



CONSTRUCTION APPRENTICESHIP AND TRAINING IN PENNSYLVANIA

Capital Area Labor-Management Council, Inc.

By: Stephen Herzenberg, Diana Polson, and Mark Price



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About the Capital Area Labor-Management Council, Inc.

The Capital Area Labor Management Council's (CALM) mission is to enhance economic growth in Central Pennsylvania through cooperation between labor and management. CALM serves as a clearinghouse for businesses and unions alike to learn, share, network, and grow into a strong healthy business community. In the construction industry, CALM aims to inform middle and high school students, teachers, guidance counselors, parents, and the public about the careers and opportunities that are available through joint labor-management apprenticeship and training programs.

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About the Keystone Research Center

The Keystone Research Center (KRC) was founded in 1996 to broaden public discussion on strategies to achieve a more prosperous and equitable Pennsylvania economy. Since its creation, KRC has become a leading source of independent analysis of Pennsylvania's economy and public policy. KRC is located at 412 North Third Street, Harrisburg, Pennsylvania 17101-1346. Most of KRC's original research is available on the KRC website at www.keystoneresearch.org. KRC welcomes questions or other inquiries about its work at 717-255-7181.

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Executive Summary

After a deep industry decline in and after the Great Recession, the Pennsylvania construction industry has in the last several years again faced a shortage of skilled craft workers. This shortage could grow more severe in the years ahead due to an aging construction workforce, leading to high rates of retirement. Since the early 1990s, the share of the Pennsylvania construction industry workers aged 40 and over has risen from less than a third to nearly half.

In the context of emerging skills shortages, this report evaluates the role of apprenticeship training in meeting Pennsylvania's need for skilled construction workers, relying primarily on official government data. The report highlights the distinction between apprenticeship programs governed by joint committees of labor and management, hereafter referred to as joint or union programs, and programs governed unilaterally by individual employers or employer associations (non-union programs).

- ***Union programs account for nearly six out of every seven construction apprentices in Pennsylvania.*** Over the 2000 to 2016 period, 85 percent of construction apprentices in Pennsylvania participated in joint labor-management programs and 15 percent in non-union, management-only, programs.
- ***Union programs account for nine out of every 10 Pennsylvania construction apprentices who are not white and male.*** Union programs had 4,883 Non-White and Hispanic male construction apprentices from 2000 to 2016 and non-union ones had 568. Over this same period, 1,083 female apprentices participated in union programs, and 83 females participated in non-union programs.
- ***Union apprenticeship programs graduate more than six veterans for every one veteran graduated by non-union programs.*** Nearly 3,000 (2,749) veterans have participated in union construction apprenticeship programs in Pennsylvania since 2000, compared to 516 veterans who participated in non-union ones.
- ***Graduation rates are higher in union apprenticeship programs, including for minorities, women, and veterans.*** Of those enrolled in union apprenticeship programs from 2000 to 2012, 56% had completed their apprenticeship by 2016, compared to a completion rate of 44% for non-union programs. For minority male and female apprentices, and for veterans, graduation rates were about 25% higher for union apprenticeship programs than non-union.
- ***Wage rates at entry and especially at completion are higher in union apprenticeship programs.*** Starting wages for union apprentices are 36% higher than for non-union apprentices. Upon completion (or "exit"), the union apprentice pay premium compared to non-union apprentices climbs to 60%.
- ***Higher shares of blue-collar union trades in Pennsylvania have a two- or four-year college degree than non-union trades and the share of blue-collar union trades with a college degree has risen to one in four.*** The share of unionized blue-collar trades that have a two-year or four-year college degree has more than doubled since the early 1990s, to just over 25%. The share of non-union trades that have a college degree has also risen but remains 10 percentage points below the union share.

Despite higher recent enrollment, especially in union programs, the roughly 3,000 individuals completing Pennsylvania construction trade apprenticeships in the last several years remains low compared to the annual number of job openings projected in construction occupations (5,406).¹ This underscores the importance of expanding enrollment in construction apprenticeship programs as older workers retire at high rates. Since union apprenticeship programs have outperformed non-union ones on every measure of program success, further bolstering union apprenticeship programs appears the most promising route to meeting future construction industry skill needs. This report highlights three ways to bolster construction apprenticeships.

1. Construction apprenticeships should continue to make it easier to acquire a college degree as well as a journey-worker card; and to market themselves as the cheapest route to a college degree and to a good-paying career.

As noted above, a growing share of unionized construction trades in Pennsylvania have a two- or a four-year college degree. This reflects the fact that many union apprenticeship programs now have articulation agreements with post-secondary educational institutions, as well as that a few apprenticeships have gained accreditation themselves as a post-secondary institution (see the Finishing Trades Institute profiled in Box 1). The college affordability crisis, and the high debt levels of college graduates in Pennsylvania, make the apprenticeship “earn as you learn” and free tuition model even more attractive. They give construction apprenticeship programs the opportunity to market themselves not as an alternative to college but as a path to a family sustaining career AND the cheapest route to college.

2. Ensure that high-quality apprenticeships qualify for state subsidies as part of any expansion of state support for post-secondary education, such as “The Pennsylvania Promise.”

In response to the college affordability crisis, a growing number of states have free college tuition programs or proposals, sometimes called “college promise” programs. In Pennsylvania itself, Keystone Research Center earlier this year advanced a proposal for free college tuition called the Pennsylvania Promise. Any future Pennsylvania free college tuition proposal should incorporate support for students to enroll in high-quality apprenticeships articulated with college credit and degrees, such as joint apprenticeship programs. While these are already free to students, state support would make it possible to cover remaining out-of-pocket costs (e.g., for books and tools), increasing access for low-income students. State direct support to joint apprenticeships to cover the costs of making tuition free would also enable these programs to grow to meet employer demand and to increase economic opportunity. Such expansion could be particularly valuable in rural parts of Pennsylvania that lack brick-and-mortar community colleges.

3. Strengthen peer learning among Pennsylvania apprenticeship programs, including on alignment with post-secondary education, increasing diversity, and pipelines into apprenticeship.

Joint construction apprenticeship programs are embedded within regional, state, and national networks that promote peer learning within and across apprenticeship programs. Opportunities exist in the next few years to build on existing peer learning including in the following three areas.

Integration with higher education – assessment, pedagogy, and curriculum: The formal process through which the Finishing Trades Institute (FTI) based in Philadelphia became a post-secondary education led to significant upgrades in quality, including in its assessment practices (evaluating what students are learning), curriculum, and pedagogy (Box 1). The lessons learned by FTI and other leading apprenticeship programs that have deeply integrated with higher education should be spread more widely.

Best diversity practices. Joint apprenticeship programs in Pennsylvania have made unrecognized improvements in diversity over the past two decades. Examples include the Pittsburgh “Intro to the Trades” program described in Box 3; “economic opportunity” plans on Philadelphia construction projects that set – and usually meet – ambitious goals for minority workforce and apprentice shares; and Reading Pennsylvania “Youth Build” and high school pre-apprenticeship programs. Today’s high construction demand and the aging of the unionized workforce provide a good context for additional progress on diversity as well as for spreading best practices in this area across apprenticeship programs and regions within Pennsylvania.

Pipelines into apprenticeship. The Wolf Administration in Pennsylvania is currently seeking to strengthen high-school career and technical education (CTE) and pre-apprenticeship programs, including by linking them better to actual apprenticeship and to employers with good-paying jobs. In construction, these efforts should focus on unionized apprenticeship programs. Increased investment in pipeline programs should be



accompanied by identification and spread of best practices that increase the return on investment in such programs.

To capitalize on these and other peer learning opportunities, the Pennsylvania Apprenticeship and Training Office could commission the development of a five-year “capacity building plan” for construction apprenticeship programs in partnership with the Pennsylvania Apprenticeship Coordinators Association.

Box 1: Finishing Trades Institute of the Mid-Atlantic Region, International Union of Painters and Allied Trades, District Council (DC) 21

The Finishing Trades Institute of the Mid-Atlantic Region is one of the strongest joint union-management construction training institutions in the country. The Institute has been a pioneer in the articulation of apprenticeship training with college credit and, in 2009, became an accredited post-secondary school. The formal requirements for accreditation as a college have helped make the Institute a leader in curriculum development grounded in a deep understanding of skills required on the job, and in the incorporation of assessment into its training programs. The Finishing Institute has taken the tried-and-true apprenticeship learning model, with its rich mix of learning-by-doing, mentoring and peer learning, and classroom instruction, to the next level.

The Institute registered its first apprenticeship standards in 1946, for Painters and Decorators and several others in subsequent years. In the mid-1990s, 19 local unions merged to form District Council 21 (DC21), based in Philadelphia. In 1997, DC 21 opened a 20,000-square foot training facility in Philadelphia, housing training and apprenticeship programs for all the merged crafts under one roof. Since the mid-2000s, DC 21 has opened several other training facilities in eastern Pennsylvania, as well as its main campus in Philadelphia today, an 80,000 square foot facility. Today, the Finishing Trades Institute runs apprenticeship programs for five industries: drywall finisher, glaziers and glassworkers, industrial coating and lining application specialist, painters and decorators, and a mixed bag program in the rural region of northeast PA.

The Trades Institute’s increased engagement with higher education was sparked by a member attending the National Labor College. His dissertation, outlining how to bring the Institute’s apprenticeships into the 21st century by gaining Institute accreditation as a post-secondary school, provided a blueprint for the Institute development over the past decade. While apprentices could previously earn some college credits, apprenticeship had historically been undervalued. To meet the rigorous requirements for accreditation, the Institute spent several years tightening up its administrative capacity, changing its structure, and strengthening grading rubrics and assessments for apprentices’ advancement. Today, graduating apprentices leave with their Associates degree in hand – and without any college debt.

Becoming an accredited post-secondary school has opened a lot of doors for the Finishing Trades Institute, including in the areas of recruitment and financial aid. High school guidance counselors typically push students towards college and overlook apprenticeship as a viable option for youth graduating high school. But once the FTI got accredited, guidance counselors began paying attention and started sharing the program’s information with students.

FTI established a recruitment system within Philadelphia high schools where students in their 11th and 12th grade years spend time at the FTI to learn about the building trades, the skills required for such a career, and labor history. As one participating employer reported, this program is part of an “effort to diversify the workforce and get more minority and women candidates interested in the trades and glazing.” Since accreditation, FTI has seen an improvement in the quality of applicants. While the average age of apprentices was 27, the program is starting to get qualified younger applicants who are coming straight out of high school. Becoming accredited also makes it easier for apprentices in their early years to access student aid such as federal Pell grants. This allows income-eligible students to access grants and loans for tools, housing and transportation, and to make ends meet in the first few years of an apprenticeship.

FTI typically has 350–400 apprentices enrolled in the program at one time. Employers sing the praises of the program and the quality of graduating apprentices. The Apprenticeship director says that, because of their advanced skills, some third- and fourth-year apprentices already manage projects on the job.

Terry Webb, President of Eureka Metal and Glass, learned glazing through an apprenticeship in the 1980s. Today he employs FTI apprentices. “This local arm of the Finishing Trades Institute is the most sophisticated of all the locals because of the rigorous accreditation process it went through,” Terry says. “This type of training brings an outside influence and ongoing learning to the job. Apprentices not only learn from trained and experienced journey-workers; journey-workers also stay current and learn new approaches and practices from apprentices. This makes our state more competitive in construction than neighboring states of Ohio, Maryland and New Jersey.”

Introduction

Apprenticeship is an age-old practice and is especially popular in many European countries. Historically, the United States has not embraced this learning model with the same enthusiasm – although, as this report shows, the exception to that generalization is the unionized construction sector. Apprenticeship has received renewed interest in the United States over the past five years as a result of several factors: rising college costs and student debt, perceived skill shortages in “middle-skill” jobs requiring less than a four-year degree but more than a high-school education, a shortage of family sustaining jobs, and a massive expansion of apprenticeship in the United Kingdom – the U.K. experience serves as a “proof of concept” that it is possible to grow apprenticeship in a country (such as the United States) which has not used apprenticeship widely in the past.²

Research shows that apprenticeship is often an excellent learning model, blending learning-by-doing on the job, mentoring by experienced workers, and classroom training. This contrasts with the approach in many U.S. occupations, within which new recruits spend years in classroom education divorced from the world of work and then find themselves “on their own” in full-time jobs within which they receive little structured mentoring. The integration of on-the-job and classroom learning in apprenticeship also contrasts favorably with many U.S. workforce development programs in which classroom training precedes the effort to find a job that would use the training. For employers, benefits from apprenticeship include increased production, workforce development training specialized to meet employer’s needs, a qualified and well- trained workforce, a reliable pipeline, lower turnover rates and increased loyalty and commitment to the company from employees.³ Research shows that the benefits of registered apprenticeship far outweigh the costs, especially when you take account of the greater productivity resulting from apprenticeship training. Apprenticeship also results in social benefits, including reduced reliance on public assistance and increasing taxable income.⁴

In 2014 President Obama made a national call to expand apprenticeship in the United States. Between 2013 and 2017, apprenticeship in the U.S. increased by 42%, with now over half a million apprentices nationwide.⁵ Governor Tom Wolf established Pennsylvania’s first Apprenticeship and Training Office (ATO) in 2016, with the charge of expanding apprenticeship including in occupations that have not traditionally deployed apprenticeship (e.g., health care and information technology) and to a more diverse population. Since the creation of ATO, Pennsylvania has increased the number of registered apprentices by 14.5 percent, from 13,282 registered apprentices to 15,208.⁶ Gov. Wolf’s proposed 2018-19 Budget would invest an additional \$7 million in apprenticeship and work-based learning initiatives, with a goal of doubling the number of registered apprentices in the state by 2025.

As noted, the industry in which apprenticeship has been deployed widely in the United States is construction. Apprenticeship in unionized U.S. construction has evolved over time to solve challenges posed for skills training by the distinct characteristics of the industry – small firm size, project-based employment and a high degree of movement of workers from one employer to another. Such elevated mobility of labor creates a challenge for employers because their investments in worker skills can literally walk out the door at the completion of a project with the return on that investment benefitting the competitor that next hires the worker trained. This free-rider problem acts as a disincentive for investment in training in the construction industry.

The unionized portion of the construction industry solves this problem through arrangements under which contractors and workers themselves make contributions to a joint fund that pays for training the next generation of construction workers, as well as for maintaining the skills of experienced journey-workers. In each region, industry associations (of electrical contractors, general contractors, mechanical contractors, and so on) negotiate collective bargaining agreements with local building trades unions. These union contracts establish the amount of money per hour worked to be contributed to the joint apprenticeship and training fund governed by labor and management. Contributions to joint apprenticeship funds typically range from 50 cents to several dollars per hour worked. New hires earn during their apprenticeship a gradually increasing fraction of the experienced journey-person rate (e.g., 40 percent initially and 100 percent upon completion of the apprenticeship). (Table 1,



Box 1, and Boxes 3-5 in this report profile four joint union construction apprenticeship programs spanning the state of Pennsylvania)

Table 1.

A Profile of Four Pennsylvania Joint Construction Apprenticeship Programs				
	<i>Finishing Trades Institute of the Mid-Atlantic Region</i> (http://www.fti.edu)	<i>IBEW Local 375</i>	<i>Lebanon Training Center</i>	<i>Steamfitters 449</i>
<i>Training center location</i>	Philadelphia, PA	Allentown, PA	Lebanon, PA	Harmony, PA
<i>Geographical region of trainees</i>	Pennsylvania, Southern New Jersey, Delaware	Lehigh Valley	Central Pennsylvania	15 counties in Western PA (Greene County to Erie County then east to Armstrong and Clarion)
<i>Affiliated union</i>	District Council 21 of the International Union of Painters and Allied Trades (http://www.dc21.org)	International Brotherhood of Electrical Workers (IBEW) Local 375 (http://ibew375.org)	Keystone Mountain Lakes Regional Council of the United Brotherhood of Carpenters and Joiners of America (http://kmlcarpenters.org)	Steamfitters Local 449 (http://www.ua449.com) of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the U.S. and Canada
<i>Affiliated industry association(s)</i>	Architectural Glass and Metal Association; Association of Master Painters and Decorators; Interior Finishing Contractors Association; Delaware Valley Industrial Painters Association	PA-DE-NJ affiliate of the National Electrical Contractors Association	Keystone Contractors Association (https://keystonecontractors.com)	Mechanics Contractors Association
<i>Contribution to apprenticeship and training fund per hour worked</i>	Average = \$1.45 per hour	\$.60 per hour	1.9% of hourly wage	\$.90/hour
<i>Current number of active apprentices</i>	350-400	93	170	400
<i>Hourly pay at intake (wage only unless otherwise stated)</i>	Average of 5 crafts = \$30-35 per hour (incl. benefits)	\$14	\$14.44	\$18.36
<i>Hourly pay at completion (wage only unless otherwise stated)</i>	Average of 5 crafts = \$70-80 per hour (incl. benefits)	\$ 39.98	\$28.88	\$40.50
<i>College credits/degree received by completers</i>	Associates Degree earned by end of apprenticeship program	Up to 50 credits	32 credits from Harrisburg Area Community College	45 credits from Washtenaw Community College in Michigan
<i>Sources.</i> Interviews with apprenticeship coordinators and others familiar with each program; web pages of affiliated unions.				

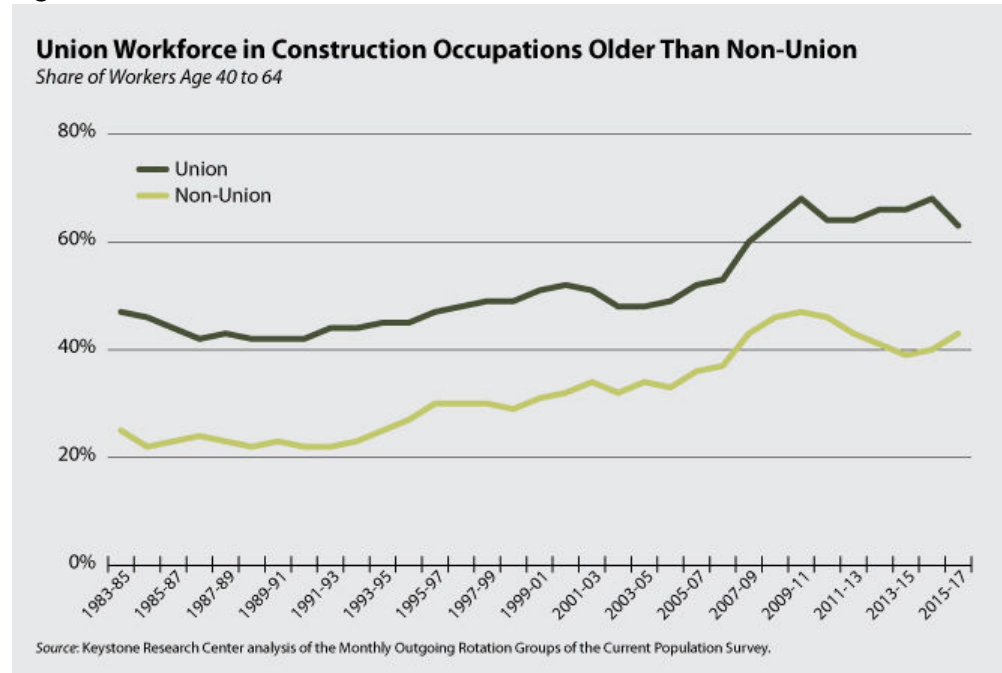
The non-union sector has found it difficult to devise an alternative to collective bargaining as a solution to the reluctance of individual employers to pay for the development of portable skills. As this report documents, the non-union sector trains relatively few apprentices in Pennsylvania. Among the small number of non-union programs that do train substantial numbers of apprentices, questions remain regarding the quality of the training. In the union sector, union members, in coordination with training directors hired by the joint fund, take much of the responsibility for ensuring quality training, in part through participation in work site mentoring. Helping new workers develop their skills upholds workers' craft identity and sustains the

competitiveness of unionized employers. In non-union programs, the experienced workers who do most mentoring have no role in governing the apprenticeship and may not see any benefit in helping new workers.

In many parts of the country, the growth of non-union market share since the early 1970s has led to recurring skill shortages in the construction industry (since non-union companies do little training). The responsibility the non-union sector bears for skill shortages is widely acknowledged in the industry. For example, the Construction Users Roundtable, which emerged in part with the goal of shrinking union presence in the industry, now recognizes the important contribution of joint apprenticeship programs to meeting construction industry skill needs.⁷

Figure 1.

Two factors make investment in construction apprenticeship training a vital issue for the industry over the next few years. First, apprenticeship training declined substantially in the last decade because of the deep industry downturn in and after the Great Recession. Second, the industry – both union and non-union – has aged steadily over the past 30 years (see Figure 1).



In the context of current and potential skill shortages, this report examines the contribution of joint apprenticeship and training

programs to meeting industry workforce needs. The report finds that joint union-management apprenticeship programs account for the lion's share of construction apprenticeship training in Pennsylvania. Most joint apprenticeship programs include the participation of one of 15 trade unions listed in Box 2.

Box 2. Building Trade Unions that Co-Manage Joint Apprenticeship Programs

Fifteen of the unions that co-manage joint building trades apprenticeship programs in Pennsylvania are listed below.

- International Union of Bricklayers and Allied Craftworkers (BAC)
- International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers, and Helpers (Boilermakers)
- United Union of Roofers, Waterproofers and Allied Workers (Roofers)
- International Brotherhood of Electrical Workers (IBEW)
- International Association of Heat and Frost Insulators and Allied Workers (Insulators)
- International Association of Bridge, Structural, Ornamental, and Reinforcing Iron Workers (Iron Workers)
- International Union of Operating Engineers (IUOE)
- Laborers' International Union of North America (LIUNA)
- The International Association of Sheet Metal, Air, Rail, and Transportation Workers (SMART)
- Operative Plasterers' and Cement Masons' International Association of the United States and Canada (OP&CMIA)
- United Association of Journeyman and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada (United Association or UA)
- International Union of Elevator Constructors (Elevators)
- International Union of Painters and Allied Trades (IUPAT)
- International Brotherhood of Teamsters (Teamsters)
- United Brotherhood of Carpenters and Joiners of America (UBC)



Box 3: Steamfitters Local 449, Pittsburgh, PA

Steamfitters fabricate, install and service piping systems in a variety of locations – high-rise apartment buildings, office buildings of all sizes, factories, public buildings, health care facilities, food warehousing and processing plants, power plants, natural coal fired plants and more. Steamfitters Local 449 was chartered back in 1913 and is affiliated with the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada.

The local union has two apprenticeship programs – the mechanical equipment service program and the building trades program. Workers train on a wide range of piping systems, including heating and air conditioning, steam, refrigeration, boilers, hydraulics, welding, medical gas, pipe fabrication, energy management, and drafting. In these five-year programs, apprentices work 10,000 hours in the field and learn from seasoned journey-workers during their training.

Just a year and a half ago, in January 2017, the Steamfitters 449 opened a new state-of-the-art 75,000 square foot training facility in Harmony, Pennsylvania. Apprentices work on-the-job most days and come in for a daylong training at the Harmony site once every two weeks. It is here that apprentices get detailed training needed on-the-job, in math, science, drafting, blueprint reading, project management, brazing, soldering, welding and other skills.

Local 449's 1700 active members work across 15 counties in Western Pennsylvania, from Erie down to Greene County and as far east as Armstrong and Clarion Counties. Apprentices can choose their career path within the industry – concentrating in detailing in a planning department, becoming a project manager, foreman, certified welder, certified rigger, certified Medical Gas Installer, even starting their own mechanical contractor business.

Local 449 currently has about 400 active apprentices and admits 60 to 80 apprentices in most years. New apprentices average about 25 years old but include some recent high school graduates and some mid-career dislocated workers. The local union also sees a lot of applicants who come out of vocational high schools and colleges, or who have a background in heating and cooling or mechanical courses of some kind.

Recruitment of young people is a critical piece of the future of the apprenticeship, especially considering 50% of the membership will retire in the next 10 years. Local 449's recruiter goes to colleges, vocational programs and career fairs across the western part of the state each week. Recruitment also happens over social media.

The Steamfitters prioritize outreach to minorities. The union partners with a number of organizations, including an Apprenticeship Readiness Program in Western Pennsylvania which brings students out to the Harmony training center on a regular basis to learn about the Steamfitters opportunity. The union also works with outreach programs to help interested candidates enhance their math skills to prepare them for the written entrance exam and interview process for entrance into the apprenticeship.

Local 449 also partners with "Intro to the Trades," a six-week training program for Pittsburgh community members run by Pittsburgh Gateways and the Builders Guild of Western Pennsylvania. The program makes sure students have the requirements needed, like a high school diploma and a driver's license, to apply for the apprenticeship. Every six or seven weeks, this program brings a new set of students to Local 449's Harmony site to do a day-long class on basic welding skills. Some of the students in these programs make it into the apprenticeship. Dale Glavin, the Director of Training, says, "We make a real effort to reach out and work with programs aimed at getting minorities into the apprenticeship program. There are certain barriers – like a lack of strong math skills and no driver's license that can be overcome. Partnering with community organizations and trying to get more minorities into the program is just the right thing to do. We can really have an impact on people's lives."

What makes this 100-year organization and its apprenticeship so successful? Dale Glavin says "the one aspect that makes our program heads and shoulders above vo-tech and vocational colleges is the fact that all of our instructors are members of our organization and have gone through the exact training that they are now teaching. They value providing the next generation with the information and training they need to keep the union and its apprenticeship strong." He also said the integrity and caring of the instructors rubs off on the students and keeps them engaged. And the benefits of the apprenticeship are vast. Once apprentices complete their program, they never again have to look for a job. Being part of Local 449 provides each member an in-house employment agency, with the union matching members with jobs over the course of their work lives.

Data and Methodology

Data in this report come primarily from official government sources.

- The Registered Apprenticeship Partners Information Data System (RAPIDS) maintained by the U.S. Department of Labor Office of Apprenticeship contains the most comprehensive information available on registered apprenticeship in Pennsylvania. This data base contains individual level data including demographic (age, race, and gender), education level, enrollment status (registered, canceled, completed), industry and occupation. RAPIDS also contains program-level data, including identifiers for single and multi-employer programs and whether a collective bargaining agreement covers the program.
- For our analysis of employment, demographic, and education trends in the Pennsylvania construction trades, we used the U.S. Census Bureau’s Current Population Survey (CPS). The CPS is a monthly household survey conducted by the Census Bureau. It is the standard source for data on economic and demographic characteristics, including but not limited to wage, employment, and education data.
- Finally, our data on projected job openings in the construction industry comes from the Pennsylvania Department of Labor and Industry.

The quantitative data presented in the text and figures below were supplemented with interviews with apprenticeship coordinators and others familiar with the four apprenticeship programs profiled in this report. In addition, as noted in the sources listed in the end notes, we drew on the research literature on apprenticeship.

A Profile of Registered Construction Apprenticeship Programs

Between 2000 and 2016 there were 315 active apprenticeship programs serving the construction industry in Pennsylvania (Figure 2). Just under one in four (72) of those programs is governed by joint committees of labor and management (i.e., a “union” or “joint” program) with the remaining three in four governed by individual employers or associations representing multiple employers (“non-union”).⁸

Although joint apprenticeship programs account for only a quarter of all apprenticeship programs, they account for 85% of all registered apprentices in the Pennsylvania (Figure 3).

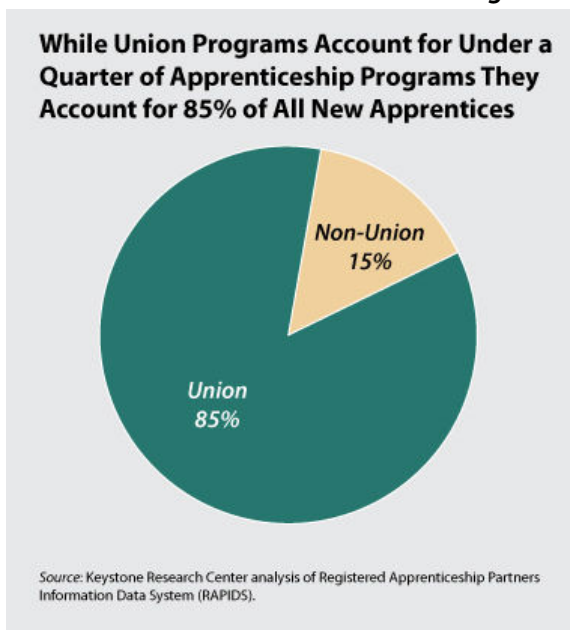


Figure 3.

Figure 2.

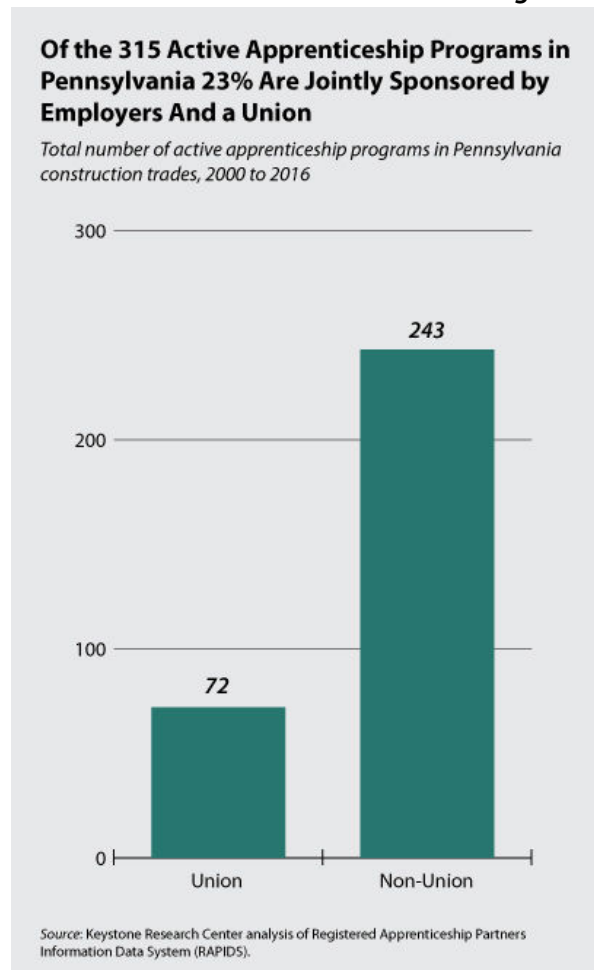
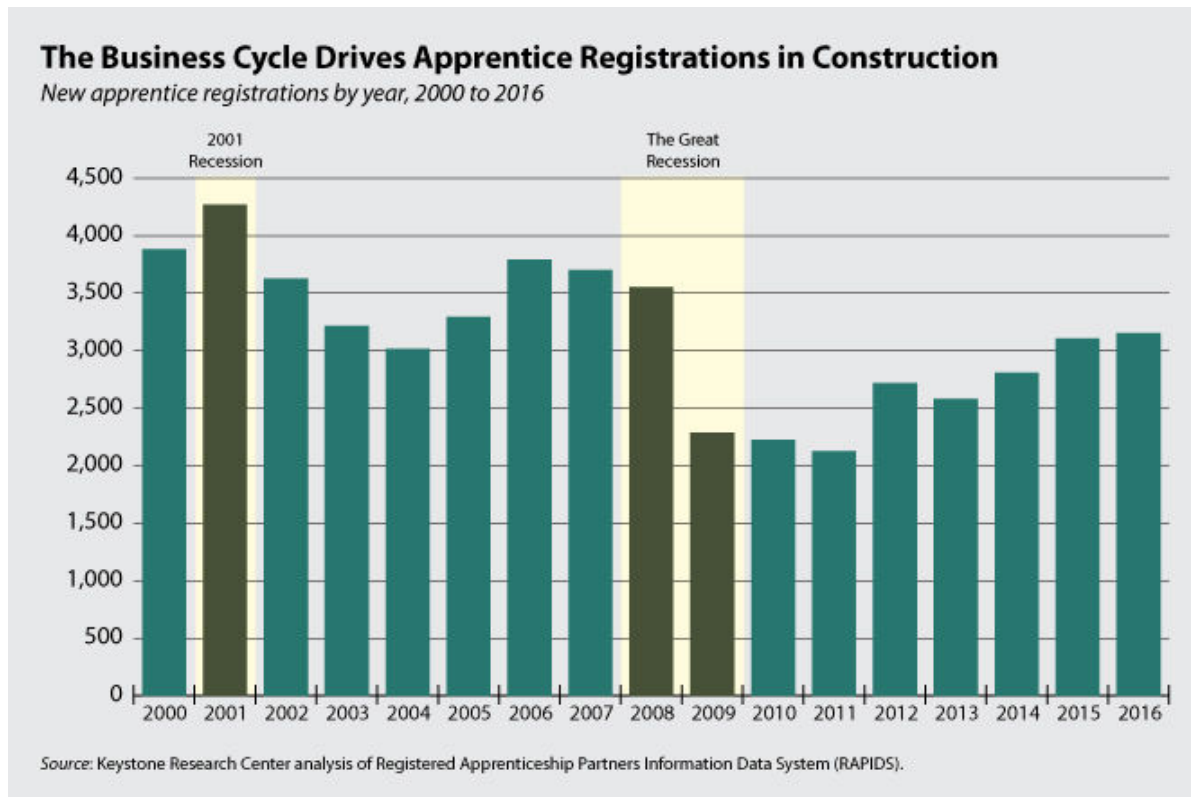




Figure 4



Employment and apprenticeship registrations in the construction industry are driven by the business cycle. New apprenticeship registrations fell 30% in the wake of the 2001 recession (2001 to 2004) and by 43% following the Great Recession (2007 to 2011). Although new apprenticeship registrations had not returned to their pre-recession peak of 3,816 by 2016, new registrations have grown by 48% since 2011. In this most recent period new apprentice registrations are up 51% in union programs and 34% in non-union programs.

Union and Non-Union Construction Apprenticeship

On average between 2000 and 2016, there were 3,020 registrations in joint construction apprenticeship programs in Pennsylvania and 539 in non-union programs. Measuring apprenticeship relative to the size of the workforce, there were 49 union apprentices per 1,000 unionized construction workers in Pennsylvania, versus 4 non-union apprentices per 1,000 non-union construction workers.⁹

Table 2.

Annual Average Blue-Collar Construction Apprenticeship Registrations and Completions in Pennsylvania 2000 to 2016			
Pennsylvania	Union	Non-Union	Union Share
Average Annual Registrations	3,020	539	85%
Average Annual Completions	1,333	194	87%
Registered Apprentices Per 1000 Blue Collar Construction Workers	49	4	

Source: Keystone Research Center analysis of data from the Current Population Survey and the Registered Apprenticeship Partners Information Data System (RAPIDS)

Women and Minorities

There are many more female and minority apprentices in the union sector than the non-union sector. In Pennsylvania from 2000 to 2016, 1,073 females and 4,883 male minorities registered in union apprenticeship programs. Over the same period, 80 females and 568 non-white non-Hispanic males registered in non-union programs.

Figure 5.

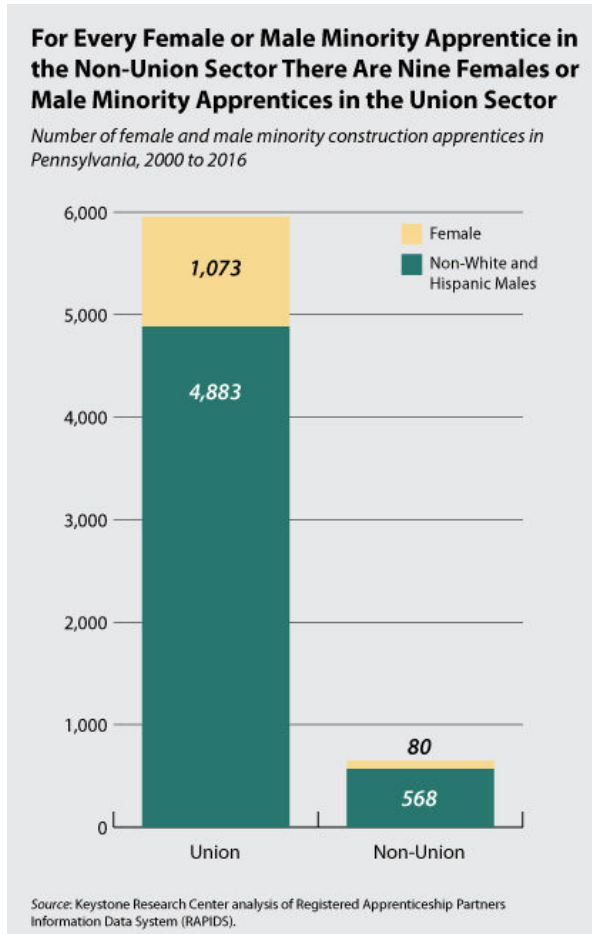
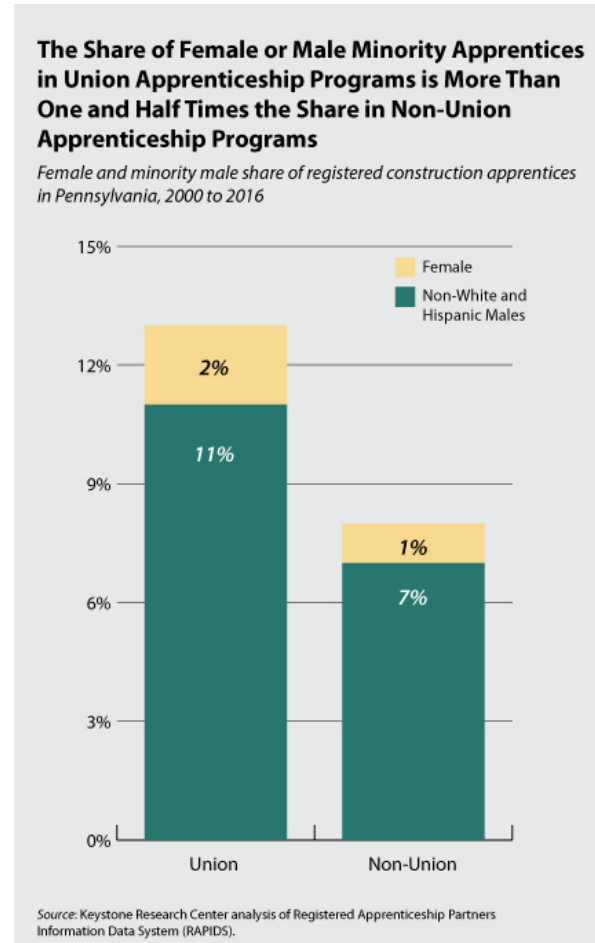


Figure 6.



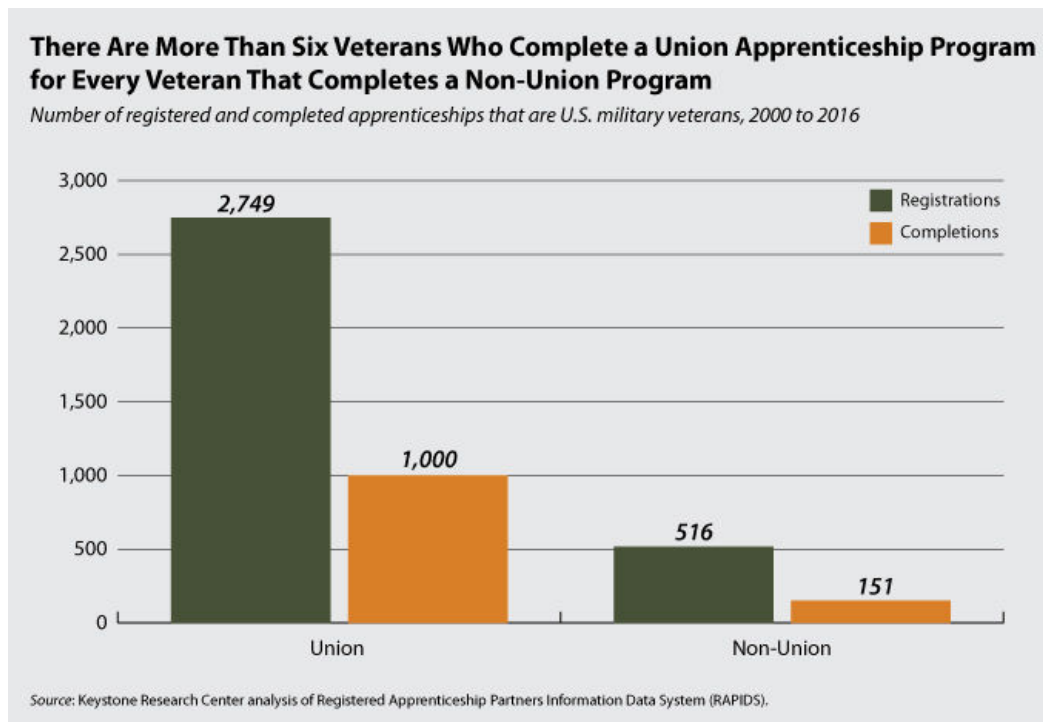
Veterans

Joint construction apprenticeship programs in Pennsylvania train a much larger number of veterans than do non-union programs.

As Figure 7 shows, joint programs enrolled over five times as many veterans as non-union ones from 2000 to 2016. The ratio of veteran apprenticeship completers in union versus non-union construction apprenticeship programs is larger: nearly seven to one.



Figure 7.



Box 4: International Brotherhood of Electrical Workers (IBEW) Local 375, Allentown, PA

Local 375 of the International Brotherhood of Electrical Workers (IBEW) was founded 104 years ago in 1914. The Local started its electrician apprenticeship 74 years ago. The program lasts five years – the first three years is identical to other IBEW apprenticeship programs across the country. In year four and five, apprentices can specialize in the area that most interests them or is in greatest local demand. In Allentown and the surrounding area, apprentices in their last two years choose from a number of options, including solar, manufacturing, automation, and voice/data/video systems. The Lehigh Valley is one of the fastest growing regions in Pennsylvania and the union has seen increasing demand for its electricians as a result.

Local 375’s Training Director, Robert Franklin, recruits new apprentices in a variety of ways – at job fairs, in high schools and at career and technical centers. He educates high schoolers and others on the building trades in general and the electricians’ apprenticeship in particular. Despite his best efforts, Mr. Franklin faces challenges related to recruitment that many other apprenticeships face when recruiting high school students. Many youth know little about the trades. In recent decades, “working with your hands has become a lost art in families.” Convincing parents is a critical step to recruitment as well. Because parents and guidance counselors’ sights have been increasingly set on college, the apprenticeship program of Local 375 sees fewer high-school graduates from career and technical education programs applying for the apprenticeship. However, the rising cost of college and Pennsylvania’s interest in expanding high-school pre-apprenticeship and other career programs aligned with apprenticeship could change that.

Apprentices work and receive on-the-job training during the day Monday through Friday and go to school for their classroom training two nights a week, from about 4:30 pm-8 pm September through May. During the five-year apprenticeship, typical apprentices will be on-the-job with at least three different contractors to learn how different companies approach the work. They may start out building schools and then perform electrical work on a manufacturing site. For each apprentice, there are several journeyworkers, which helps ensure that apprentices get the mentoring and guidance they need on the job.

Apprentices can earn college credits while taking part in the program and unlike the high cost of college, the only cost to apprentices is for books, which total about \$600/year. Apprentices begin making \$14/hour as they start their apprenticeship, with regular wage increases over the course of their program. By year five, apprentices make \$31.08/hour. Once journey-workers, most workers earn \$80,000/year as an electrician.

Completions, Entry, and Exit Wages

Apprentice program graduation – or “completion” – rates are higher in union apprenticeship programs. Of new apprentices registered from 2000 to 2012, 56% enrolled in union apprenticeship programs had completed their apprenticeship by 2016. Over this same period the completion rate in the non-union sector was 44% (Table 3). Considering female and male minorities as a group the completion rate in union programs is 41% compared to 33% in non-union programs (Table 4). (As noted at the bottom of table 3, not enough time has passed yet for apprentices enrolled in recent years to have completed. This holds down the average completion rate over the entire 2000 to 2016 period for both union and non-union apprenticeship programs.)

Table 3.

Pennsylvania Apprenticeship Completions by Registration Year and Union Status, 2000 to 2016						
<i>Year</i>	<i>Union</i>			<i>Non-Union</i>		
	<i>Completed</i>	<i>Total</i>	<i>Percent Complete</i>	<i>Completed</i>	<i>Total</i>	<i>Percent Complete</i>
2000	2047	3296	62%	196	586	33%
2001	2250	3633	62%	239	638	37%
2002	1838	3092	59%	222	537	41%
2003	1555	2632	59%	254	584	43%
2004	1474	2552	58%	195	464	42%
2005	1592	2729	58%	271	566	48%
2006	1929	3300	58%	252	495	51%
2007	1813	3186	57%	220	518	42%
2008	1660	3026	55%	255	529	48%
2009	1017	1881	54%	212	409	52%
2010	951	1851	51%	138	373	37%
2011	828	1762	47%	186	367	51%
2012	742	2375	31%	150	343	44%
2013	185	2176	9%	63	407	15%
2014	87	2437	4%	33	373	9%
2015	23	2703	1%	18	405	4%
2016	3	2666	0%	4	490	1%
2000 to 2012	19696	35315	56%	2790	6409	44%

Note: Graduation rates fall from 2012 to 2016 as not enough time has passed for all apprentices registered in those years to graduate.

Source: Keystone Research Center analysis of Registered Apprenticeship Partners Information Data System (RAPIDS)

Table 4.

Pennsylvania Apprenticeship Completions for Women and Male Minorities by Registration Year and Union Status, 2000 to 2016						
<i>Year</i>	<i>Union</i>			<i>Non-Union</i>		
	<i>Completed</i>	<i>Total</i>	<i>Percent Complete</i>	<i>Completed</i>	<i>Total</i>	<i>Percent Complete</i>
2000	187	424	44%	7	38	18%
2001	190	445	43%	18	52	35%
2002	184	419	44%	13	34	38%
2003	162	326	50%	16	42	38%
2004	166	401	41%	15	45	33%



2005	152	371	41%	15	44	34%
2006	164	394	42%	11	33	33%
2007	160	405	40%	14	40	35%
2008	159	409	39%	17	50	34%
2009	133	288	46%	9	34	26%
2010	98	250	39%	10	30	33%
2011	79	236	33%	9	27	33%
2012	64	307	21%	9	22	41%
2013	13	245	5%	6	45	13%
2014	1	272	0%	3	28	11%
2015	3	407	1%	1	34	3%
2016	0	357	0%	0	50	0%
2000 to 2012	1898	4675	41%	163	491	33%

Note: Graduation rates fall from 2012 to 2016 as not enough time has passed for all apprentices registered in those years to graduate.

Source: Keystone Research Center analysis of Registered Apprenticeship Partners Information Data System (RAPIDS)

Starting wages for union apprentices are 36% higher than for non-union apprentices. Upon completion (or “exit”), the union apprentice pay premium climbs to 60% (Figure 8 and Table 5 and 6 on the next page).

Figure 8.

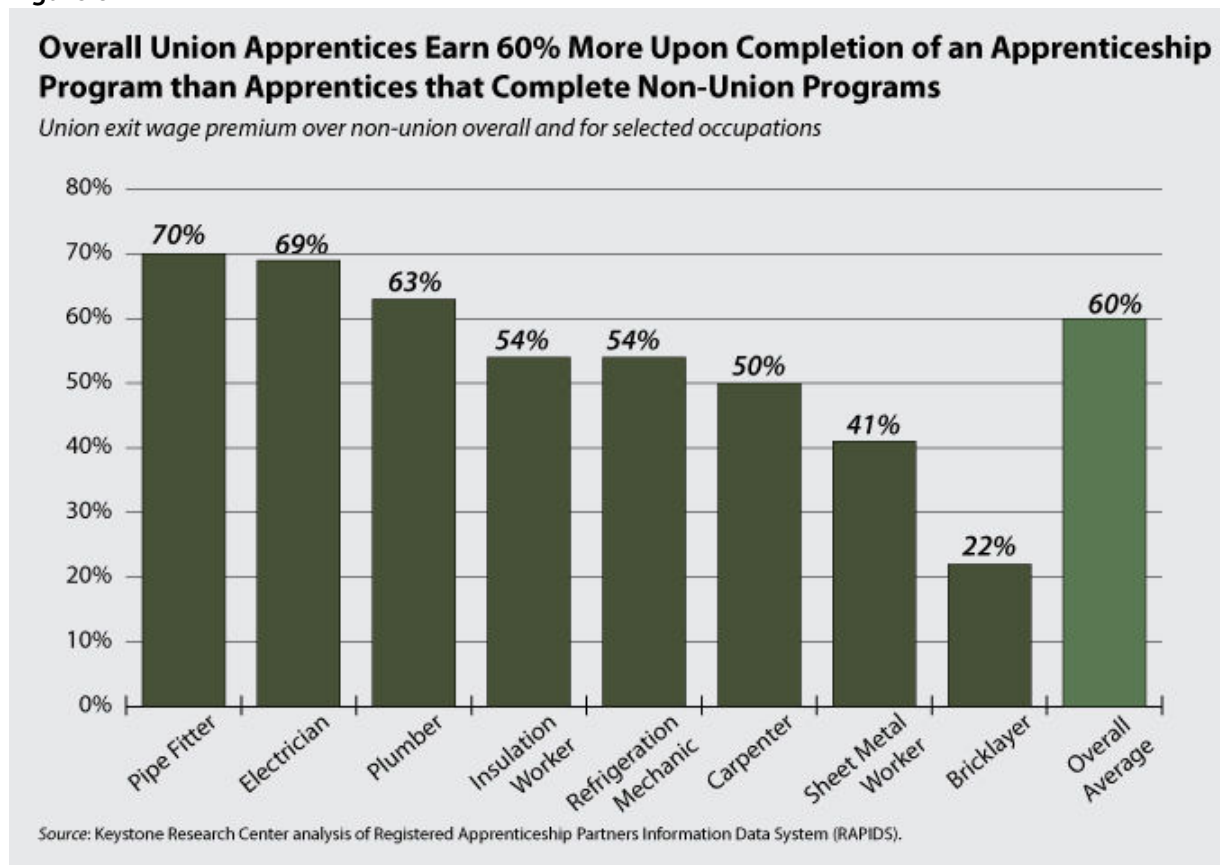


Table 5.

Pennsylvania Union Construction Apprenticeship Completers and Starting and Exit Wages (2016 \$), the Largest 20 Occupations, 2000 to 2016						
<i>Occupation</i>	<i>Number of Completers</i>	<i>Share of Total</i>	<i>Cumulative Total</i>	<i>Starting Wage</i>	<i>Exit Wage</i>	<i>Percent Change</i>
Carpenter	3764	19%	19%	\$15.93	\$26.72	68%
Electrician	3171	16%	35%	\$13.90	\$28.44	105%
Line Erector	1872	9%	44%	\$25.00	\$36.47	46%
Sheet Metal Worker	1090	5%	49%	\$16.96	\$26.96	59%
Structural Steel/Ironworker	1038	5%	55%	\$22.71	\$30.08	32%
Boilermaker I	1010	5%	60%	\$24.64	\$32.22	31%
Plumber	1006	5%	65%	\$17.62	\$29.34	67%
Pipe Fitter	947	5%	70%	\$18.34	\$33.36	82%
Bricklayer	889	4%	74%	\$16.96	\$21.57	27%
Operating Engineer	713	4%	78%	\$20.35	\$25.84	27%
Roofer	467	2%	80%	\$15.51	\$24.51	58%
Insulation Worker	455	2%	82%	\$18.14	\$30.90	70%
Painter	402	2%	84%	\$15.86	\$21.68	37%
Glazier	375	2%	86%	\$18.41	\$25.69	40%
Refrigeration Mech	359	2%	88%	\$17.53	\$29.46	68%
Construction Craft Laborer	351	2%	90%	\$13.17	\$17.54	33%
Millwright	294	1%	91%	\$18.86	\$28.35	50%
Floor Layer	223	1%	92%	\$17.53	\$28.53	63%
Cement Mason	212	1%	93%	\$17.56	\$24.16	38%
Taper	190	1%	94%	\$15.65	\$22.67	45%
Total	19994			\$18.04	\$28.36	57%

Source: Keystone Research Center analysis of Registered Apprenticeship Partners Information Data System (RAPIDS)

Table 6.

Pennsylvania Non-Union Apprenticeship Completers and Starting and Exit Wages (2016 \$), the Largest 10 Occupations, 2000 to 2016						
<i>Occupation</i>	<i>Number of Completers</i>	<i>Share of Total</i>	<i>Cumulative Total</i>	<i>Starting Wage</i>	<i>Exit Wage</i>	<i>Percent Change</i>
Electrician	1543	53%	53%	\$12.61	\$16.78	33%
Plumber	460	16%	69%	\$13.39	\$18.00	34%
Carpenter	296	10%	79%	\$13.56	\$17.82	31%
Sheet Metal Worker	149	5%	84%	\$14.46	\$19.15	32%
Heating & Air-Cond Inst-Serv	101	3%	88%	\$12.67	\$18.58	47%
Refrigeration Mech	82	3%	90%	\$14.47	\$19.14	32%
Pipe Fitter	61	2%	93%	\$15.21	\$19.59	29%
Bricklayer	31	1%	94%	\$16.44	\$17.63	7%
Elevator Constructor Mechanic	28	1%	95%	\$18.38	\$24.04	31%
Insulation Worker	27	1%	96%	\$19.13	\$20.05	5%
Total	2908			\$13.28	\$17.68	33%

Source: Keystone Research Center analysis of Registered Apprenticeship Partners Information Data System (RAPIDS)



Completions by Occupation

Figures 9 and 10 show the breakdown of construction apprenticeship completers by the major construction occupations. Nearly half of union construction trade apprenticeship completers are in three occupations: carpenter, electrician, and line erector. Of non-union programs, 53% are electricians, followed by plumbers at 16% and carpenters at 11%.

Figure 9.

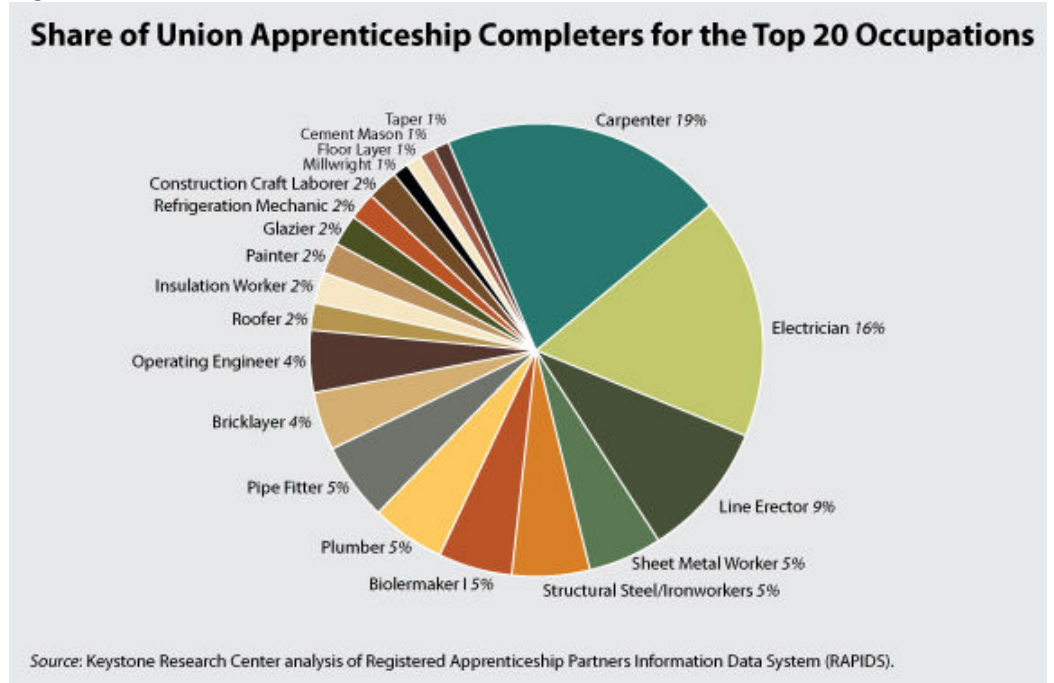
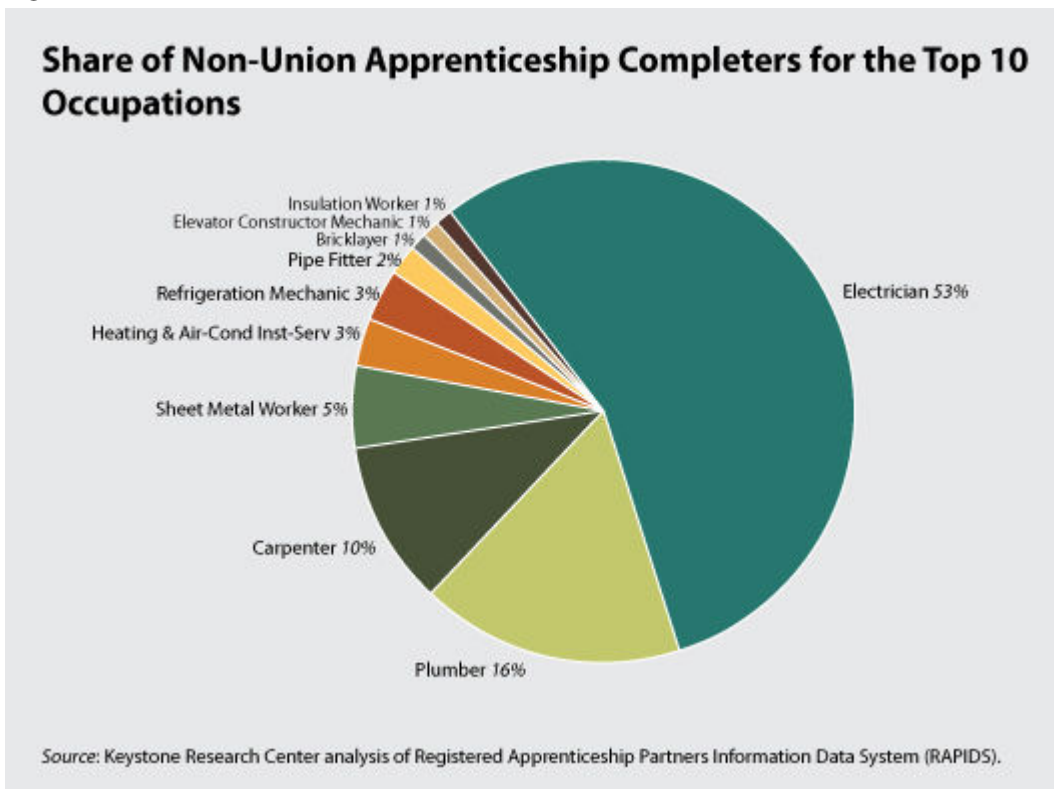


Figure 10.



Recommendations

Despite higher recent enrollment, especially in union programs, the roughly 3,000 individuals completing Pennsylvania construction trade apprenticeships in recent years remains low compared to the annual number of job openings projected in construction occupations (5,406).¹⁰ This underscores the importance of expanding enrollment in construction apprenticeship programs as older workers retire at high rates. Since union apprenticeship programs have outperformed non-union ones on every measure of program success, bolstering union apprenticeship programs appears the most promising route to meeting future construction industry skill needs. This report highlights three ways to bolster construction apprenticeships.

1. Construction apprenticeships should continue to make it easier to acquire a college degree as well as a journey-worker card; and to market themselves as the cheapest route to a college degree and to a good-paying career.

A growing share of individuals employed as unionized construction trades in Pennsylvania have a two- or a four-year college degree. This reflects the articulation agreements many joint apprenticeships now have with post-secondary educational institutions, as well as the fact that a few apprenticeships have gained accreditation themselves as a post-secondary institution (such as the Finishing Trades Institute profiled in Box 1). A growing number of joint programs lead to a two-year Associate Degree by the time apprentices complete their program. Many other joint programs provide for significant college credit, and the opportunity to gain the additional credits needed for an Associate Degree after apprentices become journey-workers.

The college affordability crisis, and the high debt levels of college graduates in Pennsylvania, make the apprenticeship “earn as you learn” and free tuition model even more attractive.¹¹ In the past, the college route siphoned off a traditional source of young construction workers – the off-spring of prior generations of trades workers. Making apprenticeship – in construction and beyond – the cheapest route to a low-cost college education, and marketing the benefits of that to guidance counselors, parents, and students, should help replenish the supply of highly qualified new apprentices.

2. Ensure that high-quality unionized apprenticeships qualify for state subsidies as part of any expansion of state support for post-secondary education, such as “The Pennsylvania Promise.”

In response to the college affordability crisis, a growing number of states have free college tuition programs or proposals, sometimes called “college promise” programs.¹² In Pennsylvania itself, Keystone Research Center earlier this year advanced a proposal for free college tuition called the Pennsylvania Promise.¹³ We recommended that any future Pennsylvania free college proposal incorporate support for students to enroll in high-quality apprenticeships articulated with college credit and degrees – such as joint unionized apprenticeship programs. While these are already free to the student, state support would make it possible to cover remaining out of pocket costs (e.g., for books and tools), increasing access for low-income students. State direct support to joint apprenticeship programs to cover the costs of making tuition free would also enable apprenticeship programs to grow to meet employer demand and to increase economic opportunity. Such expansion could be particularly valuable in rural parts of Pennsylvania that lack brick-and-mortar community colleges.

3. Strengthen peer learning on integration with post-secondary education, increasing diversity, and pipeline programs into apprenticeship from school, community college, and community organizations.

Joint construction apprenticeship programs are embedded within regional, state, and national networks that promote peer learning within and across apprenticeship programs. Opportunities exist in the next few years to build on existing peer learning including in the following three areas.



Integration with higher education – assessment, pedagogy, and curriculum: The formal process through which the Finishing Trades Institute (FTI) based in Philadelphia became a post-secondary education led to significant upgrades in quality, including in its assessment practices (evaluating what students are learning), curriculum, and pedagogy (Box 1). The lessons learned by FTI and other leading apprenticeship programs that have deeply integrated with higher education should be spread more widely.

Best diversity practices. Joint apprenticeship programs in Pennsylvania have made unrecognized improvements in diversity over the past two decades. Examples include the Pittsburgh “Intro to the Trades” program described in Box 3; “economic opportunity” plans on Philadelphia construction projects that set – and usually meet – ambitious goals for minority workforce and apprentice shares; and Reading Pennsylvania “Youth Build” and high school pre-apprenticeship programs. Today’s high construction demand and the aging of the unionized workforce provide a good context for additional progress on diversity as well as for spreading best practices in this area across apprenticeship programs and regions within Pennsylvania.

Pipelines into apprenticeship. The Wolf Administration in Pennsylvania is currently seeking to strengthen high-school career and technical education (CTE) and pre-apprenticeship programs, including by linking them better to actual apprenticeship and to employers with good-paying jobs. In construction, these efforts should focus on unionized apprenticeship programs. Increased investment in pipeline programs should be accompanied by identification and spread of best practices that increase the return on investment in such programs.

Box 5: The Keystone Mountain Lakes Regional Council of Carpenters, United Brotherhood of Carpenters, Lebanon Training Center

The Keystone Mountain Lakes Regional Council of Carpenters is a part of the United Brotherhood of Carpenters, the largest building-trade union in North America, with more than a half a million members in the construction and wood products industries. The Keystone Mountain Lakes Regional Council of Carpenters represents carpenters throughout Pennsylvania, West Virginia, Virginia, DC, North Carolina and Maryland. Aside from collective bargaining, managing the health and medical benefits packages for its members and facilitating project work with contractors and union members, the Council helps oversee a joint apprenticeship and incumbent worker training fund. The training that serves the PA I-81 corridor operates out of the Lebanon Training Center, about 30 miles east and north of Harrisburg.

The Lebanon Training Center apprenticeships prepare workers for good-paying carpentry careers in a variety of industries – for example, as carpenters in commercial construction, on scaffolding projects, or in factories as millwrights or setting up assembly lines. The apprenticeship program combines hands-on, on-the-job learning with classroom training. Apprentices learn primarily from the journey-worker they work with on the job. They also complete four weeks of classroom training each year (1 week per quarter) at the Lebanon Training Center.

Apprenticeship intake has nearly tripled since coming out of the Great Recession due to increased demand and the aging of the current carpentry workforce – many journeyman will retire in the coming years and new apprentices must fill their shoes. The program currently has about 170 active apprentices, as well as journey-worker seeking additional training to upgrade their skills. New apprentices may start the program in January, June or September.

Apprenticeship applicants range from teenagers just graduating high school to individuals changing careers in their 50s. Recruitment, especially of younger people, can be difficult – although candidates of all ages find attractive the opportunity to earn money while they learn, not take on any debt, gain college credits and enter a good paying, family-sustaining career. The barrier, often, is parents who push college over skills-based training post-high school. To recruit new apprentices, the Keystone Mountain and Lakes Training Coordinator connects with career and technical education programs in the region, tours (and gives tours to) high schools, and participates in career fairs.

One secret to the success of the Carpenters’ apprenticeship is the professional and standardized training that all apprentices around the country receive, regardless of where their training center is. The training apprentices receive at the Lebanon Training Center is the same as Carpenters’ training in New York, Atlanta, San Diego and other places across the United States. As a result of the portability of their training and their skills, if apprentices or journeymen move, they can access construction jobs in other regions through their United Brotherhood of Carpenters local unions.



To capitalize on the peer learning opportunities in the three areas above – and in other areas – the Pennsylvania Apprenticeship and Training Office (ATO) could commission the development of a five-year “capacity building plan” in partnership with the Pennsylvania Apprenticeship Coordinators Association (PACA). As input to the development of this capacity building plan, the ATO and PACA could convene a construction apprenticeship academy that showcases best practices across the state and gets input of apprenticeship programs on opportunities for peer learning.

* * * * *

Joint construction apprenticeship is sometimes referred to as the “best kept secret” within Pennsylvania’s education and training infrastructure. At a time when apprenticeship in general is garnering well-deserved – in fact, overdue – support from bipartisan state and national policymakers, joint construction apprenticeship should no longer remain a secret. As this report documents, joint construction apprenticeship is the jewel of existing apprenticeship in Pennsylvania. Relying almost entirely on private sector resources, joint construction apprenticeships train thousands of people a year for good-paying jobs, including over 90% of the women and minorities that have completed construction apprenticeships in Pennsylvania since the year 2000. This report aims to educate policymakers, educators, career counselors, students, parents, and the public about joint construction apprenticeship in Pennsylvania. This highly successful approach to training a skilled trades workforce generates significant benefits for employers, individuals, and the state’s economy. Any future public investment in construction skills training in Pennsylvania should build on the strong foundation laid by joint apprenticeship programs.



End Notes

1 Annual occupational projections in Pennsylvania for 2014-24 are available from the Center for Workforce Information & Analysis of the Pennsylvania Department of Labor & Industry at <http://www.workstats.dli.pa.gov/Products/LongTermOccupationalProjections/Pages/default.aspx>

2 In many recent writings, Robert Lerman of the Urban Institute makes the case for expanding apprenticeship and summarizes its expansion in the United Kingdom. See, for example, “Restoring Apprenticeship by Expanding Apprenticeship,” in Irwin Kirsch and Henry Braun, eds., *The Dynamics of Opportunity in America* (Princeton, NJ: Educational Testing Service and Springer International Publishing AG: Switzerland, 2016); accessible for free online at <https://link.springer.com/book/10.1007%2F978-3-319-25991-8>. See also Robert Lerman, “Can the United States Expand Apprenticeship? Lessons from Experience,” IZA Policy Paper #46, September 2012; online at <http://ftp.iza.org/pp46.pdf>. And Robert Lerman, “Proposal 7: Expanding Apprenticeship Opportunities in the United States,” The Hamilton Project-Brookings, March 2014; online at http://209.240.81.218/files/downloads_and_links/expand_apprenticeship_opportunities_united_states_lerman.pdf

3 Susan Helper et al., “The Benefits and Costs of Apprenticeship: A Business Perspective,” Case Western Reserve University and the U.S. Department of Commerce, 2016; online at <https://www.esa.gov/sites/default/files/the-benefits-and-costs-of-apprenticeships-a-business-perspective.pdf>

4 Debbie Reed et al., “An Effective Assessment and Cost-Benefit Analysis of Registered Apprenticeship in 10 states,” Mathematica Policy Research, July 2012.

5 https://doleta.gov/oa/data_statistics.cfm

6 Governor Tom Wolf, *2018-19 Governor’s Executive Budget*, p. A1-14; online at <http://www.budget.pa.gov>

7 See the Construction Users Roundtable, “Confronting the Skilled Construction Workforce Shortage,” Cincinnati, Ohio, WP-401, updated June 2004; online at <https://kcuc.org/wp-content/uploads/2013/11/Confronting-the-Skilled-Construction-Workforce-Shortage.pdf>

8 Most (95%) non-union construction apprenticeship programs in this period were governed by a single employer. However, a slight majority (55%) of new non-union construction apprentice registrations were in programs serving multiple employers.

9 We estimate average annual blue-collar construction employment in Pennsylvania to equal 213,000 by restricting our analysis to workers in the following occupational groups: construction and extraction; installation, maintenance, and repair; and production, transportation, and material moving occupations. If we consider all construction employment we estimate an annual average employment in construction of 283,000.

10 Annual occupational projections in Pennsylvania for 2014-24 are available from the Center for Workforce Information & Analysis of the Pennsylvania Department of Labor & Industry at <http://www.workstats.dli.pa.gov/Products/LongTermOccupationalProjections/Pages/default.aspx>

11 For Pennsylvania data on college affordability and student debt, see Diana Polson, Stephen Herzenberg, and Mark Price, “At Students’ Expense: Rising Costs Threaten Public Universities’ Role in Upward Mobility,” Keystone Research Center and Pennsylvania Budget and Policy Center, June 2017; online at http://www.pennbpc.org/sites/default/files/20170608_RisingCostsPaper.pdf

12 Jen Mishory, “The Future of Statewide College Promise Programs,” The Century Foundation, March 6, 2018; online at <https://tcf.org/content/report/future-statewide-college-promise-programs/>

13 Mark Price, Stephen Herzenberg, and Diana Polson, “The Pennsylvania Promise: Making College Affordable and Securing Pennsylvania’s Economic Future,” Keystone Research Center and Pennsylvania Budget and Policy Center, January 2018; online at https://www.pennbpc.org/sites/default/files/KRC_PBPC_PAPromise_Final.pdf

