

# Exposure to Automation in Ohio



## Introduction

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Automation and the future of work have been discussed for more than 50 years. Recently, economists, journalists, and researchers have been focusing on the long-term impact of automation, machine learning, and computerization on employment, occupations, and occupational mix. Some of these articles, editorials, and research studies focus on the long-term job losses associated with automation such as machine learning and computerization of job tasks and occupations while also focusing on the impact automation has on specific occupations, such as driverless technology on truck and transit drivers and machine learning technology on computer programmers and other IT jobs. Some researchers have focused on specific geographical regions and/or industries. While Ohio's labor market and employment patterns, in general, mirrors the national labor market, Ohio could see different impacts on occupational mix and jobs, particularly as automation has been increasing for decades in Ohio's manufacturing sector.

For this paper we applied automation exposure scores to the occupations in Ohio's workforce. The automation literature frequently uses the term "risk for automation." We prefer 'exposure to automation' because, even at high risk, not all jobs in an occupation will be automated. Large, automated manufacturing machines and lines will require workers to set up, tend, maintain, and repair the equipment, in addition to possibly on-loading and off-loading materials and finished goods from the equipment. Automated teller machines (ATMs) were once feared to replace all bank tellers; however, ATM use has not eliminated all tellers but rather freed tellers and bank staff to focus on helping customers with more complex financial transactions and allowed banks to expand their services and products by offering more financial instruments. This provided opportunities for tellers to update their skills for different positions or occupations. Currently, attention is being paid to driverless trucks. Over the years we have seen technology such as GPS and electronic logs make some tasks of truck drivers easier without necessarily reducing jobs for truck drivers.

The first research on the impact of automation on jobs in the United States came in 2013 from Oxford researchers Frey and Osborn.<sup>1</sup> They created a ratio from 0.000 – 1.0 on the impact of automation on individual occupations in the 2010 Standard Occupational Classification (SOC) system, with a score of 0.000 meaning no part of the job could be automated and 1.0 meaning all tasks of the occupation are automatable. Building on their work, the Information, Technology, and Innovation Foundation (ITIF) coded for all occupations within the 2010 SOC and hand coded occupations they believed did not make sense per the Frey and Osborn ratios.<sup>2</sup> ITIF used a 5-point scale, rather than a ratio, in which those occupations coded as 1 are at high exposure for automation and those listed as 5 are at low exposure for automation.

For this project, occupations from the 2018-2028 Ohio and national projections were coded for exposure to automation using the ITIF system. The occupational employment estimates from the 2018-2028 Ohio employment projections were summed for each level of exposure to automation. Employment projections data were used to compare to national projections measures. The following sections of this report compare the Ohio and U.S. shares of exposure to automation based on employment, discuss Ohio's high exposure occupations, exposure by job education level, and projected employment growth and annual job openings by exposure level.

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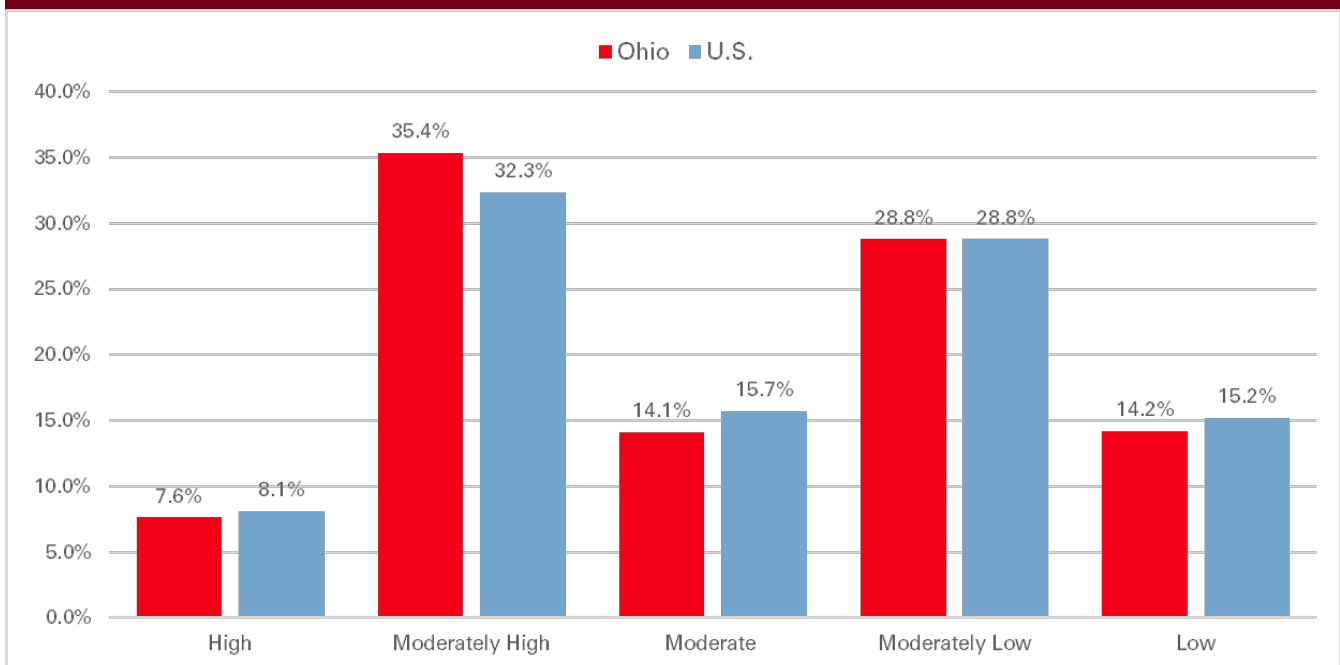
<sup>1</sup> Frey, C. B., & Osborne, M. A. (2013). The Future of Employment: How Susceptible Are Jobs to Computerisation? Accessed 10/19/2021 at [https://www.oxfordmartin.ox.ac.uk/downloads/academic/The\\_Future\\_of\\_Employment.pdf](https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf)

<sup>2</sup> Atkinson, R. D. (2017). Unfortunately, Technology Will Not Eliminate Many Jobs. *Innovation Files*, 7. Accessed 10/19/2021 at <https://itif.org/publications/2017/08/07/unfortunately-technology-will-not-eliminate-many-jobs>

## Share of Employment by Exposure Level

For 2018 employment, 7.6% of Ohio jobs have a high level of exposure to automation, as shown in Figure 1. This was the smallest share of Ohio employment among the exposure levels. The high exposure category is smaller for Ohio compared to the U.S., in which 8.1% of the national employment is in that category. The moderately high exposure category contains the largest share of Ohio jobs (35.4% of employment), and this group is a larger share than U.S. employment at 32.3%. About 14.1% of Ohio employment and 15.7% of U.S. employment are in the moderate category of exposure. The moderately low category has the second largest share of employment, and both Ohio and the U.S. have 28.8% of employment in this category. The share of Ohio employment in the low exposure to automation category is 14.2%, which is almost twice the share of the highest exposure category. Overall, Ohio's share of employment by exposure to automation appears to mirror U.S. employment and exposure to automation. The percentage of employment in occupations considered high or moderately high exposure to automation is 43.0% for Ohio compared with 40.4% in the U.S. Likewise, Ohio's employment in low or moderately low exposure occupations is even closer to the United States overall at 43.0% of statewide employment and 44.0% of national employment.

**Figure 1. Share of Employment in 2018 by Exposure to Automation**



Source: Bureau of Labor Market Information and ITIF risk categories

## High Exposure to Automation Occupations

Table 1 details the occupations with at least 1,000 jobs in the high exposure category. Thirty-two of the 41 occupations had more than 1,000 jobs and a combined 436,575 employment. These occupations account for 98% of employment categorized as high exposure. Three occupations: cashiers (41-2011); customer service (43-4051); and industrial truck and tractor operators (53-7051) make up more than 57% of the total employment in the high exposure to automation category.

The location quotient (LQ) column in Table 1 details Ohio's concentration of employment relative to the U.S. for individual occupations. An LQ value greater than 1.2 means the occupation's concentration of employment in Ohio is significantly greater than the U.S. average. Eight occupations have an LQ with a value over 1.2 as noted with bolded text and yellow highlighted rows in Table 1. These occupations include medical records and health information technicians (29-2071); switchboard operators, including answering service (43-2011); billing and posting clerks and machine operators (43-3021); brokerage clerks (43-4011); court, municipal, and license clerks (43-4031); meter readers, utilities (43-5041); coating, painting, and spraying machine setters, operators, and tenders (51-9121); and industrial truck and tractor operators (53-7051).

**Table 1. Ohio Occupations with the High Exposure to Automation and Employment Over 1,000 in 2018**

SOC Code	Occupational Title	Location Quotient	Employment	Median Wage	Typical Education at Entry
13-2041	Credit Analysts	1.06	2,932	\$34.65	Bachelor's degree
23-2093	Title Examiners, Abstractors, and Searchers	1.13	2,558	\$23.30	High school diploma or equivalent
27-3091	Interpreters and Translators	0.87	2,374	\$24.41	Bachelor's degree
<b>29-2071</b>	<b>Medical Records and Health Information Technicians</b>	<b>1.24</b>	<b>9,811</b>	<b>▲</b>	<b>Postsecondary non-degree award</b>
31-9094	Medical Transcriptionists	0.86	1,815	\$18.18	Postsecondary non-degree award
35-2011	Cooks, Fast Food	0.92	16,635	\$10.14	No formal educational credential
35-9021	Dishwashers	0.79	15,009	\$10.00	No formal educational credential
39-3031	Ushers, Lobby Attendants, and Ticket Takers	0.62	3,139	\$9.43	No formal educational credential
41-2011	Cashiers	0.89	121,962	\$10.29	No formal educational credential
<b>43-2011</b>	<b>Switchboard Operators, Including Answering Service</b>	<b>1.23</b>	<b>3,252</b>	<b>\$13.89</b>	<b>High school diploma or equivalent</b>
<b>43-3021</b>	<b>Billing and Posting Clerks and Machine Operators</b>	<b>1.21</b>	<b>21,490</b>	<b>\$17.89</b>	<b>High school diploma or equivalent</b>
43-3051	Payroll and Timekeeping Clerks	1.05	5,831	\$21.38	High school diploma or equivalent
43-3071	Tellers	1.03	18,437	\$14.40	High school diploma or equivalent
<b>43-4011</b>	<b>Brokerage Clerks</b>	<b>1.20</b>	<b>2,457</b>	<b>\$23.79</b>	<b>High school diploma or equivalent</b>

Table 1. cont'd

SOC Code	Occupational Title	Location Quotient	Employment	Median Wage	Typical Education at Entry
<b>43-4031</b>	<b>Court, Municipal, and License Clerks</b>	<b>1.75</b>	<b>9,481</b>	<b>\$17.93</b>	<b>High school diploma or equivalent</b>
43-4051	Customer Service Representatives	0.94	100,806	\$16.70	High school diploma or equivalent
43-4071	File Clerks	0.89	3,791	\$16.72	High school diploma or equivalent
43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	0.37	1,863	\$20.07	High school diploma or equivalent
43-4199	Information and Record Clerks, All Other	0.61	3,584	\$20.69	High school diploma or equivalent
43-5021	Couriers and Messengers	0.67	2,424	\$13.8	High school diploma or equivalent
<b>43-5041</b>	<b>Meter Readers, Utilities</b>	<b>1.37</b>	<b>1,713</b>	<b>\$19.52</b>	<b>High school diploma or equivalent</b>
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	0.86	2,060	\$17.15	High school diploma or equivalent
43-9021	Data Entry Keyers	0.92	6,337	\$15.60	High school diploma or equivalent
43-9022	Word Processors and Typists	0.67	1,473	\$18.71	High school diploma or equivalent
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	0.19	9,388	\$11.59	No formal educational credential
49-3021	Automotive Body and Related Repairers	0.97	5,671	\$18.56	High school diploma or equivalent
51-3022	Meat, Poultry, and Fish Cutters and Trimmers	0.32	1,875	\$14.37	No formal educational credential
<b>51-9121</b>	<b>Coating, Painting, and Spraying Machine Setters, Operators, and Tenders</b>	<b>1.67</b>	<b>5,807</b>	<b>▲</b>	<b>High school diploma or equivalent</b>
53-3041	Taxi Drivers and Chauffeurs	0.99	13,407	▲	No formal educational credential
53-6021	Parking Lot Attendants	0.83	4,545	\$10.43	No formal educational credential
53-6031	Service Station Attendants	0.89	3,834	\$11.45	No formal educational credential
<b>53-7051</b>	<b>Industrial Truck and Tractor Operators</b>	<b>1.36</b>	<b>30,814</b>	<b>\$17.32</b>	<b>No formal educational credential</b>

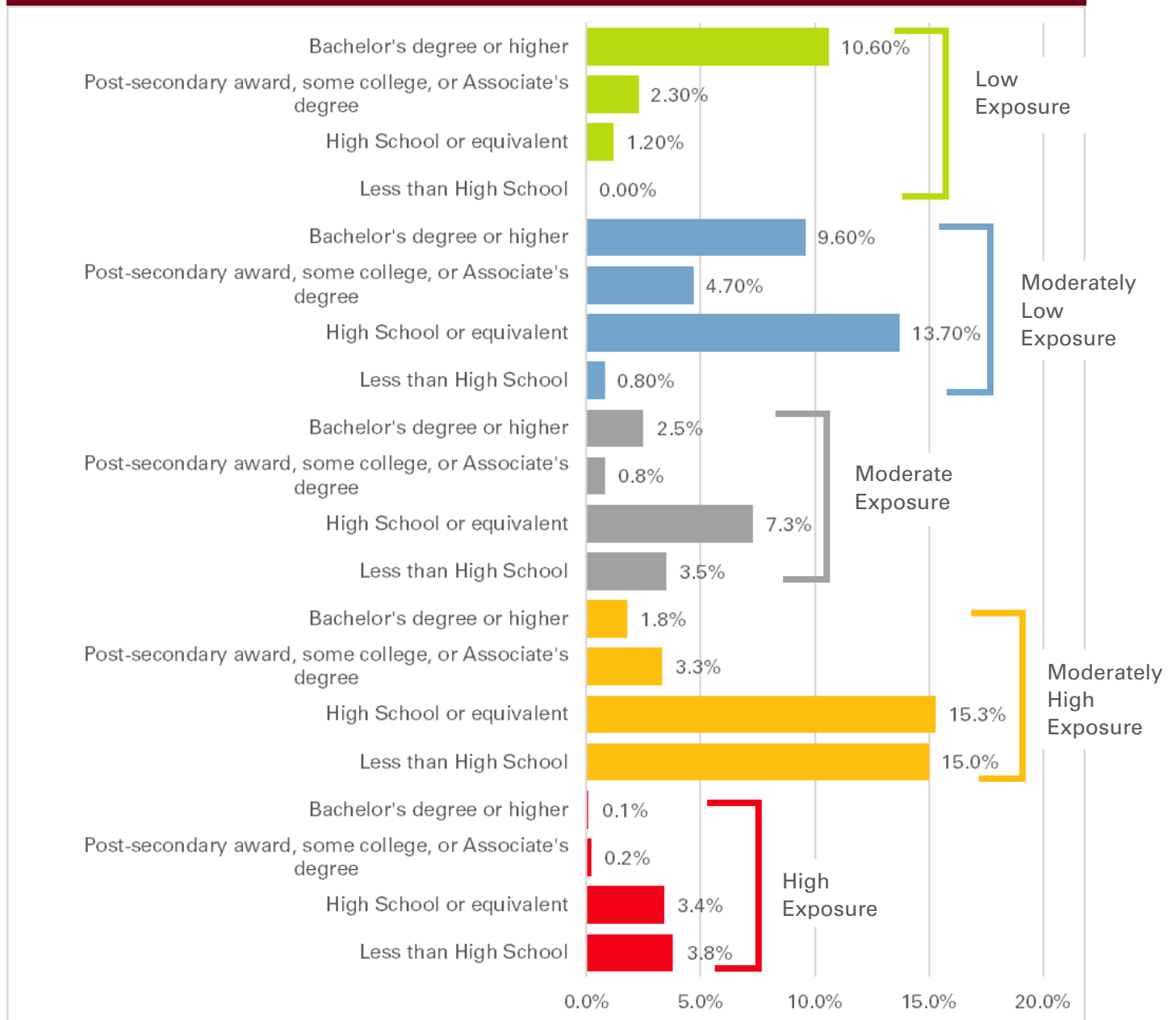
▲ Wage data unavailable due to OES/SOC changes. <https://www.bls.gov/soc/2018/#publications>

Source: Bureau of Labor Market Information and ITIF Risk Categories

## Exposure to Automation by Occupational Education Levels

Figure 2 shows Ohio employment by the educational requirements of occupations and exposure to automation. Exposure to automation disproportionately affects jobs requiring a high school diploma or less. About 25% of jobs require a bachelor's degree or higher,<sup>3</sup> and most of those jobs are concentrated in occupations with low or moderately low exposure. About 64% of jobs require a high school diploma or less,<sup>4</sup> and they are more likely to be in moderately high and high exposure to automation occupations.

**Figure 2. Share of Ohio Employment by Exposure and Educational Requirement in 2018**



Source: Bureau of Labor Market Information and ITIF Risk Categories

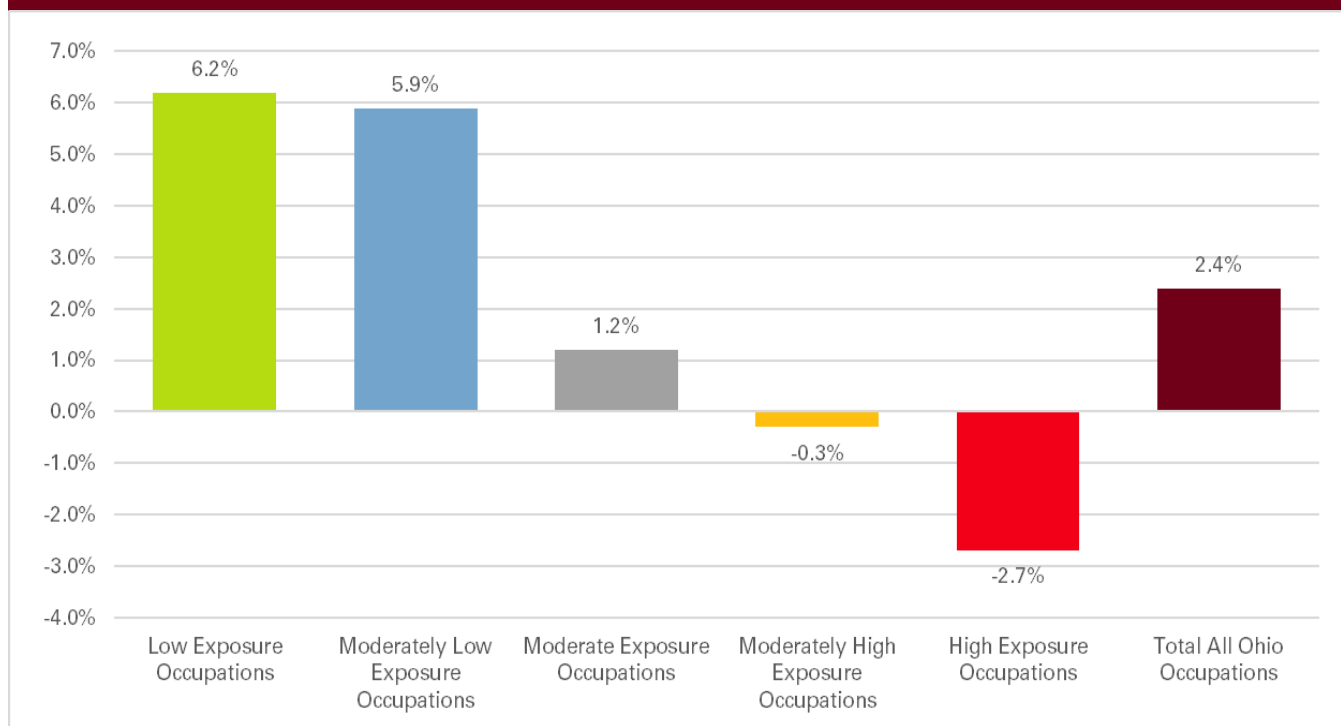
<sup>3</sup> Ohio Job Outlook 2018-2028 ([https://ohiolmi.com/docs/PROJ/Ohio/Ohio\\_Job\\_Outlook\\_2018-2028.pdf](https://ohiolmi.com/docs/PROJ/Ohio/Ohio_Job_Outlook_2018-2028.pdf)).

<sup>4</sup> Ibid.

## Job Growth and Exposure to Automation

Overall, employment in Ohio is expected to grow by 2.4% between 2018 and 2028. However, this varies by the level of exposure to automation. Occupations with high exposure and moderately high exposure are expected to shrink through 2028. Occupations with moderate exposure to automation are expected to grow 1.2%, slower than Ohio's anticipated overall growth. Moderately low occupations are expected to grow 5.9% through 2028, and low exposure occupations are expected to grow 6.2%.

**Figure 3. Projected Employment Growth by Risk Category, 2018-2028**



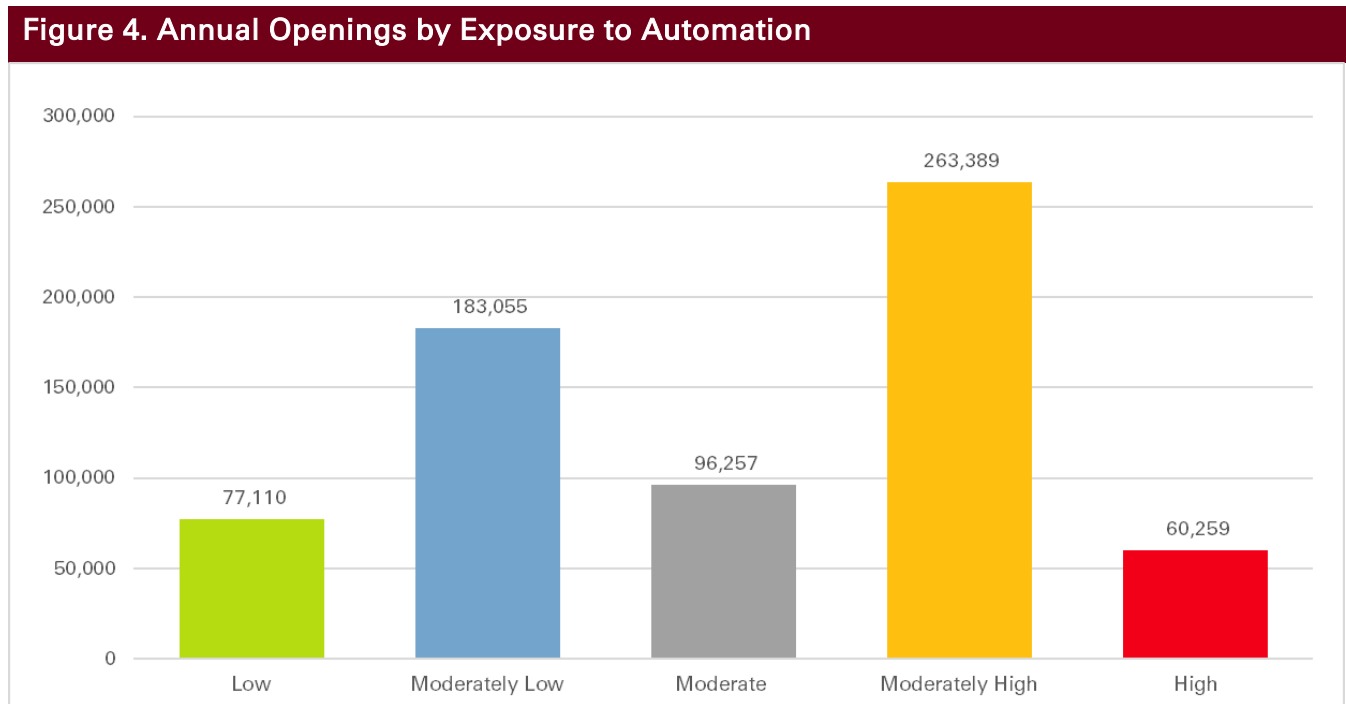
Source: Bureau of Labor Market Information and ITIF Risk Categories

Automation has affected past employment levels and can continue to do so. For example, the BLS notes that online and mobile banking allows bank customers to do routine transactions without visiting physical locations. New technologies such as video tellers allow a single teller to serve multiple locations.<sup>5</sup>

<sup>5</sup> Michael Rieley, "In the money: occupational projections for the financial industry," *Beyond the Numbers: Employment & Unemployment*, vol. 7, no. 16 (U.S. Bureau of Labor Statistics, October 2018), <https://www.bls.gov/opub/btn/volume-7/in-the-money-occupational-projections-for-the-financial-industry.htm>

## Annual Job Openings and Exposure to Automation

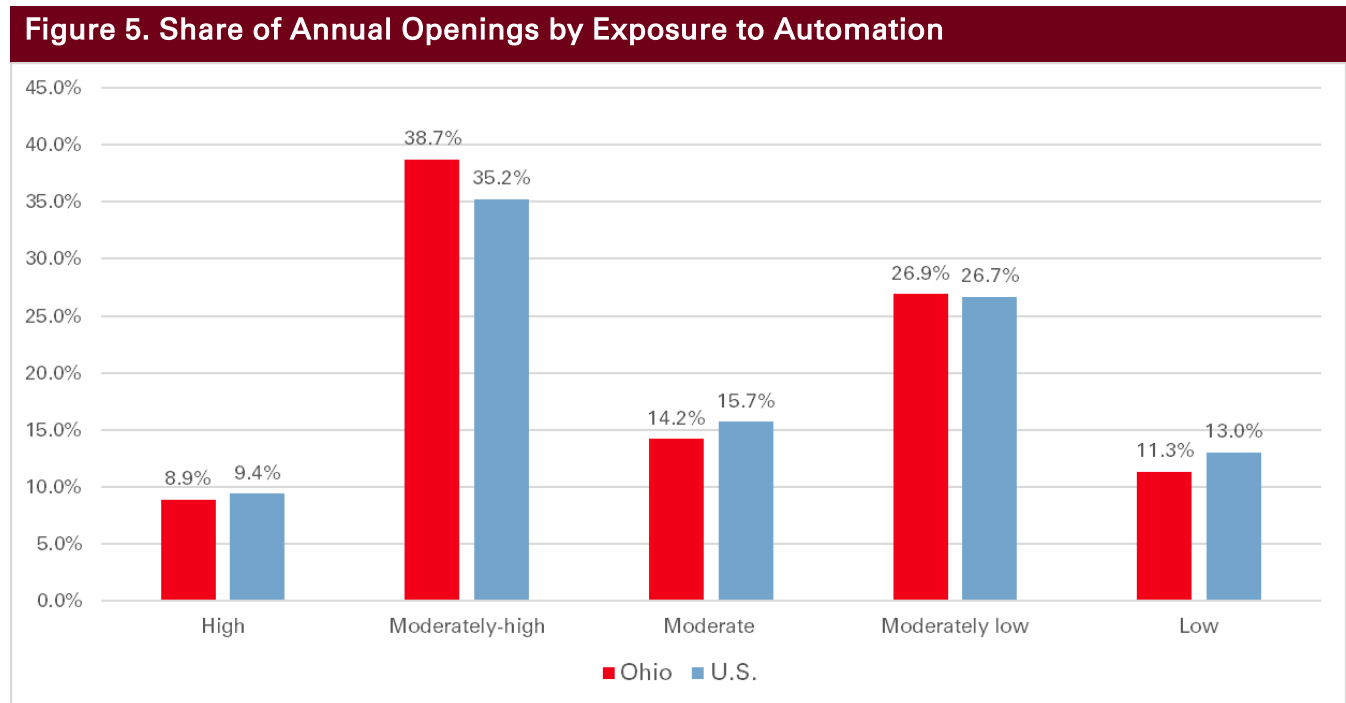
Projected growth does not tell the whole story when it comes to employment and job openings in occupations. Even in occupations that are expected to shrink, job openings occur when those employed in them exit the workforce, retire, or take new jobs in different occupations. Ohio is expected to have over 680,000 annual job openings from 2018 to 2028. The high and moderately high exposure occupations account for more than 47% of the 323,648 expected annual openings in Ohio. See Figure 4.



Source: Bureau of Labor Market Information and ITIF Risk Categories



Figure 5 compares the U.S. and Ohio distribution of expected annual job openings for the levels of exposure to automation. The two distributions are similar. Ohio has a higher percentage of annual job openings in occupations with moderately high exposure and lower percentages of job openings in moderate and low exposure occupations.



Source: Bureau of Labor Market Information and ITIF Risk Categories

## **Conclusion**

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Occupations differ in their exposure to automation. Automation carries with it the threat of job loss and the opportunity for new or modified jobs. Even in occupations with high exposure to automation, not all jobs or tasks associated with that occupation will be automated. Understanding occupational exposure to automation helps anticipate changes in employment and required occupational knowledge, skills, and abilities.

## Technical Notes

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One occupation was not able to be coded, as the original file from ITIF seemed to have an error. The SOC system combined two 2010 assembler occupations (with different ITIF exposure to automation codes) into one “assembler, all other, including team assembler” code. Based on Ohio statewide 2014-2024 and 2016-2026 occupational projections, the new SOC was coded to the assembler exposure to automation score of the most prevalent occupation in Ohio in the new Standard Occupational Classification based on those previous projections. For consistency, national projections were coded using the same ITIF codes used for Ohio.

## **Bureau of Labor Market Information Business Principles for Workforce Development**

- Partner with the workforce and economic development community.
- Develop and deploy new information solution tools and systems for the workforce and economic development community.
- Provide products and services that are customer- and demand-driven.
- Be known as an important and reliable source for information solutions that support workforce development goals and outcomes.

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