WHITE PAPER

Living Wages in Registered Apprenticeship Programs

An Assessment by Industry, Demographics, State, and Labor Policy

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DISCLAIMER

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EXECUTIVE SUMMARY

Registered apprenticeships are training programs in which participants "earn while they learn" and obtain portable, nationally recognized credentials, with tuition costs covered by employers or joint labor-management organizations sponsored by labor unions and employers who are signatories to collective bargaining agreements. Apprentices in registered apprenticeship programs are paid while receiving classroom instruction and valuable on-the-job training tailored to meet industry needs. This report utilizes data on apprentices in registered apprenticeship programs from the U.S. Department of Labor's Registered Apprenticeship Partners Information Management Data System (RAPIDS) enrolled between 2019 and 2022 to assess whether registered apprenticeships deliver "living wages."

"Living wages" are the earnings required to pay for minimum basic needs, including food, housing, transportation, clothing, and other essentials. Across the United States, about 4-in-10 adults do not earn "living wages," do not have 3 months emergency savings, and cannot cover a $400 emergency expense.

This report contrasts apprenticeship wages with three living wage metrics: $15 per hour, the Massachusetts Institute of Technology's (MIT) Living Wage Calculator for one adult, and the National Low Income Housing Coalition's (NLIHC) wage needed to afford a modest two-bedroom apartment. Both entry wages, or those earned by new apprentices on "day one" while participating in their registered apprenticeship programs, and exit wages, or those earned upon completing the programs, are compared against the three living wage metrics.

Due to state-level variation in outcomes, this report also analyzes the effect of labor market institutions and policies on average exit wages and the share of apprentices who earn living wages. Specifically, the impact of joint labor-management (union) apprenticeship programs—which are cooperatively administered by labor unions and signatory employers and have standards, apprentice-to-journeyworker ratios, and institutionalized "cents per hour" contributions from signatory employers—is considered throughout. The influence of prevailing wage laws, which establish minimum wages, benefits, and training contributions on taxpayer-funded and taxpayer-subsidized infrastructure projects, and "right-to-work" laws, which allow workers to receive the benefits of collective bargaining without paying dues or fees, are assessed as well.

During the 2019 through 2022 period, there were 2.8 million participants in registered apprenticeship programs across all industries.

- Apprentices in registered apprenticeship programs were 56 percent White, 10 percent Black, and 21 percent Hispanic.
- Apprentices in registered apprenticeship programs had a 59 percent completion rate.
- Joint labor-management (union) programs trained 59 percent of apprentices and employer-only (nonunion) programs trained 41 percent.
- Joint labor-management programs had a 61 percent completion rate, just over 7 percentage points higher than employer-only (nonunion) programs (53 percent).

The construction industry trained more apprentices than any other industry from 2019 through 2022.

- Apprentices in registered apprenticeship programs in construction had a 53 percent completion rate.
- Joint labor-management programs trained 70 percent of all construction apprentices.
- Joint construction programs had a 56 percent completion rate compared to 46 percent in employer-only construction programs, a difference of 10 percentage points.
- Joint labor-management programs graduated 87 percent of women, 80 percent of military veterans, and 75 percent of Black apprentices in construction.

Apprentices registered in joint labor-management (union) programs earned higher wages.

- Across all industries, apprentices earned on average $18 per hour at the time of entry and $32 per hour upon completing their programs—a growth of 77 percent.
- In construction, workers from joint labor-management programs earned exit wages of $38 per hour, while those from employer-only programs earned $25 per hour.
- Exit wages from joint construction programs were between $36 and $39 per hour for White, Black, Hispanic, male, female, and veteran construction workers.
- The states with the highest apprenticeship exit wages for union journeyworkers were Massachusetts ($45 per hour), Illinois ($44 per hour), and Hawaii ($40 per hour).

Registered apprenticeships are effective at delivering living wages, particularly for construction apprentices completing joint labor-management programs.

- 76 percent of starting wages for new apprentices were at least $15 an hour, 56 percent could cover basic expenses, and 35 percent could pay for modest two-bedroom apartments.
- 95 percent of exit wages for apprentice completers were at least $15 per hour, 92 percent could cover basic expenses, and 74 percent could pay for modest two-bedroom apartments.
- In construction, 98 percent of exit wages could cover basic expenses and 82 percent could pay for modest two-bedroom apartments.
- Across every demographic group, more than 99 percent of construction graduates earned $15 or more per hour and at least 97 percent could cover basic expenses.

Labor market institutions and policies can positively or negatively affect whether apprentices in registered apprenticeship programs earn living wages.

- Joint labor-management programs statistically increased apprenticeship exit wages by $10 per hour, resulting in 10 to 29 percentage point increases in the likelihood of earning a living wage.
- Prevailing wage laws statistically increased construction apprenticeship wages by $3 per hour, resulting in 2 to 6 percentage point increases in the likelihood of earning a living wage.
- "Right-to-work" laws statistically decreased apprenticeship exit wages by $3 per hour, resulting in a 1 percentage point decrease in the likelihood of earning a living wage.

The data show that registered apprenticeship programs can help participating apprentices achieve upward economic mobility, but no data was available on fringe benefits, such as contributions per hour worked towards health insurance plans or retirement funds, which are important factors in delivering high quality jobs, the U.S. Department of Labor Employment and Training Administration could update its data collection processes to request information on entry and exit benefits rates for registered apprentices.

Lawmakers and policymakers could consider several policy options to expand registered apprenticeships and enable more apprentices to earn living wages. Policies that help create registered apprenticeship programs in all industries—from establishing incentives and grant funding to issuing Executive Orders that prioritize registered apprenticeships in federal contracting decisions—could be pursued. However, the most successful registered apprenticeship programs are the joint labor-management programs in the construction industry. These programs include institutionalized funding mechanisms that ensure their efficacy. As a result, joint labor-management (union) programs produce better completion rates, boost earnings, and improve apprentices' chances of earning living wages compared to employer-only (nonunion) programs. To expand registered apprenticeship programs in other industries and ensure that they deliver access to living wages for participants, policies that strengthen unions could be considered. This includes removing barriers to union organizing and repealing "right-to-work" laws across the United States. Finally, prevailing wage laws could be implemented in more states and in new sectors of the economy to bolster the link between registered apprenticeships and living wages.

I. INTRODUCTION

College-level education is often viewed as a key pathway to achieve upward economic mobility, but the cost of higher education has risen substantially over recent decades. After adjusting for inflation, average tuition, fees, and room board costs have grown by 180 percent over the last 40 years (McGurran & Hahn, 2022). Increased higher education costs have been driven by numerous factors, ranging from higher demand from increased applicants to an erosion of federal and state government support for public higher education that has shifted the financial burden from taxpayers onto students (McGurran & Hahn, 2022; Allegretto et al., 2022). As a result, Americans now owe more than $1.7 trillion in student loan debt, with borrowers facing an average balance of nearly $40,000 (Hanson, 2024). While the Bureau of Labor Statistics (BLS) at the U.S. Department of Labor reports that workers with bachelor's degrees are much less likely to be unemployed and continue to earn significantly more than their counterparts with high school diplomas, high costs and high student loan debt have nevertheless caused many residents to seek alternative options that can develop their skills and yield living wages (BLS, 2023a).[1]

One alternative approach is the registered apprenticeship system, which has been publicly monitored by the federal government since the National Apprenticeship Act of 1937 (ApprenticeshipUSA, n.d.; Belman, 2022).[2] Registered apprenticeships are training programs in which participants "earn while they learn" and obtain portable, nationally-recognized credentials with tuition costs covered by employers or joint labor-management organizations (Apprenticeship.gov, 2020). Participants enrolled in registered apprenticeship programs are paid while they undergo structured, certified classroom instruction and on-the-job training tailored to meet industry needs. These formal apprenticeship programs typically take 4 years to complete, though they can range from under 1 year to 6 years depending on the occupation (Farrell & Lawhorn, 2022). In return for this significant investment, employers and joint labor-management organizations gain access to pools of qualified skilled workers.

The number of active participants in registered apprenticeship programs more than doubled in less than a decade (ApprenticeshipUSA, 2024). In fiscal year 2024, there were about 680,000 active apprentices across the United States, a 114 percent increase over the count in fiscal year 2014 (nearly 318,000 active apprentices). The annual number of graduates from registered apprenticeship programs grew by 143 percent over the same 10-year period, from about 46,000 completers to nearly 112,000 completers (ApprenticeshipUSA, 2024).

Registered apprenticeship programs are particularly important in the construction industry, which employs more than half of all apprentices (Belman, 2022). Recent federal laws that have been enacted to rebuild and modernize American infrastructure and spur investments in clean energy have included provisions to leverage and expand registered apprenticeships. Specifically, the Infrastructure Investment and Jobs Act (IIJA), the Inflation Reduction Act (IRA), and Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act include provisions for registered apprenticeship utilization and prevailing wage standards, among other labor standards intended to promote job quality (National Governors Association, 2023; Glass & Walter, 2022).

[1] In 2023, workers with bachelor's degrees had an unemployment rate of 2.2 percent and a median usual weekly earnings of $1,493 while those with high school diplomas or their equivalents had an unemployment rate of 3.9 percent and a median usual weekly earnings of $889 (BLS, 2023a). Consequently, workers with bachelor's degrees were 44 percent less likely to be unemployed and earned 68 percent more per week than their counterparts with high school diplomas.

[2] The National Apprenticeship Act of 1937 is also referred to as the Fitzgerald Act (Employee Benefits Security Administration, 2024).

U.S. Department of Labor-approved registered apprenticeship programs, however, are not limited to the construction industry. Registered apprenticeship training is key to combatting skilled labor shortages in the manufacturing, health care, transportation and warehousing, public administration, educational services, and information and technology industries (Employment and Training Administration [ETA], n.d.). Excluding the construction trades, the occupations that have the most active apprentices include those that serve others—such as nursing assistants, registered nurses, firefighters, correctional officers, childcare workers, housekeeping cleaners, and cooks—and those that produce, install, and fix goods—such as machinists, welders, mechanics, and maintenance workers (Farrell & Lawhorn, 2022).

This report, conducted by researchers at the Project for Middle Class Renewal (PMCR) at the University of Illinois at Urbana-Champaign and the Illinois Economic Policy Institute (ILEPI), assesses the effectiveness of registered apprenticeships at delivering living wages for participants and completers. The white paper first presents background research on registered apprenticeship training and living wages. A subsequent section provides an explanation of the methodology used throughout the report before an evaluation of the data is presented. This includes topline statistics of participating apprentices—including total apprentices and completions and cancellations by industry, demographics, union affiliation, and state—as well as comprehensive data on the earnings of apprentices in registered apprenticeship programs and whether they meet specific thresholds for providing living wage rates. Due to patterns in state-by-state variation that emerge from the data, specific labor market policies that can influence both union affiliation and worker wages are also evaluated to determine whether they affect the likelihood of apprentices earning living wages. Finally, limitations of the analysis are acknowledged before a concluding section recaps key findings and presents implications and potential options for policymakers to consider.

II. BACKGROUND

Research finds that registered apprenticeship programs have positive economic impacts. Countries that have more widespread usage of apprenticeship programs are more successful at transitioning workers into stable jobs, resulting in lower unemployment rates (Bertschy et al., 2009; Ryan, 2001; Ryan, 1998). In Germany, where these programs are especially prevalent, apprenticeships have been found to increase participant workers' wages by 8 percent per year (Clark & Fahr, 2002). In the United States, research shows that participants who complete registered apprenticeship programs earned over $240,000 more in wages during their careers than similar non-participants in constant 2000 dollars, which is equivalent to about $450,000 today (Reed et al., 2012; BLS, 2024a). Registered apprenticeship programs have also been found to improve safety outcomes, with one study showing that journey-level plumbers who graduate from apprenticeship programs have 31 percent lower workers' compensation claim rates than those with no training (Wuellner & Bonauto, 2022).

Studies of medical assistant apprenticeship programs have shown that they pay dividends for hospitals. One evaluation of medical assistant apprenticeship programs in Washington State revealed that employers experienced a 40 percent return on investment and net benefits of nearly $73,000 per medical assistant after 3 years, compared to only a 14 percent return on investment on the employment of new college graduates and net benefits of about $31,000 (Koivumäki & Marlet, 2021). Medical assistant apprentices were also more racially and ethnically diverse than new college graduates. Another case study of Dartmouth-Hitchcock Medical Center in New Hampshire found that its medical assistant apprenticeship program reduced overtime costs and alleviated staff burnout and turnover (Helper et al., 2016; Koivumäki & Marlet, 2021).

However, most economic research on registered apprenticeship programs in the United States is focused on those in the construction industry. Through registered apprenticeship programs, the construction

industry operates "the largest privately-financed system of higher education in the country" (Philips, 2014).

There are generally two types of construction apprenticeship programs: those sponsored jointly by labor unions and employers who are signatories to collective bargaining agreements and those sponsored solely by employers. Joint labor-management (union) apprenticeship programs are cooperatively administered and have standards, apprentice-to-journeyworker ratios, and institutionalized contributions. These programs are funded through "cents per hour" contributions from contractors, which are privately negotiated between labor unions and signatory contractors and agreed upon in collective bargaining agreements. By contrast, employer-only (nonunion) programs are run by a single employer or a trade association that unilaterally determines program content and tracks progress. These programs rely on voluntary contributions from contractors, who may have incentives to forgo long-term workforce development investments in order to win project bids in the short-term.

Because of these different funding models, nearly all of the investment in registered apprenticeship training comes from joint labor-management programs. Joint labor-management programs accounted for 75 percent of all construction apprentices across the United States between 1999 and 2019, including 85 percent of women apprentices, 79 percent of Black apprentices, and 79 percent of Hispanic apprentices (Bilginsoy et al., 2022). Joint labor-management programs have been found to train 97 percent of all construction apprentices in Illinois, 92 percent in California, 85 percent in Pennsylvania, 75 percent in Michigan, 63 percent in Oregon, and 55 percent in Iowa (Manzo & Bruno, 2020; Calamuci, 2020; Herzenberg et al., 2018; Manzo et al., 2023; Stepick & Manzo, 2021; Manzo & Gigstad, 2021).

The large impact of construction trade unions warrants a brief discussion of the economic research on unions. Labor unions have long been associated with higher levels of job quality, including better wages and family-supporting benefits (U.S. Department of the Treasury, 2023; BLS, 2023b; Parolin & VanHeuvelen, 2023; Farber et al., 2021). Across the United States in 2023, median weekly wages were $1,424 for union construction workers and $1,007 for nonunion construction workers, a 41 percent difference (BLS, 2024b). Because they earn higher incomes, union construction workers contribute more in taxes and are 6 percentage points less likely to rely on government assistance programs, both of which improve public budgets for taxpayers (Manzo & Thorson, 2021; Sojourner & Pacas, 2018).

Because union contractors participate in an institutionalized approach to workforce development that disproportionately produces construction apprentices, skilled labor shortages are much less severe in the union segment of the industry. An analysis of Associated General Contractors of America (AGC) surveys, including responses from nearly 5,700 construction firms, found that union contractors were 21 percentage points less likely to experience delays in project completion times due to shortages of workers and 13 percentage points less likely to lose their workers to other industries relative to the nonunion alternative (Manzo et al., 2022). A similar survey of more than 34,000 energy sector employers by the U.S. Department of Energy found that union employers had less trouble filling open positions. The union difference "was especially pronounced in the construction industry," where union contractors were 28 percentage points less likely to report that it is "very difficult" to find workers (Office of Energy Jobs, 2023).

Finally, research related to living wages must be considered. A "living wage" is the level of earnings that workers must earn to cover costs associated with minimum basic needs, including food, housing, transportation, health care, clothing, Internet access, and other essentials as well as state, federal, and local taxes (Glasmeier, 2024). Research suggests that 36 to 44 percent of American workers are paid less than the living wage necessary to cover their basic costs (Howard, 2022; Radeva et al., 2024; Bloomberg Intelligence, 2024). In 2023, 46 percent of adults did not have 3 months emergency savings, 37 percent of adults could not cover a $400 emergency expense with cash savings, and 65 percent of workers reported that they frequently lived paycheck-to-paycheck (Lloro et al., 2024; Hamilton, 2023).

Many states and cities have enacted living wage policies to ensure that workers can support themselves and earn incomes sufficient for workers to stay off government assistance programs, such as Supplemental Nutrition Assistance Program (SNAP) food stamps. Research on these living wage policies has found that they increase earnings for low-wage workers and reduce poverty by modest amounts, with the largest positive effects on Black workers (Thompson & Chapman, 2006; Adams & Neumark, 2005; Neumark & Adams, 2003; Neumark, 2002; Neumark & Adams, 2000; Niedt et al., 1999). Additionally, living wage laws improve worker retention rates by as much as 35 percent and reduce worker turnover by as much as 60 percent (Fairris et al., 2015; Reich et al., 2013; Fairris, 2004).

This report builds on the existing research on registered apprenticeship programs by assessing whether they are effective at delivering living wages, which can serve as one measure of job quality. The living wage necessary to cover minimum basic expenses can vary significantly across the country, which means that entry wages and exit wages for apprentices in registered apprenticeship programs must be higher in some jurisdictions than others to reach "living wage" thresholds. This report goes beyond national averages to understand which apprentices are most likely to earn living wages, where registered apprenticeship programs are most effective at meeting these thresholds, and how labor market institutions like unions—through joint labor-management programs—and labor policies like prevailing wage laws and "right-to-work" laws influence economic outcomes.

III. METHODS

This report utilizes 2019 through 2022 data from the U.S. Department of Labor Employment and Training Administration's (DOLETA) Registered Apprenticeship Partners Information Management Data System (RAPIDS) (ApprenticeshipUSA, 2024). RAPIDS is a database of information on apprenticeship programs from participating states, which includes both individual-level and program-level data.[3] While apprenticeship programs are registered with the U.S. Department of Labor, which establishes and maintains quality standards, the Office of Apprenticeship only had access to individual-level data for 41 states prior to 2021, with some states and territories choosing to manage their own performance systems. In fiscal year 2021, RAPIDS expanded to 46 states plus territories like Puerto Rico and Guam (ETA, n.d.). Since then, the Office of Apprenticeship worked with the remaining 4 states—Minnesota, Oregon, Vermont, and Washington—and the District of Columbia to ensure that RAPIDS includes individual-level data for all 50 states, the nation's capital, the United Services Military Apprenticeship Program (USMAP), and each U.S. territory. Because the data modernization occurred during the period of analysis, this report lacks data for some states.

After omitting participants in the United Services Military Apprenticeship Program and those in registered apprenticeship programs located in Puerto Rico, Guam, and other territories, the full dataset comprises 2.8 million observations of apprentices in registered apprenticeship programs across the United States from 2019 through 2022.[4] The dataset includes information about each individual's enrollment status—such as whether they are active participants, completed their program, or dropped out of their program—and program type, such as whether it is a joint labor-management program affiliated with a union. It also

[3] Registered apprenticeship programs report information on the program and on its apprentices to the Office of Apprenticeship. The Office of Apprenticeship compiles all the information collected from federally-registered programs and state-level registered programs and releases the data through the Registered Apprenticeship Partners Information Management Data System (RAPIDS).

[4] The United States Military Apprenticeship Program was omitted because it did not include entry wage and exit wage data, given active military have defined pay ranges based on rank (e.g., private, specialist, corporal, sergeant, major, captain, general, etc.) and classification (e.g., enlisted soldier, noncomissioned officer, warrant officer, commissioned officer, general officer, etc.). U.S. territories like Puerto Rico and Guam are not included due to incomplete data, including missing wage rates and a higher presence of wage rates below the federal minimum wage of $7.25 per hour.

contains important demographic and earnings data. The earnings data reports the entry wage, or starting wage, of apprentices when they began their program as well as the exit wage, or journeyworker wage, when they left the program. Entry wages are reported for 2.2 million apprentices (81 percent of the sample) and exit wages are available for 1.7 million apprentices (61 percent of the sample). Earnings data is missing for individual apprentices because the wages were not known or because apprentices were still active and did not yet have exit wages.

In addition, apprenticeship wages are contrasted with "living wages" as defined by three sources.

- The first comparison is to **$15 per hour**, given that Oxfam America found that 32 percent of the U.S. workforce earned less than this amount in 2021 (Henderson, 2022).
- The second relies on the **Massachusetts Institute of Technology's (MIT) Living Wage Calculator** (Glasmeier, 2024). The MIT Living Wage Calculator was developed in 2003 to estimate the employment income that a full-time worker must earn per hour to cover the cost of basic needs, including food, childcare, health care, housing, transportation, and other items. Estimates are available for all 50 states and the District of Columbia, as well as for counties and metropolitan areas. In this report, the estimated wage for one adult with no children is utilized to determine whether apprenticeship programs provide living wages for individual workers *only*. Estimates are from 2023 but were primarily based on data from 2020 through 2022 (Glasmeier, 2024).
- The third uses the wage needed to afford a modest two-bedroom apartment as determined by **National Low Income Housing Coalition (NLIHC) in its *Out of Reach* report** from 2022 (Aurand et al., 2022).[5] The wage needed to afford a modest two-bedroom apartment is calculated by using estimates of fair market rents (FMRs) across the country by the U.S. Department of Housing and Urban Development, supplemented with data from the Census' *American Community Survey*. FMRs are represented by the 40th percentile of gross rents for standard rental units in an area. Once FMRs are determined, the income needed to afford the apartment is calculated by dividing the FMR by 30 percent, consistent with the federal standard that no more than 30 percent of a household's income should be spent on housing costs. Finally, the income is divided by 2,080 hours, or 40 hours per week for 52 weeks over the year, for a full-time worker (Aurand et al., 2022). The *Out of Reach* report includes wage estimates for all 50 states and the District of Columbia, as well as for counties and metropolitan areas. A two-bedroom apartment is used to assess whether apprenticeship programs providing living wages for a worker in a family of three.

Living wages vary across states (Figure 1). Figure 1 reveals statewide living wage metrics for all 50 states and the District of Columbia. In 2023, the wage needed to cover basic needs for a single adult with no children ranged from just over $15 per hour (South Dakota) to more than $22 per hour (the District of Columbia), according to the Massachusetts Institute of Technology (MIT) Living Wage Calculator. Nationally, the average living wage was $18 per hour. However, the wage needed to afford a modest two-bedroom apartment was about $26 per hour across the United States in 2022, with a low of just under $15 per hour (Arkansas) to a high of nearly $41 per hour (Hawaii).

To parse out the independent effects of union affiliation and relevant state policies on apprentice wages and the likelihood of earning a living wage, this report utilizes advanced but common statistical techniques called "regressions." Regressions describe how much a variable is responsible for a particular outcome after accounting for other important factors. Robust ordinary least squares (OLS) regressions are used to

[5] Note that the National Low Income Housing Coalition has released two additional versions of its *Out of Reach* series in 2023 and 2024 (Aurand et al., 2023; Harati et al., 2024). The 2022 edition was utilized because the apprenticeship data is from 2019 through 2022.

Figure 1: Statewide Estimates of Living Wages Needed to Cover Basic Needs by State, 2022–2023

Statewide Living Wage Metrics	2023 MIT Living Wage	2022 Wage for Modest Two-Bed Apartment
United States	$18.05	$25.72
Alabama	$15.65	$16.32
Alaska	$17.15	$24.32
Arizona	$17.78	$23.44
Arkansas	$15.25	$14.89
California	$21.24	$39.01
Colorado	$19.22	$28.94
Connecticut	$17.76	$27.80
Delaware	$17.36	$22.76
District of Columbia	$22.15	$33.94
Florida	$17.72	$26.38
Georgia	$17.72	$20.97
Hawaii	$22.05	$40.63
Idaho	$16.07	$18.87
Illinois	$18.10	$22.80
Indiana	$15.78	$16.97
Iowa	$15.73	$16.55
Kansas	$15.69	$16.91
Kentucky	$15.45	$16.18
Louisiana	$15.86	$17.69
Maine	$16.53	$22.69
Maryland	$19.61	$28.93
Massachusetts	$21.35	$37.97
Michigan	$16.27	$19.10
Minnesota	$16.98	$22.41
Mississippi	$15.42	$15.67
Missouri	$15.77	$16.94
Montana	$15.72	$17.65
Nebraska	$15.73	$16.98
Nevada	$17.02	$23.70
New Hampshire	$17.23	$26.29
New Jersey	$18.71	$31.32
New Mexico	$16.07	$17.56
New York	$21.46	$37.72
North Carolina	$16.83	$19.18
North Dakota	$15.35	$16.61
Ohio	$15.33	$17.05
Oklahoma	$15.49	$16.61
Oregon	$19.38	$27.65
Pennsylvania	$16.41	$20.90
Rhode Island	$17.52	$24.32
South Carolina	$16.73	$19.30
South Dakota	$15.15	$16.11
Tennessee	$15.99	$18.30
Texas	$16.79	$22.54
Utah	$17.42	$22.18
Vermont	$16.82	$23.40
Virginia	$19.04	$24.85
Washington	$19.58	$31.33
West Virginia	$15.57	$15.38
Wisconsin	$16.06	$18.56
Wyoming	$15.64	$17.07

Note. State-level estimates are adapted from "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition.

evaluate how much specific factors—such as participation in a joint labor-management program—are associated with an increase or decrease in an apprentice's exit wage after accounting for the apprentice's age, racial or ethnic background, gender identification, industry of employment, and other variables. Similarly, binary response models called robust probit regressions are used to understand the associations between specific factors on the probability of an apprentice's exit wage exceeding the local living wage, as determined by either the MIT Living Wage Calculator or the NLIHC's wage needed to afford a modest two-bedroom apartment.[6] Regression results that are statistically significant at the 95-percent level of confidence or greater are considered to be highly related to the observed outcome, consistent with accepted practice in academic research.

IV. FINDINGS

The Registered Apprenticeship Partners Information Management Data System (RAPIDS) includes 2.8 million apprentices who participated in U.S. Department of Labor-approved registered apprenticeship programs from 2019 through 2022 across all 50 states and the District of Columbia (Figure 2). 1.1 million participants completed their registered apprenticeship programs and about 756,000 participants dropped out or were expelled. Another 951,000 apprentices were active and receiving training either on-the-job or in the classroom, or both. By removing those who are actively registered in the program and focusing exclusively on those who exited due to either graduation or attrition, an approximate completion rate can be estimated. Overall, apprentices in registered apprenticeship programs across America have a completion rate of about 59 percent (Figure 2).

Figure 2: Apprentice Enrollment, Completions, Cancellations, and Active Registrations, 2019–2022

All Registered Apprenticeship Programs in the United States	Total Apprentices	Completer Apprentices	Cancelled Apprentices	Registered Apprentices	Completion Rate
Total (All Apprentices)	2,785,902	1,069,383	756,426	951,073	58.6%
Construction	1,141,504	395,408	349,394	391,598	53.1%
Educational Services	426,228	161,560	117,007	145,463	58.0%
Public Administration	210,543	117,012	50,401	42,896	69.9%
Manufacturing	154,397	72,809	30,942	50,134	70.2%
Utilities	86,045	39,993	17,857	27,919	69.1%
Health Care & Social Assistance	85,648	35,069	29,642	20,878	54.2%
Other Services	82,302	30,205	19,849	31,938	60.3%
Transportation & Warehousing	24,047	11,768	8,131	4,128	59.1%
Retail Trade	18,275	6,703	10,101	1,455	39.9%
Administrative & Waste Services*	16,324	5,743	6,627	3,907	46.4%
Professional Services**	14,750	7,250	3,869	3,601	65.2%
All Other Industries	28,505	10,111	9,024	9,271	52.8%
Not Provided	497,334	175,752	103,582	217,885	62.9%
*Construction Share of All Provided****	*49.9%*	*44.2%*	*53.5%*	*53.4%*	--

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded). *"Administrative & waste services" is an abbreviated version of the administrative and support and waste management services industry. **"Professional Services" is an abbreviated version of the professional, scientific, and technical services industry. ***Apprentices in programs without an identified industry (i.e., the "not provided" category) are excluded from this calculation.

Construction trains more apprentices than any other industry (Figure 2). More than 1.1 million apprentices in the United States were enrolled in construction apprenticeship programs from 2019

[6] The robust probit regression uses average marginal effects, which are partial derivatives with respect to each variable in the model that are necessary to interpret the mean effect of regression coefficients in the sample. In basic terms, economists prefer probit regressions with average marginal effects to present results as *differences in probabilities*, or how a factor changes the chances that an outcome occurs (Coca Perraillon, 2019).

through 2022. The trades with the most apprentices in the construction industry were electricians, plumbers and pipefitters, carpenters, laborers, and sheet metal workers. After construction, the industries with the highest enrollments were educational services (426,000 apprentices), public administration (211,000 apprentices), manufacturing (154,000 apprentices), utilities (86,000 apprentices), and health care and social assistance (86,000 apprentices). The industry of the registered apprenticeship program was not provided for more than 497,000 participants in the RAPIDS dataset.[7] After excluding these apprentices, the construction industry accounted for 50 percent of all enrollees, 44 percent of completers, 54 percent of those who cancelled their programs, and 53 percent of actively registered apprentices (Figure 2).

Construction apprenticeship programs had a slightly lower completion rate than those in other industries (Figure 2). Of apprentices who exited their programs in the construction industry, 53 percent were completers and 47 percent were due to cancellations. Manufacturing had the highest completion rate (70 percent), followed closely by public administration (70 percent), utilities (69 percent), and professional, scientific, and technical services (65 percent).

Enrollment by Demographic Group

Figure 3 presents demographic breakdowns of apprentices in U.S. registered apprenticeship programs from 2019 through 2022. Nearly 1.6 million participants were White (56 percent), 270,000 were Black (10 percent), 576,000 were Hispanic (21 percent), 78,000 were Asian (3 percent), and 27,000 were Native American (1 percent). Men accounted for 9-in-10 apprentices (88 percent). Participants under 24 years old were 38 percent of total enrollees and those between the working-ages of 25 and 54 years old were another 61 percent. Additionally, more than 231,000 apprentices were military veterans (8 percent). Among those who graduated from their programs, 58 percent were White, 8 percent were Black, 19 percent were Hispanic, 88 percent were men, and 11 percent were veterans. Military veterans had the highest completion rate of any demographic group nationally (68 percent), followed by Asian participants (62 percent), White participants (61 percent), and working-age participants (60 percent). Black apprentices had the lowest completion rate (46 percent) (Figure 3).

Enrollment by Program Type

Joint labor-management programs affiliated with labor unions trained the majority of apprentices (Figure 4). More than 1.6 million apprentices were enrolled in joint labor-management apprenticeship programs over the 4-year period, representing 59 percent of all participants. Across all industries, joint labor-management programs trained 58 percent of White apprentices, 53 percent of Black apprentices, 69 percent of Hispanic apprentices, 67 percent of Asian apprentices, and 61 percent of Native American apprentices. Joint labor-management programs also accounted for 62 percent of men and 51 percent of veterans participating in registered apprenticeships. However, only 33 percent of women were in joint labor-management apprenticeship programs.

[7] This report accepts industries as reported by RAPIDS in the dataset. Note that the raw data could have been inputted incorrectly and that "cleaning" the data may have resulted in more programs being listed in the construction industry (Bilginsoy & Ormiston, 2024). For example, some apprenticeship programs that train a construction trade like carpenters may have been identified under the educational services industry. This would be understandable since the programs are indeed providing "educational services," but a more accurate accounting might include them with the rest of the construction industry. Note also that some programs outside of those in the construction industry do train construction trades workers. For example, manufacturing industry programs may train construction laborers and electricians in addition to welders and machinists.

Figure 3: Apprentice Enrollment, Completions, and Completion Rates by Demographic Group, 2019–2022

All U.S. Registered Apprenticeship Programs	Total Apprentices	Completer Apprentices	Cancelled Apprentices	Registered Apprentices	Completion Rate
Total (All Apprentices)	2,785,902	1,069,383	756,426	951,073	58.6%
White	1,572,753	623,330	396,671	548,324	61.1%
Black or African American	269,632	86,192	99,965	82,410	46.3%
Hispanic or Latinx	575,585	200,655	162,105	210,260	55.3%
Asian or Pacific Islander	78,413	30,786	18,933	28,565	61.9%
Native American	26,788	8,940	9,145	8,477	49.4%
Men	2,456,951	940,281	654,401	853,901	59.0%
Women	315,110	126,290	97,855	90,466	56.3%
Age 18-24	1,045,234	366,854	287,773	386,949	56.0%
Age 25-54	1,685,802	679,997	451,024	549,511	60.1%
Age 55+	53,077	21,775	17,279	13,931	55.8%
Military Veteran	231,137	114,345	54,389	61,750	67.8%
Not a Veteran	2,554,765	955,038	702,037	889,323	57.6%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded).

Figure 4: Apprentice Enrollment by Demographic Group and Program Type, 2019–2022

All U.S. Registered Apprenticeship Programs	Total Apprentices	Joint (Union)	Joint Share
Total (All Apprentices)	2,785,902	1,632,047	58.6%
White	1,572,753	913,760	58.1%
Black or African American	269,632	141,819	52.6%
Hispanic or Latinx	575,585	400,017	69.5%
Asian or Pacific Islander	78,413	52,550	67.0%
Native American	26,788	16,464	61.5%
Men	2,456,951	1,522,135	62.0%
Women	315,110	104,982	33.3%
Military Veteran	231,137	117,846	51.0%
Not a Veteran	2,554,765	1,514,201	59.3%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.

Enrollment and Completion Rates by Industry and Demographic Group

Unions have a significant presence in construction apprenticeship programs (Figure 5). Joint labor-management programs trained 7-in-10 registered construction apprentices across the United States (70 percent). Joint labor-management programs registered 70 percent of White apprentices, 76 percent of Black apprentices, 70 percent of Hispanic apprentices, 82 percent of Asian apprentices, and 72 percent of Native American apprentices in construction. Joint construction programs accounted for 70 percent of men and 83 percent of women. They also trained 75 percent of military veterans (Figure 5).

By contrast, joint labor-management programs only enrolled half of the apprentices registered in all other industries (50 percent). Among non-construction apprentices, joint labor-management programs enrolled most Hispanic, Asian, Native American, male, and nonveteran enrollees. Just 25 percent of female apprentices in industries outside of construction were in joint labor-management programs (Figure 5).

Completion rates are a useful measure of registered apprenticeship program performance. High completion rates mean that registered apprenticeship programs have successfully expended resources to train workers who have gained portable, nationally recognized credentials. Low completion rates, on the other hand, represent an inefficient use of resources, with programs not recruiting, screening, and admitting committed trainees and not adequately producing qualified workers for employers.

Figure 5: Industry-Level Apprentice Enrollment by Demographic Group and Program Type, 2019–2022

All U.S. Registered Apprentices: Total Apprentices	Construction Industry			All Other Industries		
	Joint (Union)	Employer-only (Nonunion)	Joint Share	Joint (Union)	Employer-only (Nonunion)	Joint Share
Total (All Apprentices)	804,056	322,687	70.4%	827,991	831,168	50.4%
White	498,883	204,815	70.1%	414,877	271,293	48.2%
Black or African American	74,481	22,187	75.6%	67,338	73,623	39.3%
Hispanic or Latinx	154,319	63,754	69.7%	245,698	56,732	69.4%
Asian or Pacific Islander	25,923	5,656	81.6%	26,627	12,069	57.1%
Native American	8,147	2,792	71.7%	8,317	4,307	53.9%
Men	763,302	313,604	70.0%	758,833	355,499	55.5%
Women	38,218	6,804	83.2%	66,764	151,446	24.8%
Military Veteran	57,210	18,083	75.1%	60,636	55,653	39.1%
Not a Veteran	746,846	304,604	70.1%	767,355	456,027	51.5%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.

Joint labor-management apprenticeship programs have higher completion rates than the employer-only alternative (Figure 6). Between 2019 and 2022, joint labor-management programs across all sectors had a 61 percent completion rate, which was 7 percentage points higher than employer-only programs (53 percent). This union difference was larger in the construction industry. While joint construction programs graduated 56 percent of their apprentices, employer-only construction programs saw just 46 percent of their enrollees graduate—a 10 percentage-point difference. For all other industries, joint labor-management programs enjoyed an 8 percentage-point advantage in their completion rate over employer-only programs (Figure 6).

Figure 6: Apprentice Enrollment and Completion Rates by Industry and Program Type, 2019–2022

U.S. Apprentices	Total Apprentices	Completer Apprentices	Cancelled Apprentices	Registered Apprentices	Completion Rate	Completion Rate Difference (Joint vs. Employer-only)
All Apprentices						
Total	2,785,902	1,069,383	756,426	951,073	58.6%	--
Joint (Union)	1,632,047	621,145	403,302	601,420	60.6%	--
Employer-only	834,367	325,935	286,943	218,671	53.2%	+7.5%
Construction						
Total	1,141,504	395,408	349,394	391,598	53.1%	--
Joint (Union)	804,056	292,645	228,417	279,565	56.2%	--
Employer-only	322,687	98,014	116,007	106,995	45.8%	+10.4%
Non-construction						
Total	1,644,398	673,975	407,032	559,475	62.3%	--
Joint (Union)	827,991	328,500	174,885	321,855	65.3%	--
Employer-only	511,680	227,921	170,936	111,676	57.1%	+8.1%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded).

Importantly, joint construction programs have higher completion rates than employer-only construction programs regardless of racial or ethnic background, gender identification, and veteran status (Figure 7). From 2019 through 2022, joint labor-management programs in construction enjoyed completion rates that were 13 percentage points higher for White apprentices, 1 percentage point higher for Black apprentices, 9 percentage points higher for Hispanic apprentices, 12 percentage points higher for Asian apprentices, and 10 percentage points higher for Native American apprentices. Completion rates were also 11 percentage points higher for both men and women enrolled in joint construction programs. Military veterans in construction were 13 percentage points more likely to graduate from joint labor-

management programs than employer-only programs as well. As a result, joint labor-management programs graduated three-fourths (74 percent) of all construction apprentices nationally—including 75 percent of Black apprentices, 87 percent of women, and 80 percent of military veterans (Figure 7).

Figure 7: Construction Apprentice Enrollment and Completion Rates by Demographic Group, 2019–2022

Construction Apprentices	Joint (Union)	Joint Completion Rate	Employer-only (Nonunion)	Employer-only Completion Rate	Completion Rate Difference (Joint vs. Employer-only)	Joint Share of Completers
Total (All Apprentices)	292,645	56.2%	98,014	45.8%	+10.4%	74.0%
White	194,893	60.7%	65,126	48.2%	+12.5%	74.2%
Black or African American	20,514	40.2%	6,176	38.8%	+1.4%	75.4%
Hispanic or Latinx	52,229	51.7%	18,275	42.9%	+8.8%	73.1%
Asian or Pacific Islander	8,146	53.1%	1,108	40.8%	+12.3%	87.4%
Native American	2,453	46.0%	643	35.5%	+10.5%	75.9%
Men	281,514	56.8%	96,325	46.2%	+10.6%	73.6%
Women	10,938	44.3%	1,467	33.1%	+11.2%	86.8%
Military Veteran	21,220	55.3%	5,238	42.1%	+13.2%	79.6%
Not a Veteran	271,425	56.2%	92,776	46.0%	+10.2%	73.6%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded).

The data is similar for non-construction apprenticeship programs (Figure 8). Across racial or ethnic groups, joint labor-management programs generally had completion rates that were between 4 percentage points (Hispanic apprentices) and 38 percentage points (White apprentices) higher than employer-only programs. Their graduation rate for men was 7 percentage points higher and their graduation rate for women was 8 percentage points higher. However, two demographic groups—Black apprentices and veteran apprentices—had lower completion rates in joint labor-management programs than in employer-only programs for non-construction industries.

Figure 8: Non-construction Apprentice Enrollment and Completion Rates by Demographics, 2019–2022

Non-construction Apprentices	Joint (Union)	Joint Completion Rate	Employer-only (Nonunion)	Employer-only Completion Rate	Completion Rate Difference (Joint vs. Employer-only	Joint Share of Completers
Total (All Apprentices)	328,500	65.3%	227,921	57.1%	+8.1%	48.7%
White	175,861	85.4%	119,920	47.5%	+37.9%	48.8%
Black or African American	19,954	28.3%	27,693	46.5%	-18.3%	33.8%
Hispanic or Latinx	89,966	60.2%	22,504	56.6%	+3.6%	69.6%
Asian or Pacific Islander	12,171	71.1%	6,020	61.7%	+9.3%	56.7%
Native American	3,016	56.0%	1,619	48.1%	+7.9%	52.9%
Men	301,854	65.5%	157,727	58.0%	+7.4%	54.1%
Women	26,109	63.1%	68,569	55.4%	+7.7%	23.0%
Military Veteran	25,108	66.6%	36,359	74.2%	-7.6%	28.6%
Not a Veteran	303,392	65.1%	191,562	54.8%	+10.4%	51.7%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded).

Completion rate data reveals a contrast between joint labor-management programs and employer-only programs. The data shows that, almost universally regardless of industry or demographic characteristic, joint labor-management programs are more successful at producing qualified, credentialed workers than employer-only programs.

Figure 9: Selected Statistics for All Registered Apprenticeships by U.S. State, 2019–2022

All Apprentices	Total Apprentices	Completer Apprentices	Completion Rate (All)	Total Joint Apprentices	Joint Completers	Completion Rate (Joint)	Joint Share of Total
United States	2,785,902	1,069,383	58.6%	1,632,047	621,145	58.6%	58.6%
California	470,809	185,335	61.8%	389,110	154,200	61.9%	82.6%
Missouri	108,777	46,452	56.4%	58,173	19,766	52.7%	53.5%
South Carolina	65,799	46,340	79.0%	1,612	790	59.5%	2.4%
Illinois	104,250	46,279	70.1%	95,704	43,240	71.2%	91.8%
Texas	132,283	42,402	48.4%	56,163	17,547	47.8%	42.5%
North Carolina	78,060	42,140	76.7%	6,923	2,364	71.7%	8.9%
Ohio	123,214	41,805	50.0%	71,429	27,882	59.8%	58.0%
Pennsylvania	98,568	40,603	66.8%	78,487	32,808	68.4%	79.6%
Michigan	106,955	38,642	54.3%	69,434	23,609	54.5%	64.9%
Indiana	111,089	38,053	48.4%	61,844	21,805	51.5%	55.7%
Florida	81,971	29,663	51.1%	32,004	11,820	54.7%	39.0%
Maryland	87,369	29,112	59.5%	48,469	15,561	61.7%	55.5%
West Virginia	28,360	26,919	71.0%	10,254	3,567	53.9%	36.2%
Iowa	52,721	23,468	60.0%	23,177	11,102	71.4%	44.0%
Virginia	65,018	22,335	50.9%	17,692	6,829	70.0%	27.2%
New Jersey	46,111	20,917	66.7%	31,433	13,446	66.8%	68.2%
Massachusetts	58,358	20,174	67.9%	14,177	6,021	67.2%	24.3%
Georgia	51,153	15,627	42.9%	33,733	11,091	49.6%	65.9%
Tennessee	38,813	14,165	53.6%	20,218	7,269	57.6%	52.1%
Colorado	37,804	13,636	48.1%	15,196	5,941	56.2%	40.2%
Hawaii	38,075	11,828	54.6%	31,998	10,774	57.1%	84.0%
Utah	25,790	10,191	55.3%	15,275	6,021	59.1%	59.2%
Kentucky	26,174	10,061	55.0%	9,899	4,181	69.2%	37.8%
Arizona	29,247	10,058	44.1%	17,998	6,282	51.8%	61.5%
Arkansas	38,300	9,138	41.7%	4,691	1,263	40.8%	12.2%
New Hampshire	11,925	8,463	62.1%	1,186	395	60.9%	9.9%
Alabama	19,700	7,022	48.9%	11,504	4,300	52.1%	58.4%
Rhode Island	14,137	6,463	62.6%	4,084	1,736	68.3%	28.9%
Idaho	16,217	6,313	52.7%	9,046	2,748	42.4%	55.8%
Louisiana	21,209	6,239	50.0%	11,923	3,271	45.5%	56.2%
Mississippi	18,046	5,800	39.3%	6,294	2,328	55.3%	34.9%
Nebraska	11,925	4,606	60.0%	8,739	3,592	66.6%	73.3%
Montana	12,147	4,250	53.4%	3,900	1,558	59.4%	32.1%
Kansas	11,562	4,220	53.6%	6,279	2,192	57.5%	54.3%
Oklahoma	10,758	4,176	60.0%	4,963	1,778	59.5%	46.1%
Alaska	12,039	4,094	49.8%	6,122	2,448	61.3%	50.9%
New Mexico	10,959	2,974	41.5%	6,530	1,795	43.6%	59.6%
Delaware	8,185	2,645	70.4%	1,792	673	66.0%	21.9%
North Dakota	6,838	2,314	52.7%	5,332	1,953	56.2%	78.0%
South Dakota	5,253	1,755	47.2%	580	247	63.8%	11.0%
Wyoming	2,695	992	50.0%	1,127	525	68.0%	41.8%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded). Data is unavailable or incomplete for 9 states (Connecticut, Maine, Minnesota, Nevada, New York, Oregon, Vermont, Washington, and Wisconsin) and the District of Columbia.

Figure 10: Selected Statistics for Construction Registered Apprenticeships by U.S. State, 2019–2022

Construction Apprentices	Total Apprentices	Completer Apprentices	Completion Rate (All)	Total Joint Apprentices	Joint Completers	Completion Rate (Joint)	Joint Share of Total
United States	1,141,504	395,408	53.1%	804,056	292,645	56.2%	70.4%
California	123,561	48,230	56.7%	110,489	41,929	55.8%	89.4%
Illinois	87,415	39,491	70.7%	85,647	38,897	71.2%	98.0%
Pennsylvania	71,783	30,226	69.4%	61,522	26,455	70.5%	85.7%
Ohio	77,733	27,713	55.5%	61,543	22,494	56.5%	79.2%
Indiana	72,045	22,941	48.2%	53,660	17,690	47.7%	74.5%
Texas	85,156	22,335	40.7%	46,039	12,818	43.7%	54.1%
Florida	58,788	20,407	47.7%	24,432	8,636	50.2%	41.6%
Michigan	64,211	18,084	44.5%	54,224	15,447	45.7%	84.4%
Missouri	46,599	14,831	47.8%	40,516	13,194	49.4%	86.9%
Iowa	27,831	12,381	63.2%	14,155	6,260	66.9%	50.9%
New Jersey	27,653	11,349	61.7%	21,680	8,954	61.9%	78.4%
Maryland	22,206	10,616	74.3%	14,832	7,299	75.1%	66.8%
Georgia	33,720	10,563	46.4%	30,418	9,826	48.1%	90.2%
Tennessee	23,388	7,684	50.0%	16,486	5,796	55.6%	70.5%
Colorado	23,546	7,539	43.4%	13,112	4,875	53.2%	55.7%
Arkansas	34,400	7,361	38.9%	3,986	950	36.0%	11.6%
Hawaii	29,840	6,990	45.2%	25,827	6,852	47.1%	86.6%
Utah	18,766	6,627	50.4%	12,514	4,617	54.5%	66.7%
Arizona	19,455	6,155	44.8%	14,310	4,688	48.2%	73.6%
Kentucky	13,014	5,112	61.6%	8,100	3,420	71.1%	62.2%
Massachusetts	10,038	4,677	67.2%	9,876	4,616	67.2%	98.4%
Virginia	18,651	4,611	37.2%	603	195	50.1%	3.2%
Rhode Island	10,342	4,450	63.4%	3,670	1,503	69.2%	35.5%
Alabama	12,525	4,216	45.8%	9,727	3,682	52.0%	77.7%
North Carolina	12,433	4,133	63.3%	5,276	1,631	70.7%	42.4%
Louisiana	12,828	3,637	47.0%	7,025	1,684	44.2%	54.8%
West Virginia	8,889	3,160	51.4%	7,661	2,556	50.2%	86.2%
Nebraska	8,407	3,089	60.1%	7,196	2,701	62.8%	85.6%
Montana	9,258	2,843	50.7%	2,736	952	55.0%	29.6%
New Hampshire	6,936	2,474	56.8%	1,174	395	61.2%	16.9%
New Mexico	8,945	2,270	39.1%	5,477	1,352	40.2%	61.2%
South Carolina	6,443	2,249	46.3%	831	384	54.1%	12.9%
Kansas	6,825	2,177	50.7%	5,015	1,532	51.8%	73.5%
Delaware	6,397	2,117	54.5%	1,314	548	80.9%	20.5%
Alaska	7,335	2,104	47.5%	3,600	1,238	58.6%	49.1%
Idaho	5,176	1,980	58.9%	2,972	1,186	64.9%	57.4%
Oklahoma	5,967	1,908	52.9%	4,386	1,539	57.2%	73.5%
North Dakota	5,321	1,495	45.3%	4,118	1,224	47.7%	77.4%
South Dakota	3,307	1,045	44.4%	206	46	33.3%	6.2%
Mississippi	4,061	872	32.9%	2,784	650	36.7%	68.6%
Wyoming	1,386	318	30.9%	245	105	55.0%	17.7%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded). Data is unavailable or incomplete for 9 states (Connecticut, Maine, Minnesota, Nevada, New York, Oregon, Vermont, Washington, and Wisconsin) and the District of Columbia.

Enrollment and Completion Rates by State

Figure 9 displays registered apprenticeship statistics by state, sorted in descending order by total number of apprentice completers from 2019 through 2022 (Figure 9). Due to unavailable or incomplete data, only 41 states are reported in the table.[8] Populous states like New York, Washington, Wisconsin, and Minnesota are omitted from Figure 9. Of the 41 states with robust data, the Top 10 by total number of graduating apprentices were California, Missouri, South Carolina, Illinois, Texas, North Carolina, Ohio, Pennsylvania, Michigan, and Indiana—which delivered at least 38,000 completions but as many as 185,000 completions (California). The 5 states with completion rates exceeding 70 percent were South Carolina, North Carolina, West Virginia, Delaware, and Illinois. The 5 states with the lowest completion rates—Mississippi, New Mexico, Arkansas, Georgia, and Arizona—each graduated fewer than 45 percent of their apprentices. Total completions were often driven by joint labor-management apprenticeship programs, with the joint completion rate exceeding the overall completion rate in 29 of the 41 states. The share of all apprentices enrolled in joint labor-management apprenticeship programs ranges from less than 10 percent in 3 states—South Carolina (2 percent), North Carolina (9 percent), and Alabama (10 percent)—to greater than 80 percent in 3 states—California (83 percent), Hawaii (84 percent), and Illinois (92 percent) (Figure 9).

The relationship between completion rates and a strong union presence in each state is more apparent when the spotlight is on apprentices registered in the construction industry (Figure 10). The Top 10 states by construction apprentices completing their programs were California, Illinois, Pennsylvania, Ohio, Indiana, Texas, Florida, Michigan, Missouri, and Iowa.[9] States with the highest overall completion rates tended to have greater shares of their construction apprentices enrolled in joint labor-management programs. As examples, Maryland, Illinois, Pennsylvania, and Massachusetts each graduated at least 67 percent of their construction apprentices. In all 4 states, the joint share of construction apprentices ranged from 67 percent (Maryland) to 98 percent (Illinois and Massachusetts). In comparison, the 5 lowest-performing states had completion rates below 40 percent. Joint labor-management construction programs accounted for fewer than 1-in-5 construction apprentices in 3 of the 5 states: Virginia (3 percent), Arkansas (12 percent), and Wyoming (18 percent) (Figure 10).

Registered Apprenticeships and Living Wages

Apprentices in registered apprenticeship programs begin earning hourly income on their first day of training. Apprenticeship programs are structured such that workers earn lower wages for an established period in exchange for class-based instruction and on-the-job training. As they progress through their programs and acquire new skills, apprentices earn higher hourly incomes. These graduated wage scales are typically tied to a percentage of the exit wage (or journeyworker rate), reflect apprentices' status as workers learning new trades, and incentivize employers to hire apprentices who are more affordable on a per-hour basis than fully trained craftworkers. First-year apprentices typically earn about 50 percent of the exit wage (Belman, 2022).

Earnings Growth

Figure 11 shows starting wages, exit wages, and average wage gains for all apprentices, construction apprentices, and non-construction apprentices by program type. From 2019 through 2022, the average

[8] Note, however, that the limited observations from the 9 remaining states—Connecticut, Maine, Minnesota, Nevada, New York, Oregon, Vermont, Washington, and Wisconsin—and the District of Columbia are included in all other metrics throughout this report, including the estimates for the United States as a whole in Figures 9 and 10.

[9] Note once again that Connecticut, Maine, Minnesota, Nevada, New York, Oregon, Vermont, Washington, Wisconsin, and the District of Columbia are not included in the analysis due to data limitations.

apprentice earned $18 per hour from "day one." Apprentices who completed their programs earned about $32 per hour, a growth of 77 percent on average. This is equivalent to more than $66,000 in annual wages for an apprentice completer employed full-time. Apprentices who dropped out and did not complete their apprenticeship programs also boosted their average hourly earnings, but by smaller amounts. The exit wage for non-completers was about $21 per hour, a gain of 15 percent relative to the average starting wage (Figure 11).

Apprentices in joint labor-management programs earn higher wages than apprentices in employer-only programs (Figure 11). At the time of entry, the average apprentice in joint labor-management programs earned $20 per hour, or 32 percent more than their counterparts in employer-only programs ($15 per hour on average).

The earnings growth potential is higher for apprentices in joint labor-management programs (Figure 11). Upon completion, the average worker graduating from a joint labor-management program earned $38 per hour, a 91 percent increase over their starting wage. By contrast, the average exit wage of an apprentice enrolled in an employer-only construction program was $23 per hour, a wage growth of 53 percent. Accordingly, graduates from joint labor-management programs earned 64 percent more than their counterparts in employer-only programs. Moreover, apprentices who exited joint labor-management programs early achieved average earnings ($23 per hour) that were comparable to the pay of those who graduate from employer-only programs.

Exit wages are higher for apprentices who complete programs in the construction industry than for those who complete non-construction programs (Figure 11). Overall, construction apprentices earned starting wages of $17 per hour and exit wages of $34 per hour, a growth of 98 percent. Non-construction apprentices initially earned almost $19 per hour but ended up at $30 per hour on average upon completion, a growth of 62 percent.

Figure 11: Apprentice Starting and Exit Wages by Industry and Program Type, 2019–2022

U.S. Apprentices	Total Apprentices	Starting Wage	Completer Exit Wage	Noncompleter Exit Wage	Wage Growth (Completers)
All Apprentices					
Total	2,785,902	$17.99	$31.81	$20.64	+76.8%
Joint (Union)	1,632,047	$19.81	$37.76	$23.13	+90.6%
Employer-only	834,367	$15.01	$23.03	$16.35	+53.5%
Joint Difference	--	*+32.0%*	*+64.0%*	*+41.5%*	*+37.2%*
Construction					
Total	1,141,504	$17.37	$34.36	$20.60	+97.8%
Joint (Union)	804,056	$18.55	$37.86	$22.04	+104.1%
Employer-only	322,687	$14.68	$24.50	$17.72	+66.9%
Joint Difference	--	*+26.4%*	*+54.5%*	*+24.3%*	*+37.2%*
Not Construction					
Total	1,644,398	$18.53	$30.00	$20.67	+61.9%
Joint (Union)	827,991	$21.27	$37.64	$24.82	+77.0%
Employer-only	511,680	$15.23	$22.39	$15.38	+47.0%
Joint Difference	--	*+39.6%*	*+68.1%*	*+61.4%*	*+30.0%*

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.

Joint labor-management programs generate higher wages than employer-only programs in both the construction industry and other sectors of the economy (Figure 11). Apprentices in joint labor-management programs in construction began at $19 per hour on average and earned $38 per hour in exit wages as journeyworkers, a growth of 104 percent. Conversely, construction apprentices in employer-only programs went from starting wages of under $15 per hour to exit wages of nearly $25 per hour, a

gain of 67 percent. This means that union apprentices earned 26 percent more in first-year wages and 55 percent more upon graduation. Outside of construction, union apprentices earned 40 percent more initially and 68 percent more after completing their programs (Figure 11).

Wage Differences by Program Type

Union apprentices earn significantly more per hour than apprentices from employer-only programs, creating a strong financial incentive for high-quality candidates to apply for and complete joint labor-management programs (Figure 12). Among all apprentices in every industry, the union wage advantage for completers is high across demographic groups. The lowest union wage advantage is experienced by Hispanic workers, who earned exit wages of nearly $39 per hour upon completion from joint labor-management programs compared to exit wages of $25 per hour upon completion from employer-only programs, a 53 percent difference. The union wage advantage is 65 percent for White completer apprentices, with union apprentices earning $38 per hour while nonunion apprentices earned only $23 per hour at exit. Additionally, Black graduates earned $36 per hour after completing joint labor-management programs, which is 88 percent more than the $19 per hour average exit wage for their counterparts from employer-only programs.

In construction, union journeyworkers earn 55 percent more than their nonunion equivalents, but Black, Asian, and female apprentices experience the largest wage gains from participating in joint labor-management programs (Figure 13). While joint construction programs produced 56 percent higher wages for White workers, they generated 59 percent higher wages for Black workers and 72 percent higher wages for Asian workers. Furthermore, women graduates earned 56 percent more after completing joint construction programs.

Figure 12: Apprentice Starting and Exit Wages by Program Type and Demographic Group, 2019–2022

U.S. Registered Apprentices in All Industries	Joint (Union) Program			Employer-only Programs			Difference in Exit Wage (Joint vs. Employer-only)
	Starting Wage	Exit Wage*	Wage Growth*	Starting Wage	Exit Wage*	Wage Growth*	
Total (All Apprentices)	$19.81	$37.76	+90.6%	$15.01	$23.03	+53.5%	+64.0%
White	$19.79	$38.20	+93.0%	$15.20	$23.13	+52.2%	+65.1%
Black or African American	$18.75	$35.46	+89.2%	$13.29	$18.86	+42.0%	+88.0%
Hispanic or Latinx	$20.49	$38.56	+88.2%	$15.33	$25.12	+63.9%	+53.5%
Asian or Pacific Islander	$20.13	$40.36	+100.5%	$16.53	$24.93	+50.8%	+61.9%
Native American	$20.50	$37.70	+83.9%	$15.36	$23.31	+51.8%	+61.8%
Men	$19.88	$38.12	+91.8%	$15.00	$23.85	+59.0%	+59.8%
Women	$18.74	$31.46	+67.9%	$14.95	$20.05	+34.1%	+56.9%
Military Veteran	$20.16	$37.50	+86.0%	$14.75	$23.81	+61.4%	+57.5%
Not a Veteran	$19.78	$37.78	+91.0%	$15.03	$22.92	+52.5%	+64.9%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. *"Exit wage" and "wage growth" are for apprentices who completed their programs only and do not include those who cancelled or dropped out.

Wage Equality by Program Type

Joint labor-management apprenticeship programs play an important role in reducing inequality in the construction industry. Not only are they more diverse than employer-only programs, but union journeyworkers who complete their apprenticeships, perform the same trade, and operate the same equipment in the same local market all earn the same wage, per their collective bargaining agreements. All able-bodied journeyworkers who have proven that they have mastered their crafts earn the same hourly income, resulting in middle-class wages of between $36 per hour and $39 per hour—regardless of racial or ethnic background, gender identification, or any other characteristic unique to an individual. The only exception is Asian construction apprentices, who earned an average of $45 per hour after finishing

joint labor-management programs. This outlier is influenced by geographic factors, with Asian apprentices more likely to live in high-wage states like Hawaii, California, and Massachusetts (Figure 13).

Figure 13: Construction Apprentice Starting and Exit Wages by Program Type and Demographics, 2019–2022

U.S. Registered Apprentices in Construction Industry	Joint (Union) Programs			Employer-only Programs			Difference in Exit Wage (Joint vs. Employer-only)
	Starting Wage	Exit Wage*	Wage Growth*	Starting Wage	Exit Wage*	Wage Growth*	
Total (All Apprentices)	$18.55	$37.86	+104.1%	$14.68	$24.50	+66.9%	+54.5%
White	$18.39	$37.77	+105.4%	$14.67	$24.28	+65.5%	+55.5%
Black or African American	$17.78	$36.09	+102.9%	$14.02	$22.64	+61.5%	+59.4%
Hispanic or Latinx	$19.55	$38.60	+97.4%	$14.75	$25.42	+72.3%	+51.8%
Asian or Pacific Islander	$19.25	$44.78	+132.7%	$14.20	$25.98	+83.0%	+72.4%
Native American	$18.81	$35.96	+91.2%	$15.12	$25.19	+66.6%	+42.7%
Men	$18.57	$37.92	+104.2%	$14.68	$24.51	+67.0%	+54.7%
Women	$18.26	$36.39	+99.3%	$14.30	$23.40	+63.7%	+55.5%
Military Veteran	$18.72	$38.14	+103.8%	$15.27	$24.81	+62.4%	+53.7%
Not a Veteran	$18.54	$37.84	+104.1%	$14.65	$24.48	+67.2%	+54.6%

Note. Compiled from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA. *"Exit wage" and "wage growth" are for apprentices who completed their programs only and do not include those who cancelled or dropped out.

Apprenticeship Wages Meeting or Exceeding Living Wages

America's registered apprenticeship system is effective at delivering living wages for workers, especially for those who complete their programs (Figure 14). From 2019 through 2022, three-fourths of all apprentices earned starting wages of $15 per hour or more (76 percent). More than half of all apprentices (56 percent) earned living wages from "day one," based on the MIT Living Wage Calculator. However, only about one-third (35 percent) earned starting wages that were enough to pay for modest two-bedroom apartments. Outcomes were meaningfully better for apprentices who graduated from their registered apprenticeship programs. 95 percent of the exit wages of apprentice completers were at or above $15 per hour, 92 percent could cover basic expenses for single households, and 74 percent could afford modest two-bedroom apartments in their states.[10]

Because joint labor-management programs boost earnings by more than the employer-only alternative, they are more successful at meeting or exceeding these living wage benchmarks (Figure 14). About 88 percent of union apprentices earned at least $15 per hour in their first year, resulting in 64 percent achieving living wages and 36 percent bringing in enough to afford two-bedroom units. By the time they finished their programs, nearly 100 percent of union completers made $15 per hour or more, 99 percent earned living wages, and 84 percent could afford modest apartments. Meanwhile, only 51 percent of nonunion apprentices cracked $15 per hour upon entry, which translated into just 38 percent meeting the MIT Living Wage threshold and 27 percent earning a two-bedroom housing wage. Apprentices who graduated from employer-only programs earned at least $15 per hour 87 percent of the time, met their local MIT Living Wage 80 percent of the time, and were able to afford modest apartments 57 percent of the time. Consequently, joint labor-management programs were between 9 and 37 percentage points more likely to meet or exceed living wage standards for new apprentices than employer-only programs, and 13 to 28 percentage points more likely for apprentice completers.

Apprenticeship Wages Meeting or Exceeding Living Wages by Industry

Results are consistent across industries (Figure 14). In construction, union apprentices were 11 to 36 percentage points more likely to attain the three living wage benchmarks for new apprentices and 1 to 28

[10] For statewide estimates of living wages needed to cover basic needs by state, see Figure 1.

percentage points more likely for apprentice completers. Outside of construction, starting wages for union apprentices were 8 to 39 percentage points more likely to meet or exceed the living wage metrics and exit wages for union apprentices were 17 to 25 percentage points more likely to do so.

Figure 14: Apprentices Earning Living Wages (Three Metrics) by Program Type, 2019–2022

All U.S. Registered Apprentices	Starting Wage Above or Equal To:			Exit Wage Above or Equal To:		
	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage
All Apprentices						
Total	76.3%	56.2%	35.3%	94.7%	92.0%	74.3%
Joint (Union)	87.8%	64.0%	35.9%	99.6%	99.2%	84.2%
Employer-only	51.3%	38.4%	27.3%	87.1%	79.8%	56.7%
Joint Difference	*+36.5%*	*+25.6%*	*+8.6%*	*+12.6%*	*+19.3%*	*+27.5%*
Construction						
Total	70.9%	51.0%	27.8%	99.6%	98.1%	81.9%
Joint (Union)	81.8%	59.9%	31.2%	100.0%	99.9%	89.2%
Employer-only	45.8%	30.5%	19.9%	98.7%	93.6%	60.8%
Joint Difference	*+36.0%*	*+29.5%*	*+11.3%*	*+1.3%*	*+6.2%*	*+28.3%*
Not Construction						
Total	80.0%	59.8%	40.5%	91.8%	88.4%	69.9%
Joint (Union)	93.7%	67.9%	40.4%	99.4%	98.5%	79.8%
Employer-only	54.8%	43.3%	32.0%	82.0%	73.9%	54.9%
Joint Difference	*+38.9%*	*+24.6%*	*+8.4%*	*+17.3%*	*+24.7%*	*+24.9%*

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition.

Registered apprenticeship programs in construction are particularly impactful (Figure 15). Across every demographic group, more than 99 percent of construction graduates earned $15 or more per hour and at least 97 percent achieved the MIT Living Wage Calculator's income needed to cover costs for food, housing, transportation, and other basic needs. Furthermore, large majorities of construction graduates could afford modest two-bedroom apartments in 2022, including 7-in-10 Asian workers, 8-in-10 men and women, and 9-in-10 White workers and military veterans. The demographic group with the smallest share of apprentice completers earning two-bedroom housing wages was Hispanic workers (63 percent). However, this group was also had the lowest union share (70 percent).

Most apprentice completers in other industries earn living wages as well (Figure 15). Nine-in-10 White, Hispanic, Asian, Native American, male, and veteran apprentices in industries outside of construction had exit wages that were both $15 per hour or more and above the local MIT Living Wage Calculator value. Eight-in-10 White, Native American, and veteran apprentice completers could afford modest apartments, as could 7-in-10 men, 6-in-10 Hispanic and Black apprentice completers, and half of Asian completers. Women are the one demographic group that not only lagged the overall non-construction averages in meeting the $15 per hour and MIT Living Wage benchmarks, but also had fewer than half of apprentice completers able to pay for modest two-bedroom apartments (48 percent). Incidentally, the union share of apprentices was lowest for women apprentices in these non-construction industries (just 25 percent).

Figure 15: Apprentices Earning Living Wages by Industry and Demographics, 2019–2022

All U.S. Registered Apprenticeships	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage	Joint (Union) Share of All Apprentices
Construction				
Total	99.6%	98.1%	81.9%	70.4%
White	99.6%	98.2%	88.7%	70.1%
Black or African American	99.2%	97.0%	77.8%	75.6%
Hispanic or Latinx	99.5%	98.1%	62.6%	69.7%
Asian or Pacific Islander	99.9%	99.1%	73.3%	81.6%
Native American	99.5%	98.3%	84.7%	71.7%
Men	99.6%	98.1%	81.9%	70.0%
Women	99.4%	98.3%	82.4%	83.2%
Military Veteran	99.7%	98.9%	89.6%	75.1%
Not a Veteran	99.6%	98.1%	81.4%	70.1%
Not Construction				
Total	91.8%	88.4%	69.9%	50.4%
White	92.3%	89.3%	78.9%	48.2%
Black or African American	76.4%	70.2%	55.9%	39.3%
Hispanic or Latinx	95.5%	92.7%	57.2%	69.4%
Asian or Pacific Islander	92.6%	87.4%	52.5%	57.1%
Native American	92.7%	90.2%	79.6%	53.9%
Men	94.2%	92.1%	74.4%	55.5%
Women	80.4%	70.5%	48.0%	24.8%
Military Veteran	88.1%	86.8%	76.9%	39.1%
Not a Veteran	92.4%	88.6%	68.9%	51.5%

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition.

Apprenticeship Wages Meeting or Exceeding Living Wages by State

Figure 16 displays starting wages, exit wages among completers, the shares achieving three living wage benchmarks, and the joint labor-management share of enrollment for all apprentices in the 41 U.S. states with available data. States are sorted by average exit wage, with Massachusetts, Illinois, and Hawaii each garnering more than $40 per hour and New Jersey, California, North Dakota, Pennsylvania, Alaska, Maryland, and Utah rounding out the Top 10. Nine states—Virginia, Florida, Idaho, New Hampshire, Louisiana, West Virginia, South Carolina, Arkansas, and North Carolina—had average exit wages of less than $25 per hour. More than 90 percent of apprentice completers earned living wages across all three metrics in 11 states, ranging from highly unionized Illinois to low-cost Mississippi. Majorities of apprentice completers could afford modest apartments in 37 of the 41 states (90 percent), while fewer than 1-in-2 apprentice completers earned the two-bedroom housing wage in California (47 percent), New Hampshire (46 percent), Virginia (43 percent), and Florida (36 percent) (Figure 16).

When highlighting construction apprentices, 5 states had exit wages that were greater than $40 per hour while 6 states paid less than $25 per hour (Figure 17). Massachusetts, Illinois, Hawaii, New Jersey, and California averaged between $41 and $46 per hour for construction tradespeople who graduated from registered apprenticeship programs, equivalent to between $86,000 and $94,800 annually at traditional full-time hours. On the other end, construction workers in Mississippi, Florida, North Carolina, South Carolina, Virginia, and Arkansas earned average exit wages ranging from $21 to $25 per hour, which equals $43,100 to $51,700 over 2,080 hours. At least 95 percent of construction workers who completed registered apprenticeship training earned living wages, according to the three metrics, in 20 of the 41

states (49 percent). Majorities of construction apprentice completers could afford modest apartments in 37 of the 41 states (90 percent), while fewer than 1-in-2 apprentice completers earned two-bedroom housing wages in New Hampshire (44 percent), California (43 percent), Florida (35 percent), and Virginia (31 percent) (Figure 17).

Figure 16: Apprentice Wages and Shares Earning Living Wages (Three Metrics) by State, 2019–2022

All U.S. Registered Apprentices	Starting Wage	Exit Wage*	Wage Growth*	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage	Joint (Union) Share
United States	$17.99	$31.81	76.8%	94.7%	92.0%	74.3%	58.6%
Massachusetts	$20.29	$45.28	123.1%	99.9%	99.8%	80.2%	24.3%
Illinois	$20.85	$43.86	110.4%	98.2%	96.9%	95.6%	91.8%
Hawaii	$18.45	$40.24	118.1%	98.5%	93.3%	50.2%	84.0%
New Jersey	$19.72	$38.57	95.6%	99.4%	95.1%	66.8%	68.2%
California	$20.23	$38.10	88.3%	99.6%	98.1%	46.5%	82.6%
North Dakota	$21.03	$35.79	70.2%	100.0%	100.0%	100.0%	78.0%
Pennsylvania	$17.98	$35.03	94.8%	97.5%	96.4%	87.2%	79.6%
Alaska	$20.73	$34.56	66.7%	98.6%	96.5%	83.4%	50.9%
Maryland	$16.27	$33.09	103.4%	98.8%	97.9%	80.2%	55.5%
Utah	$19.86	$32.50	63.7%	93.9%	88.8%	79.0%	59.2%
Wyoming	$18.12	$32.30	78.2%	98.7%	98.7%	97.4%	41.8%
Arizona	$17.23	$32.15	86.6%	96.8%	95.1%	82.6%	61.5%
Colorado	$18.24	$31.75	74.0%	96.8%	89.8%	59.4%	40.2%
Oklahoma	$18.50	$31.50	70.3%	99.9%	99.9%	99.6%	46.1%
Nebraska	$15.81	$30.13	90.6%	93.2%	92.9%	92.4%	73.3%
Michigan	$17.91	$29.36	63.9%	95.3%	92.9%	84.8%	64.9%
Montana	$17.65	$29.23	65.6%	95.0%	93.5%	90.7%	32.1%
Kentucky	$16.65	$28.72	72.5%	97.3%	97.0%	94.3%	37.8%
Rhode Island	$17.31	$28.66	65.6%	98.5%	92.3%	63.8%	28.9%
Ohio	$14.80	$28.62	93.4%	92.4%	92.2%	90.6%	58.0%
Iowa	$17.29	$28.13	62.7%	91.7%	90.1%	88.8%	44.0%
Delaware	$16.28	$27.88	71.3%	99.8%	95.7%	67.2%	21.9%
Georgia	$15.24	$27.79	82.4%	96.6%	94.2%	85.3%	65.9%
New Mexico	$15.04	$27.66	84.0%	95.8%	94.7%	93.8%	59.6%
Texas	$16.55	$27.61	66.8%	92.8%	89.8%	73.1%	42.5%
South Dakota	$17.33	$27.14	56.7%	96.1%	91.4%	90.5%	11.0%
Tennessee	$15.44	$26.90	74.2%	95.3%	94.5%	88.3%	52.1%
Indiana	$16.14	$26.80	66.1%	87.9%	86.9%	84.0%	55.7%
Kansas	$15.24	$26.70	75.2%	84.7%	84.3%	78.7%	54.3%
Alabama	$15.50	$26.55	71.3%	98.9%	97.6%	97.4%	58.4%
Missouri	$16.73	$25.88	54.6%	81.4%	79.7%	70.3%	53.5%
Mississippi	$15.63	$25.79	65.0%	98.8%	98.6%	98.6%	34.9%
Virginia	$14.40	$24.94	73.2%	87.2%	70.6%	42.6%	27.2%
Florida	$15.92	$24.71	55.2%	92.3%	85.4%	36.1%	39.0%
Idaho	$16.44	$24.40	48.5%	89.8%	83.4%	62.0%	55.8%
New Hampshire	$17.32	$24.40	40.8%	96.6%	86.2%	45.7%	9.9%
Louisiana	$15.52	$24.33	56.7%	81.9%	81.8%	79.8%	56.2%
West Virginia	$14.79	$24.09	63.0%	84.2%	78.8%	80.5%	36.2%
South Carolina	$15.33	$23.11	50.7%	90.8%	83.4%	77.0%	2.4%
Arkansas	$13.60	$22.13	62.7%	95.3%	87.8%	95.3%	12.2%
North Carolina	$12.27	$15.67	27.6%	72.6%	67.5%	63.5%	8.9%

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition. Data is incomplete for 9 states (Connecticut, Maine, Minnesota, Nevada, New York, Oregon, Vermont, Washington, and Wisconsin) and the District of Columbia. *"Exit wage" and "wage growth" are for apprentices who completed their programs only and do not include those who cancelled or dropped out.

Figure 17: Construction Apprentice Wages and Shares Earning Living Wages by State, 2019–2022

All Construction Apprentices	Starting Wage	Exit Wage*	Wage Growth*	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage	Joint (Union) Share
United States	$17.37	$34.36	97.8%	98.1%	98.1%	81.9%	70.6%
Massachusetts	$20.36	$45.57	123.8%	99.9%	99.9%	76.8%	98.4%
Illinois	$20.96	$45.24	115.8%	99.8%	99.8%	98.9%	98.0%
Hawaii	$17.78	$45.22	154.3%	99.8%	99.8%	77.3%	86.6%
New Jersey	$19.23	$42.44	120.7%	97.4%	97.4%	73.9%	78.4%
California	$21.43	$41.35	93.0%	99.8%	99.8%	43.0%	89.4%
Pennsylvania	$18.31	$38.83	112.0%	99.9%	99.9%	96.6%	85.7%
Alaska	$20.82	$38.37	84.3%	100.0%	100.0%	99.2%	49.1%
Missouri	$18.12	$35.20	94.3%	100.0%	100.0%	99.9%	86.9%
Maryland	$16.39	$34.87	112.8%	98.6%	98.6%	69.0%	66.8%
Utah	$20.27	$34.51	70.3%	97.3%	97.3%	89.0%	66.7%
Colorado	$17.97	$33.77	87.9%	99.7%	99.7%	67.7%	55.7%
Nebraska	$16.98	$33.02	94.5%	100.0%	100.0%	99.7%	85.6%
Kansas	$16.54	$32.39	95.8%	100.0%	100.0%	100.0%	73.5%
Ohio	$16.14	$31.62	95.9%	99.8%	99.8%	99.0%	79.2%
Arizona	$16.66	$31.58	89.5%	99.9%	99.9%	90.8%	73.6%
North Dakota	$18.85	$31.49	67.1%	100.0%	100.0%	100.0%	77.4%
Michigan	$16.44	$31.47	91.4%	99.9%	99.9%	97.9%	84.4%
Indiana	$16.93	$31.40	85.5%	99.5%	99.5%	98.0%	74.5%
Wyoming	$16.83	$31.18	85.3%	100.0%	100.0%	99.7%	17.7%
West Virginia	$17.79	$31.15	75.2%	89.2%	89.2%	93.3%	86.2%
Oklahoma	$16.73	$30.92	84.8%	100.0%	100.0%	99.9%	73.5%
Georgia	$15.53	$30.26	94.9%	99.0%	99.0%	95.1%	90.2%
Rhode Island	$17.29	$30.18	74.5%	98.0%	98.0%	71.4%	35.5%
Montana	$17.35	$29.48	69.9%	100.0%	100.0%	99.9%	29.6%
Idaho	$16.33	$28.44	74.2%	97.2%	97.2%	94.4%	57.4%
Delaware	$16.36	$28.32	73.2%	95.8%	95.8%	68.1%	20.5%
Kentucky	$14.66	$28.31	93.1%	99.8%	99.8%	95.6%	62.2%
Texas	$15.37	$28.30	84.2%	98.2%	98.2%	80.4%	54.1%
South Dakota	$16.84	$28.16	67.2%	93.7%	93.7%	92.5%	6.2%
Iowa	$16.42	$27.90	69.9%	99.0%	99.0%	98.1%	50.9%
New Mexico	$14.26	$27.10	90.0%	99.5%	99.5%	99.1%	61.2%
Louisiana	$15.62	$26.76	71.3%	99.8%	99.8%	99.4%	54.8%
Alabama	$15.33	$26.74	74.4%	99.7%	99.7%	99.7%	77.7%
Tennessee	$14.79	$26.71	80.6%	99.1%	99.1%	93.5%	70.5%
New Hampshire	$17.03	$26.58	56.1%	98.4%	98.4%	44.4%	16.9%
Mississippi	$12.85	$24.84	93.3%	97.1%	97.1%	97.1%	68.6%
Florida	$15.42	$24.73	60.4%	91.9%	91.9%	34.6%	41.6%
North Carolina	$13.29	$24.28	82.7%	82.9%	82.9%	72.5%	42.4%
South Carolina	$16.68	$23.83	42.9%	93.2%	93.2%	79.1%	12.9%
Virginia	$12.44	$23.25	87.0%	71.8%	71.8%	30.8%	3.2%
Arkansas	$13.07	$20.71	58.5%	86.0%	86.0%	94.9%	11.6%

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard . Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition. Data is incomplete for 9 states (Connecticut, Maine, Minnesota, Nevada, New York, Oregon, Vermont, Washington, and Wisconsin) and the District of Columbia. *"Exit wage" and "wage growth" are for apprentices who completed their programs only and do not include those who cancelled or dropped out.

Labor Market Institutions and Labor Policies

Strong relationships exist between joint labor-management apprenticeship programs and better completion rates, higher worker earnings, and greater likelihoods of earning living wages. Joint labor-

management apprenticeship programs, however, are based on cooperation between unions and signatory employers. If union membership declines due to economic, structural, or legislative factors, these apprenticeship programs can be weakened and overall performance outcomes across the U.S. registered apprenticeship system can deteriorate.

One labor policy that weakens labor unions is a "right-to-work" law.[11] "Right-to-work" laws prohibit employers and unions from voluntarily ensuring that each member who accrues a return from collective bargaining also contributes a fair share in the form of dues or fees. "Right-to-work" laws permit and incentivize "free riding" among workers in bargaining units, who can receive all the services and benefits of collective bargaining—such as a higher wage, better health insurance benefits, and legal representation—without paying anything for them.[12] Requiring unions to represent and provide services to free riders reduces the resources they have available to advocate for workers, train members, and organize new employees, which erodes worker bargaining power and decreases union membership (Fortin et al., 2022; VanHeuvelen, 2020; Stansbury & Summers, 2020; Hogler et al., 2004; Davis & Huston, 1993). In 2022, a total of 27 states had "right-to-work" laws, including 5 states that passed laws between 2012 and 2017 (National Right to Work Committee, 2024).[13]

By limiting the resources that unions have available for collective bargaining, "right-to-work" laws have been shown to reduce worker earnings by between 2 and 4 percent on average (Manzo & Bruno, 2023b; VanHeuvelen, 2020; Gould & Kimball, 2015; Shierholz & Gould, 2011; Lafer, 2011; Stevans, 2009). Worker earnings have also been found to be reduced by 1 to 3 percent for the states that enacted "right-to-work" laws between 2012 and 2017 (Manzo & Bruno, 2023b; Fortin et al., 2022; Wexler, 2022; Chava et al., 2020). Pay cuts were concentrated in "industries with high union coverage" such as construction and education (Fortin et al., 2022; Wexler, 2022). Data from collective bargaining agreements and corporate profits further exposes that "right-to-work" laws decrease wages for union workers but increase CEO pay, transferring income from workers to owners (Wexler, 2022; Stevans, 2009).

Prevailing wage laws, on the other hand, are labor policies that promote a level playing field between construction contractors—whether union or nonunion—and improve construction job quality. State prevailing wage laws establish minimum wages for skilled construction workers employed on taxpayer-funded and taxpayer-subsidized infrastructure projects that are based on the wages, benefits, and workforce training investments paid for similar work in the area where the projects are to be completed. By preventing public bodies and organizations receiving government funds and incentives from awarding bids to contractors that pay less than the privately negotiated local market rate, prevailing wage laws level playing field for businesses and ensure that more workers can afford to live in the communities where they are building public projects. The Davis-Bacon Act of 1931 establishes prevailing wages on federally

[11] The term "right-to-work" is a misnomer and a contested ideological phrase. There is no right to employment in either the Constitution of the United States or the 50 state constitutions. The phrase was first used in 1941 and has been linked to Southern segregationists who opposed the spread of unionization (Devinatz, 2015; Draut, 2018). They devised the idea of "right-to-work" as a shorthand to imply that unions forced workers into joining unions through "closed shops" as a condition of continued employment. However, "closed shops" have been prohibited since 1947 (National Labor Relations Board, n.d.). When readers engage the term "right-to-work" in this report, they should be aware of its entomological lineage.

[12] In the social sciences, the "free-rider problem" is a commonly understood term describing a market failure that occurs when those who benefit from resources, goods, or services either do not pay for them or underpay, often due to legal or regulatory frameworks that incentivize people to let other parties pay for benefits that they can then receive for free (Stanford Encyclopedia of Philosophy, 2020).

[13] This includes Michigan, which enacted a "right-to-work" law in 2013 but which is no longer a "right-to-work" state. In February 2024, Michigan became the first state in 6 decades to repeal a "right-to-work" law (Shumway, 2024; Cappelletti, 2023).

funded and assisted construction projects, while 28 states plus the District of Columbia had their own prevailing wage laws in 2022 (Wage and Hour Division [WHD], 2022).[14]

Economic research has found that prevailing wage laws bolster registered apprenticeships, improve economic outcomes for construction workers, and have no impact on total construction costs (Duncan & Ormiston, 2018). Construction apprenticeship enrollments are 8 percent higher in states with prevailing wage laws (Bilginsoy, 2005). Construction worker productivity is also higher and on-the-job injuries are lower in states with prevailing wage laws (Manzo, Bruno, & Petrucci, 2023; Li et al., 2019; Philips, 2014).

In addition to ensuring that the next generation of construction workers is trained, productive, and safe, prevailing wage laws statistically boost construction worker earnings by between 4 and 16 percent, improve their homeownership rate by 2 percent, increase their income tax and property tax contributions, and reduce their reliance on government assistance programs (Manzo, Bruno, & Petrucci, 2023; Philips & Blatter, 2017; Manzo et al., 2020; Manzo et al., 2016; Duncan & Lantsberg, 2015; Philips, 2014). Additionally, all 6 peer-reviewed studies that have examined the effect of prevailing wage laws on the number of bids per project since 2000 have concluded that they do not reduce bid competition (Kim, Kuo-Liang, & Philips, 2012; Duncan, 2015; Onsarigo, Duncan & Atalah, 2020; Duncan & Waddoups, 2020; Duncan, Gigstad, & Manzo, 2023; Duncan, Case, & Manzo, 2024).

Because prevailing wage laws are associated with stronger workforce supply pools and competitive bidding, the economic consensus is that prevailing wage laws have no effect on public works construction costs. Of the 21 peer-reviewed studies focused on schools, highways, and municipal building projects published since 2000, 18 find that the prevailing wage laws have no effect on total construction costs (86 percent) (Manzo, Bruno, & Petrucci, 2023; Duncan, Case, & Manzo, 2024).

Figure 18 shows total construction apprentices, union shares of apprentices, completion rates, exit wages, and the three living wage metrics by union affiliation and these two labor market polices. The data reveal that joint labor-management programs trained 82 percent of all construction apprentices in states that protect collective bargaining rights versus 61 percent in states that have "right-to-work" laws, a 21 percentage-point difference. Additionally, collective-bargaining states had a 59 percent completion rate compared to a 47 percent completion rate in "right-to-work" states, a 12 percentage-point difference. Exit wages for apprentice completers averaged $39 per hour in collective-bargaining states, which was 36 percent more than the $29 per hour average in "right-to-work" states. With higher incomes, construction workers in states that protect collective bargaining rights were 1 percentage point more likely to earn at least $15 per hour and 3 percentage points more likely to earn living wages. However, at first glance, the numbers suggest that construction workers were 5 percentage points less likely to be able to afford two-bedroom apartments in states with prevailing wage laws (Figure 18).

Comparable results are found when comparing construction apprentices in states with and without prevailing wage laws. Joint construction programs trained 76 percent of apprentices in states with prevailing wage laws and 63 percent in states without, a 13 percentage-point difference. States with this policy had a 7 percentage-point higher completion rate for construction apprentices (56 percent) than states without (49 percent). Moreover, construction workers averaged exit wages $37 per hour in states with prevailing wage laws and $29 per hour in states without, a difference of 30 percent. Construction workers were 1 percentage point more likely to earn $15 per hour and 2 percentage points more likely to earn a living wage but were ostensibly 5 percentage points less likely to be able to afford modest apartments at their fair market rents (Figure 18).

[14] Michigan repealed its law in 2018 but reinstituted prevailing wage in 2024 (Shumway, 2024; Fox 2 Staff, 2023).

Figure 18: Selected Apprentice and Living Wage Statistics for the Construction Industry, 2019–2022

All Construction Apprentices	Total Apprentices	Joint (Union) Share	Completion Rate	Exit Wage*	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage
Union	804,056	100.0%	56.2%	$37.86	100.0%	99.9%	89.2%
Nonunion	322,687	0.0%	45.8%	$24.50	98.7%	93.6%	60.8%
Collective Bargaining	578,050	81.5%	59.0%	$38.91	100.0%	99.5%	79.9%
"Right-to-Work"	563,454	60.8%	47.1%	$28.58	99.1%	96.3%	84.5%
Prevailing Wage	708,553	76.3%	55.9%	$37.40	99.8%	98.9%	80.0%
No Prevailing Wage	432,951	63.1%	48.6%	$28.74	99.1%	96.7%	85.4%
Union Difference	--	+100.0%	+10.4%	+54.5%	+1.3%	+6.2%	+28.3%
CB Difference	--	+20.7%	+11.9%	+36.2%	+0.9%	+3.2%	-4.7%
PW Difference	--	+13.3%	+7.2%	+30.2%	+0.8%	+2.3%	-5.4%

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition. Completion rate estimated by dividing those who completed programs by the sum total of those who completed and cancelled (i.e., actively registered apprentices are excluded). *"Exit wage" is for apprentices who completed their programs only and does not include those who cancelled or dropped out.

Many factors could influence an apprentice's starting wage, exit wage, and likelihood of earning a living wage. These include the apprentice's gender identification, racial or ethnic background, veteran status, age cohort, and industry of employment. Figure 19 uses regression analyses to parse out the unique and independent associations between joint labor-management programs, "right-to-work" laws, and prevailing wage laws and apprentice wages. Because the regressions comprise apprentices in all fields, an "interaction term" is used to assess the effect of prevailing wage laws specifically on directly affected workers in the construction industry.[15]

After accounting for these factors, enrollment in a joint labor-management program is associated with a $4 increase in the starting wages of apprentices and a $10 boost to their exit wages. Over a full-time slate of hours, unions increase a new apprentice's pay by nearly $9,300 annually and an apprentice completer's income by almost $19,900 annually. Participating in a registered apprenticeship program in a state with a "right-to-work" law is associated with a $1 decrease in starting wages and a $3 drop in exit wages—equivalent to annualized losses of $2,700 and $5,500, respectively. Conversely, for construction apprentices specifically, prevailing wage laws are associated with a $1 increase in starting wages and a $3 gain in exit wages, or $2,400 per year for new construction apprentices employed full-time and $6,400 per year for construction workers employed full-time. All results are significant at the 99-percent level of statistical confidence (Figure 19).

This report uses probit regressions to determine links between labor market institutions and policies and the probabilities of apprentices earning living wages in Figure 20.[16] Note that the regressions analyze exit wages for apprentice completers only. After accounting for other important factors, graduation from a

[15] In Figure 19, the interaction between prevailing wage and the construction industry reveals the influence of prevailing wage laws, while the "construction industry" variable shows how much higher or lower apprentice wages are in the industry itself (relative to all other industries) and the "state with a prevailing wage law" variable accounts for general differences that exist between states with prevailing wage laws and those without and which affect all workers regardless of industry. One example is the adult minimum wage. In the 29 states (including the District of Columbia) that had prevailing wage laws in 2022, 25 had minimum wages that were above the federal standard of $7.25 per hour (86 percent). In comparison, just 6 of the 26 states without prevailing wage laws had minimum wages higher than $7.25 an hour (21 percent) (WHD, 2024; WHD, 2022).

[16] The robust probit regression is a binary statistical model which uses average marginal effects, which are partial derivatives with respect to each variable in the model that are necessary to interpret the mean effect of regression coefficients in the sample. In basic terms, economists prefer probit regressions with average marginal effects to present results as *differences in probabilities*, or how a factor changes the chances that an outcome occurs (Coca Perraillon, 2019).

joint labor-management program is associated with a 10 percentage-point increase in the likelihood that an apprentice earned at least $15 per hour, a 14 percentage-point increase in the probability that an apprentice earned a living wage according to the MIT Living Wage Calculator, and a 29 percentage-point increase in the chances that an apprentice earned enough to afford a modest two-bedroom apartment at the local fair market rent. These results are significant at the 99-percent level of confidence (Figure 20).

Figure 19: Robust OLS Regressions on Apprentice Wages, All Participants, 2019–2022

Variables for Robust OLS Regressions: Average Apprenticeship Wage	Starting Wage	Exit Wage
Joint Labor-Management Program	**+$4.46*** (0.010)**	**+$9.55*** (0.018)**
State with a "Right-to-Work" Law	**-$1.32*** (0.012)**	**-$2.64*** (0.023)**
Prevailing Wage Law x Construction	**+$1.13*** (0.017)**	**+$3.10*** (0.031)**
State with a Prevailing Wage Law	-$0.77*** (0.018)	-$0.57*** (0.029)
Construction Industry	-$2.65*** (0.015)	-$1.98*** (0.024)
Completed Program	+$0.31*** (0.009)	+$11.20*** (0.015)
Gender: Woman	-$1.04*** (0.014)	-$2.96*** (0.026)
Race: White	+$1.23*** (0.015)	+$1.83*** (0.026)
Race: Black or African American	-$0.34*** (0.018)	-$0.85*** (0.033)
Race: Hispanic or Latinx	+$1.37*** (0.016)	+$1.92*** (0.029)
Race: Asian or Pacific Islander	+$1.25*** (0.027)	+$2.82*** (0.057)
Race: Native American	+$1.69*** (0.043)	+$2.12*** (0.084)
Veteran Status: Military Veteran	-$0.17*** (0.016)	+$0.20*** (0.029)
Age: 18-24	-$0.64*** (0.031)	+$2.64*** (0.062)
Age: 25-54	+$0.47*** (0.041)	+$2.84*** (0.062)
Constant Term	$16.28*** (0.045)	$12.78*** (0.070)
Sample Size (*N*=)	2,081,644	1,551,547
R^2	0.182	0.435

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition. *p<0.01; **p<0.05; *p<0.10 (two-tailed tests). Standard errors are in parentheses.

Figure 20: Robust Probit Regressions on Living Wage Likelihoods, Completers Only, 2019–2022

Variables for Robust Probit Regressions: Probability of Earning a Living Wage	$15.00 Per Hour	MIT Living Wage	Two-Bed Housing Wage
Joint Labor-Management Program	**+0.101*** (0.001)**	**+0.145*** (0.001)**	**+0.286*** (0.000)**
State with a "Right-to-Work" Law	**-0.008*** (0.001)**	**-0.013*** (0.001)**	**+0.116*** (0.001)**
Prevailing Wage Law x Construction	**+0.022*** (0.002)**	**+0.030*** (0.001)**	**+0.059*** (0.002)**
State with a Prevailing Wage Law	-0.001* (0.001)	-0.012*** (0.001)	-0.056*** (0.002)
Construction Industry	+0.072*** (0.001)	+0.059*** (0.001)	-0.006*** (0.002)
Gender: Woman	-0.025*** (0.000)	-0.051*** (0.001)	-0.109*** (0.001)
Race: White	-0.023*** (0.001)	-0.016*** (0.001)	+0.136*** (0.001)
Race: Black or African American	-0.053*** (0.001)	-0.060*** (0.001)	+0.007*** (0.002)
Race: Hispanic or Latinx	-0.018*** (0.001)	-0.019*** (0.001)	-0.079*** (0.002)
Race: Asian or Pacific Islander	-0.007*** (0.001)	-0.017*** (0.002)	-0.056*** (0.003)
Race: Native American	-0.028*** (0.002)	-0.018*** (0.003)	+0.104*** (0.005)
Veteran Status: Military Veteran	+0.018*** (0.001)	+0.038*** (0.001)	+0.107*** (0.002)
Age: 18-24	+0.038*** (0.001)	+0.047*** (0.001)	+0.151*** (0.003)
Age: 25-54	+0.025*** (0.001)	+0.039*** (0.001)	+0.115*** (0.003)
Constant Term	+0.953*** (0.000)	+0.925*** (0.000)	+0.749*** (0.000)
Sample Size (*N*=)	947,080	947,080	947,080
R^2	0.328	0.319	0.190

Note. Adapted from authors' analysis of 2019 to 2022 data from the Registered Apprenticeship Partners Information Management Data System (RAPIDS) on "Apprentices by State," by ApprenticeshipUSA (https://www.apprenticeship.gov/data-and-statistics/apprentices-by-state-dashboard). Copyright 2024 by ApprenticeshipUSA.; "Living Wage Calculator," by A. Glasmeier (https://livingwage.mit.edu/pages/methodology). Copyright 2023 by Massachusetts Institute of Technology (MIT); and "Out of Reach 2022: The High Cost of Housing," by A. Aurand, M. Clarke, D. Emmanuel, E. Foley, I. Rafi, and D. Yentel (https://nlihc.org/sites/default/files/oor/2022/OOR_2022_Mini-Book.pdf). Copyright 2022 by National Low Income Housing Coalition. *p<0.01; **p<0.05; *p<0.10 (two-tailed tests). Standard errors are in parentheses. All coefficients are average marginal effects (AMEs).

The results are consistent for prevailing wage laws but mixed for "right-to-work" laws (Figure 20). Construction workers in states with prevailing wage laws were 2 percentage points more likely to earn at least $15 per hour, 3 percentage points more likely to earn a living wage, and 6 percentage points more likely to be able to afford a modest two-bedroom apartment.[17] The data further show that "right-to-work" laws—which affect all workers and not just those in construction—are associated with 1 percentage point decreases in apprentices earning at least $15 per hour and earning the local living wage. States with these laws, however, are associated with a 12 percentage-point increase in the ability to afford a modest apartment. This latter finding is likely attributable to the lower cost of living—and lower average home values—from 2019 through 2022 in states with "right-to-work" laws relative to those that protect collective bargaining rights.[18] Nevertheless, "right-to-work" laws tend to reduce union membership and decrease funding for joint labor-management apprenticeship programs. This has the downstream effect of decreasing the chances that apprentices in registered apprenticeship programs earn living wages (according to all three metrics) because it lowers the share of apprentices enrolling in and graduating from joint labor-management programs, which are statistically the most impactful institution at boosting earnings and allowing apprentices to afford basic needs (Figure 20).

V. LIMITATIONS

There are limitations to the analyses in this report, including 4 related to the RAPIDS apprenticeship data.

- First, as previously mentioned, RAPIDS only had apprentice-level statistics available for 41 states prior to fiscal year 2021 (ETA, n.d.). Due to unavailable data in 9 states plus the District of Columbia, the analysis is based on an incomplete census of apprentices in U.S. registered apprenticeship programs from 2019 through 2022. Note, however, that the limited observations that are available in these 9 states and the District of Columbia are included in all analyses of national data (i.e., they are only excluded from state-by-state tables and evaluations). Of the 9 missing states, 8 have prevailing wage laws and 7 protect collective bargaining rights.[19] The lack of comprehensive data from these states may conceal the true associations between state-level prevailing wage laws and apprentice wages and living wage probabilities and between "right-to-work" laws and apprentice wages and living wage probabilities.
- Second, the apprentice wage data itself is missing for many participants in the dataset, which means the assessments of earnings and living wages have reduced sample sizes.
- Third, this report accepts industries as coded by RAPIDS, but the raw data may have been inputted incorrectly due to human error or multiple classifications matching a particular registered apprenticeship program. For example, some apprenticeship programs that train construction trades may have been identified under the educational services industry. Although these

[17] Note that this is after accounting for the finding that all other apprentices in registered apprenticeship programs in states with prevailing wage laws tend to be slightly less likely to achieve these living wage metrics, likely to due to the higher relative cost of living in these states. For construction workers, prevailing wage laws more than offset this effect and ensure that they earn market-competitive wages that allow them to live in the communities where they are building public works projects and other taxpayer-subsidized infrastructure.

[18] The 5 states with the highest median home prices—California, Hawaii, Massachusetts, the District of Columbia, and Washington—all protected collective bargaining rights while 4 of the 5 states with the lowest median home prices—Iowa, Arkansas, Oklahoma, and Louisiana—had "right-to-work" laws on the books in 2022 (Fontinelle & Jennings, 2024).

[19] Connecticut, Maine, Minnesota, New York, Oregon, Vermont, and Washington have state-level prevailing wage laws and protect workers' collective bargaining rights. Nevada has a prevailing wage law but has a "right-to-work" law. Wisconsin repealed its prevailing wage standards in 2017 and adopted a "right-to-work" law in 2015.

programs are in fact providing "educational services," a more accurate description may be to include them with the rest of the construction industry.

- Fourth, apprentices were categorized by the state in which their registered apprenticeship program was located, and not by the state in which they lived. Although most apprentices live in the same state of their program, this limitation means that apprentices who travelled across state lines for training or work are included in the neighboring state. For example, an operating engineer who lived in eastern Iowa along the Mississippi River but enrolled in a registered apprenticeship program located in Illinois would have been included in the estimates for Illinois. Since Iowa does not have a prevailing wage law but does have a "right-to-work" law but Illinois has a strong prevailing wage law and a Workers' Rights Amendment in its state constitution that protects collective bargaining and prohibits "right-to-work" conditions, this limitation could have an effect on the report's findings (Manzo & Bruno, 2023a).

Another limitation is that all living wage metrics are statewide estimates. This is because apprentices are categorized by state and not by their local county or metropolitan statistical area. State-level apprenticeship data is matched with the state-level MIT Living Wage and the state-level hourly wage needed to afford modest two-bedroom apartments released by the National Low Income Housing Coalition. This approach somewhat distorts the living wage findings because there are likely instances in which apprentices earned relatively lower wages but were located in high-cost areas of their state, where higher hourly incomes are required to earn living wages than the statewide estimates. A hypothetical example would be a graduating apprentice who lived in Miami, Florida and earned an exit wage of $30 per hour. This apprentice would be counted as earning enough to cover a modest apartment since the average wage required to pay for a two-bedroom unit at the state's fair market rent level was just over $26 per hour in 2022. However, the individual would technically not reach this benchmark because the two-bedroom housing wage in Miami-Dade County where they lived was more than $32 per hour (Aurand et al., 2022).

A final limitation is omitted variable bias, or "lurking variables." RAPIDS data does not include, as examples, information on whether participating apprentices are U.S. citizens or were born in another country, both of which could have statistical impacts on their entry and exit wages. It also does not consider important factors like work experience, hours worked, or job market demands. To the extent that these and other observable variables are missing, the regression results may be leaving out important factors that could theoretically change their outputs.

VI. CONCLUSIONS AND RECOMMENDATIONS

This report has sought to assess whether registered apprenticeships deliver "living wages" that enable participants and completers to pay for minimum basic needs, such as food, housing, transportation, and health care. The primary takeaway from evaluations of 2.8 million participating apprentices over a 4-year period from 2019 through 2022 is that registered apprenticeships are effective at delivering career pathways with access to living wages. Among all apprentices in registered apprenticeship programs, 76 percent of starting wages for new apprentices were at least $15 an hour, 56 percent could cover basic expenses, and 35 percent could pay for modest two-bedroom apartments in their communities at the local fair market rent. Upon completion, 95 percent of exit wages were at least $15 per hour, 92 percent of apprentice completers could cover basic expenses, and 74 percent of apprentice completers could pay for modest two-bedroom apartments. In construction, 98 percent of exit wages could cover basic expenses and 82 percent could pay for modest two-bedroom apartments. Registered apprenticeship programs could therefore be expanded to promote job quality for more U.S. workers.

No data was available on apprentices' fringe benefits, such as contributions per hour worked towards health insurance plans or retirement funds. Legally required and voluntary fringe benefits that promote economic security and mobility are important factors in delivering high quality jobs (U.S. Department of Commerce, 2022). Accordingly, the U.S. Department of Labor Employment and Training Administration could consider updating data collection processes to request information on entry and exit benefits rates for each registered apprentice to be inputted in the Registered Apprenticeship Partners Information Management Data System (RAPIDS). Further research to assess the link between registered apprenticeships and living wages could focus specifically on fringe benefits.

While joint labor-management apprenticeship programs substantially outperform employer-only programs, a study that focused on nonunion apprentices could further highlight the difference that apprentice training has on unorganized workers. Additional research possibilities include an exploration into other determinants of job quality—such as self-assessed job satisfaction, weekly schedules, health and safety conditions, and worker autonomy—or could simply delve deeper into specific industries, occupations, or metropolitan statistical areas or counties (Bellisle et al., 2022). It is possible that apprenticeship programs are associated with worker job satisfaction and higher job quality and thus policy could encourage expanding apprenticeship training as a way to increase the number of good jobs across industries.

Lawmakers could consider implementing and strengthening policies that help establish registered apprenticeship programs in all industries. These include establishing more grants and enhancing funding for existing U.S. Department of Labor Employment and Training Administration Office of Apprenticeship grants to expand registered apprenticeship programs, especially in high-demand areas such as health care, childcare, information technology and cybersecurity, and domestic supply chain sectors critical to national defense (Crist, 2024). Additional Executive Orders prioritizing the use of registered apprenticeships in federal contracting decisions could also be considered (Rainey, 2024).

Tax credits and incentives can also expand registered apprenticeships. In Illinois, Governor JB Pritzker signed Senate Bill 1591 in 2019, incentivizing employers to assist apprentices with tuition through a tax break. The law provided a nonrefundable tax credit up to $3,500 for tuition, books, and fees per apprentice per year that reduced a business' income tax liability. The credit was increased to $5,000 if either the business address or the apprentice's home address was in an underserved area (Blaze & Calafell, 2019). Similarly, in South Carolina, "Apprenticeship Carolina" provided a $1,000 employer tax credit per apprentice per year (Olinsky & Ayres, 2013). It focused on building relations with employers, marketing apprenticeships as alternatives to traditional educational pathways, identifying core job competencies, and coordinating curricula for apprenticeship programs and technical colleges. Apprenticeship Carolina is credited with boosting the number of apprentices in South Carolina at a faster rate than the national average (Olinsky & Ayres, 2013). Note that, as data in this report have shown, South Carolina ranks in the Top 5 states for apprentice completers but also ranks in the Bottom 5 states for average exit wages.

The most successful registered apprenticeship programs at achieving the highest exit wages and delivering living wages to participants are the joint labor-management programs in the construction industry. These programs, which trained 70 percent of all construction apprentices, are sponsored jointly by labor unions and signatory contractors and include institutionalized funding mechanisms that ensure their efficacy. From 2019 through 2022, they were more diverse than employer-only construction programs, disproportionately enrolling and graduating women, military veterans, and Black apprentices. Exit wages from these programs averaged $38 per hour and ranged between $36 and $39 per hour for nearly every demographic group. As a result, joint labor-management programs were associated with a 10 to 29 percentage-point increase in the likelihood that apprentices earned living wages upon completion.

The data in this paper suggest that policymakers could look to the example of joint labor-management programs in construction if they want to expand registered apprenticeship programs in other industries and ensure that they deliver access to living wages to their participants. Policies that strengthen unions and encourage greater levels of cooperation between employers and unions could bolster the U.S. system of registered apprenticeships, improve completion rates, and boost wages for participants. This could include new legislation to remove barriers to organizing or to repeal "right-to-work" laws in states across America. Additionally, the data show that recent expansions of prevailing wage standards could enable more apprentices to earn living wages. Not only are nearly all Infrastructure Investment and Jobs Act (IIJA) dollars subject to federal Davis-Bacon prevailing wage standards, but enhanced tax credits for wind projects, solar projects, and electric vehicle charging stations under the Inflation Reduction Act (IRA) must pay prevailing wages and satisfy applicable apprentice-to-journeyworker ratios (Schurle & Roessler, 2022; The White House, 2022b). Under the CHIPS and Science Act, funding for the construction of manufacturing facilities includes prevailing wage coverage and certain industrial development projects that use American-made steel and iron, and source large portions of their manufactured products domestically, are eligible for tax credits if they pay prevailing wages and meet apprenticeship requirements (The White House, 2022a; McGuireWoods, 2023). Continuing these policies and implementing prevailing wage standards in more states and in new emerging sectors of the economy could help apprentices in registered apprenticeship programs across the United States to achieve upward economic mobility.

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