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# Automation Potential for Jobs in Phoenix

An Economic Analysis of the Phoenix  
Metropolitan Area

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## **About the Author(s)**

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## **About New America**

We are dedicated to renewing America by continuing the quest to realize our nation's highest ideals, honestly confronting the challenges caused by rapid technological and social change, and seizing the opportunities those changes create.

## **About Work, Workers, and Technology**

Today, work as we know it is shifting, and rapidly. Advanced technologies are changing the demand for skills, the nature of occupations, and what is required to earn a good living. Jobs are no longer so clearly defined. Workers cannot expect to stay in one job or industry for 40 years, while experience and seniority doesn't guarantee advancement. As a result, more people are proactively creating jobs for themselves, such as in creative fields or the gig economy. Automation and artificial intelligence drive some of these changes and will continue to profoundly change what it takes to earn a good living in the future -- a recent McKinsey study found that 45 percent of job activities could be automated with existing technology.

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# 1. Introduction

Today, work as we know it is shifting, and rapidly. Over the next decade and beyond, how will artificial intelligence and automation change work and opportunity in cities like Phoenix?

The Phoenix metro area and other communities across the country will be at the front lines of this change.<sup>1</sup> To prepare for this future, New America will host the first **ShiftLabs** on April 20th in Phoenix, Arizona in partnership with Arizona State University and with **support from the Rockefeller Foundation**. At the day-long design lab, leaders from the Phoenix region and across the country—technology, industry, policy, philanthropy and culture—will come together to consider the impact of technology and automation on work in Phoenix and to develop a long-term, place-based vision for opportunity.

To bring a data-driven lens to ShiftLabs, New America partnered with leading labor market analytics company **Burning Glass Technologies** and their analysis of **data from Oxford researchers Carl Benedikt Frey and Michael Osborne** to conduct a first-of-its-kind analysis of the potential of automation to impact jobs in the greater Phoenix region. We ask: Of the thousands of jobs held by Phoenix workers today, which could be performed by existing technology in the next decade? Which occupations and skills are at greatest risk of automation, and who holds those jobs today? To answer these questions, we combined and analyzed Burning Glass data on the likelihood of a computer being able to do a job using existing technology, as well as data from the Bureau of Labor Statistics on occupations in Phoenix and nationally.

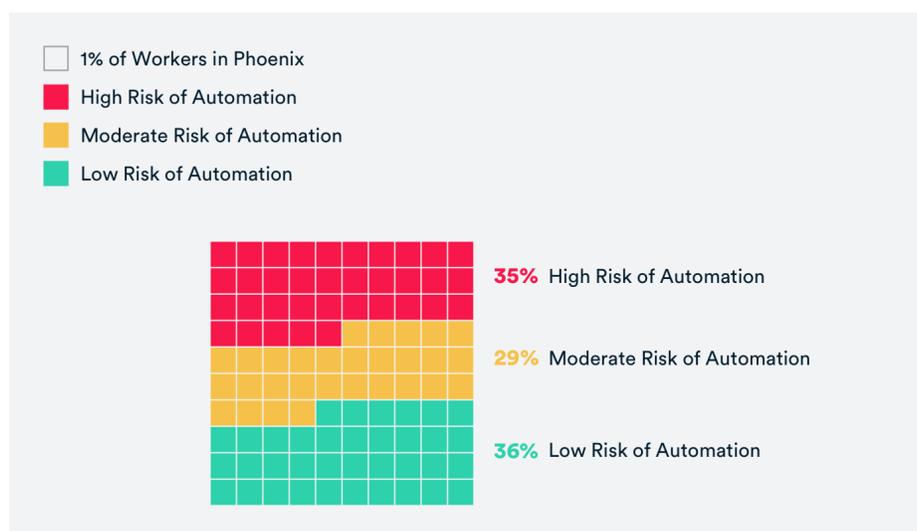
To be sure, emerging technologies will also create many jobs, including entirely new jobs that don't even exist today. This is a familiar pattern—about **half of all job growth from 1980 to 2010** came from the creation and expansion of brand new jobs. On balance, automation and technology may create more jobs than they eliminate, but predictions of the number and types of jobs that will be created are outside the scope of this study.

The findings of our analysis are clear: Automation will have a widespread impact on jobs in Phoenix in the years ahead, and especially on low-skilled jobs. In some cases, technology will eliminate high-risk jobs. In many more cases, technology will change them—sometimes dramatically.

## 2. Overview: How Vulnerable are Phoenix Jobs to Automation?

In the Phoenix metro area, 649,040 people are employed in occupations that are at high risk of automation—35 percent of total jobs. Another 537,110 jobs (29 percent of total jobs) are at moderate risk of automation. Only a little more than a third (36 percent) are at low risk.

**Figure 1 |** How Vulnerable are Phoenix Workers to Automation?



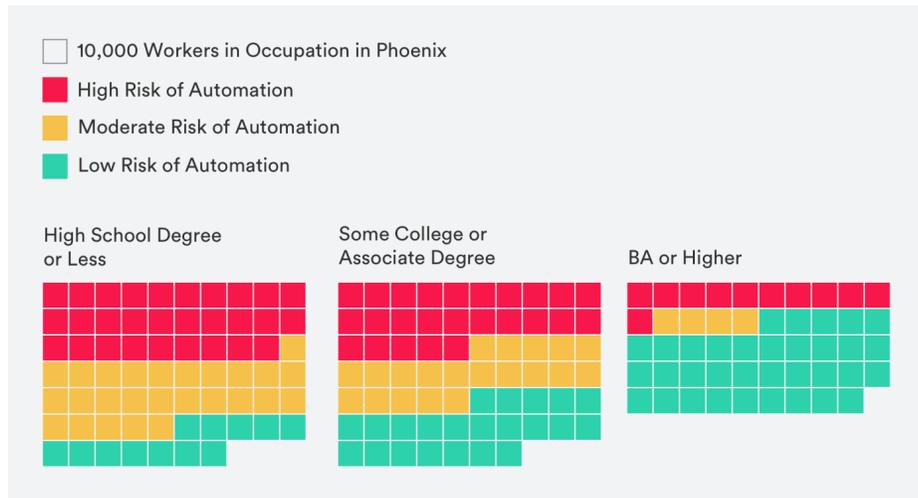
### Which Workers in Phoenix Are Most Vulnerable to Automation?

#### Workers with less education

Among workers, the least educated workers are at greatest risk of automation. This is especially true of workers with a high school degree or less, who comprise 45 percent of the workers at high risk of automation in Phoenix and just 18 percent of workers at low risk. Those numbers are flipped for low-risk jobs: Half of workers in low-risk occupations have a BA or higher, while just 18 percent have a high school degree or less.

This vulnerability is further magnified by Phoenix's lower levels of post-secondary education attainment, compared to the country overall. Across the United States, between 2012 and 2016, **87 percent of people above age 25** had a high school degree or higher and just over 30 percent held a BA or higher. In contrast, in Phoenix, **81 percent** had a high school degree or higher and just over 27 percent held a BA or higher.

**Figure 2 | Phoenix Workers by Education and Risk of Automation**



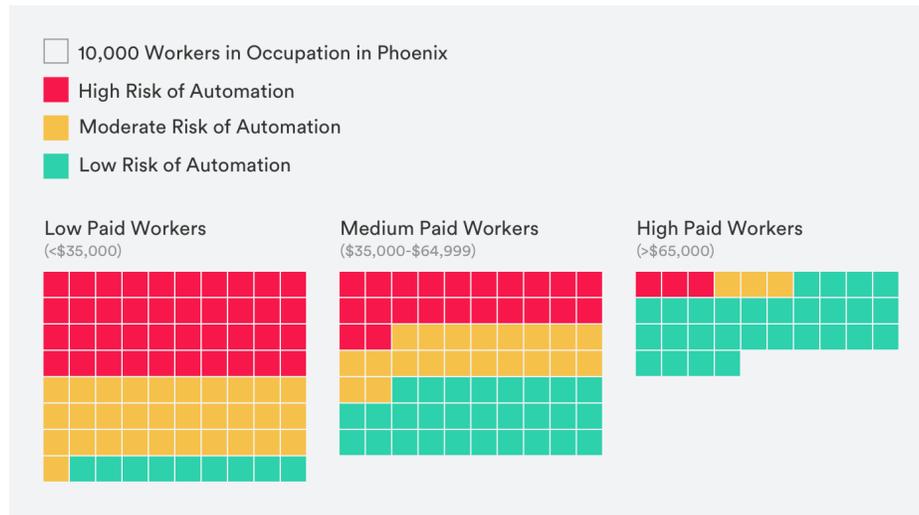
**Figure 3 | Phoenix's Occupations by Automation Risk**



**Workers who earn the least money**

The jobs at high risk of automation are nearly half as well paid, on average, as the jobs at low risk of automation. The average annual salary of workers in the more than 200 jobs that are at high risk of automation is \$32,959. Meanwhile, the average salary of the workers in the more than 300 jobs that are at low risk of automation is \$67,416—more than double that of the high-risk workers.

**Figure 4 | Phoenix Workers by Income Range and Risk of Automation**



## Women

The high risk occupations in Phoenix disproportionately employ women. Applying national averages of women employed across occupations,<sup>2</sup> women constitute 58 percent of workers in high risk occupations in Phoenix. Women dominate in many food and retail-related industries that are especially high risk. For instance:

- **Cashiers:** Over 44,000 people in Phoenix worked last year as a cashier - a job with a 97 percent risk of automation. Nationally, 73 percent of cashier jobs were held by women.
- **Office clerks:** More than 36,000 people in Phoenix worked as office clerks - an occupation with a 96 percent risk of automation. Nationally, 83 percent of those positions were held by women.
- **Secretaries and administrative assistants:** More than 29,000 people worked as secretaries and administrative assistants in Phoenix, which carry a 96 percent risk of automation. Nationally, 95 percent of those positions were held by women.

## Occupations at Highest and Least Risk

### The Largest Occupations Most at Risk

Of the 50 occupations that employ the most people in the Phoenix metro area (totalling just over half of all workers), the following 15 occupations are the most at risk of automation.

**Table 1**

Pay scale	Top occupations that are high risk to automation	# employed
Low paid jobs (< \$35k)	Retail Salespersons	67,450
	Cashiers	44,630
	Combined Food Preparation and Serving Workers, Including Fast Food	44,930
	Waiters and Waitresses	36,870
	Cooks, Restaurant	16,410
	Landscaping and Groundskeeping Workers	13,380
	Receptionists and Information Clerks	12,590
	Telemarketers	10,520
Middle paid jobs (\$35k - \$60k)	Office Clerks, General	36,220
	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	29,630
	Bookkeeping, Accounting, and Auditing Clerks	16,650
	Construction Laborers	12,590
	Billing and Posting Clerks	9,130
High paid jobs (\$60k-\$90k)	Accountants and Auditors	16,270
	Loan officers	8,510

### Largest Occupations Least at Risk

Of the 50 occupations that employ the most people in the Phoenix metro area (or about half of all workers), the following 17 occupations have a low risk of automation.

**Table 2**

Pay scale	Top Occupations Least at Risk of Automation	# Employed
Low paid jobs (<\$35k)	Medical Assistants	12,260
	Home Health Aides	10,770
	Nursing Assistants	8,950
Middle paid jobs (\$35k-\$60k)	First-Line Supervisors of Office and Administrative Support Workers	28,260
	First-Line Supervisors of Retail Sales Workers	18,810
	Sales Representatives, Services, All Other	16,120
	Elementary School Teachers, Except Special Education	15,010
	Computer User Support Specialists	10,980
	Secondary School Teachers, Except Special and Career/Technical Education	10,640
	Registered Nurses	37,120
High paid jobs (\$60k- \$90k)	First-Line Supervisors of Construction Trades and Extraction Workers	10,030
	General and Operations Managers	32,210
Top paid jobs (>\$90k)	Computer Systems Analysts	12,900
	Software Developers, Applications	12,190
	Business Operations Specialists, All Other	8,650
	Sales Managers	8,770
	Financial Managers	8,730

## Top 50 Occupations by Number of People Employed

**Table 3**

Top occupations in the Phoenix metro area	Automation risk	# employed	Mean salary
Customer service Representatives	Medium Risk	69,170	\$33,590
Retail Salespersons	High Risk	67,450	\$25,570
Cashiers	High Risk	44,630	\$21,910
Combined Food Preparation and Serving Workers, Including Fast Food	High Risk	44,930	\$20,120
Registered Nurses	Low Risk	37,120	\$74,930
Waiters and Waitresses	High Risk	36,870	\$22,420
Office Clerks, General	High Risk	36,220	\$35,170
Laborers and Freight, Stock, and Material Movers, Hand	Medium Risk	33,840	\$29,000
General and Operations Managers	Low Risk	32,210	\$103,090
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	High Risk	29,630	\$35,910
First-Line Supervisors of Office and Administrative Support Workers	Low Risk	28,260	\$53,900
Stock Clerks and Order Fillers	Medium Risk	26,720	\$26,490
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	Medium Risk	26,150	\$24,660
Personal Care Aides	Medium Risk	25,490	\$22,310
First-Line Supervisors of Retail Sales Workers	Low Risk	18,810	\$42,340
Security Guards	Medium Risk	17,830	\$29,580

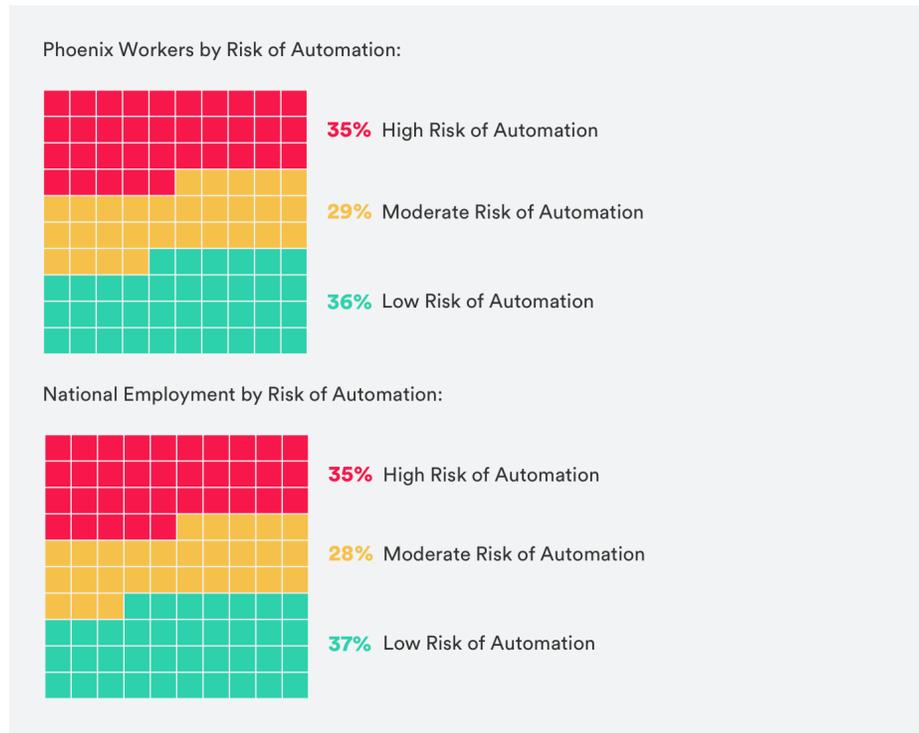
Top occupations in the Phoenix metro area	Automation risk	# employed	Mean salary
Heavy and Tractor-Trailer Truck Drivers	Medium Risk	17,760	\$43,410
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	Medium Risk	17,710	\$62,450
Bookkeeping, Accounting, and Auditing Clerks	High Risk	16,650	\$39,060
Cooks, Restaurant	High Risk	16,410	\$25,160
Accountants and Auditors	High Risk	16,270	\$68,650
Maintenance and Repair Workers, General	Medium Risk	16,160	\$36,470
Sales Representatives, Services, All Other	Low Risk	16,120	\$52,410
Teacher Assistants	Medium Risk	15,290	\$25,200
Elementary School Teachers, Except Special Education	Low Risk	15,010	\$43,730
Cooks, Fast Food	Medium Risk	13,660	\$20,350
Landscaping and Groundskeeping Workers	High Risk	13,380	\$25,970
First-Line Supervisors of Food Preparation and Serving Workers	Medium Risk	13,230	\$33,590
Computer Systems Analysts	Low Risk	12,900	\$91,080
Construction Laborers	High Risk	12,590	\$40,984
Receptionists and Information Clerks	High Risk	12,590	\$28,790
Medical Assistants	Low Risk	12,260	\$33,990
Software Developers, Applications	Low Risk	12,190	\$94,490
Light Truck or Delivery Services Drivers	Medium Risk	11,460	\$37,230
Computer User Support Specialists	Low Risk	10,980	\$50,080
Home Health Aides	Low Risk	10,770	\$24,000

Top occupations in the Phoenix metro area	Automation risk	# employed	Mean salary
Secondary School Teachers, Except Special and Career/ Technical Education	Low Risk	10,640	\$50,360
Telemarketers	High Risk	10,520	\$28,190
First-Line Supervisors of Construction Trades and Extraction Workers	Low Risk	10,030	\$63,320
Medical Secretaries	Medium Risk	9,930	\$33,530
Correctional Officers and Jailers	Medium Risk	9,920	\$43,920
Automotive Service Technicians and Mechanics	Medium Risk	9,240	\$41,300
Billing and Posting Clerks	High Risk	9,130	\$36,150
Nursing Assistants	Low Risk	8,950	\$30,400
Sales Managers	Low Risk	8,770	\$113,110
Maids and Housekeeping Cleaners	Medium Risk	8,750	\$22,400
Financial Managers	Low Risk	8,730	\$116,760
Market Research Analysts and Marketing Specialists	Medium Risk	8,720	\$64,810
Business Operations Specialists, All Other	Low Risk	8,650	\$68,340
Loan officers	High Risk	8,510	\$68,060

### How Does Phoenix Differ From the U.S. Average?

Overall, the risk of automation facing workers in the Phoenix region is just slightly above the risk to all workers nationally. Workers in Phoenix and nationally have the same rate of high risk, but Phoenix is one percentage point higher than the United States on medium risk, and one percentage point less in low risk.

**Figure 5 | Phoenix vs National Workers by Risk of Automation**



Looking more closely at specific occupational groups within the economy, there are some pockets of greater vulnerability and greater resilience.

The chart below illustrates the occupational groups in Phoenix that differ significantly from the national average.

**Table 4**

Phoenix occupational group	% of total US employment 2016	% of Phoenix 2017	% difference from US average	Automation risk
Management	5.1	6.4	+20%	Low
Business and financial operations	5.2	5.7	+9%	Low
Computer and mathematical	3	3.8	+21%	Medium

Phoenix occupational group	% of total US employment 2016	% of Phoenix 2017	% difference from US average	Automation risk
Education, training, and library	6.2	4.7	-32%	Low
Healthcare support	2.9	2.5	+16%	Medium
Sales and related	10.4	11.1	+6%	Medium
Office and administrative support	15.7	17.4	+10%	Medium
Production	6.5	4.3	-51%	High
Transportation and material moving	6.9	6.1	-13%	Medium

### Ways the Phoenix area workforce is more resilient to automation than the nation overall

- Management, business and finance have a low risk of automation. As a percent of employment, Phoenix's population has 20 percent more workers in management positions than the national average. As a percent of employment, Phoenix's population has 9 percent more workers in business and financial operations, which carry a low risk of automation.
- Phoenix also has 21 percent more of its workforce in computers and mathematical positions.
- Compared to the national average, Phoenix has 51 percent fewer workers in manufacturing and 13 percent fewer workers employed in transportation and material moving. Both of these occupations are high risk of automation.

### Ways the Phoenix area workforce is more vulnerable to automation than the national overall

Phoenix has a greater share of its workforce than the national average in several big occupational groups that have a medium or high risk of automation. These include:

- Phoenix employs 10 percent more workers in office and administrative support than national average. These occupations have a medium-high risk of automation, and include many high risk jobs.

- Phoenix has 6 percent more workers in sales and related occupations than national average, and many of these jobs (like cashiers) are high risk of automation..

Phoenix area employees are less well-represented in certain low-risk occupational groups than the national average:

- Education, training and library occupations are at very low risk of automation. Phoenix has 32 percent fewer workers in these occupations than the national average. Nationally, 73 percent of those positions are held by women. Thus, compared to the rest of the country, Phoenix has significantly fewer low-risk jobs in education that overwhelmingly employ women.

### 3. Data and Methodology

#### What Do We Mean by Automation and Risk of Automation?

In our analysis, the rankings of automation risk describe the technical feasibility that an occupation can be computerized or automated with start-of-the-art technology available today. This data comes from Burning Glass Technologies, and is derived largely from a well known 2013 study from two researchers at Oxford, Carl Benedikt Frey and Michael A. Osborn. To calculate the automation risk, the Oxford researchers evaluated the ability of computers to perform the underlying tasks associated with the given occupation.

1. “High risk” occupations are the top quartile of risk, with at least 85 percent risk of automation for a given occupation.
2. “Medium risk” occupations are in the second quartile of risk, between 50 percent and 85 percent risk of automation for a given occupation.
3. “Low risk” occupations are in the bottom two quartiles, with less than 50 percent risk.

A few key caveats are important to consider when interpreting the data.

First, the rankings are *not* a probability that a given job will actually be automated. Because a job or task can *technically* be done by a computer does not mean that it *will*. A range of legal, logistical, business, financial, political, and social factors could lower the real rate at which businesses and employers adopt technology and automate functions. Moreover, predictions about technology have a relatively high degree of uncertainty.

Second, jobs that have some tasks that can technically be automated will not necessarily be displaced. Instead, the nature of many jobs will change—in some cases, dramatically—but will not be eliminated. (McKinsey estimates that **just 5 percent of jobs** will be outright eliminated, but that half of job tasks could be automated.) The implication of this change is the need for workers in at risk occupations to continuously upskill to keep pace with the changing requirements of their occupation.

Finally, while technology and automation will displace some jobs and change others, new jobs will also be created and other jobs will expand. Our analysis does not capture the impact of projected job creation.

#### Notes on the Data

- The data on automation potential comes from Burning Glass Technologies, which is derived largely from a well known 2013 study from two researchers at Oxford, Carl Benedikt Frey and Michael A. Osborn,

titled “**The Future of Employment: How Susceptible are Jobs to Computerisation?**”

- Occupational and wage data for the Phoenix metropolitan area is from the Bureau of Labor Statistics and covers the period from January 1, 2017 to December 31, 2017. The geographic area spans Phoenix, Mesa, and Scottsdale, including Pinal and Maricopa counties.
- Data on national averages of women in occupations comes from the Bureau of Labor Statistics.
- Data on education levels of employed individuals comes from the American Community Survey (ACS) five-year estimates (2011 - 2015).

## Notes

1 Throughout this report, when we refer to Phoenix, we are referring to the Phoenix metropolitan area, including Phoenix, Mesa, and Scottsdale, and spanning Maricopa and Pinal counties.

2 Data from gender makeup of national occupations from the Bureau of Labor statistics.

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