$10
Family and general practitioners	$87	$2	$54	$47	$50	$44	$59	$53	$60	$46	$34	$51	$57	$67	$63	$71	$69	$63	$69	$68
Middle school teachers, except special and career/technical education	$28	-$56	-$5	-$11	-$9	-$15	$1	-$6	$1	-$13	-$25	-$8	-$1	$8	$5	$13	$11	$5	$10	$10
Physician assistants	$49	-$36	$16	$9	$12	$6	$21	$15	$22	$8	-$4	$13	$19	$29	$25	$33	$31	$25	$31	$30
Police and sheriff's patrol officers	$28	-$57	-$5	-$12	-$10	-$15	$0	-$6	$1	-$13	-$25	-$8	-$2	$8	$4	$12	$10	$4	$10	$9

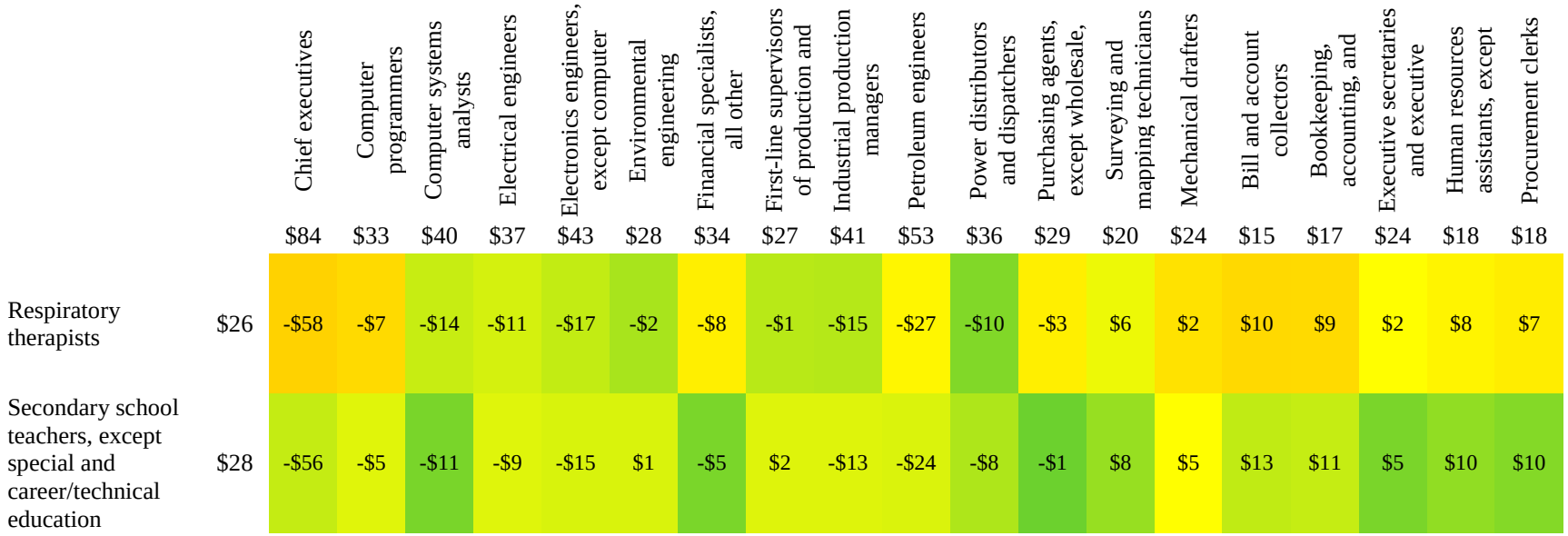

Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering
Financial specialists, all other
First-line supervisors of production and
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale,
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and
Executive secretaries and executive
Human resources assistants, except
Procurement clerks
$84 $33 $40 $37 $43 $28 $34 $27 $41 $53 $36 $29 $20 $24 $15 $17 $24 $18 $18
Respiratory therapists
$26
-$58 -$7 -$14 -$11 -$17 -$2 -$8 -$1 -$15 -$27 -$10 -$3 $6 $2 $10 $9 $2 $8 $7
Secondary school teachers, except special and career/technical education
$28
-$56 -$5 -$11 -$9 -$15 $1 -$5 $2 -$13 -$24 -$8 -$1 $8 $5 $13 $11 $5 $10 $10

Table D.5: Blue Collar Occupations into Occupations Requiring Customer and Personal Service Skill

		Helpers--production workers	**Inspectors, testers, sorters, samplers, and weighers**	**Laborers and freight, stock, and material movers, hand**	**Meter readers, utilities**	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
		$13	$17	$12	$20	$31	$29	$34	$32	$26	$19	$33	$18	$23	$19	$18	$23	$33	$25
Counter attendants, cafeteria, food concession, and coffee shop	$9	-$4	-$8	-$3	-$11	-$22	-$20	-$25	-$23	-$17	-$10	-$24	-$9	-$14	-$10	-$9	-$14	-$24	-$16

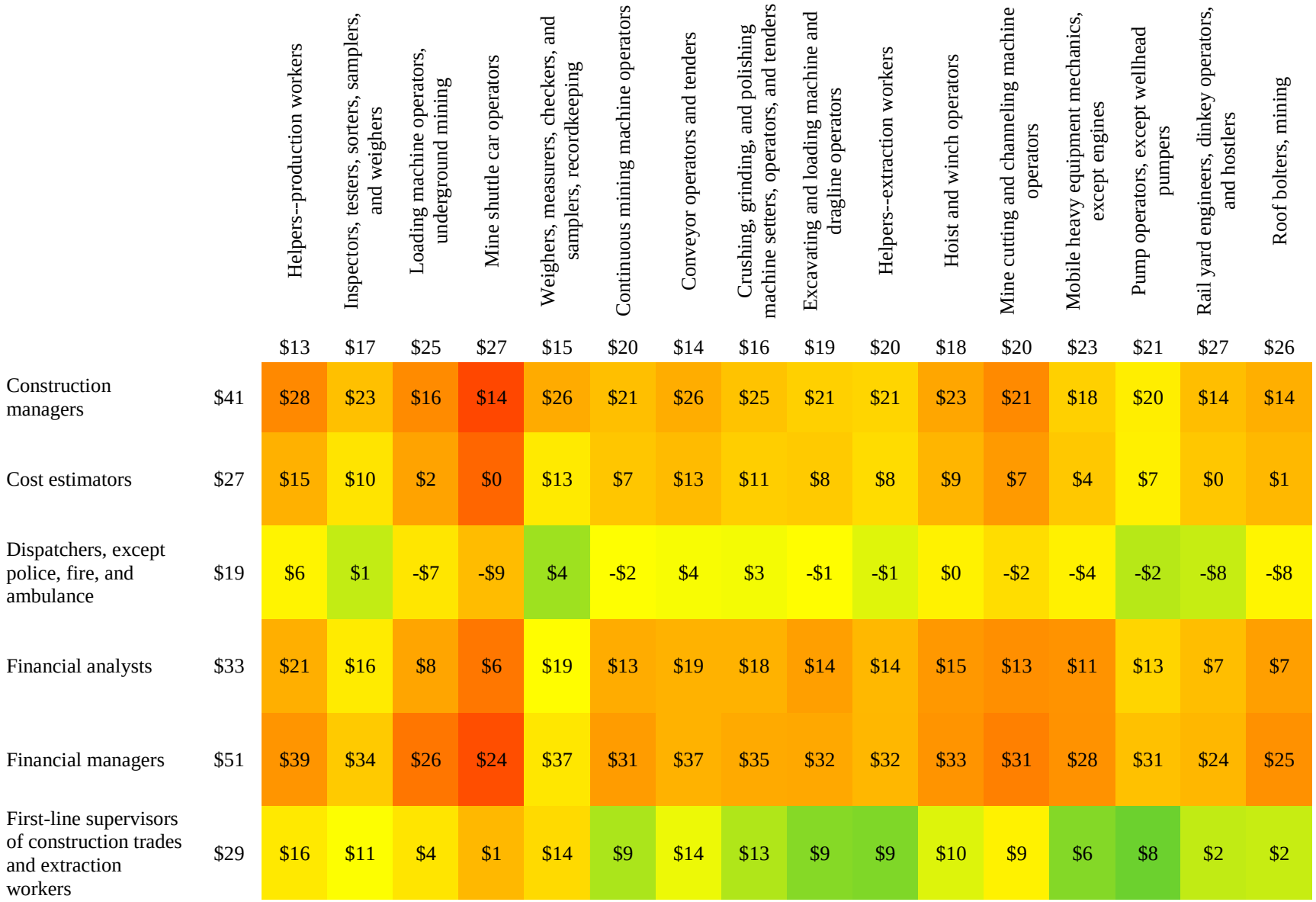
Table D.6: White Collar Occupations into Occupations Requiring Customer and Personal Service Skill

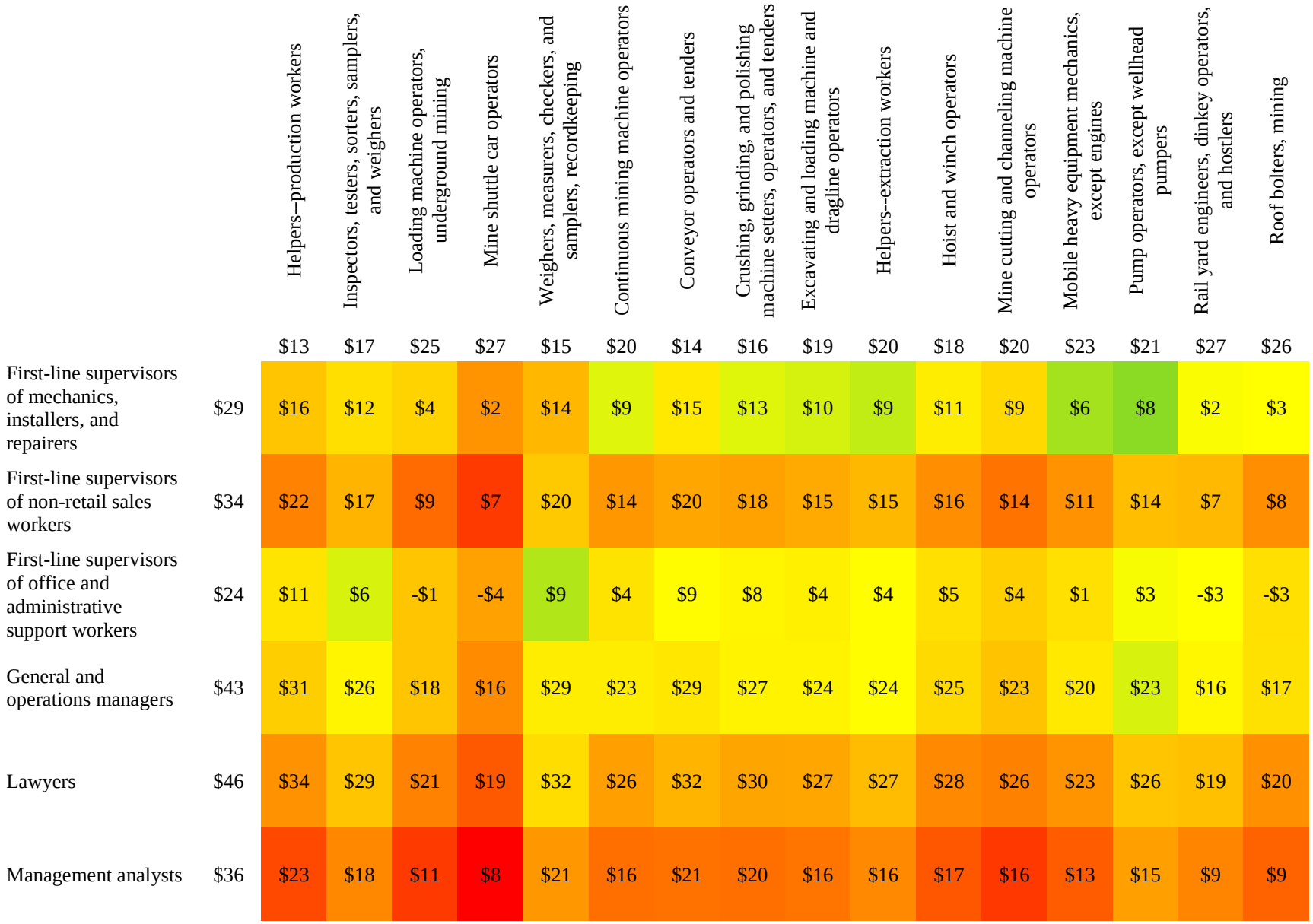
		Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
		$84	$33	$40	$37	$43	$28	$34	$27	$41	$53	$36	$29	$20	$24	$15	$17	$24	$18	$18
Counter attendants, cafeteria, food concession, and coffee shop	$9	-$75	-$24	-$31	-$28	-$34	-$19	-$25	-$18	-$32	-$44	-$27	-$20	-$11	-$15	-$6	-$8	-$15	-$9	-$9

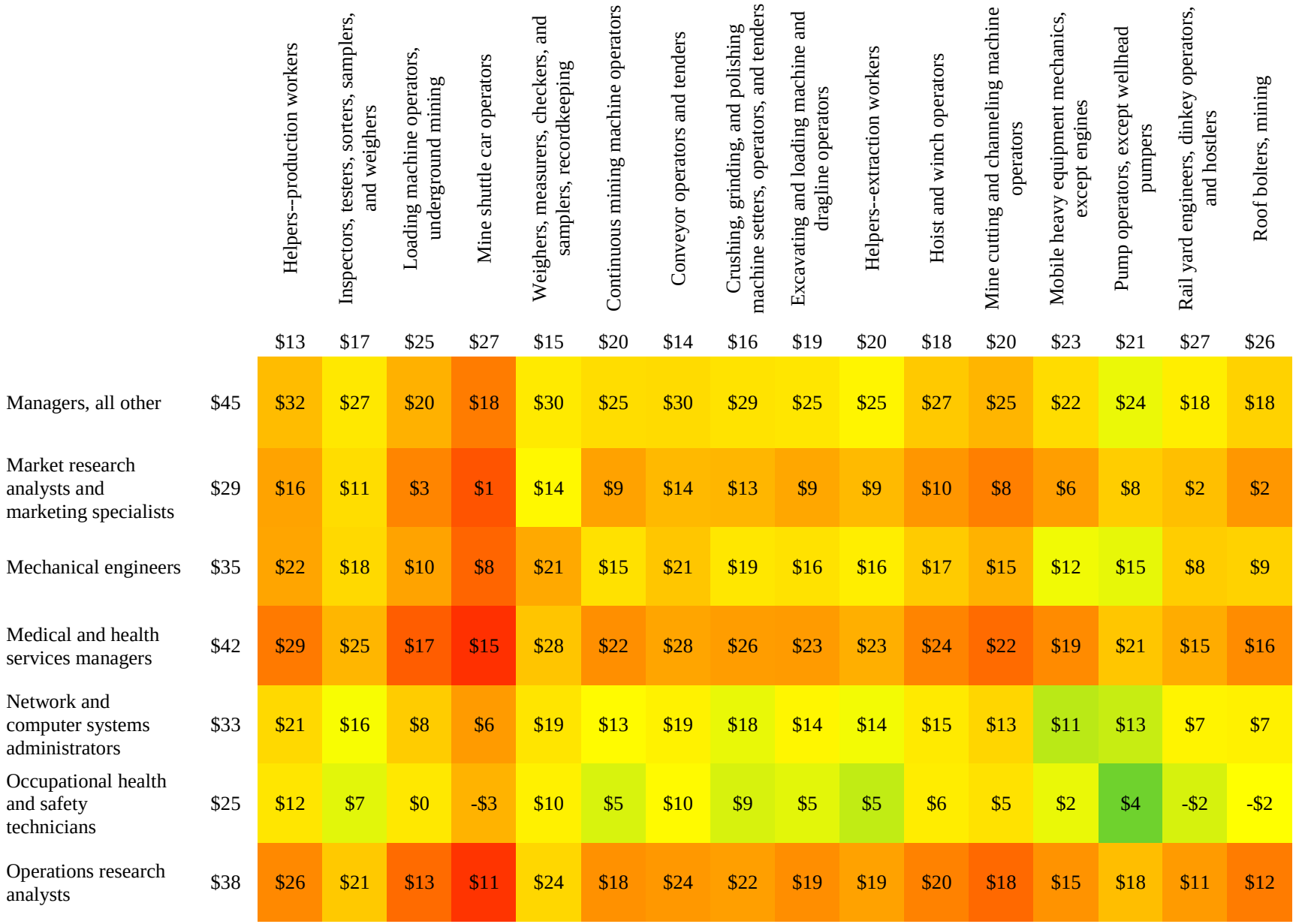
Appendix E: Mine Occupations to Emerging Occupations in the OMEGA Region

Table E.1: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
		$13	$17	$25	$27	$15	$20	$14	$16	$19	$20	$18	$20	$23	$21	$27	$26
Accountants and auditors	$30	$18	$13	$5	$3	$16	$10	$16	$15	$11	$11	$12	$10	$8	$10	$4	$4
Administrative services managers	$37	$25	$20	$12	$10	$23	$17	$23	$22	$18	$18	$19	$17	$15	$17	$11	$11
Business operations specialists, all other	$30	$17	$13	$5	$3	$15	$10	$16	$14	$11	$10	$12	$10	$7	$9	$3	$4
Civil engineers	$37	$24	$19	$11	$9	$22	$17	$22	$21	$17	$17	$18	$16	$14	$16	$10	$10
Computer and information systems managers	$57	$44	$39	$32	$30	$42	$37	$42	$41	$37	$37	$39	$37	$34	$36	$30	$30
Computer user support specialists	$21	$8	$3	-$5	-$7	$6	$1	$6	$5	$1	$1	$2	$0	-$2	$0	-$6	-$6


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
$13 $17 $25 $27 $15 $20 $14 $16 $19 $20 $18 $20 $23 $21 $27 $26
Construction managers $41 $28 $23 $16 $14 $26 $21 $26 $25 $21 $21 $23 $21 $18 $20 $14 $14
Cost estimators $27 $15 $10 $2 $0 $13 $7 $13 $11 $8 $8 $9 $7 $4 $7 $0 $1
Dispatchers, except police, fire, and ambulance $19 $6 $1 -$7 -$9 $4 -$2 $4 $3 -$1 -$1 $0 -$2 -$4 -$2 -$8 -$8
Financial analysts $33 $21 $16 $8 $6 $19 $13 $19 $18 $14 $14 $15 $13 $11 $13 $7 $7
Financial managers $51 $39 $34 $26 $24 $37 $31 $37 $35 $32 $32 $33 $31 $28 $31 $24 $25
First-line supervisors of construction trades and extraction workers $29 $16 $11 $4 $1 $14 $9 $14 $13 $9 $9 $10 $9 $6 $8 $2 $2


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
$13 $17 $25 $27 $15 $20 $14 $16 $19 $20 $18 $20 $23 $21 $27 $26
First-line supervisors of mechanics, installers, and repairers $29 $16 $12 $4 $2 $14 $9 $15 $13 $10 $9 $11 $9 $6 $8 $2 $3
First-line supervisors of non-retail sales workers $34 $22 $17 $9 $7 $20 $14 $20 $18 $15 $15 $16 $14 $11 $14 $7 $8
First-line supervisors of office and administrative support workers $24 $11 $6 -$1 -$4 $9 $4 $9 $8 $4 $4 $5 $4 $1 $3 -$3 -$3
General and operations managers $43 $31 $26 $18 $16 $29 $23 $29 $27 $24 $24 $25 $23 $20 $23 $16 $17
Lawyers $46 $34 $29 $21 $19 $32 $26 $32 $30 $27 $27 $28 $26 $23 $26 $19 $20
Management analysts $36 $23 $18 $11 $8 $21 $16 $21 $20 $16 $16 $17 $16 $13 $15 $9 $9


Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
$13 $17 $25 $27 $15 $20 $14 $16 $19 $20 $18 $20 $23 $21 $27 $26
Managers, all other $45 $32 $27 $20 $18 $30 $25 $30 $29 $25 $25 $27 $25 $22 $24 $18 $18
Market research analysts and marketing specialists $29 $16 $11 $3 $1 $14 $9 $14 $13 $9 $9 $10 $8 $6 $8 $2 $2
Mechanical engineers $35 $22 $18 $10 $8 $21 $15 $21 $19 $16 $16 $17 $15 $12 $15 $8 $9
Medical and health services managers $42 $29 $25 $17 $15 $28 $22 $28 $26 $23 $23 $24 $22 $19 $21 $15 $16
Network and computer systems administrators $33 $21 $16 $8 $6 $19 $13 $19 $18 $14 $14 $15 $13 $11 $13 $7 $7
Occupational health and safety technicians $25 $12 $7 $0 -$3 $10 $5 $10 $9 $5 $5 $6 $5 $2 $4 -$2 -$2
Operations research analysts $38 $26 $21 $13 $11 $24 $18 $24 $22 $19 $19 $20 $18 $15 $18 $11 $12

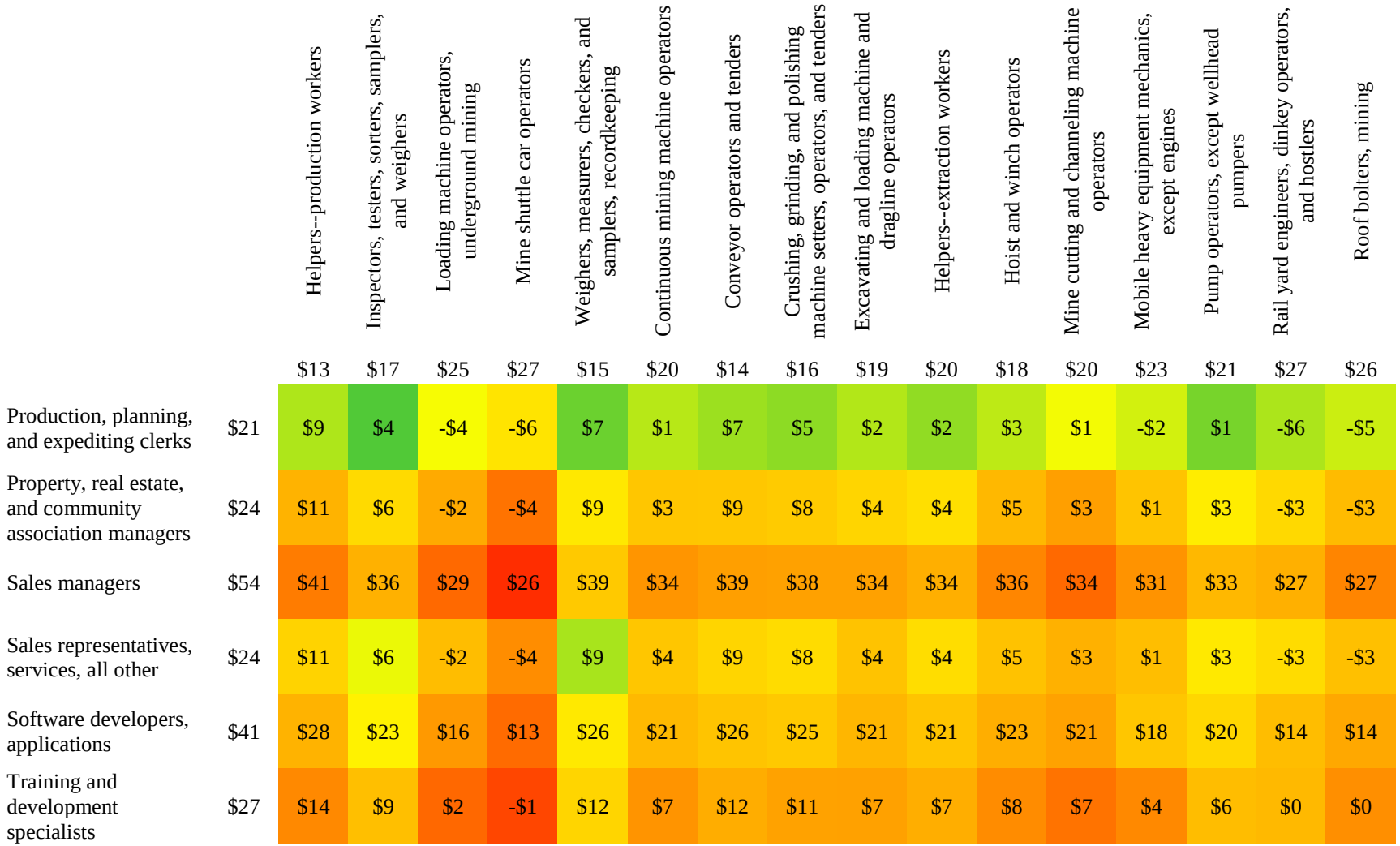

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
$13 $17 $25 $27 $15 $20 $14 $16 $19 $20 $18 $20 $23 $21 $27 $26
Production, planning, and expediting clerks $21 $9 $4 -$4 -$6 $7 $1 $7 $5 $2 $2 $3 $1 -$2 $1 -$6 -$5
Property, real estate, and community association managers $24 $11 $6 -$2 -$4 $9 $3 $9 $8 $4 $4 $5 $3 $1 $3 -$3 -$3
Sales managers $54 $41 $36 $29 $26 $39 $34 $39 $38 $34 $34 $36 $34 $31 $33 $27 $27
Sales representatives, services, all other $24 $11 $6 -$2 -$4 $9 $4 $9 $8 $4 $4 $5 $3 $1 $3 -$3 -$3
Software developers, applications $41 $28 $23 $16 $13 $26 $21 $26 $25 $21 $21 $23 $21 $18 $20 $14 $14
Training and development specialists $27 $14 $9 $2 -$1 $12 $7 $12 $11 $7 $7 $8 $7 $4 $6 $0 $0

Table E.2: Blue Collar Occupations into Occupations Requiring Clerical Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
		$13	$17	$25	$27	$15	$20	$14	$16	$19	$20	$18	$20	$23	$21	$27	$26
Billing and posting clerks	$16	$4	-$1	-$9	-$11	$2	-$4	$2	$1	-$3	-$3	-$2	-$4	-$6	-$4	-$10	-$10
Customer service representatives	$15	$2	-$3	-$10	-$13	$0	-$5	$0	-$1	-$5	-$5	-$4	-$6	-$8	-$6	-$12	-$12
Human resources specialists	$26	$14	$9	$1	-$1	$12	$6	$12	$10	$7	$7	$8	$6	$3	$6	-$1	$0
Office clerks, general	$14	$1	-$4	-$11	-$14	-$1	-$6	-$1	-$2	-$6	-$6	-$5	-$6	-$9	-$7	-$13	-$13
Real estate sales agents	$15	$2	-$2	-$10	-$12	$1	-$5	$1	-$1	-$4	-$4	-$3	-$5	-$8	-$6	-$12	-$11
Receptionists and information clerks	$12	-$1	-$6	-$14	-$16	-$3	-$9	-$3	-$4	-$8	-$8	-$7	-$9	-$11	-$9	-$15	-$15
Retail salespersons	$10	-$3	-$7	-$15	-$17	-$5	-$10	-$5	-$6	-$10	-$10	-$8	-$10	-$13	-$11	-$17	-$17

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
		$13	$17	$25	$27	$15	$20	$14	$16	$19	$20	$18	$20	$23	$21	$27	$26
Sales representatives, wholesale and manufacturing, except technical and scientific products	$27	$14	$9	$1	-$1	$12	$7	$12	$11	$7	$7	$8	$6	$4	$6	$0	$0
Sales representatives, wholesale and manufacturing, technical and scientific products	$33	$20	$15	$8	$6	$18	$13	$18	$17	$13	$13	$15	$13	$10	$12	$6	$6
Secretaries and administrative assistants, except legal, medical, and executive	$16	$3	-$2	-$9	-$12	$1	-$4	$1	$0	-$4	-$4	-$3	-$4	-$7	-$5	-$11	-$11
Security guards	$11	-$1	-$6	-$14	-$16	-$3	-$9	-$3	-$5	-$8	-$8	-$7	-$9	-$12	-$9	-$16	-$15
Self-enrichment education teachers	$14	$1	-$3	-$11	-$13	-$1	-$6	-$1	-$2	-$5	-$6	-$4	-$6	-$9	-$7	-$13	-$12
Teacher assistants	$12	$0	-$5	-$13	-$15	-$2	-$8	-$2	-$4	-$7	-$7	-$6	-$8	-$11	-$8	-$15	-$14

Table E.3: White Collar Occupations into Occupations Requiring Clerical Skill

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Billing and posting clerks	$16	-$11	-$10	-$25	-$15	-$13	-$11	-$1	-$3
Customer service representatives	$15	-$13	-$12	-$26	-$17	-$15	-$13	-$3	-$4
Human resources specialists	$26	-$1	$0	-$15	-$5	-$3	-$1	$9	$7
Office clerks, general	$14	-$14	-$13	-$27	-$18	-$16	-$14	-$3	-$5
Real estate sales agents	$15	-$13	-$12	-$26	-$16	-$14	-$13	-$2	-$4
Receptionists and information clerks	$12	-$16	-$15	-$29	-$20	-$18	-$16	-$6	-$8
Retail salespersons	$10	-$18	-$17	-$31	-$22	-$19	-$18	-$7	-$9
Sales representatives, wholesale and manufacturing, except technical and scientific products	$27	-$1	$0	-$14	-$5	-$3	-$1	$9	$7

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Sales representatives, wholesale and manufacturing, technical and scientific products	$33	$5	$6	-$8	$1	$4	$5	$16	$14
Secretaries and administrative assistants, except legal, medical, and executive	$16	-$12	-$11	-$25	-$16	-$14	-$12	-$2	-$3
Security guards	$11	-$16	-$15	-$30	-$20	-$18	-$16	-$6	-$8
Self-enrichment education teachers	$14	-$14	-$13	-$27	-$18	-$15	-$14	-$3	-$5
Teacher assistants	$12	-$15	-$14	-$29	-$19	-$17	-$15	-$5	-$7

Table E.4: Blue Collar Occupations into Occupations Requiring Customer and Personal Service Skill

		Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
		$13	$17	$25	$27	$15	$20	$14	$16	$19	$20	$18	$20	$23	$21	$27	$26
Bakers	$11	-$2	-$6	-$14	-$16	-$3	-$9	-$3	-$5	-$8	-$8	-$7	-$9	-$12	-$10	-$16	-$15
Butchers and meat cutters	$15	$3	-$2	-$10	-$12	$1	-$5	$1	$0	-$4	-$4	-$3	-$5	-$7	-$5	-$11	-$11
Cleaners of vehicles and equipment	$10	-$2	-$7	-$15	-$17	-$4	-$10	-$4	-$5	-$9	-$9	-$8	-$10	-$12	-$10	-$16	-$16
Combined food preparation and serving workers, including fast food	$9	-$4	-$8	-$16	-$18	-$6	-$11	-$6	-$7	-$10	-$11	-$9	-$11	-$14	-$12	-$18	-$17
Counter attendants, cafeteria, food concession, and coffee shop	$9	-$4	-$8	-$16	-$18	-$5	-$11	-$5	-$7	-$10	-$10	-$9	-$11	-$14	-$12	-$18	-$17
Driver/sales workers	$9	-$3	-$8	-$16	-$18	-$5	-$11	-$5	-$7	-$10	-$10	-$9	-$11	-$14	-$11	-$18	-$17
Food preparation workers	$10	-$3	-$8	-$16	-$18	-$5	-$11	-$5	-$6	-$10	-$10	-$9	-$11	-$13	-$11	-$17	-$17

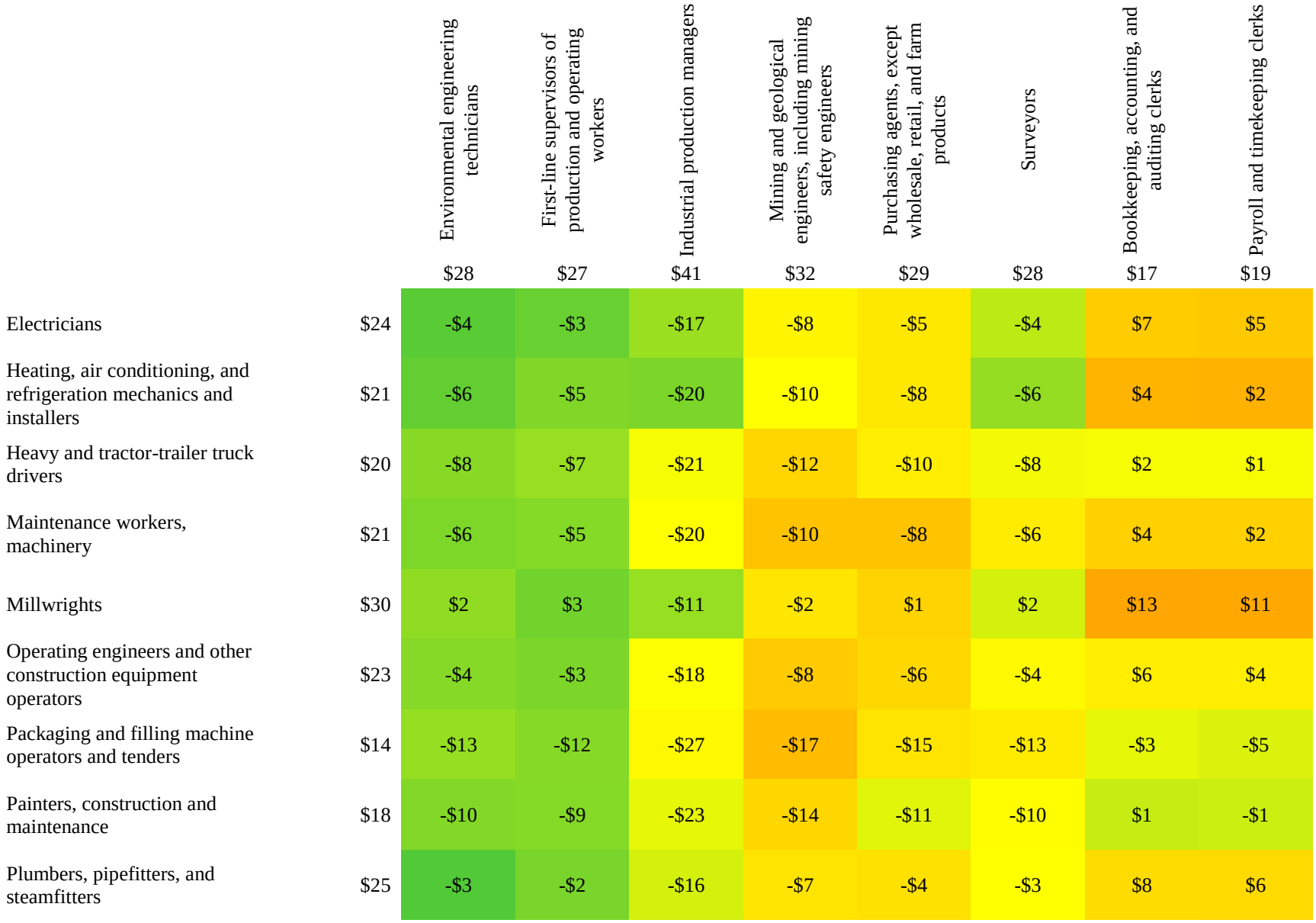
Janitors and cleaners, except maids and housekeeping cleaners	$11	-$2	-$7	-$14	-$17	-$4	-$9	-$4	-$5	-$9	-$9	-$8	-$9	-$12	-$10	-$16	-$16
Landscaping and groundskeeping workers	$11	-$1	-$6	-$14	-$16	-$3	-$9	-$3	-$5	-$8	-$8	-$7	-$9	-$12	-$9	-$16	-$15
Light truck or delivery services drivers	$14	$1	-$4	-$12	-$14	-$1	-$6	-$1	-$2	-$6	-$6	-$5	-$7	-$9	-$7	-$13	-$13
Packers and packagers, hand	$11	-$2	-$7	-$15	-$17	-$4	-$10	-$4	-$5	-$9	-$9	-$8	-$10	-$12	-$10	-$16	-$16
Stock clerks and order fillers	$11	-$1	-$6	-$14	-$16	-$3	-$9	-$3	-$5	-$8	-$8	-$7	-$9	-$12	-$9	-$16	-$15
Waiters and waitresses	$9	-$4	-$8	-$16	-$18	-$6	-$11	-$5	-$7	-$10	-$11	-$9	-$11	-$14	-$12	-$18	-$17

Table E.5: White Collar Occupations into Occupations Requiring Customer and Personal Service Skill

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Bakers	$11	-$17	-$16	-$30	-$20	-$18	-$17	-$6	-$8
Butchers and meat cutters	$15	-$12	-$11	-$26	-$16	-$14	-$12	-$2	-$4
Cleaners of vehicles and equipment	$10	-$17	-$16	-$31	-$21	-$19	-$17	-$7	-$9
Combined food preparation and serving workers, including fast food	$9	-$19	-$18	-$32	-$23	-$20	-$19	-$8	-$10
Counter attendants, cafeteria, food concession, and coffee shop	$9	-$19	-$18	-$32	-$23	-$20	-$19	-$8	-$10
Driver/sales workers	$9	-$18	-$18	-$32	-$22	-$20	-$18	-$8	-$10
Food preparation workers	$10	-$18	-$17	-$31	-$22	-$20	-$18	-$8	-$10
Janitors and cleaners, except maids and housekeeping cleaners	$11	-$17	-$16	-$30	-$21	-$19	-$17	-$6	-$8
Landscaping and groundskeeping workers	$11	-$16	-$15	-$30	-$20	-$18	-$16	-$6	-$8
Light truck or delivery services drivers	$14	-$14	-$13	-$27	-$18	-$16	-$14	-$4	-$6
Packers and packagers, hand	$11	-$17	-$16	-$30	-$21	-$19	-$17	-$7	-$9
Stock clerks and order fillers	$11	-$16	-$15	-$30	-$20	-$18	-$16	-$6	-$8
Waiters and waitresses	$9	-$19	-$18	-$32	-$23	-$20	-$19	-$8	-$10

Table E.6: White Collar Occupations into Occupations Requiring Mechanical Skill

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Automotive service technicians and mechanics	$17	-$11	-$10	-$24	-$15	-$12	-$11	$0	-$2
Brickmasons and blockmasons	$25	-$3	-$2	-$16	-$7	-$5	-$3	$8	$6
Bus and truck mechanics and diesel engine specialists	$21	-$7	-$6	-$20	-$10	-$8	-$6	$4	$2
Cabinetmakers and bench carpenters	$15	-$12	-$11	-$26	-$16	-$14	-$12	-$2	-$4
Carpenters	$21	-$7	-$6	-$20	-$11	-$8	-$7	$4	$2
Cement masons and concrete finishers	$20	-$8	-$7	-$21	-$12	-$10	-$8	$3	$1
Computer-controlled machine tool operators, metal and plastic	$18	-$10	-$9	-$23	-$14	-$12	-$10	$1	-$1
Construction laborers	$18	-$10	-$9	-$23	-$14	-$12	-$10	$0	-$1


Environmental engineering technicians
First-line supervisors of production and operating workers
Industrial production managers
Mining and geological engineers, including mining safety engineers
Purchasing agents, except wholesale, retail, and farm products
Surveyors
Bookkeeping, accounting, and auditing clerks
Payroll and timekeeping clerks
$28 $27 $41 $32 $29 $28 $17 $19
Electricians $24 -$4 -$3 -$17 -$8 -$5 -$4 $7 $5
Heating, air conditioning, and refrigeration mechanics and installers $21 -$6 -$5 -$20 -$10 -$8 -$6 $4 $2
Heavy and tractor-trailer truck drivers $20 -$8 -$7 -$21 -$12 -$10 -$8 $2 $1
Maintenance workers, machinery $21 -$6 -$5 -$20 -$10 -$8 -$6 $4 $2
Millwrights $30 $2 $3 -$11 -$2 $1 $2 $13 $11
Operating engineers and other construction equipment operators $23 -$4 -$3 -$18 -$8 -$6 -$4 $6 $4
Packaging and filling machine operators and tenders $14 -$13 -$12 -$27 -$17 -$15 -$13 -$3 -$5
Painters, construction and maintenance $18 -$10 -$9 -$23 -$14 -$11 -$10 $1 -$1
Plumbers, pipefitters, and steamfitters $25 -$3 -$2 -$16 -$7 -$4 -$3 $8 $6

		Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
		$28	$27	$41	$32	$29	$28	$17	$19
Production workers, all other	$15	-$12	-$12	-$26	-$16	-$14	-$12	-$2	-$4

Appendix F: Dissimilarity Measure

Power Plant Occupations to Emerging Occupations in OVRDC, ECG, and Buckeye Hills Regions

Table F.1: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Accountants and auditors	400	279	423	274	352	300	415	377	367	398	362	431	496	352	440	364	324	333
Computer and information systems managers	444	318	515	325	275	210	308	278	255	351	316	397	430	318	416	281	290	275
Computer user support specialists	181	122	208	113	145	86	147	202	112	183	128	190	178	119	148	150	111	128
Cost estimators	400	289	455	260	255	221	308	328	283	345	286	392	397	294	378	270	315	293
Financial managers	463	345	495	332	392	348	455	388	405	420	404	465	547	399	478	396	378	377
First-line supervisors of construction trades and extraction workers	277	227	338	181	82	93	121	101	115	133	131	201	187	153	191	85	161	127
First-line supervisors of food preparation and serving workers	189	138	212	114	206	193	258	228	235	200	185	222	260	176	204	187	176	201

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
First-line supervisors of mechanics, installers, and repairers	353	300	411	246	115	117	127	133	122	195	153	268	200	197	211	105	200	164
First-line supervisors of office and administrative support workers	289	196	318	178	248	210	302	246	264	262	248	297	370	248	311	247	218	235
General and operations managers	337	251	385	216	203	192	254	214	238	256	234	310	330	247	302	205	246	228
Management analysts	631	491	701	490	438	409	516	435	477	533	513	601	661	514	618	464	504	460
Managers, all other	377	279	428	241	214	201	270	217	247	283	252	348	377	279	340	219	264	241
Market research analysts and marketing specialists	431	304	459	305	359	300	419	381	358	423	375	459	498	356	446	366	358	353
Medical and health services managers	521	390	579	383	377	337	430	361	390	449	413	499	565	431	520	377	387	366
Sales representatives, services, all other	326	213	337	205	301	250	361	385	320	360	290	364	411	284	357	312	280	298
Software developers, applications	395	258	435	291	326	201	323	398	243	390	292	407	366	266	369	316	283	300

Table F.2: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
Accountants and auditors	139	158	114	214	247	269	37	238	231	191	205	102	208	279	135	106	99	65	111
Computer and information systems managers	120	172	57	124	123	227	85	166	124	120	150	124	199	240	300	269	194	173	225
Computer user support specialists	381	130	130	152	140	155	228	139	232	251	106	262	117	173	183	176	140	171	152
Cost estimators	98	194	126	116	153	175	56	192	132	96	160	52	151	164	230	203	187	174	149
Financial managers	79	213	122	242	277	304	42	229	209	200	232	85	263	332	193	172	145	115	149
First-line supervisors of construction trades and extraction workers	192	295	162	93	106	94	209	70	48	138	77	135	137	162	336	319	229	256	219
First-line supervisors of food preparation and serving workers	225	234	168	207	238	161	172	100	163	232	143	131	155	214	150	136	108	129	86
First-line supervisors of mechanics, installers, and repairers	203	365	187	115	118	106	251	81	31	155	122	153	190	220	409	385	287	315	268
First-line supervisors of office and administrative support workers	148	170	93	173	203	199	85	118	154	188	129	91	165	224	130	118	66	60	84
General and operations managers	84	245	118	139	157	150	104	102	72	130	123	54	170	209	240	218	154	152	135
Management analysts	63	336	164	263	281	368	102	309	213	218	287	105	354	384	363	349	277	226	275
Managers, all other	49	215	85	121	140	150	56	139	72	94	108	34	152	208	231	213	141	134	141

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
Market research analysts and marketing specialists	114	163	90	201	215	257	48	246	225	178	219	94	190	270	175	163	129	115	133
Medical and health services managers	89	274	119	227	262	285	94	224	162	199	225	105	292	346	293	256	186	149	207
Sales representatives, services, all other	184	136	130	179	209	210	48	230	237	157	180	99	151	201	101	81	108	93	77
Software developers, applications	318	68	79	158	145	233	170	256	275	178	210	265	175	184	276	261	245	255	254

Table F.3: Blue Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Clinical, counseling, and school psychologists	512	403	539	392	447	428	501	392	475	474	454	542	631	470	524	447	427	436
Dentists, general	420	344	494	317	238	221	275	202	249	298	266	369	384	306	361	218	269	239
Emergency medical technicians and paramedics	365	329	423	256	173	211	199	123	222	234	207	312	319	282	280	160	236	226
Healthcare social workers	518	416	527	383	466	445	518	396	488	488	451	552	623	480	500	463	454	469
Licensed practical and licensed vocational nurses	319	253	364	233	249	260	294	200	291	268	261	329	396	294	316	237	235	250
Mental health and substance abuse social workers	464	359	468	339	423	401	464	387	446	445	403	503	563	426	453	418	402	418
Mental health counselors	533	413	537	398	492	450	522	460	496	525	452	581	622	490	510	480	465	476
Nurse practitioners	538	432	596	409	373	365	409	314	398	449	396	530	556	450	487	356	396	389
Occupational therapists	304	229	331	205	253	246	298	224	283	275	251	325	379	264	300	246	243	251
Occupational therapy assistants	240	184	252	166	241	249	290	236	286	241	222	288	341	239	260	226	205	231
Physical therapist assistants	185	122	197	113	203	197	241	233	237	210	174	242	275	182	194	189	159	198
Physical therapists	315	237	336	217	263	249	289	255	289	295	250	349	359	269	289	247	247	259

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Physicians and surgeons, all other	505	396	570	373	325	316	366	291	351	411	358	483	510	405	466	309	350	339
Recreation workers	281	228	316	192	233	237	287	207	275	244	244	290	368	256	289	232	233	234
Registered nurses	425	334	478	316	301	301	340	248	329	349	318	421	467	359	399	283	305	306
Social and human service assistants	306	229	314	204	298	296	354	275	340	305	282	349	431	303	328	296	266	293
Speech-language pathologists	351	245	364	245	327	281	355	318	322	349	293	388	423	300	347	317	286	296

Table F.4: White Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Clinical, counseling, and school psychologists	221	318	196	352	390	380	178	319	324	345	284	215	347	443	240	264	199	172	243
Dentists, general	186	353	160	187	205	188	213	173	114	196	165	190	271	314	370	350	255	261	294
Emergency medical technicians and paramedics	284	404	229	224	234	171	302	189	140	267	140	230	234	321	395	394	282	304	294
Healthcare social workers	221	344	212	380	406	375	210	312	329	374	302	205	339	453	238	262	194	189	227
Licensed practical and licensed vocational nurses	252	303	176	258	290	231	211	185	199	271	159	207	242	332	242	246	159	175	205
Mental health and substance abuse social workers	237	286	196	341	369	336	195	305	325	337	273	204	300	404	208	234	176	171	206
Mental health counselors	262	326	224	379	407	374	234	350	363	387	324	229	349	436	237	265	208	204	230
Nurse practitioners	206	382	189	296	317	294	227	286	217	277	249	211	338	420	375	379	274	272	314
Occupational therapists	192	227	122	218	245	204	144	175	194	226	144	145	184	265	178	183	113	123	144
Occupational therapy assistants	310	253	181	264	292	218	216	198	256	286	163	223	199	287	173	186	133	158	162
Physical therapist assistants	303	202	150	221	251	156	199	164	231	248	138	203	151	222	140	150	117	145	127
Physical therapists	259	265	156	240	265	190	212	207	223	259	178	208	216	284	226	230	167	184	191
Physicians and surgeons, all other	169	336	151	237	261	245	171	260	170	205	210	177	296	358	350	340	251	241	281

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Recreation workers	169	244	140	214	241	214	136	141	170	223	130	115	186	271	184	176	98	110	121
Registered nurses	198	328	154	259	283	248	191	216	183	249	187	186	280	362	298	300	208	208	246
Social and human service assistants	226	225	157	275	299	255	150	209	250	274	173	162	207	314	137	147	95	102	128
Speech-language pathologists	262	185	122	249	276	241	169	246	279	276	194	207	206	282	168	180	128	138	165

Table F.5: Blue Collar Occupations into Occupations Requiring Clerical Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation, and relay	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Billing and posting clerks	193	127	174	111	312	286	386	384	357	305	267	305	391	254	291	322	226	290
Childcare workers	134	105	131	94	268	266	311	288	305	206	204	213	281	183	173	246	186	245
Customer service representatives	252	175	257	141	268	251	331	291	310	291	252	317	383	256	285	274	239	277
Dental assistants	142	105	174	99	145	144	189	182	185	160	136	182	224	139	164	137	113	132
Dental hygienists	202	155	229	139	191	204	250	211	249	214	188	243	293	203	227	188	165	186
Health technologists and technicians, all other	199	149	242	130	140	139	173	143	167	173	140	208	243	166	194	126	121	139
Home health aides	133	101	148	88	221	229	275	231	276	173	193	185	285	182	193	206	157	200
Massage therapists	196	157	194	132	303	310	373	349	377	291	284	304	378	256	263	312	249	285
Medical and clinical laboratory technicians	205	150	255	151	118	106	138	164	121	172	121	194	214	148	194	104	88	97
Medical and clinical laboratory technologists	163	101	203	122	142	119	166	200	142	168	116	182	202	128	169	117	84	106
Medical assistants	241	171	274	150	195	199	251	196	242	230	211	273	338	237	269	196	173	194
Medical records and health information technicians	170	111	164	114	309	277	362	397	339	303	256	281	357	231	269	315	213	272
Medical secretaries	222	159	213	138	325	300	381	385	366	338	277	326	399	271	293	337	259	309
Nursing assistants	129	101	139	97	235	252	285	287	296	206	207	199	285	186	186	229	174	225
Office clerks, general	175	124	147	103	333	301	379	402	362	308	256	288	359	241	248	330	233	304
Personal care aides	113	100	101	96	300	307	349	344	353	230	229	212	302	204	184	284	201	275
Pharmacy technicians	157	105	180	95	203	190	260	236	242	215	185	224	290	184	216	196	152	188
Phlebotomists	179	126	205	103	190	190	241	213	233	214	169	244	285	193	205	184	156	198

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation, and relay	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Preschool teachers, except special education	194	145	203	126	269	267	334	264	316	227	237	255	350	226	236	262	212	249
Radiologic technologists	219	170	254	134	145	160	188	158	195	191	151	230	253	184	207	138	144	163
Receptionists and information clerks	185	127	167	106	313	287	376	369	357	299	265	289	382	251	270	317	229	293
Retail salespersons	156	115	150	77	237	219	304	270	282	217	204	229	293	179	207	235	194	241
Sales representatives, wholesale and manufacturing, except technical and scientific products	250	174	250	147	270	247	360	323	320	280	268	303	375	241	300	287	255	271
Sales representatives, wholesale and manufacturing, technical and scientific products	251	165	256	130	215	182	269	295	245	265	198	297	285	196	235	224	233	247
Secretaries and administrative assistants, except legal, medical, and executive	200	127	188	106	276	248	333	335	310	283	239	285	348	227	254	279	216	262
Security guards	157	128	179	100	214	246	291	218	295	181	204	205	341	219	234	221	166	203
Self-enrichment education teachers	178	139	190	106	238	234	299	230	278	209	212	236	316	200	227	234	186	226
Teacher assistants	153	112	155	105	275	258	322	307	302	240	212	246	319	197	209	262	196	249

Table F.6: White Collar Occupations into Occupations Requiring Clerical Skill

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Billing and posting clerks	426	167	246	317	356	277	206	286	408	361	217	266	178	262	31	32	73	78	82
Childcare workers	411	245	249	321	368	226	280	196	339	351	207	261	174	271	113	131	116	170	115
Customer service representatives	230	172	144	235	259	219	115	205	255	253	162	131	153	243	59	70	53	57	59
Dental assistants	332	218	164	194	214	146	213	139	210	250	112	220	153	214	157	151	123	147	133
Dental hygienists	334	254	189	239	263	178	233	187	242	274	145	236	186	261	177	186	143	170	168
Health technologists and technicians, all other	290	228	138	171	193	131	198	125	157	214	93	207	152	224	198	192	133	156	163
Home health aides	358	227	217	267	316	207	221	173	288	291	147	225	164	255	114	115	93	125	113
Massage therapists	399	254	259	338	385	266	253	278	389	380	237	273	217	304	107	109	114	132	128
Medical and clinical laboratory technicians	366	224	162	159	176	115	240	152	168	219	99	259	155	219	257	236	196	213	206
Medical and clinical laboratory technologists	327	181	136	160	188	97	200	131	168	190	109	220	128	197	194	166	142	163	151
Medical assistants	259	214	143	202	229	187	161	165	194	230	113	177	176	253	158	152	88	102	133
Medical records and health information technicians	464	156	243	318	354	275	238	286	419	367	224	289	163	244	63	54	80	97	85
Medical secretaries	380	187	224	314	343	283	203	263	376	356	226	231	183	270	43	41	64	73	61
Nursing assistants	414	230	236	302	345	228	253	205	326	335	183	257	181	267	120	121	121	149	114
Office clerks, general	472	212	278	348	392	279	268	267	423	398	250	292	179	278	48	47	68	100	73
Personal care aides	538	285	332	396	447	281	355	255	432	439	253	349	221	320	128	138	149	199	143
Pharmacy technicians	308	179	161	213	250	172	165	162	239	253	136	186	144	220	96	84	79	92	85
Phlebotomists	308	217	163	218	252	168	198	155	219	263	128	186	151	224	122	130	91	115	103
Preschool teachers, except special education	299	217	194	279	324	226	207	195	295	306	174	204	173	271	116	128	92	124	115

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Radiologic technologists	324	267	187	200	214	149	231	154	183	241	110	224	165	232	216	214	148	182	177
Receptionists and information clerks	429	191	248	325	364	284	233	267	404	376	222	266	186	272	50	50	58	86	78
Retail salespersons	311	200	203	252	277	206	195	175	288	299	170	189	152	221	74	99	91	117	75
Sales representatives, wholesale and manufacturing, except technical and scientific products	214	170	162	224	246	221	117	212	268	240	178	126	161	214	80	91	85	97	68
Sales representatives, wholesale and manufacturing, technical and scientific products	184	163	130	148	168	131	116	168	189	170	149	89	105	136	110	121	115	135	68
Secretaries and administrative assistants, except legal, medical, and executive	311	158	184	254	288	217	161	200	298	282	186	165	135	221	48	32	30	52	31
Security guards	359	237	234	286	327	236	220	210	298	309	118	241	174	286	131	133	110	117	142
Self-enrichment education teachers	301	213	182	261	298	214	197	181	279	314	154	208	160	248	108	127	97	110	110
Teacher assistants	390	186	205	294	335	231	227	217	347	331	190	250	143	250	83	98	93	127	108

Table F.7: Blue Collar Occupations into Occupations Requiring Customer and Personal Service Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Bus drivers, school or special client	104	116	82	97	271	304	316	323	341	181	197	162	271	194	160	259	175	249
Cleaners of vehicles and equipment	76	107	60	100	291	312	336	402	347	226	200	187	222	169	135	277	199	273
Combined food preparation and serving workers, including fast food	100	95	110	75	260	266	322	324	314	220	209	196	274	181	181	249	191	254
Cooks, institution and cafeteria	83	57	94	61	221	201	267	249	248	147	171	142	244	136	156	199	126	176
Driver/sales workers	92	98	68	66	273	274	345	291	317	175	211	174	288	178	185	252	177	247
Food preparation workers	70	77	98	61	208	224	284	236	272	146	192	135	259	152	174	206	141	180
Food servers, nonrestaurant	90	96	81	103	354	351	411	436	408	258	266	220	324	215	205	338	231	310
Janitors and cleaners, except maids and housekeeping cleaners	57	92	49	73	279	303	329	358	344	189	201	169	241	169	140	266	176	243
Landscaping and groundskeeping workers	55	83	60	72	194	225	245	291	259	130	146	123	155	110	102	179	125	172
Maids and housekeeping cleaners	71	84	71	73	271	291	341	309	341	183	227	152	296	186	188	269	175	231
Packers and packagers, hand	61	81	103	72	178	219	265	210	264	129	191	122	256	147	183	187	127	161

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Stock clerks and order fillers	58	56	52	60	270	264	333	336	319	192	211	165	270	154	178	257	165	230
Taxi drivers and chauffeurs	89	86	78	57	220	242	282	253	288	146	173	148	259	160	161	208	146	202
Waiters and waitresses	127	127	108	105	358	356	432	421	417	292	289	264	356	245	237	351	260	346

Table F.8: White Collar Occupations into Occupations Requiring Customer and Personal Service Skill

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Bus drivers, school or special client	628	330	400	428	460	291	437	287	465	492	250	426	249	360	193	204	218	268	209
Cleaners of vehicles and equipment	709	376	466	454	490	299	506	305	506	520	324	474	247	337	235	239	295	346	233
Combined food preparation and serving workers, including fast food	457	273	307	344	379	248	303	214	359	386	217	287	185	269	128	135	165	191	123
Cooks, institution and cafeteria	407	213	241	270	316	199	260	157	303	322	159	268	161	240	128	113	116	154	123
Driver/sales workers	508	276	340	369	411	267	341	240	416	429	228	344	202	312	138	154	162	216	160
Food preparation workers	456	258	289	307	351	243	291	183	336	368	172	299	182	270	142	135	143	169	141
Food servers, nonrestaurant	650	307	421	456	515	335	426	316	533	510	314	437	250	339	152	155	212	259	185
Janitors and cleaners, except maids and housekeeping cleaners	675	339	443	438	486	297	467	293	502	507	285	458	240	333	192	197	239	289	215
Landscaping and groundskeeping workers	627	331	391	359	397	223	442	232	399	423	242	424	199	281	243	233	248	308	232
Maids and housekeeping cleaners	559	290	362	391	448	291	364	255	443	455	233	376	222	319	144	144	168	203	163
Packers and packagers, hand	479	279	310	305	349	248	304	197	339	370	164	314	188	269	179	167	160	186	170
Stock clerks and order fillers	538	243	332	357	409	268	327	231	431	416	233	343	186	269	106	106	145	185	126
Taxi drivers and chauffeurs	454	262	299	326	360	228	290	209	349	361	177	293	172	280	129	130	129	170	131

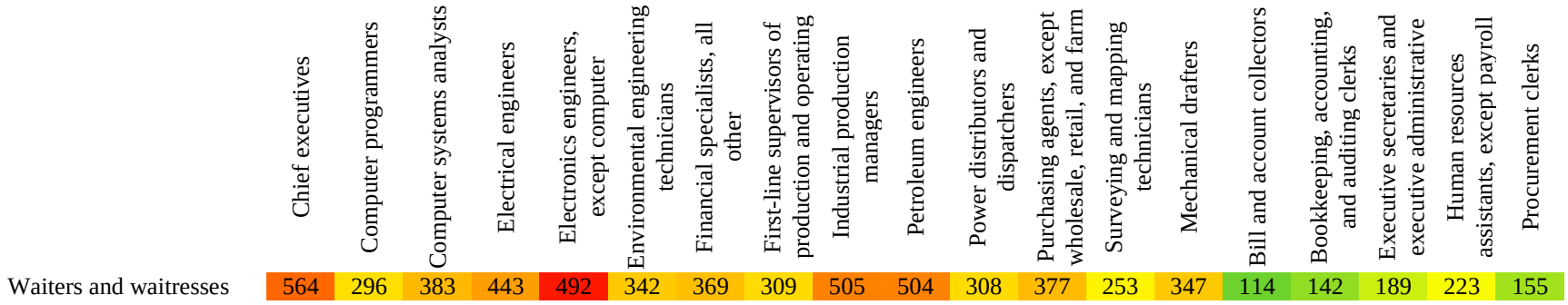

Chief executives
Computer programmers
Computer systems analysts
Electrical engineers
Electronics engineers, except computer
Environmental engineering technicians
Financial specialists, all other
First-line supervisors of production and operating
Industrial production managers
Petroleum engineers
Power distributors and dispatchers
Purchasing agents, except wholesale, retail, and farm
Surveying and mapping technicians
Mechanical drafters
Bill and account collectors
Bookkeeping, accounting, and auditing clerks
Executive secretaries and executive administrative
Human resources assistants, except payroll
Procurement clerks
Waiters and waitresses
564
296
383
443
492
342
369
309
505
504
308
377
253
347
114
142
189
223
155

Table F.9: Blue Collar Occupations into Occupations Requiring Mechanical Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Automotive service technicians and mechanics	125	124	154	97	55	52	68	117	56	84	51	100	58	52	61	49	60	59
Bus and truck mechanics and diesel engine specialists	124	126	169	102	31	58	56	92	63	62	49	75	65	59	70	33	53	48
Carpenters	117	118	158	91	75	107	108	118	122	56	78	104	89	65	72	62	102	97
Computer-controlled machine tool operators, metal and plastic	136	112	189	118	60	36	66	127	35	84	45	110	51	32	82	32	48	49
Construction laborers	93	122	133	74	81	142	129	151	159	78	90	98	102	84	79	84	109	119
Electricians	193	173	232	135	64	69	65	103	66	84	74	139	78	83	79	55	105	86
Heavy and tractor-trailer truck drivers	101	110	116	67	87	126	136	113	146	61	86	90	147	97	102	82	76	83
Operating engineers and other construction equipment operators	70	96	110	68	75	116	115	123	129	30	66	56	93	59	73	67	64	68
Painters, construction and maintenance	99	98	129	58	122	165	182	182	202	114	111	137	169	116	115	122	128	145
Plumbers, pipefitters, and steamfitters	123	122	151	88	72	93	91	133	106	64	59	109	57	53	49	58	94	90

Table F.10: White Collar Occupations into Occupations Requiring Mechanical Skill

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale,	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and	Executive secretaries and executive	Human resources assistants, except	Procurement clerks
Automotive service technicians and mechanics	455	280	250	155	165	105	342	113	194	259	112	314	140	180	302	292	257	302	241
Bus and truck mechanics and diesel engine specialists	444	304	263	154	171	102	341	110	167	250	89	291	146	174	327	306	255	301	242
Carpenters	371	318	258	181	216	109	313	89	164	246	112	246	128	169	290	276	233	281	208
Computer-controlled machine tool operators, metal and plastic	433	247	209	127	129	75	317	97	158	202	105	298	116	134	328	310	269	316	259
Construction laborers	467	351	328	242	265	138	368	163	239	303	143	301	140	209	289	289	263	302	221
Electricians	384	309	238	140	157	97	335	110	149	232	99	280	145	181	356	342	282	330	274
Heavy and tractor-trailer truck drivers	408	279	260	214	225	134	295	147	220	278	92	267	133	228	241	221	180	220	184
Operating engineers and other construction equipment operators	461	305	299	215	248	133	348	125	227	289	111	314	134	196	280	265	244	281	229
Painters, construction and maintenance	350	278	254	223	262	131	260	132	209	259	126	204	124	185	184	183	164	199	130
Plumbers, pipefitters, and steamfitters	427	322	285	181	214	92	360	123	194	261	124	294	135	158	312	306	270	324	246

Power plant Occupations to emerging occupations specific to the OVRDC and Buckeye Hills regions

Table F.11: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Construction managers	488	367	548	320	244	228	283	266	275	333	279	424	394	336	392	249	341	294
Opticians, dispensing	229	161	268	138	177	162	246	207	224	218	187	244	296	191	250	187	177	184

Table F.12: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Construction managers	90	313	167	128	158	160	165	177	74	108	151	88	205	204	380	358	273	279	261
Opticians, dispensing	194	208	126	157	183	154	121	122	148	183	112	124	156	192	139	133	106	101	105

Table F.13: Blue Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Child, family, and school social workers	391	299	393	279	390	356	435	330	402	374	361	424	521	376	405	380	340	356
Health specialties teachers, postsecondary	464	352	513	330	323	308	349	318	348	405	331	465	475	373	420	310	342	338

Table F.14: White Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
Child, family, and school social workers	243	260	186	319	358	315	186	253	309	328	229	201	271	381	165	189	130	132	179
Health specialties teachers, postsecondary	181	305	154	230	270	230	170	256	195	219	206	160	260	304	288	288	218	215	227

Table F.15: Blue Collar Occupations into Occupations Requiring Mechanical Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical door	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse, substation,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Heating, air conditioning, and refrigeration mechanics and installers	236	228	292	173	44	63	69	80	60	101	92	168	102	109	120	47	120	82

Table F.16: White Collar Occupations into Occupations Requiring Mechanical Skill

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll and	Procurement clerks
Heating, air conditioning, and refrigeration mechanics and installers	370	365	258	128	136	105	342	128	125	222	108	280	169	194	406	393	318	354	315

Power plant Occupations to emerging occupations specific to the Buckeye Hills region

Table F.17: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except mechanical	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline operators	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Lawyers	468	353	483	319	377	342	433	373	408	425	394	488	547	408	468	390	377	370
Network and computer systems administrators	312	223	357	221	156	71	141	225	84	249	156	276	189	156	215	152	165	155
Web developers	317	200	355	218	279	182	311	342	238	328	261	348	359	233	339	280	241	254

Table F.18: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Lawyers	130	233	150	254	274	289	80	278	250	234	221	117	256	345	182	186	143	107	160
Network and computer systems administrators	317	141	86	90	52	131	215	148	160	171	125	238	125	158	305	285	225	260	230
Web developers	234	50	51	136	135	205	96	212	238	169	160	170	131	162	165	155	131	138	148

Table F.19: Blue Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Elementary school teachers, except special education	355	262	377	242	310	295	366	299	336	335	302	386	450	318	361	302	291	300
Family and general practitioners	470	359	497	343	376	362	396	375	406	440	368	487	512	408	426	366	372	379
Middle school teachers, except special and career/technical education	316	225	337	199	268	252	324	285	296	311	258	351	386	269	315	267	268	282
Physician assistants	325	248	369	234	217	213	245	205	238	265	222	320	344	259	288	199	213	216
Police and sheriff's patrol officers	363	301	397	234	231	262	291	174	303	268	267	346	418	327	349	238	263	266
Respiratory therapists	289	241	347	221	169	166	181	145	180	208	178	264	285	223	244	145	164	166
Secondary school teachers, except special and career/technical education	343	246	370	228	276	253	315	289	293	326	269	370	393	282	327	268	274	288

Table F.20: White Collar Occupations into Occupations Requiring Psychology/Education and Training/Medicine and Dentistry Skills

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Elementary school teachers, except special education	205	216	137	248	278	235	135	239	246	236	179	153	176	291	181	185	123	137	160
Family and general practitioners	255	317	199	296	339	267	218	311	276	284	263	227	309	377	281	287	250	240	254
Middle school teachers, except special and career/technical education	205	199	136	216	240	206	131	205	221	214	162	129	148	227	156	166	115	136	124
Physician assistants	253	269	148	201	227	169	201	198	176	218	144	208	210	286	268	264	192	208	223
Police and sheriff's patrol officers	202	323	189	248	261	236	185	198	175	257	122	162	230	332	252	268	165	158	201
Respiratory therapists	327	309	184	194	210	160	265	172	170	250	129	265	214	293	313	309	231	253	268
Secondary school teachers, except special and career/technical education	182	204	123	203	228	198	124	202	202	199	165	113	147	232	178	183	123	142	132

Table F.21: Blue Collar Occupations into Occupations Requiring Customer and Personal Service Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Laborers and freight, stock, and material movers, hand	Meter readers, utilities	Control and valve installers and repairers, except	Electrical and electronics engineering technicians	Electrical and electronics repairers, powerhouse,	Electrical power-line installers and repairers	Electro-mechanical technicians	Excavating and loading machine and dragline	Gas plant operators	Hoist and winch operators	Industrial machinery mechanics	Machinists	Maintenance and repair workers, general	Plant and system operators, all other	Power plant operators	Stationary engineers and boiler operators
Counter attendants, cafeteria, food concession, and coffee shop	89	82	80	69	279	264	335	335	312	208	208	182	272	170	169	259	174	242

Table F.22: White Collar Occupations into Occupations Requiring Customer and Personal Service Skill

	Chief executives	Computer programmers	Computer systems analysts	Electrical engineers	Electronics engineers, except computer	Environmental engineering technicians	Financial specialists, all other	First-line supervisors of production and operating	Industrial production managers	Petroleum engineers	Power distributors and dispatchers	Purchasing agents, except wholesale, retail, and farm	Surveying and mapping technicians	Mechanical drafters	Bill and account collectors	Bookkeeping, accounting, and auditing clerks	Executive secretaries and executive administrative	Human resources assistants, except payroll	Procurement clerks
Counter attendants, cafeteria, food concession, and coffee shop	500	254	315	349	393	256	322	227	400	405	234	329	198	285	108	114	151	186	133

Mine Occupations to Emerging Occupations in the OMEGA Region

Table F.23: Blue Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
Accountants and auditors	400	279	475	554	216	412	350	377	398	358	431	469	434	329	344	429
Administrative services managers	294	218	353	433	222	255	236	236	223	201	271	323	251	183	213	266
Business operations specialists, all other	311	213	333	461	208	264	269	247	256	221	308	351	261	183	237	290
Civil engineers	538	420	532	688	471	405	467	416	377	358	468	531	353	299	419	447
Computer and information systems managers	444	318	506	612	331	386	358	359	351	312	397	460	348	288	353	398
Computer user support specialists	181	122	246	306	158	191	154	148	183	163	190	231	144	150	175	206
Construction managers	488	367	485	633	414	368	409	361	333	321	424	487	332	265	371	404
Cost estimators	400	289	431	566	275	355	379	336	345	307	392	451	349	262	352	386
Dispatchers, except police, fire, and ambulance	253	180	283	376	152	227	222	219	232	203	257	303	259	171	184	251
Financial analysts	405	272	427	527	233	412	398	398	440	384	456	475	467	322	371	440

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
Financial managers	463	345	530	617	282	446	398	415	420	388	465	509	468	366	386	471
First-line supervisors of construction trades and extraction workers	277	227	285	386	310	162	214	166	133	128	201	257	131	113	179	184
First-line supervisors of mechanics, installers, and repairers	353	300	325	465	388	203	278	203	195	180	268	312	156	137	224	230
First-line supervisors of non-retail sales workers	504	391	554	661	347	456	423	434	417	385	477	534	467	369	382	476
First-line supervisors of office and administrative support workers	289	196	356	435	167	289	235	251	262	234	297	335	296	223	228	297
General and operations managers	337	251	357	482	267	268	281	255	256	234	310	360	276	196	246	294
Lawyers	468	353	501	594	303	438	391	427	425	376	488	505	465	353	367	470
Management analysts	631	491	662	788	456	547	540	546	533	488	601	666	587	441	500	573
Managers, all other	377	279	400	517	276	303	308	291	283	250	348	392	305	212	265	328
Market research analysts and marketing specialists	431	304	498	604	244	434	383	389	423	381	459	510	443	340	370	457
Mechanical engineers	427	313	431	566	417	295	354	281	292	266	343	398	217	209	338	329

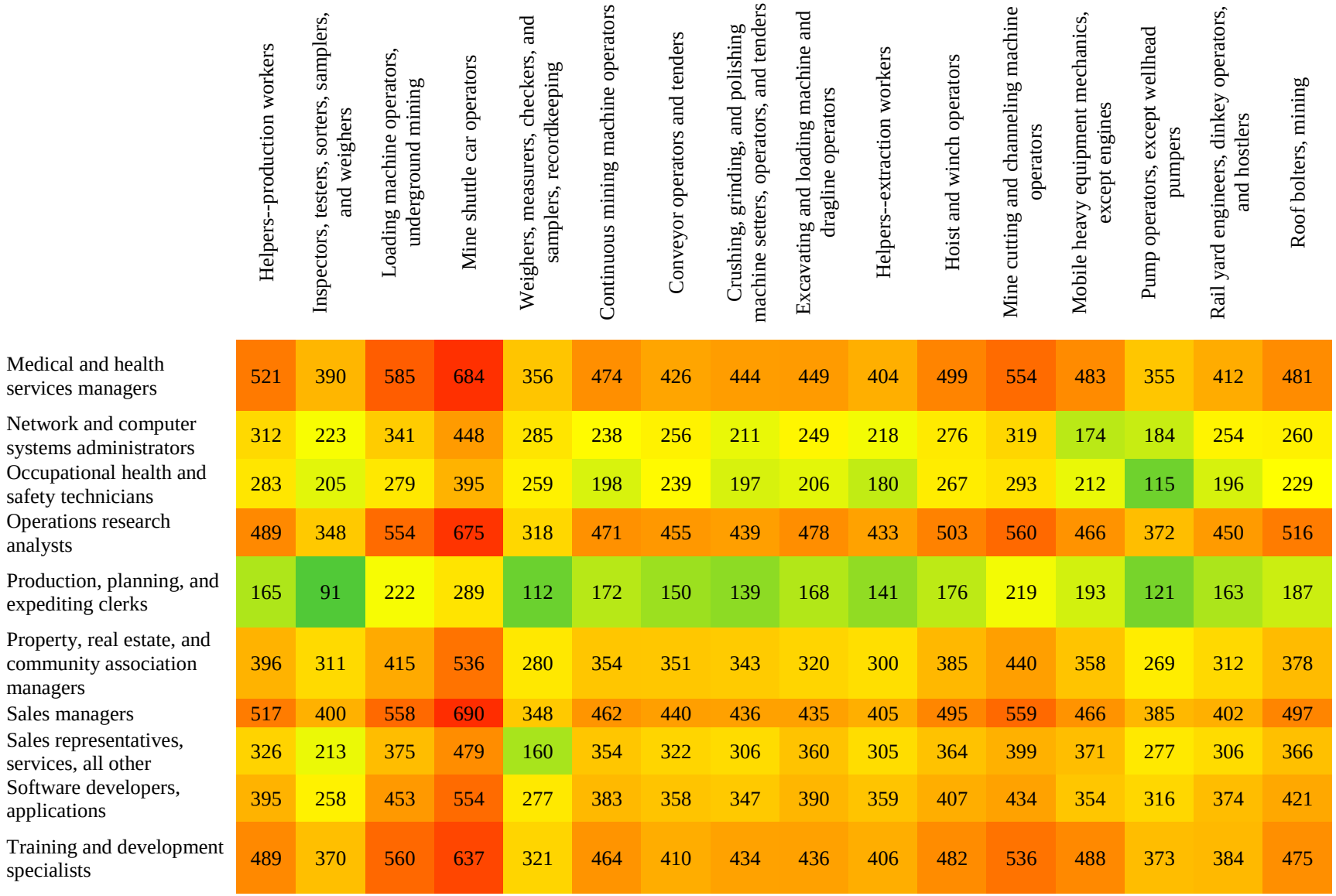

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
Medical and health services managers 521 390 585 684 356 474 426 444 449 404 499 554 483 355 412 481
Network and computer systems administrators 312 223 341 448 285 238 256 211 249 218 276 319 174 184 254 260
Occupational health and safety technicians 283 205 279 395 259 198 239 197 206 180 267 293 212 115 196 229
Operations research analysts 489 348 554 675 318 471 455 439 478 433 503 560 466 372 450 516
Production, planning, and expediting clerks 165 91 222 289 112 172 150 139 168 141 176 219 193 121 163 187
Property, real estate, and community association managers 396 311 415 536 280 354 351 343 320 300 385 440 358 269 312 378
Sales managers 517 400 558 690 348 462 440 436 435 405 495 559 466 385 402 497
Sales representatives, services, all other 326 213 375 479 160 354 322 306 360 305 364 399 371 277 306 366
Software developers, applications 395 258 453 554 277 383 358 347 390 359 407 434 354 316 374 421
Training and development specialists 489 370 560 637 321 464 410 434 436 406 482 536 488 373 384 475

Table F.24: White Collar Occupations into Occupations Requiring Computer and Electronics/Administration and Management Skills

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Accountants and auditors	269	238	231	261	102	222	106	118
Administrative services managers	166	92	94	190	76	128	174	181
Business operations specialists, all other	122	127	91	112	38	89	162	174
Civil engineers	164	231	93	54	112	83	417	425
Computer and information systems managers	227	166	124	150	124	130	269	277
Computer user support specialists	155	139	232	310	262	234	176	174
Construction managers	160	177	74	80	88	107	358	372
Cost estimators	175	192	132	121	52	136	203	224
Dispatchers, except police, fire, and ambulance	164	130	146	216	69	152	124	130
Financial analysts	265	339	308	279	146	270	141	139
Financial managers	304	229	209	255	85	243	172	200
First-line supervisors of construction trades and extraction workers	94	70	48	130	135	79	319	326

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
First-line supervisors of mechanics, installers, and repairers	106	81	31	144	153	100	385	396
First-line supervisors of non-retail sales workers	305	226	171	226	74	209	254	279
First-line supervisors of office and administrative support workers	199	118	154	245	91	185	118	129
General and operations managers	150	102	72	144	54	116	218	242
Lawyers	289	278	250	277	117	242	186	193
Management analysts	368	309	213	241	105	232	349	345
Managers, all other	150	139	72	111	34	88	213	224
Market research analysts and marketing specialists	257	246	225	228	94	195	163	178
Mechanical engineers	108	170	75	59	186	99	412	412
Medical and health services managers	285	224	162	220	105	208	256	265
Network and computer systems administrators	131	148	160	197	238	162	285	288
Occupational health and safety technicians	76	121	67	123	103	89	258	242
Operations research analysts	264	305	246	180	142	213	252	264

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Production, planning, and expediting clerks	124	82	131	206	95	167	105	109
Property, real estate, and community association managers	215	172	136	211	60	164	189	205
Sales managers	299	228	181	235	80	208	255	295
Sales representatives, services, all other	210	230	237	241	99	226	81	104
Software developers, applications	233	256	275	239	265	265	261	268
Training and development specialists	327	240	231	301	130	252	246	252

Table F.25: Blue Collar Occupations into Occupations Requiring Clerical Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
Billing and posting clerks	193	127	273	318	71	315	226	257	305	275	305	315	357	266	251	331
Customer service representatives	252	175	303	381	120	300	248	261	291	258	317	339	337	229	234	323
Human resources specialists	340	248	413	490	180	376	314	338	355	317	392	426	407	298	296	402
Office clerks, general	175	124	245	293	61	304	221	241	308	278	288	304	347	268	234	324
Real estate sales agents	324	239	356	461	200	326	288	302	297	277	361	389	336	260	271	362
Receptionists and information clerks	185	127	271	310	65	311	217	253	299	267	289	306	352	258	236	328
Retail salespersons	156	115	210	287	95	225	179	183	217	198	229	251	263	191	178	262
Sales representatives, wholesale and manufacturing, except technical and scientific products	250	174	306	391	129	299	247	258	280	259	303	343	324	253	249	334
Sales representatives, wholesale and manufacturing, technical and scientific products	251	165	260	393	152	257	262	226	265	235	297	325	272	198	238	299
Secretaries and administrative assistants,	200	127	258	331	68	284	216	229	283	249	285	308	316	229	216	304

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
except legal, medical, and executive																
Security guards	157	128	219	231	125	208	142	197	181	164	205	216	275	173	145	215
Self-enrichment education teachers	178	139	240	282	121	222	172	200	209	201	236	252	274	198	160	249
Teacher assistants	153	112	218	251	81	240	182	197	240	221	246	247	300	207	193	271

Table F.26: White Collar Occupations into Occupations Requiring Clerical Skill

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Billing and posting clerks	277	286	408	465	266	375	32	35
Customer service representatives	219	205	255	334	131	250	70	76
Human resources specialists	282	200	242	338	130	259	105	103
Office clerks, general	279	267	423	510	292	418	47	55
Real estate sales agents	214	205	220	268	98	203	128	149
Receptionists and information clerks	284	267	404	481	266	388	50	52
Retail salespersons	206	175	288	368	189	291	99	125
Sales representatives, wholesale and manufacturing, except technical and scientific products	221	212	268	302	126	260	91	122
Sales representatives, wholesale and manufacturing, technical and scientific products	131	168	189	206	89	194	121	147
Secretaries and administrative assistants, except legal, medical, and executive	217	200	298	366	165	294	32	41
Security guards	236	210	298	397	241	287	133	127

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Self-enrichment education teachers	214	181	279	380	208	268	127	143
Teacher assistants	231	217	347	430	250	343	98	102

Table F.27: Blue Collar Occupations into Occupations Requiring Customer and Personal Service Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
Bakers	89	61	122	190	78	172	153	123	212	196	182	185	261	173	172	206
Butchers and meat cutters	82	78	166	190	108	146	92	90	124	119	128	144	176	135	130	161
Cleaners of vehicles and equipment	76	107	73	130	135	169	178	153	226	208	187	171	282	208	172	211
Combined food preparation and serving workers, including fast food	100	95	139	215	80	194	168	153	220	192	196	204	290	187	170	215
Counter attendants, cafeteria, food concession, and coffee shop	89	82	146	190	67	202	141	145	208	189	182	181	271	209	173	229
Driver/sales workers	92	98	180	191	94	202	124	146	175	184	174	179	241	210	146	230
Food preparation workers	70	77	167	172	87	164	108	126	146	135	135	156	224	166	135	176
Janitors and cleaners, except maids and housekeeping cleaners	57	92	102	111	112	175	144	149	189	191	169	155	272	202	166	213
Landscaping and groundskeeping workers	55	83	91	90	152	105	124	106	130	131	123	109	194	141	124	141

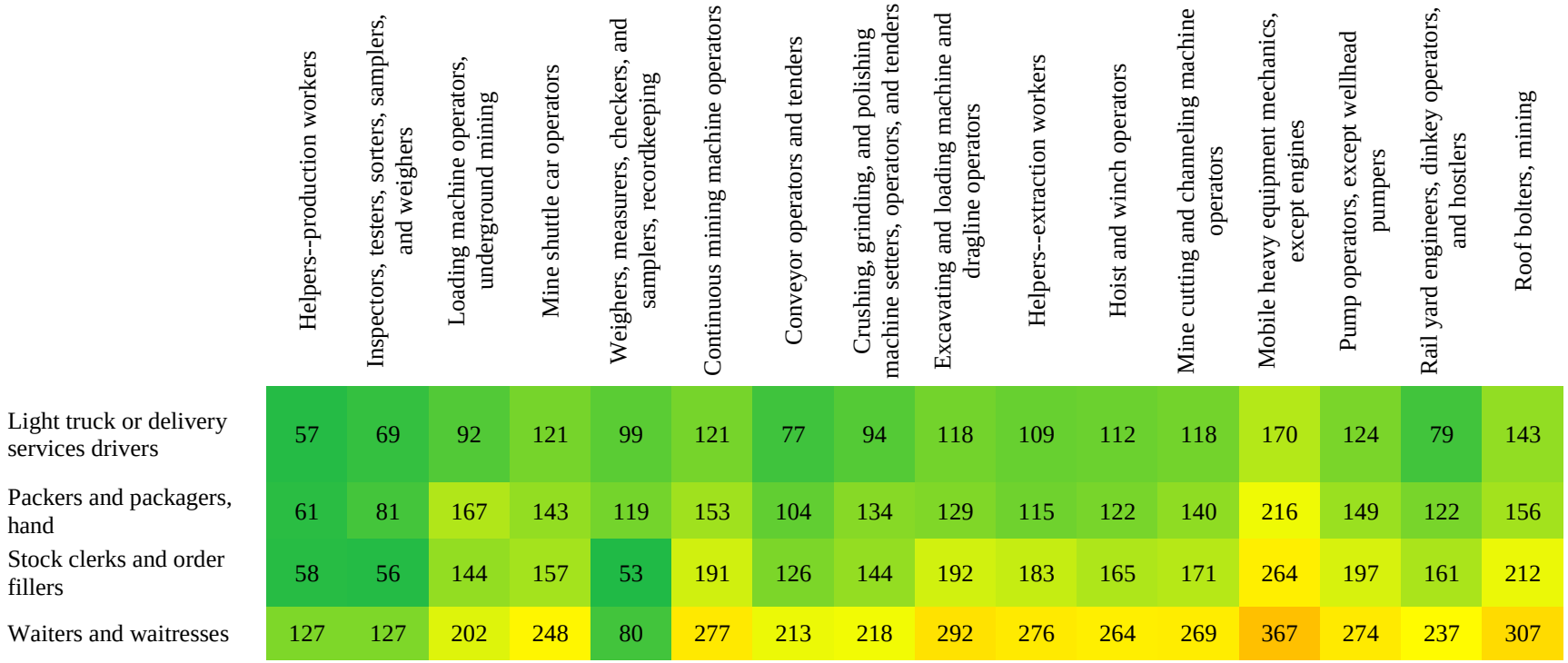

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
Light truck or delivery services drivers 57 69 92 121 99 121 77 94 118 109 112 118 170 124 79 143
Packers and packagers, hand 61 81 167 143 119 153 104 134 129 115 122 140 216 149 122 156
Stock clerks and order fillers 58 56 144 157 53 191 126 144 192 183 165 171 264 197 161 212
Waiters and waitresses 127 127 202 248 80 277 213 218 292 276 264 269 367 274 237 307

Table F.28: White Collar Occupations into Occupations Requiring Customer and Personal Service Skill

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Bakers	209	210	362	457	307	407	154	174
Butchers and meat cutters	193	138	272	392	260	304	154	189
Cleaners of vehicles and equipment	299	305	506	637	474	543	239	248
Combined food preparation and serving workers, including fast food	248	214	359	485	287	384	135	152
Counter attendants, cafeteria, food concession, and coffee shop	256	227	400	514	329	428	114	142
Driver/sales workers	267	240	416	512	344	414	154	192
Food preparation workers	243	183	336	462	299	347	135	155
Janitors and cleaners, except maids and housekeeping cleaners	297	293	502	627	458	526	197	211
Landscaping and groundskeeping workers	223	232	399	530	424	431	233	238
Light truck or delivery services drivers	194	200	347	445	314	338	149	161
Packers and packagers, hand	248	197	339	458	314	328	167	174
Stock clerks and order fillers	268	231	431	528	343	431	106	129

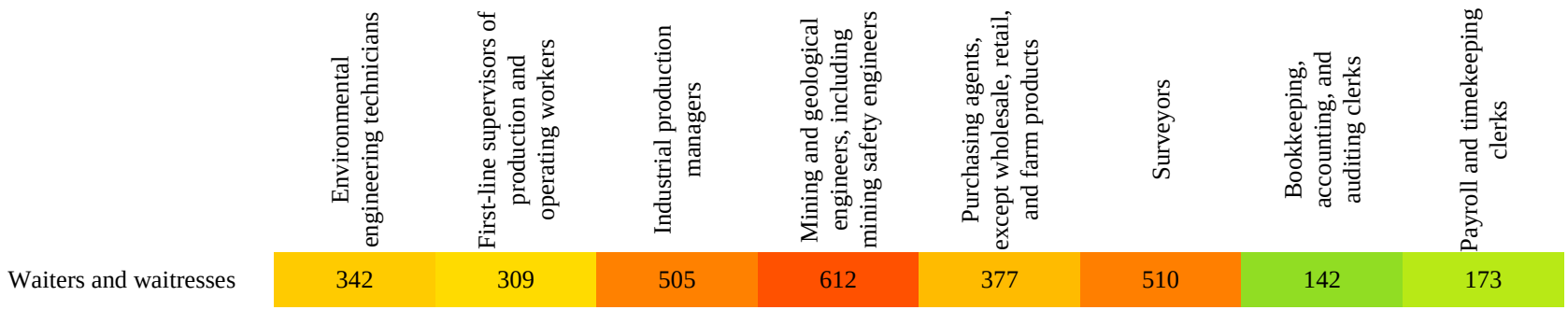

Environmental engineering technicians
First-line supervisors of production and operating workers
Industrial production managers
Mining and geological engineers, including mining safety engineers
Purchasing agents, except wholesale, retail, and farm products
Surveyors
Bookkeeping, accounting, and auditing clerks
Payroll and timekeeping clerks
Waiters and waitresses
342
309
505
612
377
510
142
173

Table F.29: Blue Collar Occupations into Occupations Requiring Mechanical Skill

	Helpers--production workers	Inspectors, testers, sorters, samplers, and weighers	Loading machine operators, underground mining	Mine shuttle car operators	Weighers, measurers, checkers, and samplers, recordkeeping	Continuous mining machine operators	Conveyor operators and tenders	Crushing, grinding, and polishing machine setters, operators, and tenders	Excavating and loading machine and dragline operators	Helpers--extraction workers	Hoist and winch operators	Mine cutting and channeling machine operators	Mobile heavy equipment mechanics, except engines	Pump operators, except wellhead pumpers	Rail yard engineers, dinkey operators, and hostlers	Roof bolters, mining
Automotive service technicians and mechanics	125	124	139	204	232	74	113	68	84	75	100	119	34	70	110	96
Brickmasons and blockmasons	136	150	173	188	255	88	138	115	59	73	113	131	125	82	114	102
Bus and truck mechanics and diesel engine specialists	124	126	126	181	239	56	96	65	62	50	75	101	34	57	87	69
Cabinetmakers and bench carpenters	77	92	128	149	211	80	102	72	76	80	105	99	98	91	140	114
Carpenters	117	118	127	190	211	68	123	75	56	69	104	120	90	62	103	100
Cement masons and concrete finishers	87	87	105	145	167	79	123	89	82	89	102	105	143	77	101	106
Computer-controlled machine tool operators, metal and plastic	136	112	162	213	235	74	121	60	84	81	110	122	48	60	128	99
Construction laborers	93	122	86	148	200	63	130	83	78	77	98	120	117	73	90	89
Electricians	193	173	197	270	287	97	161	111	84	95	139	160	61	88	147	123
Heating, air conditioning, and refrigeration mechanics and installers	236	228	245	315	355	119	196	135	101	102	168	193	52	99	174	141

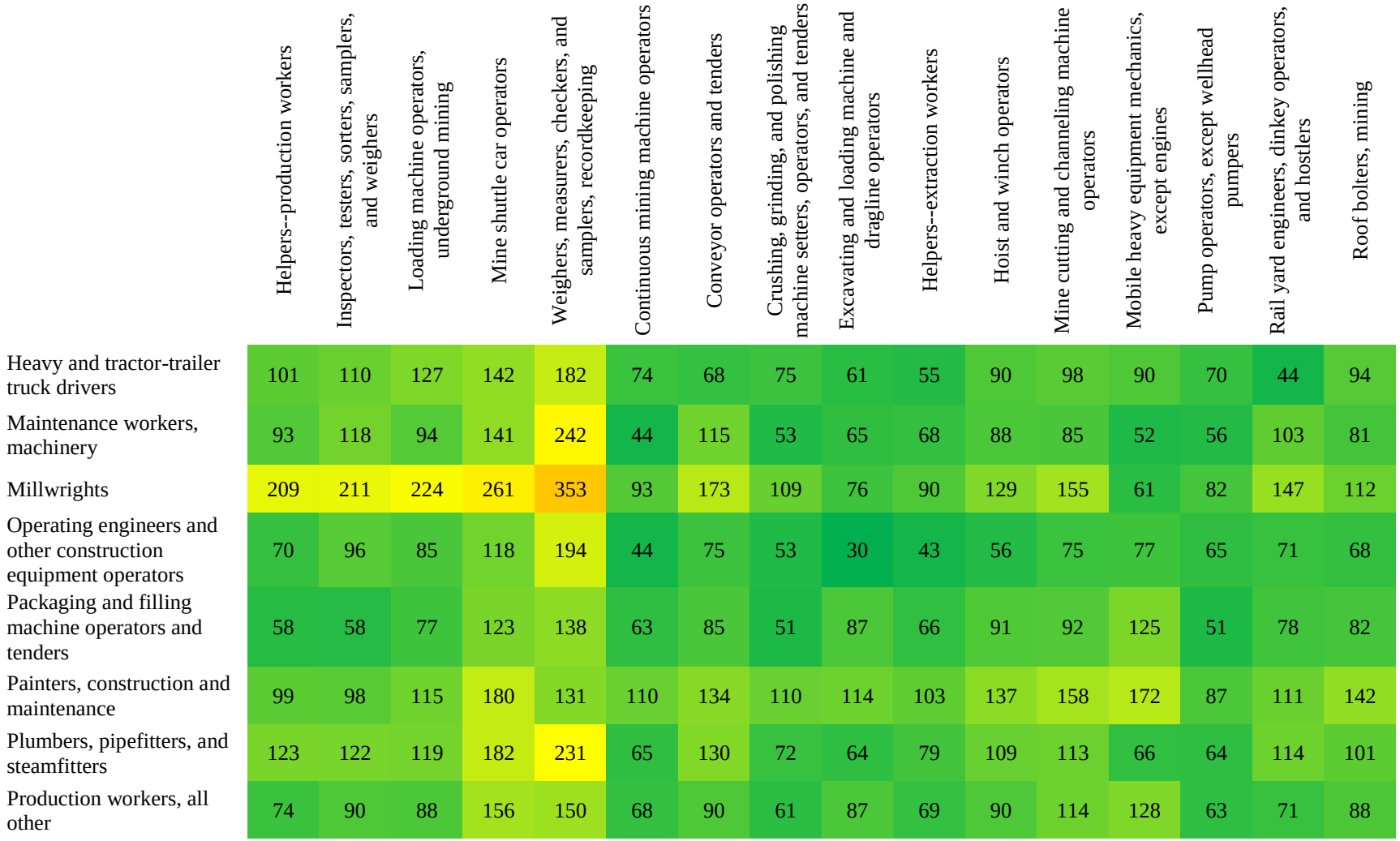

Helpers--production workers
Inspectors, testers, sorters, samplers, and weighers
Loading machine operators, underground mining
Mine shuttle car operators
Weighers, measurers, checkers, and samplers, recordkeeping
Continuous mining machine operators
Conveyor operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Excavating and loading machine and dragline operators
Helpers--extraction workers
Hoist and winch operators
Mine cutting and channeling machine operators
Mobile heavy equipment mechanics, except engines
Pump operators, except wellhead pumpers
Rail yard engineers, dinkey operators, and hostlers
Roof bolters, mining
Heavy and tractor-trailer truck drivers 101 110 127 142 182 74 68 75 61 55 90 98 90 70 44 94
Maintenance workers, machinery 93 118 94 141 242 44 115 53 65 68 88 85 52 56 103 81
Millwrights 209 211 224 261 353 93 173 109 76 90 129 155 61 82 147 112
Operating engineers and other construction equipment operators 70 96 85 118 194 44 75 53 30 43 56 75 77 65 71 68
Packaging and filling machine operators and tenders 58 58 77 123 138 63 85 51 87 66 91 92 125 51 78 82
Painters, construction and maintenance 99 98 115 180 131 110 134 110 114 103 137 158 172 87 111 142
Plumbers, pipefitters, and steamfitters 123 122 119 182 231 65 130 72 64 79 109 113 66 64 114 101
Production workers, all other 74 90 88 156 150 68 90 61 87 69 90 114 128 63 71 88

Table F.30: White Collar Occupations into Occupations Requiring Mechanical Skill

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Automotive service technicians and mechanics	105	113	194	310	314	214	292	302
Brickmasons and blockmasons	148	138	188	290	272	201	315	314
Bus and truck mechanics and diesel engine specialists	102	110	167	292	291	198	306	300
Cabinetmakers and bench carpenters	147	161	287	353	366	297	298	301
Carpenters	109	89	164	276	246	197	276	282
Cement masons and concrete finishers	143	142	234	322	272	263	237	239
Computer-controlled machine tool operators, metal and plastic	75	97	158	245	298	186	310	310
Construction laborers	138	163	239	358	301	246	289	286
Electricians	97	110	149	252	280	175	342	346
Heating, air conditioning, and refrigeration mechanics and installers	105	128	125	228	280	144	393	398
Heavy and tractor-trailer truck drivers	134	147	220	320	267	218	221	222
Maintenance workers, machinery	126	132	230	360	361	270	330	329
Millwrights	141	117	147	284	325	194	425	418

	Environmental engineering technicians	First-line supervisors of production and operating workers	Industrial production managers	Mining and geological engineers, including mining safety engineers	Purchasing agents, except wholesale, retail, and farm products	Surveyors	Bookkeeping, accounting, and auditing clerks	Payroll and timekeeping clerks
Operating engineers and other construction equipment operators	133	125	227	344	314	242	265	267
Packaging and filling machine operators and tenders	145	133	242	376	289	273	209	200
Painters, construction and maintenance	131	132	209	317	204	234	183	188
Plumbers, pipefitters, and steamfitters	92	123	194	288	294	228	306	311
Production workers, all other	149	110	220	367	268	249	218	228