

All data used in this analysis comes from the U.S. Bureau of Labor Statistics (“BLS”) and U.S. Bureau of Economic Analysis (“BEA”).

1. Narrowing the scope down to occupations that don’t require higher level of education

In defining what “don’t require” means, let’s start looking at some data first. BLS provides data on educational levels by occupation ranging from CEOs and lawyers to farmers and parking lot attendants. BLS shows the distribution of educational levels by occupation. The example distribution for CEOs can be seen in the table below. Evidently, 69% of CEOs have received a Bachelor’s degree or higher.

Educational level	Percent of CEOs
Less than high school diploma	1.5%
High school diploma or equivalent	9.2%
Some college, no degree	15.2%
Associate's degree	5.3%
Bachelor's degree	40.3%
Master's degree	21.3%
Doctoral or professional degree	7.2%

To unpack this data, let’s combine Associate’s degree or lower (“Lower education”) and Bachelor’s degree or higher (“Higher education”), as shown in the table below.

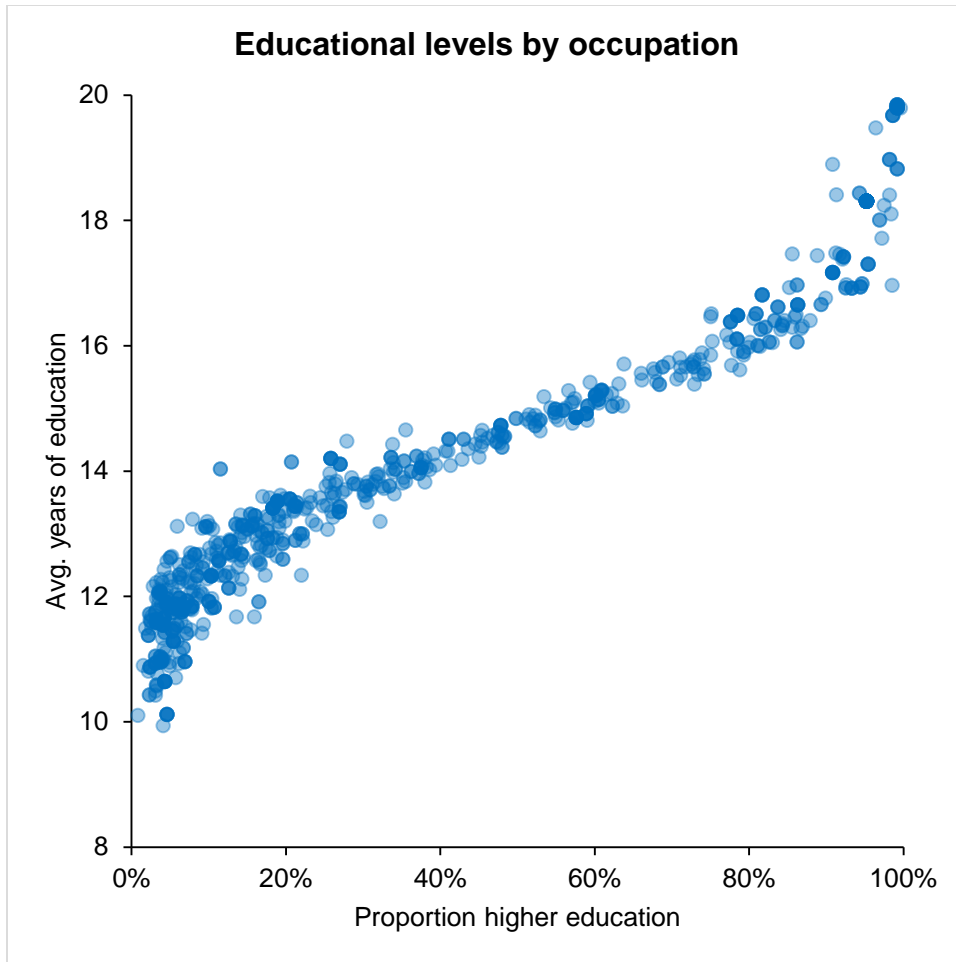
Educational level	Percent of CEOs
Lower education	31.2%
Higher education	68.8%

Further, let’s assume a certain length of education per level to get the average length of education per occupation.

Educational level	Assumed years of education
Less than high school diploma	8
High school diploma or equivalent	12
Some college, no degree	13
Associate's degree	14
Bachelor's degree	16
Master's degree	18
Doctoral or professional degree	20

So our two metrics for CEO then are 68.8% higher education, and 15.7 years of education on average.

The below chart plots these two metrics for all occupations in the data set.



Now armed with some data, we can start creating our own definition of what don't require higher education means. The chart shows the distribution two types of curvatures – a high slope in the beginning and end of the curve, indicating pockets of low vs. high levels of required education. The middle section exhibits a flatter slope. The beginning of the flattening out part of the curve starts around 25% of proportion of higher education. Let's further pick the semi-arbitrary number of 13 years of education, at the educational attainment level "some college, no degree."

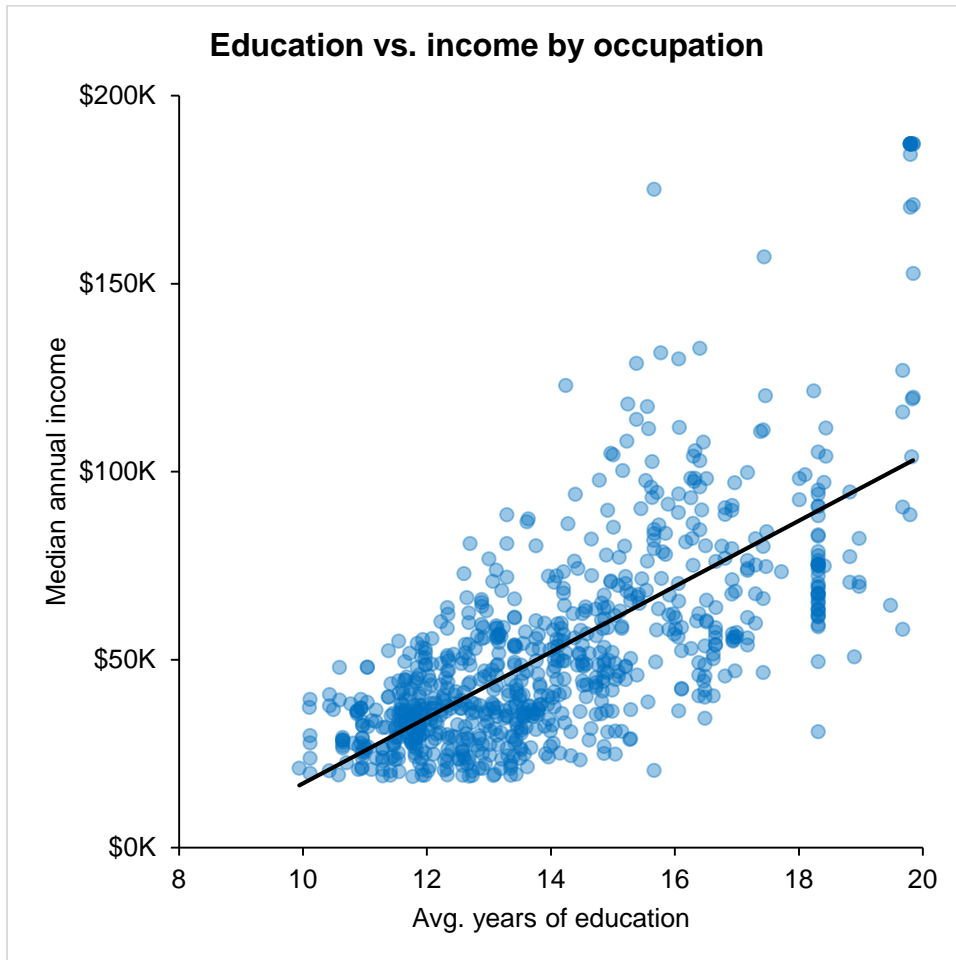
So our working definition is don't require higher education means the educational profile of the occupation has both below 13 years of education on average and below 25% of higher educated workers. While this may sound like a tough criteria, it only eliminates 61% of occupations, leaving a total of 39% left. That's almost half of all kinds of jobs that are up for grabs.

2. Identifying occupations with attractive employment characteristics

a. Income relative to education

It makes sense that the more you study, the higher degree of specialization you attain, and as such command a higher wage. Plotting the median income against average length of education shows this positive trend. There is a certain 'return on your investment' with respect to education. That being said, for the same amount of education, some occupations pay more and some pay less. To shortlist

occupations, let's think of drawing a line in the middle and only choosing occupations that are above the fold, that is, occupations that have higher than average wages for a certain level of education.

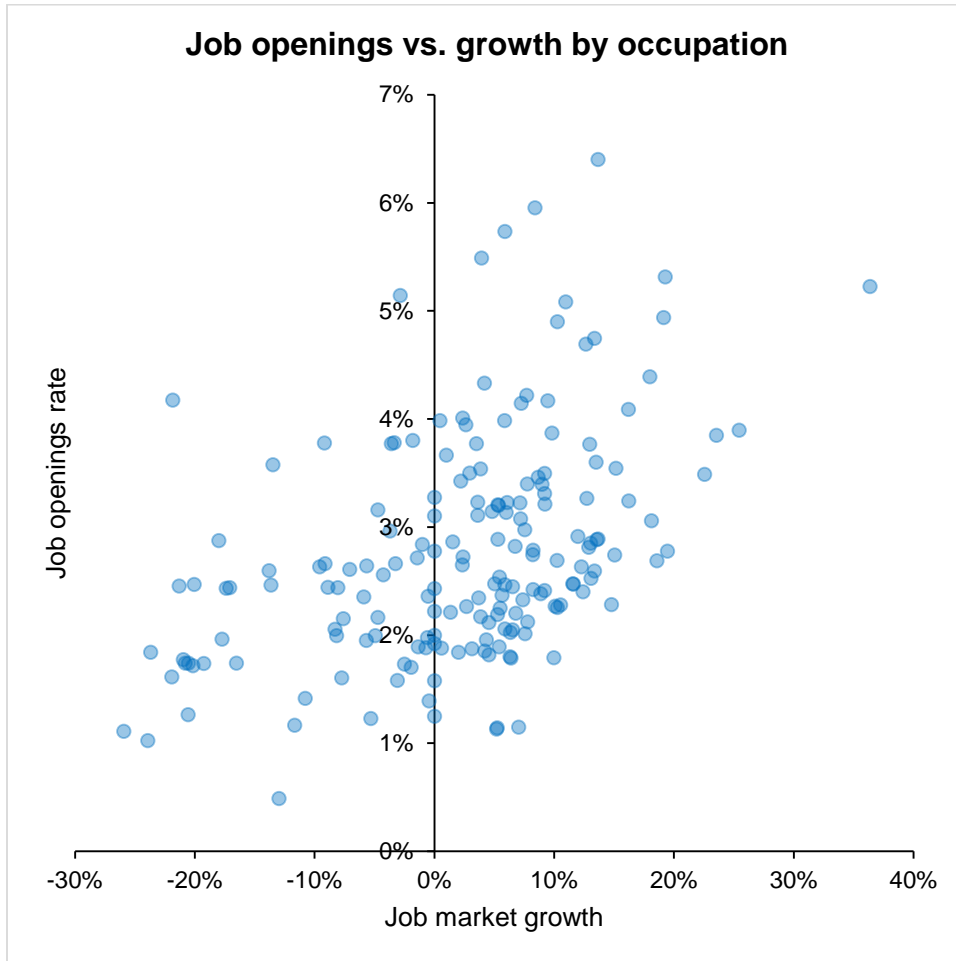


Among the 39% of occupations identified in the first step, 57% of those are above the fold (the black regression line in the chart above), leaving 22% of jobs overall. The thinking here is that while there are some higher paying jobs below the fold than above it, those would suggest have a higher income because of a higher degree of education or training.

b. Job openings, new jobs, and replacement needs

To identify more attractive occupations, let's look at how 'easy' it would be to get that job simply by looking at market forces. We can look at if there is a growing demand for a certain occupation as well as if there is a high replacement rate (i.e. older people retiring and younger workers replacing them). We can combine these two and call it 'job openings' either due to growth or replacement. For instance, in 2014 there were 13,100 gas pump operators and BLS projects that in 10 years there will be 14,200, an addition of 1,100 jobs. However, 6,700 gas pump operators will also need to be replaced, so the total job opportunity is 7,800, or 780 per year roughly. This creates a high job openings rate of 6.0% annually. One can further posit that a high rate is good if most of that is coming from growth of new jobs as

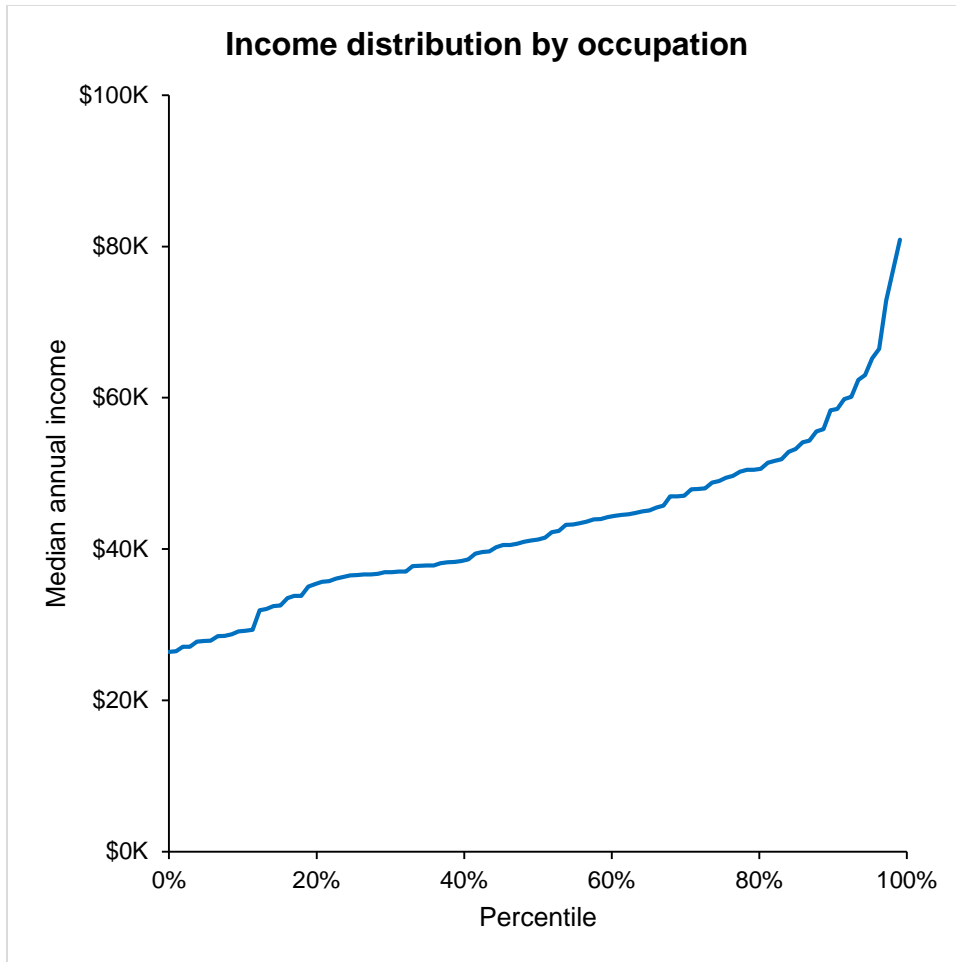
opposed to a replacement of older workers. So let's plot the job market growth rate against the job openings rate.



We can narrow occupations down to the ones that are at least not shrinking. While the average job opening rate is 2.8%, we can be a bit more inclusive and set our filter to include occupations that have a job openings rate of 2% or higher. Adding these filters, excludes 41% of the jobs remaining from the last step while keeping 59%, or 13% overall.

c. Pay

After all, we are looking at jobs that pay well. So let's plot annual median wages by percentile.



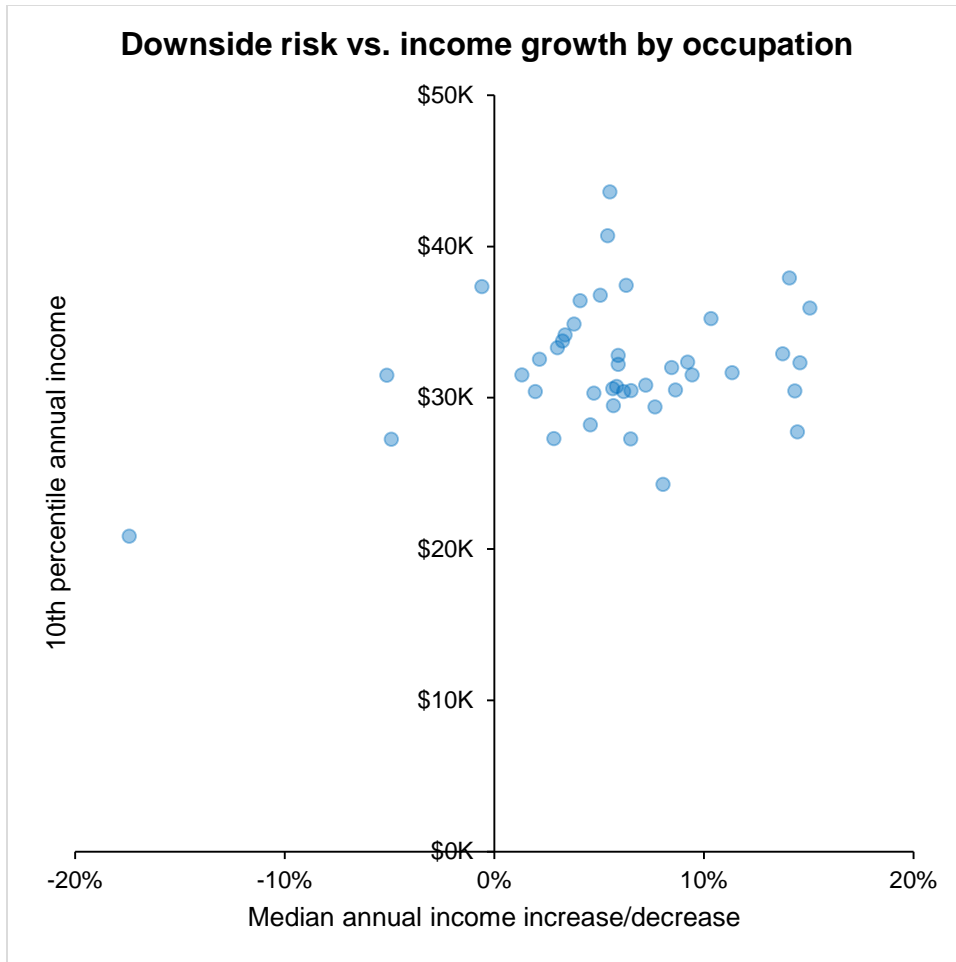
For our filtering purposes. Let's cut out half of these, sticking to the remaining jobs that are at the top half of the income distribution, leaving 7% of occupations overall. These remaining occupations have a median annual income greater than \$41,260.

d. Manual review

A manual review of the remaining occupations revealed that 23% of the remaining jobs were jobs likely requiring a promotion (e.g. supervisor of mechanics) or more specialized knowledge or training (e.g. ship engineer). This leaves overall 5% of jobs.

e. Downside risk

A final filter is comparing the median wage with the 10th percentile wage, to assess downside potential. For example, median income for an electrician was \$51,880 meanwhile the 10th percentile only received \$36,420, 30% less. In addition, we can look at how the electrician wages looked like 2 years ago and see if there was a decline or increase in wages. For the electricians, median wages used to be \$49,840 2 years ago, representing a 4% increase.



Let's further filter down to only include occupations where median income grew and the 10th percentile income is at least \$25K, still leaving 5% of overall occupations.

Remaining is a list of 37 occupations, all covered by 4 of BLS' major occupational groups, "Construction and Extraction", "Installation, Maintenance, and Repair", "Production", and "Transportation and Material Moving", under major occupation codes 47, 49, 51, and 53. All at a glance physical jobs.

Occupation	Code	Job market growth	Job market size	Job openings rate	Median annual income
Elevator installers and repairers	47-4021	13%	21K	3%	\$80,870
Electrical power-line installers and repairers	49-9051	11%	119K	5%	\$66,450
Petroleum pump system operators	51-8093	2%	42K	4%	\$65,190
Boilermakers	47-2011	9%	17K	2%	\$60,120
Rail transportation workers, all other	53-4099	3%	3.8K	4%	\$59,840
Gas compressor and gas pumping station operators	53-7071	4%	5.1K	5%	\$58,350
Rail car repairers	49-3043	2%	22K	3%	\$55,570
Rotary drill operators, oil and gas	47-5012	13%	28K	5%	\$54,310
Control and valve installers and repairers	49-9012	0%	42K	4%	\$54,100
Rail-track laying and equipment operators	47-4061	9%	16K	3%	\$52,830

Electricians	47-2111	14%	629K	3%	\$51,880
Crane and tower operators	53-7021	8%	46K	4%	\$51,650
Millwrights	49-9044	15%	41K	4%	\$51,390
Plumbers, pipefitters, and steamfitters	47-2152	12%	425K	2%	\$50,620
Structural iron and steel workers	47-2221	5%	61K	2%	\$50,490
Commercial divers	49-9092	36%	4.4K	5%	\$50,470
Industrial machinery mechanics	49-9041	18%	332K	4%	\$49,690
Pile-driver operators	47-2072	16%	3.7K	3%	\$49,430
Mobile heavy equipment mechanics	49-3042	5%	125K	3%	\$48,770
Reinforcing iron and rebar workers	47-2171	24%	19K	4%	\$48,010
Brickmasons and blockmasons	47-2021	19%	78K	3%	\$47,950
Derrick operators, oil and gas	47-5011	13%	22K	5%	\$47,910
Refractory materials repairers	49-9045	0%	1.8K	3%	\$47,060
Wellhead pumpers	53-7073	14%	14K	6%	\$46,990
Sheet metal workers	47-2211	7%	141K	3%	\$45,750
Heating, AC, and refrigeration mechanics and installers	49-9021	14%	292K	3%	\$45,110
Service unit operators, oil, gas, and mining	47-5013	7%	65K	4%	\$45,000
Water and wastewater treatment plant operators	51-8031	6%	117K	3%	\$44,790
Construction equipment operators	47-2073	10%	363K	3%	\$44,600
Extraction workers, all other	47-5099	11%	5.7K	2%	\$44,370
Earth drillers, except oil and gas	47-5021	14%	20K	4%	\$44,240
Traffic technicians	53-6041	6%	6.8K	6%	\$43,930
Insulation workers, mechanical	47-2132	19%	30K	5%	\$43,610
Security and fire alarm systems installers	49-2098	13%	64K	4%	\$43,420
Maintenance workers, machinery	49-9043	8%	91K	2%	\$43,260
Riggers	49-9096	9%	21K	3%	\$43,220
Hoist and winch operators	53-7041	0%	2.9K	3%	\$42,220

3. Finding the most attractive locations for the jobs

The final step is to take the national level data and apply it to a localized context. Differences in pay, cost of living (purchasing power), job market saturation, and state income taxes may shed some light on what jobs to look at and where.

So for this step we will convert gross income to net income at a state level, and normalize the net pay based on local purchasing power.

The top 10 cities based on average net purchasing power in the collection of the 37 jobs above shown in the table below. Many of them and other top cities in Illinois.

City	Gross pay	Net pay	Purchasing power
Springfield, IL	\$64K	\$51K	\$56K
Kennewick-Pasco-Richland, WA	\$64K	\$54K	\$56K
Danville, IL	\$53K	\$43K	\$55K

Fairbanks, AK	\$68K	\$57K	\$53K
Rockford, IL	\$60K	\$49K	\$53K
Peoria, IL	\$58K	\$47K	\$52K
Anchorage, AK	\$68K	\$57K	\$51K
Michigan City-La Porte, IN	\$53K	\$44K	\$52K
Longview, WA	\$57K	\$49K	\$52K
Champaign-Urbana, IL	\$59K	\$48K	\$51K

The top 3 states are Alaska, Illinois, and Washington. Within these 3 top states, the top jobs by net purchasing power are shown in the table below.

Job	Gross pay	Net pay	Purchasing power
Elevator Installers and Repairers	\$83K	\$65K	\$66K
Electrical Power-Line Installers and Repairers	\$80K	\$65K	\$65K
Hoist and Winch Operators	\$87K	\$68K	\$64K
Service Unit Operators, Oil, Gas, and Mining	\$84K	\$69K	\$62K
Rotary Drill Operators, Oil and Gas	\$79K	\$65K	\$58K
Derrick Operators, Oil and Gas	\$78K	\$64K	\$58K
Plumbers, Pipefitters, and Steamfitters	\$65K	\$54K	\$55K
Insulation Workers, Mechanical	\$68K	\$56K	\$54K
Reinforcing Iron and Rebar Workers	\$71K	\$58K	\$54K
Millwrights	\$64K	\$53K	\$54K
Structural Iron and Steel Workers	\$66K	\$54K	\$54K
Electricians	\$63K	\$52K	\$53K
Brickmasons and Blockmasons	\$62K	\$50K	\$52K
Pile-Driver Operators	\$68K	\$57K	\$52K
Construction Equipment Operators	\$61K	\$50K	\$52K
Crane and Tower Operators	\$62K	\$51K	\$51K
Water and Wastewater Treatment Plant Operators	\$60K	\$50K	\$50K
Rail Transportation Workers, All Other	\$65K	\$52K	\$49K
Control and Valve Installers and Repairers	\$62K	\$52K	\$48K
Petroleum Pump System Operators	\$61K	\$51K	\$47K
Sheet Metal Workers	\$55K	\$46K	\$47K
Boilermakers	\$58K	\$48K	\$47K
Industrial Machinery Mechanics	\$54K	\$45K	\$47K
Earth Drillers, Except Oil and Gas	\$58K	\$48K	\$46K
Heating, AC, and Refrigeration Mechanics and Installers	\$53K	\$45K	\$46K
Mobile Heavy Equipment Mechanics	\$53K	\$45K	\$45K
Security and Fire Alarm Systems Installers	\$54K	\$45K	\$44K
Rail-Track Laying and Maintenance Equipment Operators	\$57K	\$47K	\$44K
Traffic Technicians	\$55K	\$47K	\$44K
Maintenance Workers, Machinery	\$48K	\$41K	\$43K

Rail Car Repairers	\$53K	\$45K	\$42K
Riggers	\$51K	\$43K	\$40K
Refractory Materials Repairers	\$47K	\$39K	\$37K

Finally, if you are on a golden goose chase hunt, the top 10 job-city pairs by purchasing power are shown in the table below. Location quotient refers to how many such workers are in a given location relative to that occupation nationally. A number above 1 means a higher concentration of such workers in a city, and below 1, a lower concentration.

Job	City	State	Gross pay	Net pay	Purchasing power	Location
Electrical Power-Line Installers/Repairers	Kennewick, WA	WA	\$88K	\$72K	\$74K	1.3
Electrical Power-Line Installers/Repairers	Spokane, WA	WA	\$85K	\$70K	\$72K	0.7
Electrical Power-Line Installers/Repairers	Wenatchee, WA	WA	\$85K	\$70K	\$72K	3.5
Millwrights	Kennewick, WA	WA	\$84K	\$69K	\$71K	1.6
Plumbers, Pipefitters, and Steamfitters	Yakima, WA	WA	\$82K	\$67K	\$71K	0.3
Elevator Installers and Repairers	Peoria, IL	IL	\$81K	\$63K	\$69K	2.4
Electrical Power-Line Installers/Repairers	Bellingham, WA	WA	\$83K	\$68K	\$68K	1.3
Plumbers, Pipefitters, and Steamfitters	Rockford, IL	IL	\$79K	\$62K	\$67K	0.6
Electrical Power-Line Installers/Repairers	Springfield, IL	IL	\$79K	\$62K	\$67K	0.8
Electricians	Rockford, IL	IL	\$76K	\$60K	\$65K	1.1