



Rebuilding California: The Golden State's Housing Workforce Reckoning

By **SCOTT LITTLEHALE**

JANUARY 2019

“...[W]hen commercial and heavy construction are active in the context of a high employment economy, shortages are likely to be particularly severe for home builders.”

— DUNLOP AND MILLS, THE PRESIDENT’S COMMITTEE ON URBAN HOUSING, 1968

“It’s not so simple as to say, ‘Oh, we have a shortage of construction workers.’ We have a shortage of construction workers at the price people want to pay. The simple way to solve shortages is to pay people more.”

— GARY PAINTER, UNIVERSITY OF SOUTHERN CALIFORNIA, 2018

About the Author

SCOTT LITTLEHALE received his Bachelor of Arts degree with honors from Stanford University and passed Ph.D. candidacy qualifying examinations at the Department of Political Science at the University of North Carolina at Chapel Hill. Littlehale has researched the U.S. political economy and labor-related U.S. public policy since 1993, with a focus on development and construction since 2003. He is the author of “Revisiting the Costs of Developing New Subsidized Housing: The Relative Import of Construction Wage Standards and Nonprofit Development,” a statistical analysis of drivers of costs of California low-income housing developments that was published in the Berkeley Planning Journal. Littlehale has given numerous research presentations at national academic and professional conferences, including those convened by the Labor and Employment Research Association, the National Alliance for Fair Contracting, the Economic Analysis and Research Network, and a Living Wage Symposium convened by the Robert M. La Follette Institute of Public Affairs at the University of Wisconsin-Madison. He served on the technical committee of CASA — The Committee to House the Bay Area — between 2017 and 2018. A California native, Littlehale lives in a house that was built in 1942 for shipbuilding workers in the city of Richmond, CA.

About the Report

“REBUILDING CALIFORNIA: THE GOLDEN STATE’S HOUSING WORKFORCE RECKONING by Scott Littlehale is an excellent analysis of the issues facing the state’s housing industry with respect to its workforce. Littlehale develops strong arguments that following its current trajectory, there will not be sufficient craft workers available to the industry in the near future. The paper provides a strong argument that developing an adequate workforce will require restoration of middle class wages and working conditions and training programs, and that these depend on strengthening the application of labor and employment law in residential housing and of construction unions. The study is remarkable in the depth of its documentation and deft use of available data. It is a terrific example of developing solidly based policy arguments.”

JANUARY 3, 2018

DR. DALE BELMAN, PHD

PRESIDENT, INSTITUTE FOR CONSTRUCTION ECONOMIC RESEARCH
PROFESSOR, SCHOOL OF HUMAN RESOURCES AND LABOR RELATIONS,
MICHIGAN STATE UNIVERSITY

REBUILDING CALIFORNIA: The Golden State's Housing Workforce Reckoning



EXECUTIVE SUMMARY, JANUARY 2019

To address California's historic housing affordability crisis, policymakers increasingly agree that housing production must increase dramatically and quickly.

However, to produce enough new housing to keep the crisis from getting worse, California needs to recruit at least 100,000 new residential construction workers. And to produce enough new housing to start making housing more affordable — production levels not seen since the 1970s and 1980s — California needs at least 200,000 new construction workers.

This study examines the underlying industry and workforce dynamics standing in the way of meeting these ambitious goals, while outlining cooperative strategies that could boost the labor market competitiveness and productive capacity of California's housing construction sector.

The construction labor market is tight and job vacancies are rising

- California non-supervisory construction workers' unemployment rate was lower in 2017 than it was in 2006, when statewide construction employment hit a historic peak.
- Since 2011, publicly posted vacancies for Construction Supervisors and the four trades central to housing production (carpentry, laborers, electricians, and plumbers) have jumped as much as 75%.

Housing industry productivity lags behind public works construction and non-construction sectors

- Real Gross State Product per job for construction declined 18% between 1998 and 2017.
- According to the BLS, nationwide construction sector output per unit of labor declined by almost 13% between 1987-2016, while productivity in other business sectors increased by 31%.
- Construction industry-wide, the specialty trades that supply labor for residential builders had the lowest productivity and the most negative productivity growth between 2002 and 2012.
- The prefabricated manufacturing industry shed 40% of its workforce between 2005 and 2016, and large scale adoption of standardization technologies is uncertain.
- For more than a decade, residential contractors have sought to meet rising demand for housing with increased employment instead of increased productivity.

Wages and compensation in the housing construction industry are not competitive

- Adjusted for cost of living, median California construction trades pay ranks 46th in the United States.
- On average, residential construction workers earn 24% less per year than other jobs; less than half have health insurance coverage at work.
- On average, residential construction workers earn 33% less per year than non-residential construction workers. The gap has widened since 1990.
- Nonresidential subcontractors' contributions for fringe benefits are more than triple those made by residential contractors.
- When California housing production peaked during the 1970s and 1980s, average hourly pay rates for most residential and non-residential construction workers were practically equal.
- The share of construction workers facing some form of wage theft is up 400% since 1972.

Construction jobs are physically demanding and economically risky

- On average, construction jobs require considerably longer commutes and more flexibility in work hours than other jobs.
- Among all major industrial sectors, construction jobs have the third highest occupational fatal injury rate and a lifetime risk of a lost-time injury of 78%.
- Construction work is seasonal and vulnerable to economic downturns. Workers face twice the earnings volatility of other jobs.
- More than 365,000 California construction trades jobs were eliminated during the last recession (2006-2011). Construction trades employment in 2017 remained 25% lower than 2006 levels.

The housing industry is older and its traditional labor pools are shrinking:

- The construction labor force is getting older. Workers under the age of 35 went from being nearly 60% of all male construction employees in 2016 to being only 36% in 2017.
- While 6% of Americans work in construction, a 2016 NAHB survey found only 3% of Americans aged 18-25 planned to pursue a career in the construction trades.
- California's stock of male workers with a high school degree or less has shrunk since 2005.
- Net flows of unauthorized immigrants turned negative in 2007, and there are 350,000 fewer young, non-naturalized immigrants in California's labor force in 2016 vs. 2005.
- Housing construction wages are not competitive enough to lure young workers away from other states or industries.

The housing industry has not invested in apprenticeship training

- Apprenticeship training attaches workers to the industry and increases their lifetime earnings.
- Construction ranks with agriculture and the retail sectors as having the worst rates of skills training of all U.S. industry sectors.
- While prevailing wages and collective bargaining agreements include apprenticeship funding mechanisms, these investments are "voluntary" in the largely non-unionized residential sector.
- Joint Labor-Management programs funded by prevailing wage and collective bargaining agreements train 10 times more workers than voluntary "Employer Only" programs.
- Data shows that career technology education, Job Corps, and government initiatives are neither scalable nor sufficient to meet the industry's needs.

Prevailing wage and collective bargaining boost labor market competitiveness and productivity

- The housing industry currently lacks the wage competitiveness and career training pipeline needed to offset the physical and economic risks of construction. This is hindering its ability to attract and retain the workers needed to increase production of new units.
- Prevailing Wage standards and collective bargaining agreements are consistently associated with higher wages, increased apprenticeship enrollment, more production efficiency, and fewer workplace safety problems.
- Most peer reviewed studies have concluded prevailing wage has no significant effect on overall project costs.

Housing builders' reservoir of low-wage, less-skilled labor is not refilling itself. Background regulations that promote labor-management cooperation around the vital elements of skilled construction workforce development can play a vital role in restoring California residential building to the production engine that it once was.

Table of Contents

1	Overview	1
2	Building Trades Labor: Less slack, more search, flat wages	6
3	Young Americans are skeptical about the construction trades	8
4	Building trades jobs' unattractive requirements and risks	10
	4.1 REQUIREMENTS: PREPARATION, MOBILITY & SCHEDULE FLEXIBILITY	10
	4.2 PHYSICAL REQUIREMENTS, ENVIRONMENTAL CONDITIONS, AND COSTS TO HEALTH	11
	4.3 CONSTRUCTION CAREERS ARE ECONOMICALLY RISKY	12
5	Housing Trades' compensation is decreasingly competitive	15
	5.1 THE BUILDING TRADES' "COMPENSATING DIFFERENTIAL" HAS SHRUNK	15
	5.2 HOUSING CONSTRUCTION COMPENSATION IS BELOW AVERAGE	17
	5.3 CALIFORNIA'S HOUSING COMPENSATION GAP HAS INCREASED, NOT SHRUNK	19
6	Failure to adequately invest in craft skills training	22
7	Construction productivity lags behind the rest of the economy	27
8	Housing's traditional labor pools are shrinking	30
	8.1 CALIFORNIA POPULATION GROWTH	31
	8.2 YOUNG WORKERS FROM OTHER SECTORS	31
	8.3 YOUNG IMMIGRANT WORKERS	32
	8.4 WORKERS FROM OTHER STATES	34
9	Recruiting, training & retaining productive labor	37
	9.1 CONSTRUCTION TRADES COLLECTIVE BARGAINING	37
	9.2 PUBLIC WORKS PREVAILING WAGE AND APPRENTICESHIP STANDARDS	38
	9.3 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING, AND RISKS OF INJURY AND DEATH	39
	9.4 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING AND TRAINING	40
	9.5 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING AND "COMPENSATING DIFFERENTIALS"	40
	9.6 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING AND GREATER EFFICIENCY OF PRODUCTION	41
	9.7 PREVAILING WAGE LAWS AND HOUSING PROJECT COSTS	43
10	Construction Labor standards versus free-rider dynamics	44

1

OVERVIEW

California has under-produced new housing to meet the growth of jobs and households in the Golden State. The shortfall has exacerbated housing cost burdens for California residents. Recognizing that housing costs have depressed living standards, California policy makers increasingly agree with academic and professional analysts that production must increase dramatically and quickly to avoid even greater gaps between typical California incomes and housing costs.

To simply tread water and meet projected jobs and household growth, California must supply over 210,000 new units of housing per year over the next seven consecutive years, according to the California's Housing and Community Development Department (HCD). That rate is more than double the average annual number of housing units permitted in California between 2013 and 2017.

Production of epic proportions and duration will be necessary to actually alleviate California's affordability crisis. California needs to supply 3.4 – 3.5 million new units of housing – more than 15 percent of California's existing housing stock – in order to reduce the costs that burden over forty percent of California households.¹ Production on this scale did occur over the two decades of the 1970s and 1980s, when California permitted the construction of about 3.9 million new units of housing. To accomplish this on the timeframe proposed by Governor-elect Newsom, builders would have to develop and deliver 500,000 units per year between 2018 and 2025.²

Construction of 100,000 units of new housing requires roughly 90,000 – 100,000 building trades workers.³ To meet HCD's goal of not losing additional ground, the construction workforce for new residential building needs to nearly double. But California housing contractors would need to attract, train and retain well over 200,000 additional workers to meet an accelerated production timetable.

More than doubling the housing production workforce is a daunting challenge under current conditions, which include near record-low unemployment. Housing market analysts started as early as 2013 to warn that increasing percentages of contractors were finding it difficult to recruit workers to meet demand for residential construction, and that labor shortages lead to delays in housing starts, prolong the number of months of construction, and raise the prices of finished houses. Those reports highlight particularly high shortages of carpentry subcontractors, who

To simply tread water and meet projected jobs and household growth, California must supply over 210,000 new units of housing per year over the next seven consecutive years

are the backbone of housing construction.⁴

There is little reason to expect success in doubling recruitment of workers if home builders persist in adhering to laissez faire workforce strategies and economy-wide unemployment remains low. This study examines the factors that have brought the housing industry to this point.

HOMEBUILDING “BUSINESS AS USUAL” EXPLAINS A NEGATIVE WORKFORCE GROWTH OUTLOOK

- Construction employers require workers to accept extraordinary working conditions that narrow the pool of workers willing and able to fill job openings;
- Housing construction work is subject to extreme business cycles and volatile earnings, which is unattractive to skilled workers as well as to heads of families.
- Compensation for housing construction jobs is less competitive than work that poses equal or less risk to worker health and welfare and is not structured to attach workers more permanently to the industry.
- Firms in the construction sector — and housing builders and residential specialty subcontractors in particular — under-invest in formal workforce development.
- The construction sector — and housing construction in particular — has been a laggard in terms of productivity growth.

CALIFORNIA LABOR SUPPLY DYNAMICS HAVE CHANGED

Labor supply dynamics that had favored housing builders when they faced surges in demand came to a halt with the Great Recession of the late 2000s. Over the 20 year period between 1970 and 1989 — when California sustained housing production that averaged over 200,000 units per year — the state’s labor force grew by almost 80%, or a compound annual rate of 3.1 percent. Though overall labor force growth rates slowed between the 1990s and 2005, the population of foreign-born immigrants to California doubled and housing contractors drew heavily from this well of less skilled — but highly motivated — workers. Since the peak of California construction employment in 2006, however, the number of younger California’s males in the labor force has contracted, and inflows of less-skilled immigrants from Mexico have slowed.

Shallower pools of young and newly arrived labor makes attracting, training and retaining workers from other sources essential to the housing industry.

The most obvious ways to increase the size and productive capacity of the workforce are the inverse of the traits listed above that have dogged housing construction:

- Smooth out housing production cycles over the seasons and across the years;
- Improve the working conditions under which housing trades workers labor relative to other occupations;
- Attach skilled workers to the industry through fringe benefit plans that are portable from contractor to contractor.
- Invest in apprentice and skills-upgrade training;
- Increase the efficiency with which land, capital and labor are combined in order to increase the output of finished housing relative to total cost inputs;
- Attract more skilled workers with increased pay

HOUSING CONSTRUCTION WORKFORCE DEVELOPMENT IS A COLLECTIVE ACTION PROBLEM

Investments in recruitment, training, and in retention-oriented compensation plans can only come from workers, housing project budgets, or taxpayers. In an environment of volatile demand and cut-throat competitiveness, “the long-term costs of maintaining the health and skills of the [construction] labor force are put off or never paid at all.”⁵

In an environment of volatile demand and cut-throat competitiveness, “The long-term costs of maintaining the health and skills of the [construction] labor force are put off or never paid at all.”

Major players in the construction industry have long recognized the risks of under-investment in workers’ skills, and have called for project owners and contractors to commit resources to train and retain a quality workforce. The fact that reports appear every business cycle that decry underinvestment by contractors in workforce development highlights the fact that employers’ voluntary coordination efforts to meet these challenges have been inadequate or unsuccessful.

The temptation to gain competitive advantage or increase profit margins during good times of unpredictable duration by not making long-run investments in training and fringe benefits overwhelms the potential rewards of cooperation. Until the rules of housing production are revised, the record of residential construction contractors voluntarily implementing any of the above strategies will continue to fall short.

PUBLIC INTERVENTION IS NECESSARY

Prevailing wage laws that apply to contracts for construction with state and local government agencies address the collective action challenge for recruitment, training, and retention for the workforce that builds public infrastructure.* The laws buttress a nearly century-old workforce development innovation that was generated through private collective bargaining: the “joint apprenticeship committee.”⁷

Building trades unions and employers who are party to craft-specific collective bargaining agreements jointly administer training benefit plans that provide both classroom and on-the-job training to aspiring journeyman across all skilled construction crafts. Industry coordination has been extended through collective bargaining to the creation of multi-employer health care and retirement fringe benefit plans. Taken together, these plans, funded out of the construction worker labor compensation package, promote recruitment, training, and “attachment” of skilled workers to the industry, reducing turnover, and thereby increasing workforce productivity.⁸

Public works’ labor standards apply to a significant percentage of construction work – roughly \$1 out of every \$5 spent statewide on construction – but the standards are largely relegated to nonresidential construction.⁹ Collective bargaining agreements influence a significant percentage of privately owned nonresidential construction projects in California.

Residential building is largely divorced from prevailing wage and/or collectively bargained labor standards. In fact, the residential construction sub-sector has become a major center of “underground” economic activity, including wage theft, tax fraud, and the shifting of costs onto taxpayers.¹⁰

Transitioning housing builders from a “low road” workforce strategy to the “high road” of a better compensated, more stable and productive workforce will entail private sector adjustments and public sector investments in counter-cyclical finance for housing construction during private sector building recessions. Evidence from the realm of public works construction indicates that owners and contractors adjust to the introduction of prevailing wage laws within a relatively short period of time.¹¹

The State of California needs a plan for bridging the period of transition. The experience of three decades has demonstrated that residential developers will not commit to even transitory costs voluntarily and unilaterally. Absent a clear system of incentives for workers, contractors, and private

Additional state policies to enforce wage, workers compensation insurance, and tax laws would help to disincentivize continued residential construction dependence on “underground economy” practices.

*The law sets uniform standards and ensures that a portion of pay for construction workers on public works projects is withheld and allocated to building trades training programs. The wage standards also provide funds sufficient for health and retirement benefits, which reward workers who attach themselves to the construction industry over extended periods of time.

developers, it is practically assured that California will fall far short of new housing production needs.

It is beyond the scope of this study to flesh out specific terms of a package of incentives and disincentives. Research on the impacts of government regulation of land use, density, parking, development impact fees, building code provisions is extensive and ongoing, and can assist policy makers in their efforts to design a package of reforms.¹²

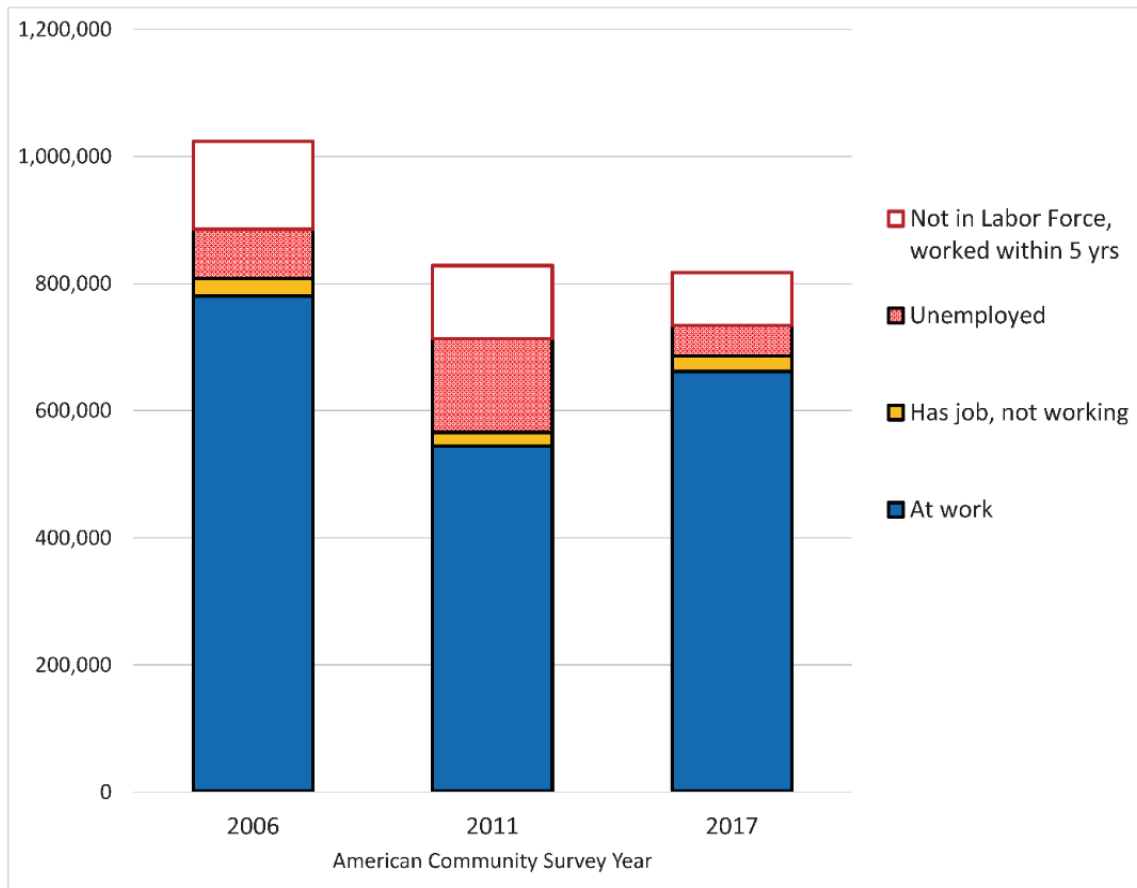
It is clear, however, that California's elected leaders must decide to require apprentice utilization and payment of prevailing wages for projects that benefit from state funding or state regulatory reforms that balance housing project costs with project value. Additional state policies to enforce wage, workers compensation insurance, and tax laws would help to disincentivize continued residential construction dependence on "underground economy" practices.

2

Building Trades Labor: less slack, more search, flat wages

California construction sector gross domestic product is below that of the expansion of the 2000s, but the state’s construction labor market is now tighter than ever. California non-supervisory construction workers’ unemployment rate was lower in 2017 than it was in 2006, when statewide construction employment hit a historic peak. If construction employment is to return to previous heights of employment, contractors will need to attract workers who are not already building trades workers.

Figure 1 | Less slack in the supply of California building and construction trades workers



Notes: Includes all non-supervisory construction industry building trades workers
Source: IPUMS-USA, University of Minnesota, www.ipums.org

Contractors have had to search harder to fill building trades vacancies since the Great Recession. Job vacancy postings data from The Conference Board Help Wanted Online™ Data Series indicate that

California construction employers' building trades vacancy postings in 2017 equaled one-fifth of the total building and construction trades work force at the beginning of the year, with higher percentages of online job vacancy postings for specific trades (FIGURE 2).

Construction supervisors are in highest demand: On a base of under 50,000 supervisors employed statewide, 28,000 vacancies were posted in 2017, up 75 percent from 2011's volume. The publicly posted job vacancy rate increased from 38 percent in 2011 to 58 percent in 2017. The jumps in the vacancy rates between 2011 and 2017 for four construction trades that are essential to housing construction also are notable.¹³

Figure 2 | California Help Wanted Online™ construction vacancy rates

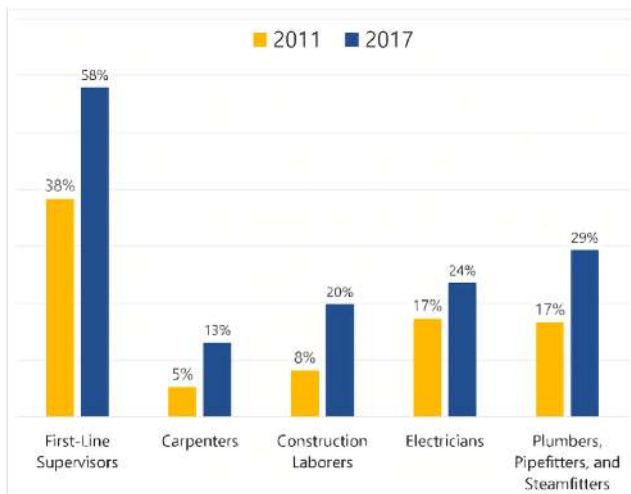
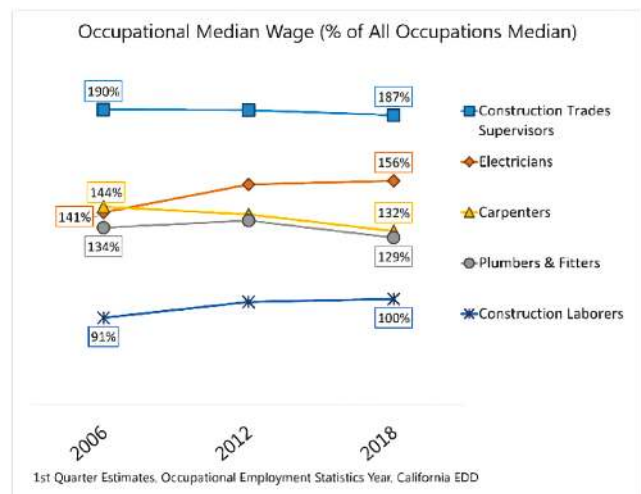


Figure 3 | Relative wages, selected California occupations



Annual postings as % of same-year, first quarter employment
Source: California Employment Development Department

An occupation-specific labor shortage generally is expected to drive employers to increase an hourly wages relative to other wages. Wage behavior for California construction trades workers, however, has not followed any clear, simple pattern.

Since 2006, the wages of construction laborers and electricians, relative to wages of all other occupations, have risen. Electricians are perhaps the most trained, best paid, and regulated of all the major California building trades.¹⁴ Construction laborers are at the other end of the spectrum. The relative wages of carpenters and plumbers have declined and construction supervisors' relative wages have been flat. More complex dynamics for relative wage trends clearly are in play.

3

Young Americans are skeptical about the construction trades

While only 5 percent of the population works in construction occupations, an even smaller percentage of young Americans aim to have a career in the building trades. The National Association of Home Builders (NAHB) surveyed young adults age 18 to 25 in 2016 and found that only 3 percent of those who know what they want to do will pursue the construction trades.¹⁵ Roughly one-quarter of the young adult survey respondents were undecided about their future career.

Among young adults who had not identified a preferred career, nearly two in three said that they had zero or little likelihood of opting to work in the building trades. The preferences that led undecided young adults to discount construction trades work as a possible career are depicted in TABLE 1:

Table 1 | Why not the trades?

Too physically demanding	48%
Too difficult	32%
Not an office job	26%
Pay is below respondent's goal	19%
Not a career that requires a college degree	18%
Seasonal work	18%
Outdoor work exposed to elements	17%
# of survey respondents	328

Table 2 | Beliefs re: construction trades annual pay

Under \$25,000	9%
\$25,000 - \$50,999	34%
\$51,000 - \$75,999	34%
\$76,000 - \$100,000	11%
Over \$100,000	2%
Don't know	10%
# of survey respondents	2,001

Source: NAHB (2017)

Levels of compensation and chances to advance are important factors that motivate pursuit of a career. The NAHB asked survey respondents to estimate the annual earnings levels of the building trades. Most respondents thought that building trades incomes ranged between \$25,000 up to \$76,000 (TABLE 2).

More than 60 percent of the NAHB survey respondents who were undecided about a career preference said that chances were slim to none that they would consider a career in the trades. Of those, 25% said that that *no amount of money would attract them to the trades*. One-fifth of the young construction skeptics said that \$75,000—\$100,000 would make them reconsider; another fifth said that it would take at least \$100,000 to change their minds.

In sum, young people believe that building trades careers involve strenuous and difficult working conditions and also believe that annual pay in the trades falls short of attractive levels. The next sections validate these perceptions, *particularly when it comes to work in the housing construction industry.*

4

Building trades jobs' unattractive requirements and risks

Building trades work under status quo conditions is attractive to the few, not the many, as the 2017 National Association Home Builders survey of young adults considering future careers revealed. The job requirements are difficult or undesirable for many working people. SECTIONS 4.1 AND 4.2 below summarize the major differences in requirements between construction trades jobs and all jobs.

The factors that weigh against choosing to work in construction do not end with job requirements. Labor market participants assess both potential rewards from investing their time or money in a particular opportunity and risks. Building trades work entails risks to earnings and to health that are two-to-three times greater than average risks faced by all workers, as summarized in SECTION 4.3.

4.1 REQUIREMENTS: PREPARATION, MOBILITY & SCHEDULE FLEXIBILITY¹⁶

Construction work has reduced status and appeal for workers with higher levels of educational attainment, yet often requires workers to come to a job with skills. It also requires flexibility with respect to travel and work hours, which is often difficult for dual-earner households with children.

Most housing-related construction jobs do not require educational credentials in excess of a high school diploma or its equivalent. Educational attainment levels within California's blue-collar construction workforce have shifted over recent decades. The percentage of male employees of general building contractors and specialty trade contractors who have less than a high school education rose from 22 percent to 27 percent between 1992 and 2017. The share of the California construction industry's non-supervisory workforce with an 8th grade education or less has risen to 20 percent.¹⁷

In contrast to educational prerequisites, higher percentages of construction trades jobs require greater pre-employment training. The average number of days that construction workers have received pre-employment training is 700, five times greater than the 140-average number of days of training received by all workers.¹⁸

Key requirements for many construction trades workers revolve around mobility and flexibility with regard to hours of work, factors that deter people interested in work-life balance:¹⁹

- 80 percent of building trades jobs require workers to work at least four different locations over the course of a year versus less than 25 percent of all U.S. jobs.
- Unscheduled overtime, unexpected weekend hours, and unexpectedly shortened work days all are more common for construction workers than for workers overall.

- The typical California construction worker's departure time for work is 45 minutes earlier in the day than for all other male workers.
- Average reported time spent traveling to work by male California construction workers exceeds that of all other male California employees by 33 percent.

4.2 PHYSICAL REQUIREMENTS, ENVIRONMENTAL CONDITIONS, AND COSTS TO HEALTH

Physical and environmental job requirements and conditions factored heavily into the high percentage of young Americans surveyed by the NAHB who were uncertain about their future career, but fairly certain that they do not want to work in construction.

Construction workers are in fact exposed to a range of demanding physical and environmental working conditions. TABLE 3 summarizes the degree to which unattractive requirements or conditions apply to construction workers compared to the overall civilian workforce: The conditions summarized

Table 3 | Construction occupational requirements

Requirement/Condition	Incidence Rate/Estimate	Rate/Estimate compared to All Occupations
Climbing ladders, ropes, or scaffolds	87 – 97%	5 times greater
Work in high, exposed places	78 – 91%	6 – 7 times greater
Kneeling	89%	2 times greater
Level of strength: heavy or very heavy	55%	over 3 times greater
Exposure to extreme heat	21%	2 times greater rate
Exposure to heavy vibration	41%	over 8 times greater
Exposure to loud noise intensity level	50%	almost 4 times greater
Proximity to moving mechanical parts	75%	3.5 times greater
Exposure to hazardous contaminants	48%	Over 3 times greater
Lift or carry maximum weight of ...	50 – 65 lbs. (median)	20 – 35 lbs greater
Exposure to hazardous contaminants	48%	Over 3 times greater
Lift or carry maximum weight of ...	50 – 65 lbs. (median)	20 – 35 lbs greater

Source: U.S. BLS Occupational Requirements Survey, 2017

above contribute to construction occupations' high ranking for workplace injuries and fatalities. In 2017, construction occupations' incidence rate for accidents that required days away from work was over 2.4 times greater than the overall rate in California and ranked second-worst out of all major occupational groups.²⁰

One of every five serious workers' compensation insurance claims – which involve death, permanent total disability or major permanent partial disability – is related to a construction trades employee, despite the fact that construction trades jobs account for less than one out of every 25 California jobs.²¹

Construction has the third highest occupational fatal injury rate of major industry sectors in California, a rate that is more than two and one-half times greater than the rate for all sectors. The industry accounts for about 6 percent of total workers, but 16 percent of fatal workplace injuries.²² During the building boom of 2003-2006, 106 construction workers died on California residential job sites, an average of over 26 workers per year.²³ Ten times that number suffered reportable injuries. A total of 294 California construction industry trades workers died in occupational incidents from 2011-2016.²⁴

Risks of fatal and nonfatal injury accumulate over a working lifetime. For a working life in construction, the risk of fatal injury was approximately *one death per 200 full-time-equivalent employees (FTEs) according to a recent study in the American Journal of Industrial Medicine. The adjusted lifetime risk of nonfatal injury resulting in days away from work was an astoundingly high 78 per 100 FTEs.*²⁵

Risks of fatal and nonfatal injury accumulate over a working lifetime. For a working life in construction, the risk of fatal injury was approximately one death per 200 full-time-equivalent employees...

4.3 CONSTRUCTION CAREERS ARE ECONOMICALLY RISKY

Volatility of employment and earnings factor into Californians' calculations of whether or not to dedicate their labor toward housing production. Construction sector employment is unstable, both over the course of years-long business cycles and within a year's seasons.

Construction workers, most of whom are male, face two times greater-than-average earnings volatility than do all male workers economy-wide.²⁶ Even in years when demand for construction is high, the irregularity of construction labor demand results in construction employees working – and getting paid for – fewer total annual hours than men in all other jobs, on average.²⁷

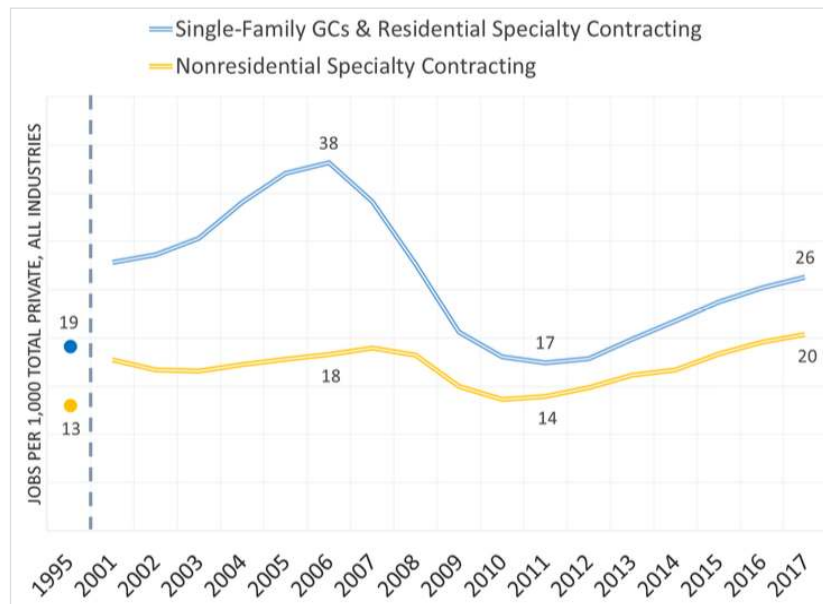
Employment and earnings risks for construction workers have been particularly high in California. California statewide construction sector employment as a percentage of total employment is close to the average for the past five decades,²⁸ but workers only have to think about the roller coaster of the past 25 years to be reminded that construction is an extraordinarily turbulent industry.

The Census Bureau estimates that construction employment of men without four-year college degrees nearly doubled — an increase of about 300,000 jobs — between 1993 and 2006. Within 4 years, 250,000 of those jobs were gone. Construction employment of men without bachelor's degrees in 2017 remained 13 percent lower than 2006 levels.^{29†} Many construction workers cannot count on the sector to employ them consistently for the span of a career.

Residential building accounts for a large part of the construction sector's instability. FIGURE 4 reflects employment in two distinct construction sub-sectors relative to total private employment.³⁰ The residential construction industries' employment rate relative to total private sector employment doubled between 1995 and 2006, only to crash by more than 50 percent in the five years between 2006 and 2011. By 2017, total employment for single-family general contractors and residential specialty contracting firms had recovered ground, but still had not recovered in relative terms to even 2001 levels.

Nonresidential construction employment, Figure 4 shows, has grown to twenty-plus-year record heights

Figure 4 | Residential vs Nonresidential Employment per 1,000 Private Jobs



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

during the current construction business cycle. Relative to residential construction, employment in nonresidential construction has been far less volatile. California's **residential framing contractors and workers** have had the roughest of rides on the housing rollercoaster. In 2001, 728 residential framing

[†]The greater San Jose — San Francisco — Oakland Bay Area is an exception to the statewide rule. Construction sector-wide employment for Bay Area metropolitan statistical areas that report construction employment surpassed their prior 2001 peak in the mid-2018. U.S. Bureau of Labor Statistics total industry employment data available via <https://fred.stlouisfed.org/graph/?g=IXW5>.

specialty contractor establishments did business in California and employed over 25,000 workers. By 2006, the housing bubble's peak, 100 firms and over 50 percent more employees had been added to the state's framing subcontractor supply. By 2011, 80 percent of the framing workforce had been wiped out. By 2013, California had over 300 fewer residential framing contractor establishments than it had had in 2006. By 2017, after six years of recovery, the residential framing industry's inflation-adjusted total payroll and the number of all employees were still more than 20 percent lower than 2001 levels.

Turning to occupational employment, **carpenters and laborers** have been subjected to the most extreme swings over the past 20 years (TABLE 4). Employment for both trades remain one-third below the mid-2000s housing bubble peak. The number of construction supervisors employed in 2017 was also significantly lower than during the previous decade. Employment of electricians and plumbers (the building equipment trades), on the other hand, has recovered. Building equipment trades workers enjoy more options for employment, including performing alterations and maintenance as well as work for utilities, the entertainment industries, and government agencies.

Table 4 | California occupational employment, selected trades in selected years

	All Construction	First-Line Supervisors	Carpenters	Laborers	Electricians	Plumbers
2006	816,000	65,000	145,000	142,000	60,000	49,000
2011	449,000	38,000	57,000	84,000	42,000	30,000
2017	613,000	52,000	97,000	97,000	63,000	48,000
2006–2011 (#)	(367,000)	(27,000)	(88,000)	(58,000)	(18,000)	(19,000)
2006–2011 (%)	-45%	-42%	-61%	-41%	-30%	-39%
2011–2017 (#)	164,000	14,000	40,000	12,000	21,000	18,000
2011–2017 (%)	37%	37%	71%	14%	50%	60%
2006–2017 (#)	(203,000)	(13,000)	(48,000)	(46,000)	3,000	(1,000)
2006–2017 (%)	-25%	-20%	-33%	-32%	5%	-2%

Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics. Estimates rounded to the nearest thousand.³¹

5

Housing trades' compensation is decreasingly competitive

Three facts about compensation (pay and benefits) help explain why residential builders and subcontractors in 2017 find it difficult to attract and retain productive workers:³²

1. The construction sector no longer delivers a compensating differential in pay and benefits that offsets the trades' less attractive requirements and risks.
2. A compensation gap separates relatively low-paying residential construction work and higher-paying nonresidential construction work.
3. The residential pay penalty has increased, not shrunk, despite strong demand for residential construction services.

5.1 THE BUILDING TRADES' "COMPENSATING DIFFERENTIAL" HAS SHRUNK

Construction work delivered substantial hourly wage premiums to blue collar building trades workers during much of the post-World War II era. Economists explained that the premium was a "compensating differential" for the working conditions and risks discussed in Section 4.³³

The construction wage differential has declined significantly since the 1970s. One study traced the income differential for male employees of the U.S. construction industry versus the services sector and found that the differential, after accounting for various earnings control variables, had declined by 2008 to only one-third of early 1970s peak levels.³⁴ The decline is attributable primarily to falling construction wages rather than rising wages of other workers.³⁵

Pay differentials have vanished for employees of building subcontractors, but not for employees of contractors influenced by prevailing wage laws and collective bargaining, nationwide data indicate. A recent academic study included analysis of three construction sub-sectors: building construction (general contractors); heavy and highway construction; and specialty trade contractors (usually building subcontractors). Housing contractors fall within the building construction and specialty trades categories, whereas heavy construction includes more public works projects, which often are subject to prevailing wage requirements. The authors' statistical analysis of data spanning 1990 to 2001 found a negligible overall industry wage differential for U.S. specialty trade contractors but a substantial industry wage differential of nearly 20 percent for heavy construction. The overall industry wage differential for general contractors was less than five percent.³⁶

The changes to labor markets and compensating differentials are apparent in California earnings data.

5

Housing trades' compensation is decreasingly competitive

The typical annual full-time, year-round pay of California construction trades workers in 2017 was equal to that of the typical comparable California male: about \$40,000 in 2017 dollars (TABLE 5).³⁷

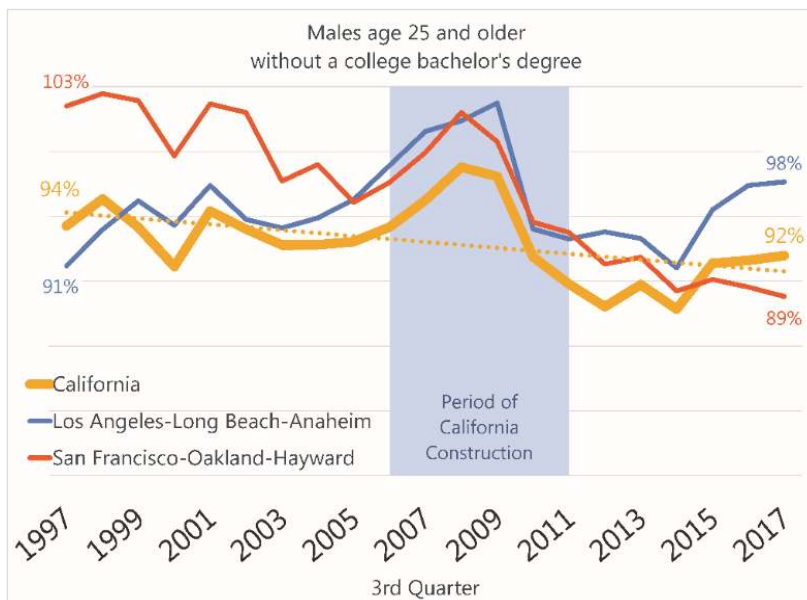
Table 5 | California 12-month earnings of male workers without a four-year college degree

Full-time, year-round private & public employees & the self-employed					
	Average	25th Percentile	Median	75th Percentile	No. of workers
All workers exc. Construction Industry Building Trades	\$53,395	\$26,000	\$40,000	\$65,000	4,091,117
Construction Industry Building Trades Workers	\$48,343	\$25,000	\$40,000	\$60,000	536,223
Total	\$52,809	\$26,000	\$40,000	\$65,000	4,627,340

Source: Analysis of U.S. Census, American Community Survey 2017 1-Yr PUMS file

The construction wage differential has turned negative in certain California regions where demand for construction workers has risen the most. In the San Francisco – Oakland metropolitan area, as shown in FIGURE 5, a gap has appeared and grown between the average monthly earnings of male workers without a four-year college degree who are employed by building foundation, structure, exterior, and finishing specialty contractors versus the average for all male workers without a degree.³⁸

Figure 5 | Relative average earnings of building structure and finishing specialty trade workers



Source: QWI Explorer application, U.S. Census Bureau, qwexplorer.ces.census.gov

Fringe benefits for construction workers have also become less competitive. Nationwide, according to one recent study, the overall uninsured rate for the prime working age population with full-time jobs, was about 12 percent. Carpenters and construction laborers were uninsured at about triple that rate. Half of roofers, drywall workers, plasterers, and stucco masons reported not having insurance.³⁹

California contractors offer fringe benefits at low rates to building trades workers, echoing the national statistics. Only one third of construction industry trades workers are policyholders for employment-based health insurance, compared to over half of all other employed male civilian workers, according to data from the Annual Social and Economic Supplement of the U.S. Bureau of Labor Statistics' Current Population Survey (CPS).⁴⁰ California construction workers' rate of coverage under any employer- or union-provided health care insurance ranks 35th out of all of the United States, proximate in rank to Alabama, Colorado, Louisiana, Nevada, and Virginia.⁴¹

5.2 HOUSING CONSTRUCTION COMPENSATION IS BELOW AVERAGE

Nationally, residential builders and their specialty trade subcontractors have tended, in the words of nationally renowned labor economists writing in 1968, to stand “at the end of the line for manpower.”

*This largely because in some localities wages and benefits are lower in homebuilding than elsewhere in construction, and overtime opportunities are fewer. ... [W]hen commercial and heavy construction are active in the context of a high employment economy, shortages are likely to be particularly severe for home builders.*⁴²

FIGURE 6 shows that, nationally, **residential specialty trade contractors'** total compensation (wages plus voluntary fringe benefits) is substantially below the economy-wide average. Average hourly wages for **nonresidential specialty contractors** are *more than 30 percent greater* than those for residential specialty contractor employees. In all, *nonresidential specialty contractors' average voluntary hourly compensation costs are almost 50 percent higher than average voluntary compensation costs for residential specialty contractors.* Nonresidential contractors' contributions for voluntary fringe benefits are more than triple those made by residential contractors.[‡]

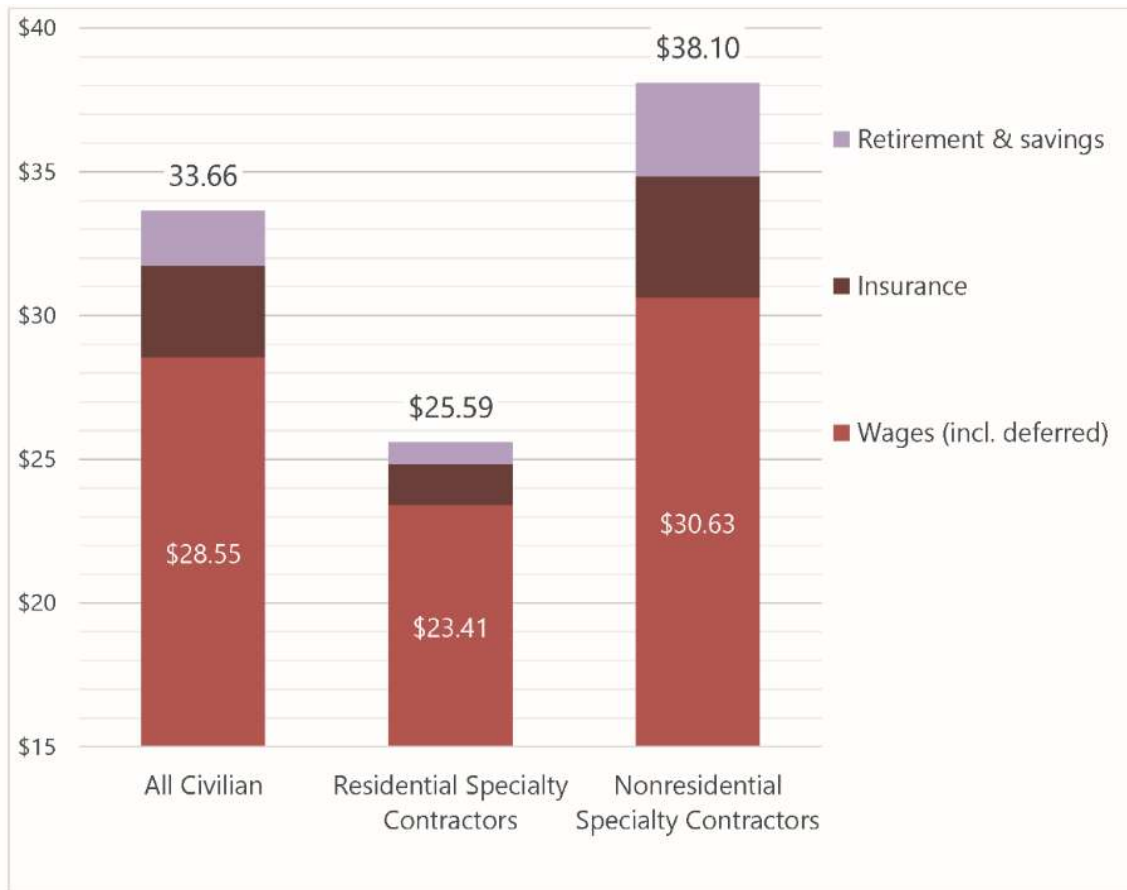
Differentials in fringe benefits between residential and nonresidential specialty trades employees help to explain residential contractors' difficulty attaching skilled crafts people to careers building housing. A peer-reviewed study in 2010 found that only 35 percent of blue-collar construction workers who are not covered by collective bargaining had health insurance that was paid for at least in part by an employer. This same study found that health insurance funded through collectively bargained employer contributions to plans that are portable within the construction industry increased industry-retention

[‡]All average wage statistics intentionally focus on the specialty trades industries. White-collar employees as a share of total industry employment is much higher percentages in NAICS 236 “building contractor” industries.

rates by up to 40 percent, compared to baseline retention rates of construction workers without any health insurance coverage.⁴³

During the 1970's and 1980s, when California produced more than 200,000 units of housing annually, urban coastal California had been an exception to the general rule that residential contractors paid much

Figure 6 | Average employer costs for employee compensation per hour worked, March 2018



Source: U.S. Bureau of Labor Statistics, National Compensation Survey unpublished estimates

less than nonresidential employers. A 1973 U.S. BLS construction wage survey found that average hourly pay rates for carpenters, cement masons, electricians, plumbers, roofers, and sheet metal workers in the metropolitan areas of Los Angeles-Long Beach and the San Francisco Bay Area were *practically equal* across the major types of construction, including residential buildings under five-stories.⁴⁴

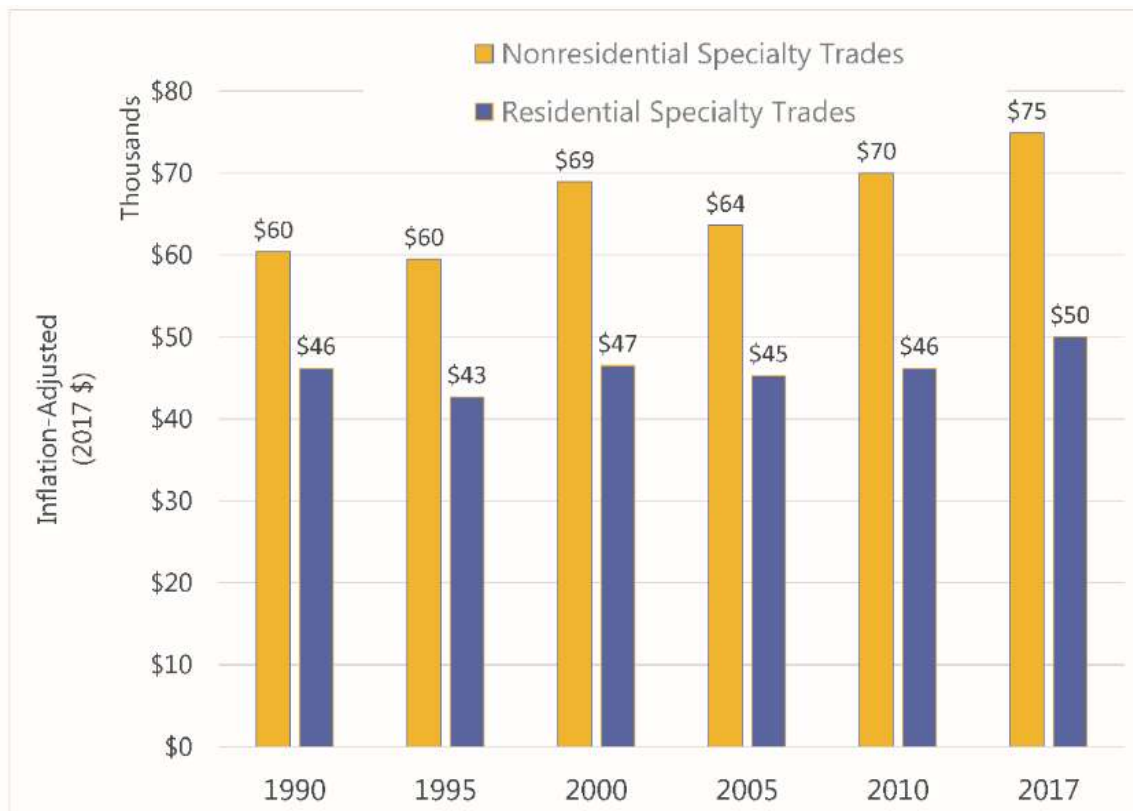
De-unionization of residential building between 1970 and 1990 transformed the structure of construction wages in California. By 1990 the statewide average annual pay for employees of *nonresidential specialty trade contractors* was 31 percent higher than the average for residential specialty trade contractor employees.⁴⁶ That pay gap grew over the next 27 years.

5.3 CALIFORNIA'S HOUSING COMPENSATION GAP HAS INCREASED, NOT SHRUNK

A wage penalty for California residential construction work grew markedly between 1990 and 2000. FIGURE 7 shows that inflation-adjusted, average annual pay for all employees of residential specialty contractors was essentially flat between 1990 and 2000, while average pay for nonresidential subcontractors rose more than 13 percent.

Wage growth for *all* specialty trade contractors, however, was less than the growth of average annual wages economy-wide between 1990 and 2005. FIGURE 8 shows that during this period, annual pay per employee for both residential and nonresidential building contractors fell *relative* to average statewide pay across all industries – though the decline was much more significant in the residential sector.[§]

Figure 7 | California average annual pay per job, all employees, by industry

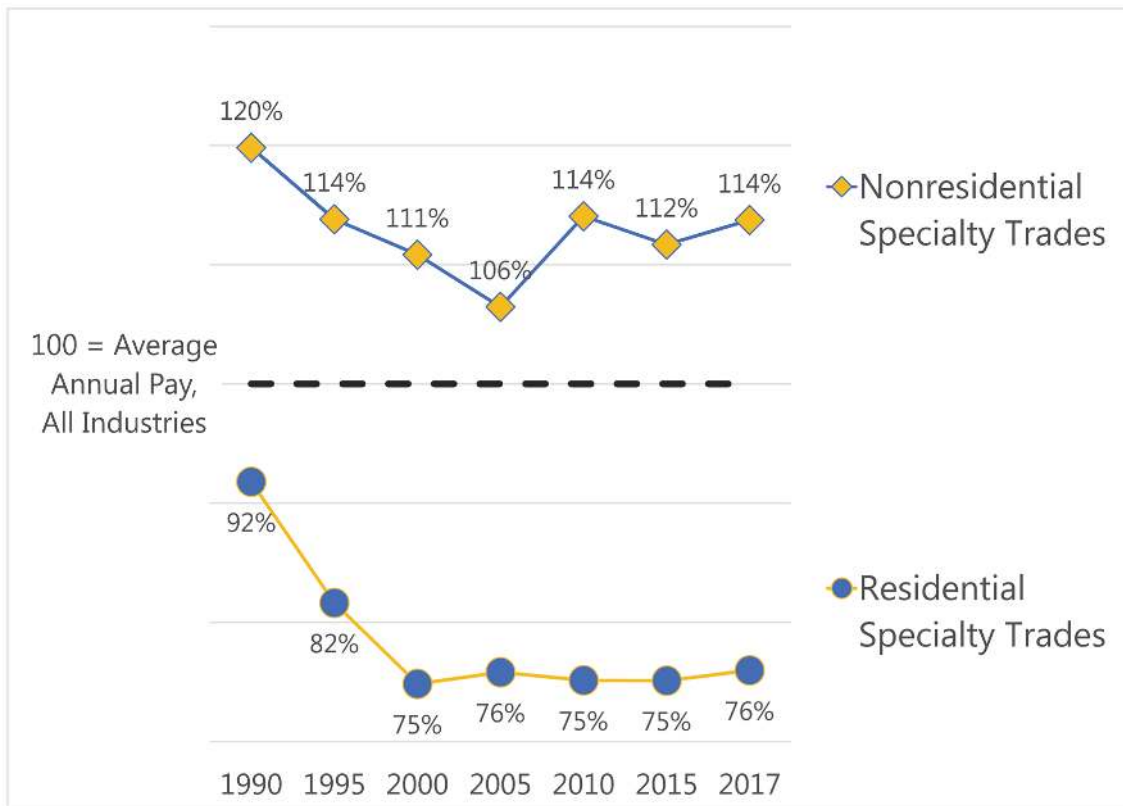


Note: Includes white-collar employees.

Nonresidential: NAICS 238nn2; Residential: NAICS 238nn1

Source: California Employment Development Department, Quarterly Census of Employment and Wages

[§]The Quarterly Census of Employment and Wages “serves as a near census of monthly employment and quarterly wage information ... at the national, state, and county levels.” Wages accounted for by the QCEW include all compensation that is subject to employment taxes, including overtime, sales commissions, bonuses, vacation pay, meal & lodging stipends, and reported tips. The only pay and employment excluded from the QCEW is that of workers not covered by either state or federal unemployment insurance.

Figure 8 | California statewide average annual pay per job (as % of average pay of all industries)

Note: Includes white-collar employees.

Nonresidential: NAICS 238nn2; Residential: NAICS 238nn1

Source: California Employment Development Department, Quarterly Census of Employment and Wages

FIGURES 7 AND 8 show that relatively high hourly wages for construction do not necessarily aggregate into relatively high annual income, at least not for residential construction workers. As will be recalled from FIGURE 3, the estimated typical hourly **Carpenter** wage in early 2018 was nearly one-third higher than the median hourly wage of workers across all occupations. However, the 2017 average annual pay for residential framing subcontractors, which predominantly employ carpenters, was \$39,700 or 40 percent below the average for all of California's industries. Average annual pay for all employees of residential framing contractors, after adjustment for inflation, increased only 2 percent between 1990 and 2017, a compound annual growth rate less than 0.1 percent.⁴⁷

In sum, housing construction pay is low relative to other construction work and relative to economy-wide average pay. Residential contractor average hourly payments for health insurance and retirement benefit plans are even further below par.

The loss of competitiveness of residential construction wages puts the housing industry in a poor position. Private and public sector demand for nonresidential construction is healthy. The State of

California has committed to invest billions annually in transportation infrastructure. The information sector has fueled strong demand for commercial office buildings. Evolution in goods supply chains has motivated major investments in warehouse and distribution center construction. Utilities require new or overhauled power generation and water-related infrastructure. California contractors who build new housing will be challenged to recruit large numbers of additional workers until they are able to substantially reduce the residential pay penalty.

6

Failure to adequately invest in craft skills training

Job skills training costs time and money, triggering workers and employers to do a cost-benefit analysis before they make a commitment. Rather than pay to train workers, residential construction contractors often rely on poaching already-skilled employees from other firms to fill key positions. Residential building crews are filled out with lower-wage workers, as evidenced by the data in SECTION 5.2. Training occurs with much higher frequency, on the other hand, when employers are influenced by collective bargaining and/or government regulation.⁴⁸

While construction leaders and experts have sounded the alarm for four decades about inadequate contractor investment in craft training (see **text box below**), the failure of the residential building industry’s reliance on voluntary private action to train construction workers is clear in national data. Construction ranks with agriculture and the retail sectors as having the worst rates of skills training of all U.S. industry sectors.⁴⁹

Four decades of appeals for voluntary industry commitment to training	
1982	“Current [construction industry] training levels are not adequate to meet the shortfall of close to 2 million workers in the construction industry projected by 1990. A significant increase in craft training within the open shop [non-union] sector is essential. ... If the open shop sector of construction remains at the present level of 60 percent [market share] without a significant increase in its training, there could be a long-term deterioration in the quality and productivity of the construction work force. (Business Roundtable)” ⁵⁰
1997	“The open [non-union] shop, as a whole, has not supported formal craft training to the extent necessary. They have succeeded by attracting skilled workers from the union sector as market share shifted and recruiting skilled workers from competitors as individual workload changed. As the well begins to dry up, the ability to use these methods decreases ... (Business Roundtable)” ⁵¹
2004	“... [T]he open-shop sector as a whole has not supported formal craft training and assessment to the extent necessary to effect real, meaningful, and lasting change. The lack of standardized training in the majority of the open-shop sector has been taking its toll. (Construction Users Roundtable)” ⁵²
2018	“Owners need to require contractors to invest in training and improve the skill sets of their workforce. Moreover, contractors must recognize the necessity and benefits of investing in their employees.” ⁵³

Source: Analysis of U.S. Census, American Community Survey 2017 1-Yr PUMS file

6

Failure to adequately invest in craft skills training

The biggest indicator of a construction craft worker receiving training is whether or not the worker was covered under the terms of a collective bargaining agreement. Collective bargaining agreements push training rates for covered craft workers up to the national average for other industries (TABLE 6).

Studies have found that **apprenticeship training** outperforms other workforce training programs in improving participants' earnings.⁵⁴ Apprenticeship training also has the added benefit of being largely

Table 6 | U.S. work related training, by collective bargaining coverage

Worker received employer, government or apprenticeship-paid training	CONSTRUCTION CRAFTS		OTHER INDUSTRIES	
	Covered	Not Covered	Covered	Not Covered
... in last 12 months	16%	6	19%	16%
... in the last 10 years	38%	17	38%	34%

Source: Waddoups (2014)

self-financing. Employers make training fund contributions based on the number of hours worked by trades persons who are covered by either a collective bargaining agreement or by California's prevailing wage law. Collective bargaining agreements, apprenticeship program standards, and California's prevailing wage laws also require contractors to employ apprentices in order to provide them with on-the-job training.

California residential builders in the greater Los Angeles and San Francisco Bay Area regions utilized apprentices during the 1970s every bit as much (and in the case of San Francisco-Oakland, even more) as commercial builders, the Bureau of Labor Statistics found (TABLE 7). The development of a healthy stock of trained residential trades people assured that the high levels of housing construction could continue through the 1980s.

Table 7 | California carpenter apprentices' share of craft employment, 1973

	Los Angeles – Long Beach	San Francisco – Oakland
Apprentice Carpenters (% of Total Carpenters)	10%	14%
Residential apprentice carpenters (% of Residential Carpenters)	10%	20%

Source: U.S. Bureau of Labor Statistics (1976)⁵⁵

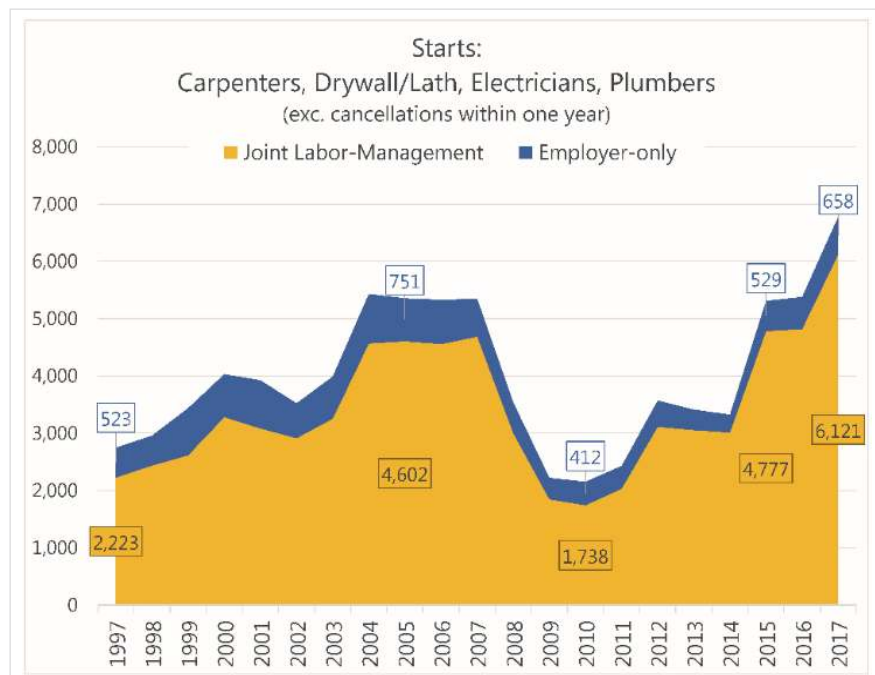
During the 1970s, when California was producing housing at the average annual rate of 200,000 units, the state reported an average of 9,000 state-registered carpenter apprentices. Between 1973 and 1982, more than 11,000 carpenter apprentices statewide completed their programs.⁵⁶ These carpenters were the core of California’s trained and skilled residential construction workforce through the 1980s, when housing production continued at a strong pace.

De-unionization of California’s residential building contractors in the mid- to late-1980s and the recession of the early 1990s led to sharply reduced demand for apprentices from the residential contractors. Carpenter apprenticeship completions fell by 50 percent between 1996 and 2005 compared to the 10 year period between 1973 and 1982.⁵⁷

Residential contractors have not institutionalized any craft training programs of significant scale that operate outside of the collective bargaining framework. In 2017, over 20,000 California workers were actively enrolled in joint apprenticeship programs for carpenters, drywall installers, electricians and non-maintenance plumbers, which is about 10 percent of those trades’ estimated 2017 total construction sector employment of 206,000. Employer-only (“unilateral”) programs, by contrast, enrolled only 2,100 active apprentices, or about 1 percent of the selected crafts’ total employed workforce.⁵⁸

Demand for both new housing and nonresidential construction has gathered momentum since 2012 and has already absorbed unemployed residential workers who did not leave the industry or the

Figure 9 | California apprentices, selected trades, by year and program sponsor type



Note: Start counts exclude apprentice agreements with terms less than or equal to 6 months

Source: California Department of Industrial Relations, Division of Apprenticeship Standards

labor force (FIGURE 1). Programs undergirded by a jointly administered set of standards opened their training pipelines in response to post-Great Recession infrastructure investment and demand growth for nonresidential and heavy and civil construction. Joint programs more than tripled individual apprenticeship starts – from 1,700 to 6,100 – between 2010 and 2017, rising to levels that topped the prior building cycle’s heights by 33 percent. Voluntary, employer-only programs, in contrast, managed to increase apprentice starts by only 246 workers (FIGURE 9).**

Carpenter apprenticeship starts have *increased* in proportion to total carpenter employment during the current construction business cycle. Whereas carpenter apprentice starts during the mid-2000s boom were less than 4 percent of total carpenter employment, they were 7 percent of total 2017 carpenter employment, due entirely to increased starts in the joint labor-management programs. Most carpenter apprentices, however, work on nonresidential public works projects.

Housing contractors by-and-large are institutionally disconnected from the recent increase in the supply of construction apprentices because most housing contractors are not parties to collective bargaining agreements nor required to comply with prevailing wage standards. In northern California, unionized contractors with businesses concentrated in residential building employed only a small minority of all union-member carpenter apprentices.

Career Technology Education provided by community colleges and private colleges, paid for either with taxpayer funds, trainees’ personal funds, or by sponsoring employers have not trained craft workers essential to new housing construction at a scale commensurate with the need.

- Only 1,350 Californians received post-secondary education awards for carpentry, drywall & insulation, electrical/electrician, or plumbing training on average over the 2014-2015 and 2015-2016 academic years.^{††}
- Over half of construction-related awards were for electrician coursework, which leaves gaps in support for building foundation, structure, exterior, and finishing-related crafts.
- Only 132 career technology education awards statewide in 2015-2016 were for carpentry and drywall.

Government funding for other, non-apprenticeship training programs similarly provide training at a scale that falls far short of the level of demand. **Job Corps** has annual slots in carpentry and home building-related *pre-apprenticeship* training programs for 8,250 trainees at dozens of different centers *nationwide*.⁶¹ The programs are geared to train 16 – 24 year olds for between 8-12 months, *readying* them for – but not substituting for – registered apprenticeships or training-related jobs.

** Apprentices who canceled their agreements within the first year are considered “false starts” and are excluded from these and subsequent statistics.

†† Awards include non-credit awards that require as little as 144 hours of instruction and as much as an associate’s degree. An apprentice award in the selected crafts requires 4 to 5 years of training, including 576 to 720 hours of relevant and supplemental instruction.

The Home Builders Institute (HBI), a non-profit organization created by the National Association of Home Builders (NAHB), relies primarily on government funding rather than its own base of for-profit developers. A U.S. Department of Labor grant titled "President's High Growth Job Training Initiative" allows HBI to work in 10 states with high schools, community colleges, employers and the public workforce investment system to reach and train more than 3,000 young people in the residential construction industry trades. The HBI's *total* annual revenues in 2016 were \$25 million, or roughly 2.5 percent of the \$1 billion in approximate total annual revenues of apprenticeship programs nationwide.⁶²

The data are clear: construction contractors that are unorganized either around multi-employer collective bargaining or through the requirements established in government public works contracts under-invest in training. Deficits in training for new construction trades workers have been compounding over three decades. Career technology education programs and government pre-apprenticeship programs are neither sufficient to meet labor force needs across all crafts, nor an adequate substitute for full apprenticeship programs registered with state and federal agencies.

The residential building industry only benefits from apprenticeship programs' supply of trained workers when strong demand for residential construction coincides with a decline in nonresidential construction. An ambitious, sustained drive to more than double annual California housing production ought not to rely on the occurrence of such a coincidence.

7

Construction productivity lags behind the rest of the economy

California housing productivity growth is crucial to increasing housing supply. As summarized by the McKinsey Global Institute,

[A productivity] increase means that higher value can be provided to customers with the same or fewer resources, which translates into a desirable mix of higher-quality structures at lower cost for owners, higher profitability for contractors, and higher wages for workers.⁶³

Productivity growth across the entire U.S. construction sector has lagged economy-wide growth for decades. The U.S. Bureau of Labor Statistics estimates that nationwide construction sector output per unit of labor declined by almost 13 percent between 1987-2016,⁶⁴ while productivity in the nonfarm business sector increased 31 percent during the same period.⁶⁵

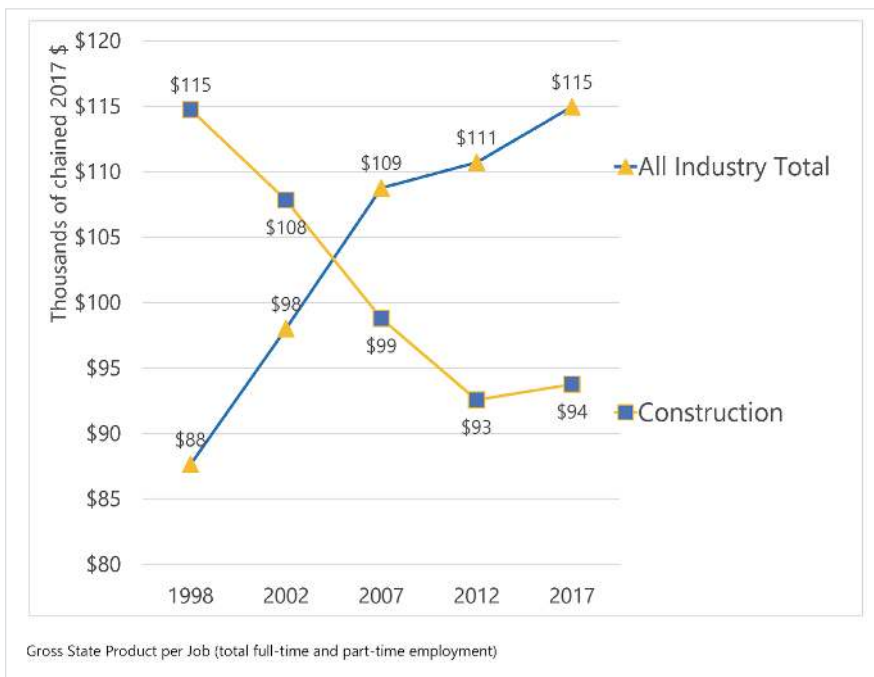
Construction’s industrial building and heavy and civil sub-sectors both have productivity levels and productivity growth that exceed sector-wide averages. In contrast, the specialty trades that supply much of the labor for residential builders – such as framing and drywall subcontractors – have the lowest levels of productivity and the most negative productivity growth rates between 2002 and 2012

out of all of the construction industries.⁶⁶ For 10 years or more, subcontractors, when pushed to meet growth in demand, have relied on increasing employment rather than increasing productivity.

Productivity in California has matched the national pattern. Real Gross State Product per job for construction declined 18 percent between 1998 and 2017 (FIGURE 10).

California’s construction productivity gap has three serious implications for meeting the challenge of doubling

Figure 10 | California real gross state product per job, chained 2017 dollars



Source: U.S. Bureau of Economic Analysis

California's output of new housing:

1. Employers need more employees in order to increase output precisely when builders already are running into tight labor markets, especially in high-demand urban coastal markets;
2. Wage increases are important for attracting more workers to construction, and it is more difficult to raise wages sustainably when productivity growth is stagnant.
3. Industries with greater productivity have an advantage in competing for productive workers in a tight labor market.

For decades, observers have commented on potential productivity gains from standardization and offsite manufacturing of construction components or virtually complete modules. However relatively little progress has been made on this front.

Statistics from the prefabricated wood building manufacturing industry indicate the fits and starts of technological change in housing construction. Nationwide capital expenditures by wood building manufacturers, a mere \$75 million in 2005, had shrunk to \$45 million in 2016. Nationwide, in 2005 the small prefabricated wood build industry employed 26,050 production workers. By 2016, the industry had shed 40 percent of this workforce and employed only 15,600 workers. Industry shipments totaled only \$3.2 billion (current 2016 dollars). These numbers pale in comparison to employment with new housing builders and framing subcontractors, which, combined, employed 393,000 in 2016.⁶⁷

While recent investments in factory-built housing technologies in California signals a new wave of interest in significant technological change in housing production,⁶⁸ large-scale adoption is uncertain. Factory investors and managers still need to reckon with risky, high-amplitude cycles of demand. If factory-built housing proves to be able to deliver on hoped-for production efficiencies and successfully ride out a construction industry recession, investment in factory-built housing modules may grow by orders of magnitude.

Until radical transformation of housing production technology occurs, however, poor productivity will weigh on housing production schedules, costs, and excess demands for labor. The Turner Center for Housing Innovation at UC Berkeley reported in 2018 that housing industry interviewees from San Francisco claim that *supervisory expertise lost since the prior business cycle's peak has reduced housing construction productivity, driving up total labor costs (distinct from average hourly wage rates) by 10 to 20 percent.*⁶⁹

...supervisory expertise lost since the prior business cycle's peak has reduced housing construction productivity, driving up total labor costs (distinct from average hourly wage rates) by 10 to 20 percent.

Given current historic low unemployment – and labor supply dynamics to be discussed below in [SECTION 10](#) – construction labor productivity must improve if California is to dramatically increase its housing output without dramatically raising costs of production.

8

Housing's traditional labor pools **are shrinking**

The housing industry cannot expect to replicate its workforce growth experience of the mid-1990s through the mid-2000s. Spiking demand for new housing during that period coincided with three important developments: (1) the cresting of a wave of less-educated immigrants; (2) decline of nonresidential construction employment in the wake of the “Dot Com” bubble; and (3) weak growth of male employment outside of the construction sector. There was a substantial reserve of workers, and, for many men living in California with few formal credentials, housing was the growth industry during the early 2000s.

Housing production depends more than most industries on workers who are (a) male (b) young and (c) have lower levels of formal education. This sub-set of the labor force constitutes the “traditional” labor pool for housing construction trades.

Only 2 percent of the California construction industry’s building trades workers are female, a statistic that has remained essentially unchanged for at least four decades.⁷⁰ While construction working conditions deter most men from choosing the construction trades as a career, women confront additional barriers.⁷¹ While women have better chances of joining the high-skill construction workforce if they enroll in joint labor-management apprenticeship programs as opposed to unilateral, employer-only-managed programs, women’s participation levels in apprenticeship remain at very low levels.⁷² Public agencies recently have started to partner with construction labor unions to leverage infrastructure capital improvement programs to increase employment of women and other traditionally under-represented groups,⁷³ but this model has not been replicated by housing developers.

Table 8 | California males aged 25 — 44, by educational attainment

	2005	2017	Change
High School or less	2,361,000	2,159,000	-202,000
Less than High School	1,131,000	833,000	-298,000
High School Diploma or GED	1,230,000	1,326,000	96,000
Some college, including Associates degree	1,386,000	1,665,000	279,000
Four-year+ college degree	1,517,000	1,910,000	393,000

Source: U.S. Census Bureau, 2017 American Community Survey 1-Year Estimates, Table B15001

In 2001, more than half of all male employees of California building foundation, structure, exterior, and building finishing contractors (NAICS 2381 and 2383) were non-college-educated. Twenty percent were under the age of 25. Across all sectors, only 37 percent of all male workers had a high school degree or less, and only 13 percent were under age 25.⁷⁴

California's stock of men without any college education has shrunk since the last housing production boom (TABLE 8). The supply of men without college education ready and willing to work construction jobs is unlikely to be inflated in the foreseeable future by any of the major potential sources for increased labor supply: (1) California population growth; (2) Young workers from other industry sectors; (3) Young, less-educated immigrants; or (4) Non-college-educated workers from other states.

8.1 CALIFORNIA POPULATION GROWTH

California's State Department of Finance estimates that California's population between the ages of 20 and 54 will grow only modestly at an average annual rate of 58,000 between 2018 and 2025.⁷⁵ The current labor employment rate of people between the ages of 20 and 54 is 75 percent, which reduces the average annual growth of employed Californians aged 20 – 54 to 43,000.

If residential construction contractors succeed in attracting an unprecedentedly high ratio of 40 out of 1,000 total employees (see FIGURE 4), then we can expect population growth to increase residential construction employment by about 1,700 employees per year. Of that, we should expect at least 30 percent of the residential contractor employees to work in non-building trades occupations, consistent with current occupational distribution patterns. It therefore is reasonable to estimate the upper-limit of annual increases in housing construction employment from population growth alone to around **1,200 workers per year** – a tiny fraction of the 100,000 – 200,000 new workers that are needed to stabilize or reduce housing costs.

8.2 YOUNG WORKERS FROM OTHER SECTORS

Construction's workforce for basic specialty trades has aged more rapidly than the rest of the economy due to low hiring rates of young workers. As a result of the disproportionate blows to young building specialty contractor employment during the Great Recession, and greater rates of hiring older workers since recovery began in 2012, workers under the age of 35 have fallen from being nearly 60 percent of all male construction employees to being only 36 percent.⁷⁶

It is unlikely that housing builders will be able to attract more young workers away from other industries under a "business as usual" scenario because the subcontractor industries do not pay the premiums that are needed to motivate large numbers of young workers to switch jobs and attach themselves to building foundation, structure, exterior, and finishing contractors.

The U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) program helps to illustrate why young workers probably will not be won over by current wages to the building specialty trades that are critical to large-scale housing production. LEHD "Job-to-Job Flows" data track worker movements across sectors of the economy.⁷⁷ In 2016, male workers between the age of 25 and 34 who moved from continuous employment in a non-construction sector (the "origin" sector) *into* the construction sector (the "destination" sector) had average monthly earnings of \$3,250 *before* changing employment and \$3,920 *after* becoming a construction sector employee. The average monthly earnings of *stable* (full-quarter) new hires of *residential building* contractors and the building foundation, structure, exterior and finishing *specialty trades* contractors for males age 25-34 was only \$3,150, less than the average earnings in the origin sector (TABLE 9).

Table 9 | California average monthly earnings differentials from job-to-job flows vs. stable new hires, 2016

	Job-to-Job: Origin All exc. Construction Avg Origin Earnings⁷⁸	Job-to-Job: Origin All exc. Construction Avg Construction Earnings	New hires: Residential Building, Foundation, Structure & Finishing Avg Earnings⁷⁹	Pay differential: Construction vs Origin Sector Avg Earnings (%)	Pay differential: Residential & subcontracto vs origin earnings (%)
Age 22-24	\$2,200	\$3,020	\$2,510	36%	13%
Age 25-34	\$3,250	\$3,920	\$3,150	20%	-3%

Source: U.S. Census Bureau, Longitudinal Employer-Household Dynamics program data.

8.3 YOUNG IMMIGRANT WORKERS

California's construction industry has been a major destination for foreign-born male workers since the 1980s. Construction contractors have relied on this labor pool, paying them average wages that are significantly lower than those paid to U.S.-born workers. Using U.S. Census nationwide household survey data, researchers have estimated that undocumented immigrant construction workers on average are paid 47 percent less than U.S.-born construction industry workers.⁸⁰

Based on estimates calculated from US Census American Community Survey data, foreign-born, non-naturalized workers constituted almost half of all non-supervisory, non-college-educated California construction trades workers in 2005. After construction employment plummeted during the Great Recession, the non-supervisory construction trades labor force contracted, but immigrant, non-citizen

workers' share of the total remained essentially unchanged.⁸¹ Research into California's construction workforce found a concurrent increase in the employment of undocumented immigrant workers and "informal" or "underground" construction employment, in which employers do not pay workers legally required fringe benefits or withhold federal and state taxes. The share of California workers unreported by contractors on payrolls or misclassified as independent contractors increased by 400 percent from 1972 to 2012.⁸²

Housing builders should not expect to be able to continue to depend on recently arrived immigrants for the bulk of construction workforce renewal and expansion. Net flows to California of all unauthorized immigrants turned negative around 2007. In 2009, the number of unauthorized immigrants in California contracted by 108,000, by one study's estimate.⁸³

Housing builders should not expect to be able to continue to depend on recently arrived immigrants for the bulk of construction workforce renewal and expansion.

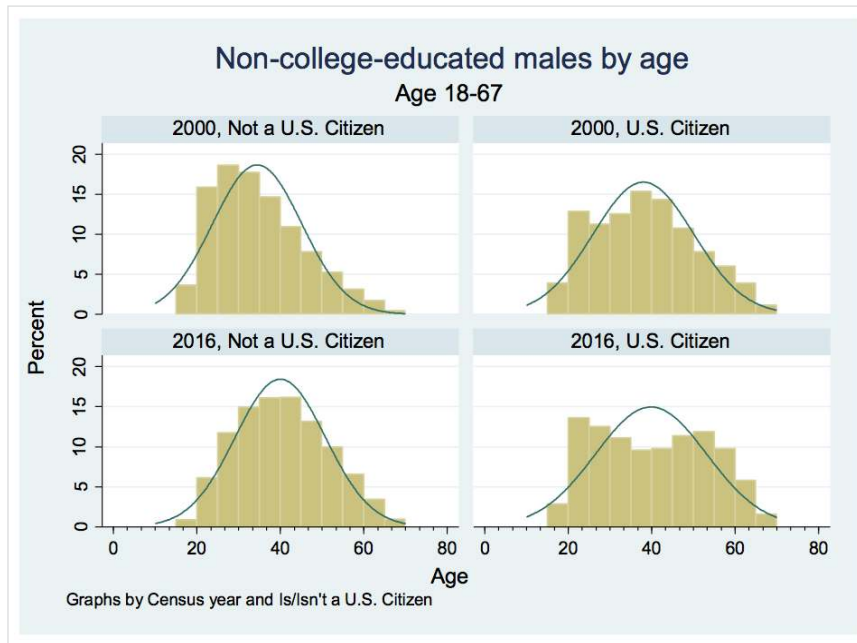
Less-skilled young immigrants are far less abundant in California's total labor force now than they were during the housing construction boom of the 2000s. Census household survey data suggest that the number of young adult (age 18-34), non-naturalized, non-college-educated male immigrant workers in California dropped nearly 60 percent between 2006 and 2017. By comparison, young adult, non-college-educated male citizen workers in California decreased in number by less than 10 percent.⁸⁴ By 2016, the demographic bulge of young, less-educated immigrant workers that existed in California's labor force before the last housing boom had moved into the middle of the prime working age range (FIGURE 11).

Young adult male non-college-educated immigrants still frequently work in the construction industry's building trades occupations. But the turning of the immigration tide has significant implications for California's construction workforce:

- The number of young (18-34), non-college-educated, non-citizens in California's construction trades dropped by two-thirds – or about 130,000 workers – between 2006 and 2017.⁸⁵
- The median age of non-citizen, non-college-educated construction workers increased from 33 in 2006 to 41 in 2017, and now equals the median age of non-college-educated construction industry building trades workers who were born in the United States.⁸⁶

Mexico still ranks as California's single greatest external source for inflows of male, non-college-educated members of the labor force, but California is unlikely to receive a surge of young, less-educated immigrant males in the decade ahead. Inflows to the United States of less-educated foreign-born immigrants peaked more than 10 years ago. The nationwide stock of less-educated young (age 15-40)

Figure 11 | Age distribution of California's non-college-educated male labor force, by citizenship



Source: Author's analysis of U.S. Census Bureau data accessed via IPUMS-USA

immigrants from Mexico is projected to drop to less than half of its current level by the year 2040.⁸⁷

Housing builders' go-to pool of labor has shrunk, and contractors will need to look elsewhere in order to expand its workforce in sufficient numbers to meet demand for new housing output.

8.4 WORKERS FROM OTHER STATES

If California builders should not expect inflows of foreign-born workers to meet greatly expanded demand for construction labor, might they instead entice domestic migration from other states to fill jobs building housing?

As was the case with young California workers, analysis of relative wage incentives suggests that the answer is no, at least under status quo conditions. The purchasing power of typical California construction annual earnings is too low relative to the purchasing power of typical earnings in other states to reasonably expect migration of construction workers in numbers that would make a dent in the need for at least 100,000 more workers focused on new housing construction.

California median (50th percentile) nominal earnings for full-time, year-round construction trades workers were just under \$40,000, as measured by the 2017 American Community Survey. Median earnings fall to \$35,200 when all part-time, part-year workers are included. These earnings rank 32nd and 35th, respectively, among all states.

Cross-state comparisons of construction trades workers' nominal annual earnings are poor indicators of the monetary incentives for skilled construction workers from other states to move to California. California's consumer prices, including housing costs, are 14 percent higher than nationwide price averages.⁸⁸

TABLE 10 shows 2016 median building trades worker earnings that have been adjusted by a federal government regional purchasing parity (RPP) index. These adjustments make for better “apples to apples” comparisons of the purchasing power of median earnings across states and help to clarify and quantify how typical earnings for workers in California – including construction workers – rank low in the United States after adjustment for California's high rents and higher-than-average prices.

- California's full-time, year-round building trades median income, after state purchasing power adjustment, is 12 percent *below* that of nationwide median building trades earnings.
- Purchasing-power-adjusted California median building and construction trades earnings rank 46th among all states.⁸⁹

Table 10 | Comparable 12-month earnings of full-time year-round workers by state, 2016 RPP-adjusted dollars

Geography	RPP-Adjusted Median earnings for civilian employed population	State Rank: all Civilians with earnings	RPP-adjusted Median earnings Construction and extraction occupations	State Rank: Construction Occupations
United States	\$44,900	--	\$40,600	--
Arkansas	\$42,100	44	\$38,000	41
Virginia	\$49,200	8	\$37,800	42
Arizona	\$43,400	38	\$37,300	43
Tennessee	\$43,800	33	\$37,000	44
South Carolina	\$43,400	38	\$36,000	45
California	\$42,600	42	\$35,900	46
Texas	\$43,500	37	\$35,300	47
North Carolina	\$44,600	31	\$35,000	48
Georgia	\$45,100	29	\$34,600	49
Florida	\$39,000	49	\$31,500	50

Source: U.S. Census Bureau, American Community Survey, 2012–2016 5-year estimates, Table B24021, and U.S. BEA 2016 Regional Price Parities by State.

Note: RPP-adjusted earnings were rounded to the nearest \$100. The margin of error for the California median construction earnings estimate was \$230.

Universal: The full-time, year-round civilian employed population 16 years and over with earnings.

Texas and several western states do rank after Mexico as other top sources for gross inflows of non-college-educated men into California's labor force. But domestic migration estimates from the U.S. Census American Community Survey (2012-2016 5-year PUMS) indicate that total outflows of such workers from California outnumber the total inflows:

- Outflows of non-college-educated men from California to Texas, Nevada and Oregon outnumbered inflows by 2:1
- Outflows from California to Washington State, Arizona, and North Carolina outnumbered inflows by over 40 percent.
- Inflows to California of non-college-educated men from Florida and Illinois were cancelled out by outflows.
- California had small net inflows of non-college-educated men in the labor force from New York and Alaska.⁹⁰

California's producers of new housing should not expect that workers most likely to be or become construction workers will migrate from other states in large numbers to take part in a California homebuilding blitz under business-as-usual conditions.

California needs to solve its housing labor supply problem by looking for ways to recruit, train, and retain *Californians* for the risky work of construction by making the work more rewarding.

9

Recruiting, training & retaining productive labor

Residential builders and subcontractors have exhausted the easy and unilateral strategies for accessing more labor to meet higher levels of market demand. They have increased advertising of job openings;⁹¹ increased average weekly hours per worker and full-quarter employment;⁹² increased utilization of workers with low levels of educational attainment; and readily employed unauthorized immigrants.⁹³ The industry still finds itself confronting shortages of skilled labor.

The “hard” workforce growth strategies that remain are subject to collective action problems and the challenge of product market demand turbulence. The previous sections of this research paper provide ample evidence that housing construction contractors, acting voluntarily, have not coordinated voluntarily to:

- Improve working conditions and lower risks of occupational injury and death
- Re-establish an attractive “compensating differential” for construction pay
- Invest in training programs
- Re-organize construction work to employ high productivity technologies

Two non-market institutions — collective bargaining and government-regulated labor standards for construction workers employed on public works projects — are associated with these necessary changes. This section summarizes key features of both institutional arrangements and evidence of their association with outcomes for labor that could bolster supply if extended to housing construction.

9.1 CONSTRUCTION TRADES COLLECTIVE BARGAINING

Collective bargaining between construction contractors and building trades unions has features that are distinct from those found in other sectors. Contractors who believe that they need to tap the labor of craft union members agree to sign an *existing* multi-employer “master” labor agreement that covers the workforces of numerous other contractors. Because contractors’ needs for labor vary widely over time and geography, the union dispatches craft workers to the contractor only in response to a request. When the employer no longer has as much demand for labor or has need for a different skill set, the union member is laid off and rejoins the hiring hall list of trades people who are available for work.

Throughout the time that a union member is employed, the signatory contractor pays an hourly wage to the worker and makes *pro rata* payments into fringe benefit trust funds that are administered jointly by labor and management representatives. The trusts direct money for the benefit of union members

to health insurers, investment firms, and training programs, among other benefit providers. A union member's benefits increase or are sustained as a function of total work performed for any master labor agreement-signatory contractors rather than of continuous employment by a single firm.

Under collective bargaining, the welfare of both workers and contractors is tied to whether or not *together* they manage to successfully win a strong share of the volume of work in the targeted construction sub-market. With strong market share, signatory contractors can more safely bet that the workforce-related costs that they have to put into their bids for construction projects *also* will be in the bids of their competitors.

In the words of construction labor economist Peter Philips, taking long-run costs of developing a stable, skilled workforce out of competition “cuts through this Gordian knot of free-rider problems and overcomes the failures of the market” to adequately train the labor force, improve working conditions, provide a compensating pay differential, and invest in retention-promoting deferred health and retirement benefit plans.⁹⁴ The field of competition shifts away from minimizing training and deferred compensation toward efficient management of overhead, materials, labor, and capital. That competition drives increased utilization of efficient technologies and incentivizes employers to expand and deepen workers' skills.

9.2 PUBLIC WORKS PREVAILING WAGE AND APPRENTICESHIP STANDARDS

Prevailing wages laws are region- and craft-specific minimum wage standards that apply to construction workers employed by private construction firms performing work paid for with public funds. California's law originally was created in 1931. All public works contractors are required by statute to pay workers prevailing wages, make payments to construction workforce training funds, and request and utilize available apprentices.⁹⁵ Tax laws incentivize employers to direct a portion of total compensation into deferred compensation fringe benefit plans.

Contractors that wish to bid on public works projects incorporate into their bids the costs of prevailing wages. Bidders that are party to multi-employer labor agreements pay workers a specified base wage and direct additional hourly fringe benefit amounts to benefit trusts as prescribed by their agreement(s). Bidders that are not bound to any labor agreement pay workers the base wage but may choose to pay the fringe benefit balance either by making contributions to qualified plans, by “putting it all on the check,” or by some combination. Payments to qualified benefit plans are tax-advantaged, as federal and state payroll taxes are levied on wages up to certain limits.

California public works-related labor laws also promote utilization of apprentices. First, contractors must formally request apprentices from local apprenticeship programs and are subject to state penalties if they fail to do so. Second, apprentices are subject to separate, reduced-rate schedules of wages and hourly fringe benefit payments. *Firms that effectively train apprentices can actually save on labor costs.*

If 60 percent of all 96,000 new taxpayer subsidized low-income housing units that were developed over the decade of the 2000s were subject to the standards, that amounts to 60,500 units, or less than five percent of all 1.36 million new California housing units permitted...

California's prevailing wage laws apply to construction of new housing projects that are financed at least in part with grants, certain loans, and/or discounted land from State and local public agencies. A sample of low-income housing projects in California from between 2001 and 2010 indicates that approximately 60 percent of projects were subject to either a federal or state requirement to pay prevailing wages.⁹⁶

The relative scale of the impact of prevailing wage standards on California's housing industry, however, has been small. If 60 percent of all 96,000 new taxpayer subsidized low-income housing units that were developed over the decade of the 2000s were subject to the standards, that amounts to 60,500 units, or less than five percent of all 1.36 million new California housing units permitted that decade. We can safely

assume that prevailing wage standards have to this point exerted little influence on average and median labor standards for residential builders and subcontractors.

9.3 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING, AND RISKS OF INJURY AND DEATH

Prevailing wage laws do not regulate worksite safety. Prevailing wage standards, however, indirectly reinforce training through mandates for contractors to make payments to training funds based on the number of building trades work hours performed on State of California public works projects. Similarly, collective bargaining agreements promote training that educates workers about preventing occupational injuries and illnesses. Labor-management agreements contain provisions that empower workers to voice concerns with jobsite practices or conditions that endanger worker safety, offering protections against employer retaliation that are stronger than anti-retaliation protections under general labor laws. Greater unionization of an industry "increases the probability and stringency" of inspections by government occupational health and safety agents, studies have found repeatedly.⁹⁷

Numerous academic researchers have linked collective bargaining and prevailing wage laws with positive construction worker occupational health outcomes. One study showed that construction fatality incidence rates in states with strong prevailing wage laws were one-third lower than in states with weak or no laws. A second study found lower reports by construction workers of disabilities in prevailing wage law states versus no-law states. An academic economist employed peer-reviewed statistical analysis techniques and found that non-fatal injuries occurred at significantly lower rates in prevailing wage law states compared to states without such laws.⁹⁸ A recent replication of an academic study of construction fatal injury risks found a 26 percent difference in incidence rates between states with weak or no prevailing wage laws versus states with strong or average prevailing wage laws.⁹⁹

9.4 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING AND TRAINING

Construction workers who are covered by collective bargaining agreements receive training at higher rates, as summarized [SECTION 6](#). The relationship between collective bargaining and greater incidence rates of training holds up even after controlling for traits of workers and employers that hypothetically are related to the likelihood of training irrespective of collective bargaining coverage status.¹⁰⁰

Prevailing wage laws similarly have been found to increase construction worker training. One statistical study found that states in the U.S. with prevailing wage laws covering state-funded public works projects had apprenticeship enrollment rates that were 6 to 8 percent higher than states without such laws.¹⁰¹ A novel, but preliminary study of apprenticeship program assets nationwide found that states without prevailing wage laws account for only 15% of all construction training assets, despite containing almost one third of the nationwide total blue-collar construction workforce. The study found that doubling of states' construction unionization rate is associated with an average of 65% higher apprenticeship training investment per construction worker.¹⁰²

Apprenticeship *completion* rates were significantly higher in states with prevailing wage laws. States that *repealed* their prevailing wage laws in the 1970s and 1980s experienced decreases of 40 percent in the utilization of apprentices relative to employment of journey-level workers.¹⁰³

Apprenticeship completion is highly meaningful. Apprenticeship program completers were found to have a dramatically higher lifetime *earnings differential* of \$240,000 compared to nonparticipants in apprenticeship with similar demographic traits.¹⁰⁴ If workers had greater knowledge of such outcomes *and* confidence that contractor demand for apprentice labor will be sufficient to enable program completion, then recruitment and retention rates for the construction trades would most likely improve.

California's housing construction industry desperately needs more supervisory-caliber workers and deeper pools of contractors. Joint labor-management training programs historically have served as programs for developing both future supervisors and future contractors. A mid-20th century California study found that of apprentices who completed apprenticeship training programs, nearly 3 in 10 had become foremen or supervisors within 5 years. Another 13 percent became contractors.

9.5 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING AND “COMPENSATING DIFFERENTIALS”

As shown in [SECTION 5](#), compensation differentials in pay for risky construction work have been on the decline, relative to pay for other, less risky work. Differentials in employer-paid fringe benefits, in fact, are negative. The absence of a compensating reward for higher risk is particularly prevalent for societally marginalized groups, like unauthorized foreign-born workers.¹⁰⁵

Collective bargaining agreements and prevailing wage laws set wages for construction workers who tend

to be concentrated in specialized construction sub-sectors at levels higher than the median of wages of construction trades workers *across all industries*, a fact that frequently draws critics. One academic journal-published study found that in the union/nonunion wage differential for construction workers in California in 2000 was nearly 50 percent. Another study of prevailing wages in California in the early 2000s found similar unadjusted differentials. What the academic study recognized and subsequently controlled for is the fact that wage differentials are influenced by employer and individual worker traits.

Multi-employer collective bargaining agreements provide for health care benefits that benefit construction workers in two respects. First and unsurprisingly, collective bargaining delivers health insurance coverage to workers at dramatically higher rates than is the case for workers employed by non-union contractors. Second, collectively bargained and administered multi-employer health and welfare trusts design insurance plans to smooth out some of the risks to workers' finances from industry economic turbulence. As a result, an empirical, academic peer-reviewed study found that “there does not appear to be a cyclical pattern in health insurance prevalence among union workers.”¹⁰⁶

Investment in fringe benefits for construction workers also induce *complementary* training effects.¹⁰⁷ Increases in fringe benefits as a ratio of wages leads to a *larger* increase in training assets in proportion to construction labor indicators.¹⁰⁸ This is consistent with a “high road” workforce development logic: contractors who devote a larger portion of total compensation to fringe benefits also invest in training because they expect to reap productivity returns through higher rates of retention of trained workers (and vice versa).

Prevailing wage laws help to keep average incomes and fringe benefits at levels that are more competitive with other industries in the labor market. More than a dozen different studies of cross-state variation of construction worker incomes found that prevailing wage laws are associated with positive wage differentials between 2 percent and 17 percent (**TABLE 1**).¹⁰⁹ The differentials may be understated due to the fact that in most states prevailing wages directly influence about 20 percent of construction spending. A journal-published 2018 study found that states that repealed prevailing wage laws negatively *impacted voluntary fringe benefit payments* by construction contractors.¹¹⁰

Housing builders and subcontractors will not sustainably win over between 100,000 and 200,000 new workers into the residential building trades without raising wages and increasing the health and retirement security of construction workers. If made to apply to a critical mass of new housing construction, prevailing wage standards could be instrumental to meeting workforce expansion needs.

9.6 PREVAILING WAGE LAWS, COLLECTIVE BARGAINING AND GREATER EFFICIENCY OF PRODUCTION

Analysis of construction productivity at the national, sectoral level is difficult. Analysis of productivity at the sub-national, sub-sectoral level is fraught with definitional and measurement challenges.

Nonetheless, evidence suggests that prevailing wage laws and/or collective bargaining are positively associated with changes that increase construction labor productivity.

A cross-state examination of various productivity and efficiency measures found that higher statewide construction industry unionization rates are associated with more capital-intensive technologies and greater production efficiencies.¹¹¹ For example, doubling states' rate of unionization is associated with higher ratios of capital-per-worker and materials put-in-place per construction worker for the specialty

Table 11 | Summary of studies estimated prevailing wage law total sector earnings effects

Study	Authors	Year	Geography	Effect Range	Best Estimate (or Average)
1	Frank Manzo IV; Kevin Duncan	2018	7-state region, with Minnesota at center	--	--
2	Frank Manzo IV; Robert Bruno; Jill Manzo	2018	United States	8.8%–27.1%	15.0%
3	Ari Fenn; Zhi Li; Gabriel Pleites; Chimedlkham Zorigtbaatar; Peter Phillips	2018 [†]	United States	1.9%–4.2%	3.1%*
4	Frank Manzo IV; Kevin Duncan	2018	Indiana and 3 states with prevailing wage (Illinois, Ohio, Michigan)	7.0%–15.1%	8.5%
5	Lameck Onsarigo; Alan Atalah; Frank Manzo IV; Kevin Duncan	2017	9-state region, with Ohio at center	--	16.1%
6	Kevin Duncan; Frank Manzo IV	2016	10-state region, with Kentucky at center	--	10.3%
7	Frank Manzo IV; Robert Bruno; Kevin Duncan	2016	United States (*veterans)	7.0%–10.7%	8.9%
8	Frank Manzo IV; Alex Lantsberg; Kevin Duncan	2016	United States	15.7%–17.2%	17.2%
9	Kevin Duncan; Stephen Herzenberg; Alex Lantsberg; Frank Manzo IV	2016	New England (6 states)	12.2%–31.8%	16.2%
10	Kevin Duncan; Alex Lantsberg	2015	United States	--	14%
11	Frank Manzo IV; Robert Bruno; Scott Littlehale	2014	Indiana	4.5%–10.7%	8.4%
12	Frank Manzo IV; Robert Bruno	2014	United States	1.6%–1.7%	1.6%
13	Peter Phillips	2014	Kentucky	4%–8%	6%*
14	Michael Kelsay; L. Randall Wray; Kelly Pinkham	2004	10 states repealing laws from 1979–1995	--	3.4%
15	Daniel Kessler; Lawrence Katz	2001 [†]	United States	2.0%–4.0%	3.4%
16	Peter Phillips; Garth Mangum; Norm Waitzman; Anne Yeagle	1995	9 states repealing laws from 1979–1988	--	7.5%
Average of 16 Studies					9.0%

*Average of effect range. [†]Peer-reviewed in an academic journal.

trades and the heavy construction sub-sectors. Subsequent studies consistently found that value added per construction worker is higher in states with prevailing wage laws. States with prevailing wage laws have a ratio of volume of materials to hours of construction labor that is greater on average than states without laws.¹¹² This suggests that better compensated workers install materials at greater rates of efficiency.

9.7 PREVAILING WAGE LAWS AND HOUSING PROJECT COSTS

There is consensus that prevailing wage laws and collective bargaining raise worker earnings and improve health and retirement fringe benefits. Studies disagree, however, whether increased construction hourly labor compensation costs necessarily translate into significantly higher project costs.

The preponderance of methodologically rigorous studies of the effect of prevailing wage laws on construction costs find no statistically significant effect.¹¹³ Several studies have attempted statistical analysis of cost effects of prevailing wage standards on California low income housing rental housing projects. Unfortunately, estimation of regulatory policy impacts is difficult across a state as diverse as California. One frequently cited cost estimate, for example, is the product of a two-stage statistical model that failed in its first stage to attain conventionally accepted levels of statistical robustness.¹¹⁴ A re-analysis of data collected for the State of California from over 300 apartment projects initiated between 2001 and 2010, found that public policy choices around the scale of housing projects, parking standards, and approval delays, among other things, have greater influences on costs than paying construction workers prevailing wages.¹¹⁵

One critical test of the impact of prevailing wage standards on housing project costs has not occurred. Can and will project developers and contractors *adjust* to higher hourly labor costs by increasing total productivity? It is plausible that a floor for worker wages and benefits could incentivize the discovery and/or implementation of efficient housing production technology, from start to finish.



Duncan *et al.* studied the dynamics of efficiency of school construction before and after introduction of a prevailing wage law for public works projects in the Canadian province of British Columbia. The authors found that “in a relatively short period, the construction industry adjusted to wage requirements by increasing overall efficiency.”¹¹⁶

10

Construction labor standards versus free-rider dynamics

Professor Peter Philips of the University of Utah, who has explored the complexity of construction trades' labor markets and institutions for over three decades, put the central problem—and potential solution—of construction skilled workforce needs succinctly in his book chapter, “Dual worlds: the two growth paths of US construction”:

The future development of US construction presents a contest between a contractor strategy that relies upon a crew of career craft workers and a contractor strategy that relies upon a handful of key workers backed by a majority of casual and cheaper labor. The presence or absence of government regulation on the wages of construction workers on public works proves to be key to the choice between the high-wage, high-skill path and the low-wage, low-skill path for construction.¹¹⁷

For California's critical housing supply needs, the low-wage, low-skill path has come to a dead end, and has revealed itself as an unsustainable solution to the residential construction industry's long-term workforce and productivity growth needs. Challenging work requirements, combined with extraordinary physical and economic occupational risks, deter many who might overlook societal biases that diminish the status of manual craft work from even considering working in the residential building trades. For those who are open to such work, negligible compensating pay differentials and sub-par employer-paid fringe benefits results in weak worker attachment to the societally crucial work of building new housing.

Weak worker attachment to either specific housing construction employers or to the housing construction industry leads to paltry employer and worker investments in training and skills development. Contractors that specialize in building housing subdivisions or apartments assume that the construction worker will either depart to work for another firm or another industry. Hence, contractors invest minimally in deepening workers' skills. For their part, workers in the residential foundation, structure, exterior, and finishing trades recognize that the next housing bust could leave up to forty percent of them jobless. They rationally decide not to invest their own time and money in the career technical education offerings of community colleges.

Housing industry productivity is hampered by low rates of training, compensation that fails to attract or retain skilled and ambitious people when commercial construction opportunities are available, and vicious economic fluctuations that lead to rapid hiring then firing of hundreds of thousands of workers and the rise and fall of thousands of construction contracting business establishments.

Taking together (1) occupational demands and risks; (2) relatively unattractive total compensation;

and (3) extraordinarily low training expenditures, it is not surprising that residential construction contractors' hires have tended increasingly to be entrants to California's labor market who have low levels of education and who often are the most vulnerable members of society.

But California housing builders' reservoir of casual, less-skilled labor is not refilling itself. California cannot wait for the economic stars to align, as they did in the mid-2000s, so that housing builders can find sufficient "cheap labor" to build new housing that is urgently needed in the immediate future.

California policy makers should not expect housing construction's lead private players to end the vicious circle described above through voluntary action. Residential construction's highly decentralized form of industrial organization makes free-rider problems too insidious. The incentive and temptation to wait for others to shoulder the burdens that must be born to recruit, train, and encourage the retention of a more skilled and productive workforce will lead only to protracted collective *inaction*.

Paraphrasing Professor Philips: The abundant and destructive free-rider strategies found in housing construction need to be brought under control through appropriate regulations. While direct regulation of training, health and pension arrangements is not necessarily required for a healthy housing construction industry, background regulations that *promote* labor-management cooperation around these vital elements of skilled construction workforce development are needed to restore California residential building to the production engine that it once was.¹¹⁸

What was true in 2003, when Philips analyzed the U.S. construction industry, is every bit as much true in California today. What has changed for California is the urgency of the need to heed his analysis and recommendation.

¹Two distinct reports reached similar conclusions: McKinsey Global Institute, "A tool kit to close California's housing gap: 3.5 million homes by 2025," McKinsey & Company, October 2016, accessed via <https://www.mckinsey.com/featured-insights/urbanization/closing-californias-housing-gap>; Up for Growth National Coalition, "Housing underproduction in California." Washington, D.C.: Up for Growth National Coalition, 2018.

²Dillon, Liam, "How California's candidates for governor want to fix the state's housing problems," *Los Angeles Times*, May 10, 2018 <http://www.latimes.com/politics/la-pol-ca-governor-housing-roundup-20180510-htmlstory.html>

³This estimate is necessarily more illustrative than precise. The quantity of labor required to build a unit of housing varies with a myriad of variables specific to the housing itself and its site. Nonetheless, two different estimation methods support this rule of thumb. The National Association of Home Builders estimated that 100 units of new single-family housing or multi-family housing in a typical state is associated with 176 or 68 construction jobs, respectively. See National Association of Home Builders, Housing Policy Department. April 2015. "The Economic Impact of Home Building in a Typical State," downloaded and available via <https://www.nahb.org>. I adjusted the NAHB estimates for three factors: first, only two-thirds of all residential building and specialty trades jobs are construction trades jobs, according to U.S. Bureau of Labor Statistics Occupational Employment Statistics estimates; second, construction workers typically work almost 10 percent fewer hours than that of a full-time-equivalent employee; third, new construction trades workers are needed to replace approximately 10 percent of the construction workforce that exits the trades every year. These calculations, when applied to the current California mix of housing types, which is nearly evenly divided between single-family and multi-family units, yields the estimate that 95 new construction trades workers are needed to build 100 units of new housing. The second method is based on calculations using U.S. Census Bureau Economic Census 2007 data and methods of estimating requisite units of labor input described by Sveikauskas et al. January 2018. "Measuring productivity growth in construction," *Monthly Labor Review*. <https://www.bls.gov/opub/mlr/2018/article/measuring-productivity-growth-in-construction.htm>. Details are available from the author upon request.

⁴Early reports of shortages: Caulfield, John. "Where is the Labor?" *Builder Magazine*, posted on August 15, 2013, downloaded via <https://www.builderonline.com/building/where-is-the-labor-o>. Homebuilder survey trends as reported on the National Association of Home Builders "Eye on Housing" blog: Paul Emrath, "Reported shortage of rough carpentry contractors hits record 90 percent," posted September 6, 2018 via <http://eyeonhousing.org/2018/09/reported-shortage-of-rough-carpentry-contractors-hits-record-90-percent/>; Paul Emrath, "Labor and subcontractor costs outpacing inflation, raising home prices," posted September 10, 2018 via <http://eyeonhousing.org/2018/09/labor-and-subcontractor-costs-outpacing-inflation-raising-home-prices/>.

⁵Philips, Peter. 2003. "Dual worlds: the two growth paths in US construction." In *Building Chaos: An international comparison of deregulation in the construction industry*, by Gerhard Bosch and Peter Philips, 161-187. New York: Routledge, page 185.

⁶See text box and associated footnotes in [Section 6](#).

⁷For a historical survey of apprenticeship committees during their nascence in several cities, see Bulletin of the *U.S. Bureau of Labor Statistics*, No. 459, April, 1928. Digitized for FRASER, <http://fraser.stlouisfed.org/> Federal Reserve Bank of St. Louis. For a discussion

of multi-employer pensions, see Weinberg, Edgar, "Reducing skill shortages in construction," 92 *Monthly Lab. Rev.* 3 (1969)

⁸Philips, *Ibid.*, pp 175-179.

⁹In 2007, public works receipts were 17 percent of total California construction receipts; in 2012 they were 22.5 percent, according to U.S. Census Bureau, Economic Census 2007 and 2012 Tables EC0723SG01 and EC1223SG01, downloaded via <https://factfinder.census.gov/>. California construction trades union membership as a percentage of private employment in the trades, excluding the self-employed, is between 20 percent and 25 percent, according to the author's analysis of Center for Economic Policy Research, CEPR CPS ORG Uniform Extracts version 2.3 data files for 2015-2017.

¹⁰See "News and Resources" at <https://www.stopwagetheftca.org/>

¹¹Duncan, Kevin. 2009. "The Effects of Prevailing Wage Regulations on Construction Efficiency in British Columbia," *International Journal of Construction Education and Research*, Vol5, No. 1, pp. 63-78.

¹²For a sampling of research, see Gyourko, J. and R. Molloy. 2014. "Regulation and Housing Supply," Working Paper 20536, Cambridge, MA: National Bureau of Economic Research. Littlehale analyzed correlates of costs for low-income housing tax credit (LIHTC) projects in California between 2001 and 2010 in Littlehale, S. 2017. "Revisiting the Costs of Developing New Subsidized Housing: The Relative Import of Construction Wage Standards and Nonprofit Development," *Berkeley Planning Journal*, Vol. 29, Issue 1. The Turner Center for Housing Innovation is conducting ongoing research on housing development costs and feasibility. <http://turnercenter.berkeley.edu/>

¹³Vacancy rates for the workers that are essential for housing construction shown in Fig. 3 are complicated by the fact that construction contractors often recruit their workforces through informal, non-public channels, especially when it comes to carpenters and laborers. It is not known, however, whether the increases are attributable workers choosing to leave a firm for a better offer made by a different contractor or are due to expansion-driven searches for workers.

¹⁴Certain other trades, such as elevator and fire sprinkler installers, are more regulated, but employ far fewer workers.

¹⁵Rose Quint, "Young adults & the Construction Trades," National Association of Home Builders, March 1, 2017. Building trades share of total employment: U.S. Census Bureau, 2017 American Community Survey 1-Year Estimates.

¹⁶Unless otherwise noted, statistics in this section are based on the author's analysis of data from the U.S. Bureau of Labor Statistics 2017 Occupational Requirements Survey (ORS) and the U.S. Census Bureau American Community Survey Occupational Requirements Survey publications and data were accessed via <https://www.bls.gov/hcs/ors/home.htm>. IPUMS-USA processes and harmonizes Public Use Microdata Sample (PUMS) data from U.S. Census Bureau's American Community Survey and makes them available via <https://usa.ipums.org/usa/>

¹⁷QWI Explorer application, U.S. Census Bureau, qwexplorer.ces.census.gov and American Community Survey and decennial Census Public Use Microdata Sample data reprocessed and distributed by IPUMS-USA, University of Minnesota, www.ipums.org

¹⁸Published Occupational Requirements Survey data do not disaggregate construction jobs into nonresidential versus residential work. It is possible that the relatively high average masks disparate requirements between the two sub-sectors. Published ORS data include the estimate that the 75th percentile

of construction and extraction jobs require 1,460 days of pre-employment training, versus 90 days for all jobs for the 75th percentile across all occupations. Employers require pre-employment training for 40 percent of carpenters, according to the U.S. BLS estimates from the 2017 survey data.

¹⁹Travel time to work estimates: Author's analysis of U.S. Census American Community Survey 1-year 2017 Public Use Microdata Sample.

²⁰California Department of Industrial Relations, Office of Policy, Research, and Legislation. 2018. "2017 nonfatal occupational injuries and illnesses in California - case and demographic tables." Table 18. Available via <https://www.dir.ca.gov/oprli/Injuries/Demographics/2017/Menu.htm#pyt>. Only "Building and grounds cleaning and maintenance occupations" ranked worse than "construction and extraction" occupations.

²¹Author's estimates, based on the U.S. Bureau of Labor Statistics Occupational Employment Statistics, 2017 and the California Workers Compensation Insurance Rating Bureau, "Classification Relativities" Excel spreadsheet for the 2019, published in 2018, downloaded via <https://www.wcirb.com/document/22586> and documented in <https://www.wcirb.com/document/22586>

²²State of California, Department of Industrial Relations, "Fatal Occupational Injuries in California, 2013-2016," December 19, 2017, downloaded via <https://www.dir.ca.gov/DOSH/GF01/Fatalities-Report-2013-2016.pdf>

²³U.S. Department of Labor, Occupational Safety & Health Administration, OSHA Accident data file downloaded via https://enforcedata.dol.gov/views/data_summary.php, November 2018.

²⁴The major proximate causes of the construction fatal accidents break down as follows: 146 died from falls, slips or trips, including 139 deaths from falls to a lower level; 45 died from exposure to harmful substances or environments; 30 were struck by an object or equipment; 26 died from exposure to electricity. The remainder died from other causes.

²⁵Dong, XS, K Ringen, L Welch and J Dement. 2014. "Risks of a lifetime in construction part I: traumatic injuries." *American Journal of Industrial Medicine*. 57:973-983.

²⁶Güvenen, Fatih, Sam Schulhofer-Wohl, Jae Song, and Motohiro Yogo. 2017. "Worker Betas: Five Facts about Systematic Earnings Risk." *American Economic Review*, 107 (5): 398-403. Available for download via <https://www.aeaweb.org/articles?id=10.1257/aer.p20171094>. For earnings volatility estimates by industry sector, see appendix Tables B1 and B2 via <https://assets.aeaweb.org/assets/production/files/4380.pdf>

²⁷Using American Community Survey 2016 and 2017 one-year PUMS data, I estimate that private construction industry trades employees averaged 1,861 hours per year, while all other privately employed men worked an average of 1,988 hours. The difference in means, 6 percent, is primarily attributable to smaller percentages of year-round employment for construction workers.

²⁸U.S. Bureau of Economic Analysis. Employment Series 25 and 25N, 1969-2001 and 1998-2017.

²⁹U.S. Census Bureau, QWI Explorer application (qwexplorer.ces.census.gov). California's Beginning of Quarter Employment. qwexplorer.ces.census.gov/exp-r/f45ed.html, generated December 11, 2018. Data filtered to include all employed men in the construction sector except those with college degrees.

³⁰The measure discussed is based on the U.S. Bureau of Labor Statistics' Quarterly Census of Employment and Wages, which captures employment numbers from establishments that are covered by unemployment insurance laws.

³¹The U.S. Bureau of Labor Statistics cautions users of its data that OES estimates over years may be complicated by various measurement and methodological changes over years (see https://www.bls.gov/oes/oes_ques.htm). The selected occupations and years are unlikely to be impacted by the major changes identified by BLS. The direction and rough magnitude of changes depicted in Table ought to be reliable. Specific numeric or percentage change estimates are subject to error.

³²Pay motivates people choosing how and where they work. For pay to attract a person to a particular job, the important metric is expected total annual compensation relative to expected total compensation of other jobs. An occupation's average hourly wage is important information, but provides an incomplete picture of the relative competitiveness of an occupation in the labor market. Workers will consider whether a job's compensation package includes employer-paid health care benefits, paid time-off. Can a worker expect that this month's pay will not be matched necessarily in future months due to seasonal or cyclical volatility? Finally, a job's rewards, to be competitive relative to other potential jobs, are adjusted in workers' rough calculations to account for elevated risk exposure and significant opportunity costs (e.g., work-life balance considerations) that accompany the job.

³³Dunlop and Mills wrote in 1968: "Probably the most important characteristic of employment in construction for most workers is its intermittency. In addition, working conditions are frequently less favorable than elsewhere. Construction work is often physically difficult, and in adverse weather may be unpleasant (certainly more so than in-plant maintenance work, for example). Building tradesmen employed by contractors must be prepared to move considerable distances and, sometimes, to be away from home for long periods. The pace of work is often hard, with relatively high accident rates. There are, of course, wide variations among crafts and sites in the nature of working conditions. The wage rate in the building trades should be expected to include, in the long run, a differential reflecting these characteristics of employment in the industry." (Dunlop & Mills 1968, p. 259)

³⁴Ricuarte, Migue. August 2009. "Interindustry wage differences: an empirical review." Central Bank of Chile Working Papers No. 525, Figure 4.4. Retrieved via <http://si2.bcentral.cl/public/pdf/documentos-trabajo/pdf/dtbc525.pdf> The author included dummy control variables for female workers, African-American workers, living in a metropolitan area, division of residence, age group, and educational attainment.

³⁵The University of Texas at Austin-based Construction Industry Institute summarized national average hourly earnings trends: "The gap of [construction vs other sectors] real wages almost shrunk by half in 2014 when compared to 1974. The construction industry's workers in 2014 earned \$5.53/hr. less real income than in 1974, while the total private industries' workers in 2014 earned \$0.67/hr. less real income value as in 1974. Construction Industry Institute, "Is there a Demographic Craft Labor Cliff that Will Affect Project Performance," RT-318 Topic Summary, available via <https://www.construction-institute.org/resources/knowledgebase/knowledge-areas/human-resource-management/topics/rt-318>

³⁶Abowd, John, Francis Kramarz, Paul Lengeremann, Kevin McKinney and Sebastien Roux (2012), "Persistent inter-industry wage differences: rent sharing and opportunity costs," IZA Journal of Labor Economics, 1:7. See online Appendix Table A1, retrieved via

³⁷Author's analysis of U.S. Census, 2017 American Community

Survey 1-year Public Use Microdata Sample (PUMS), downloaded via <https://www.census.gov/programs-surveys/acs/data/pums.html>. The comparison group of workers without four-year college degrees is limited to males because 98 percent of the building trades workforce is male. The nationwide PUMS includes over 60,000 individual respondents employed as building trades workers within the construction sector. The California PUMS for the 2017 ACS includes over 6,500 construction industry building trades respondents. The Census Bureau statistically allocated 30 percent of the California construction trades respondents' earnings. Results do not change substantially when respondents with allocated earnings are excluded. Analysis of a sub-sample that included workers who work less than full-time, year-round yielded similar results, though 12-month average and median earnings levels were about 15 percent lower.

³⁸The construction wage differential story is more complex when one uses multiple regression statistical models to control for individual worker traits and analyze regions within California. Utilizing 2012-2016 American Community Survey PUMS data to model male earnings, I controlled for a variety of typical individual traits such as age, race, education, citizenship status, and region of residence. Construction workers who live on the outskirts of the San Francisco Bay "megaregion," including Stockton and Modesto and the less densely populated counties to the north of the San Francisco Bay, enjoy earnings premiums on average of ten percent or more compared to similar male workers from their counties. Southland California counties of Los Angeles, Orange, Riverside, San Bernardino enjoy similar premiums. Controlling for individual traits, the model estimated that construction workers from the three core Bay Area metropolitan areas of Oakland, San Francisco, San Jose have earnings that are 4 percent lower than earnings of comparable male workers.

³⁹Kolmar, Chris. 2018. "These are the jobs with the highest rate of uninsured workers," downloaded via <https://www.zippia.com/advice/jobs-with-highest-uninsured-rate/>

⁴⁰Author's analysis of data provided via IPUMS-CPS, University of Minnesota, www.ipums.org. The reader will notice that the base rate of coverage of all non-construction workers is different from the zippia.com analysis of American Community Survey health insurance coverage rates. While zippia analyzed simply whether the worker was covered by any health insurance plan, the CPS-ASEC focused in on a narrower question: was the respondent a policyholder for group health insurance that was related to current or past employment. Persons who are covered by a family health insurance policy held by another person are not included in the CPS-ASEC coverage rate.

⁴¹Author's analysis of American Community Survey 2012-2016 data processed and distributed by IPUMS-USA, University of Minnesota, www.ipums.org. The sample was limited to employees of private for-profit firms age 26 and older who reported that they usually worked 30 hours or more per week and did not attend school or college.

⁴²Dunlop, J.T. and D.Q. Mills. 1968. "Manpower in Construction: A Profile of the Industry and Projections to 1975," in United States. President's Committee on Urban Housing. 1968 *Technical Studies Volume II*. Accessed via www.michaelcarliner.com/files/Pres.com-Kaiser-68Technical-v2.pdf

⁴³Kim, Jaewhan and Peter Philips. 2010. "Health Insurance and Worker Retention in the Construction Industry," *Journal of Labor Research* 31:20-38.

⁴⁴U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 1911. "Industry Wage Survey: Contract Construction September 1973." Washington, D.C.: 1976. See Tables 28 & 46. Downloaded

via <http://fraser.stlouisfed.org>. The BLS surveyed 530 California construction establishments that employed over 20,000 nonsupervisory workers (Table A-1). Over 90 percent of the California workers were covered by collective bargaining agreements (Text table 3).

⁴⁵Union density in construction nationally decreased by half between 1970 and 1990. Huang, Allison L., Robert E. Chapman, and David T. Butry. September 2009. "Metrics and Tools for Measuring Construction Productivity: Technical and Empirical Considerations." U.S. Department of Commerce, National Institute of Standards and Technology, NIST Special Publication 1101, Figure 3.3. For a dissertation-length treatment of the history of business' strategy to reduce the influence of unions in construction, see Linder, Marc. 2000. *Wars of Attrition: Vietnam, the Business Roundtable, and the Decline of Construction Unions* (2d Rev. Ed). Downloaded via https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2221464

⁴⁶Author's analysis of California Employment Development Department Quarterly Census of Employment and Wages data for Specialty Trade Contractors, disaggregated into residential contractors (NAICS codes 238nn1) and nonresidential contractors (NAICS 238nn2). Data downloaded via <https://www.labormarketinfo.edd.ca.gov/qcew/qcew-select.asp>

⁴⁷Author's analysis of data for NAICS industry 238131 accessed and downloaded from State of California, Employment Development Department, Quarterly Census of Employment and Wages via https://www.labormarketinfo.edd.ca.gov/data/Quarterly_Census_of_Employment_and_Wages.html

⁴⁸Philips, Peter. 2003. "Dual worlds: the two growth paths in US construction." In *Building Chaos: An international comparison of deregulation in the construction industry*, by Gerhard Bosch and Peter Philips. New York: Routledge, p. 168. Philips explained that the combination of industry turbulence, short-term employer-employee relationships, and one-shot bidding wars for construction contracts lower the risk-adjusted short-run returns of investments in the development of construction craft skills. Workers and the private players who influence construction budgets rationally under-invest "today" in training that will only pay uncertain dividends "tomorrow."

⁴⁹C. Jeffrey Waddoups. 2014. "Union Coverage and Work-Related Training in the Construction Industry." *Industrial & Labor Relations Review*. 67:2 (532-555)

⁵⁰The Business Roundtable, "Training Problems in Open Shop Construction: A construction industry cost effectiveness project report," Report D-4, September, 1982, reprinted October, 1990, p. 4. At the time the report was written, the Business Roundtable estimated that non-union contractors accounted for 60 percent of the value of construction business. Non-union construction workers account roughly for 80 percent of the nationwide workforce in the late 2010s.

⁵¹Quoted in Philips, Peter. 2003. "Dual worlds: the two growth paths in US construction." In *Building Chaos: An international comparison of deregulation in the construction industry*, by Gerhard Bosch and Peter Philips. New York: Routledge, p. 169.

⁵²Construction Users Roundtable, "Confronting the Skilled Construction Workforce Shortage," WP-401, June 2004, p. 3.

⁵³Construction Industry Institute Research Team 335. July 2018. "Improving the Workforce Development System." Final Report 335, CII Annual Conference 2018 Edition, p. 77. Downloaded via https://www.construction-institute.org/CII/media/Publications/publications/fr-335_ac18.pdf

⁵⁴Exiting [California Division of Apprenticeship Standards]

participants employed in Construction earned a median quarterly wage more than twice that sector's average wage statewide." "Participants who earned a certificate fared significantly better than participants who did not in terms of both post-exit employment and earnings. Participants who attained a certificate were employed four quarters after exit at a rate nearly 30 percentage points higher than those who did not attain a certificate. Certificate-earning participants had a median quarterly wage more than two times that of participants who exited without earning a certificate." See California Workforce Development Board, "Workforce Metrics Dashboard Report 2018 AB 2148 Legislative Report," <https://cwdb.ca.gov/wp-content/uploads/sites/43/2018/05/2148-Report-FINAL.pdf>, p. 34.

For strong state-registered apprenticeship program results in the state of Washington, see Hollenbeck, Kevin, and Wei-Jang Huang. 2016. "Net Impact and Benefit-Cost Estimates of the Workforce Development System in Washington State." Upjohn Institute Technical Report No. 16-033. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

For a multi-state study, see Reed, Debbie et al. 2012. "An Effectiveness Assessment and Cost-Benefit Analysis of Registered Apprenticeship in 10 States." Final report submitted to the U.S. Department of Labor Employment and Training Administration. Per the study abstract, "The study found program participants had substantially higher earnings than nonparticipants, and program social benefits were much larger than costs. Retrieved via https://wdr.doleta.gov/research/FullText_Documents/ETAOP_2012_10.pdf

⁵⁵U.S. Department of Labor, Bureau of Labor Statistics. 1976. Op.cit. supra note 2.

⁵⁶California Statistical Abstract. 1974 – 2008. Published by 1961-1981 by the Economic Development Agency of the State of California; 1982 – 2008 by the California Department of Finance. Various volumes available for download via Internet Archive, www.archive.org. For 1973 data in the 1974 volume, see Table C-22.

⁵⁷Author's analysis of State of California, Department of Industrial Relations, Division of Apprenticeship Standards data.

⁵⁸California Department of Industrial Relations, Division of Apprenticeship Standards. I am grateful to DAS for providing a copy of the full apprentice and apprentice sponsor database that had data current as of early May 2018.

⁵⁹The Carpenters Training Committee of Northern California received 9,500 notifications between October 2016 and October 2018 from contractors – including 4,000 from non-union contractors – of projects that potentially could employ carpentry and allied craft apprentices. Of those, only about 230 (less than 3 percent) were for projects where the word "housing" or "apartments" appeared in the project title.

⁶⁰Author's analysis of private data for May 2017 reported by construction employers that are signatory to the Carpenters Master Agreement for Northern California.

⁶¹See <https://ephr.jobcorps.gov/Appendices/Forms/AllItems.aspx>, specifically for Memorandums of Understanding with the Home Builders Institute and various other entities related to building trades unions. Curriculum development and instruction is provided under contract. Non-instructional program costs (including facilities, equipment, and residential and social services for trainees) are provided by Job Corps center around the country and are not enumerated in the MOUs.

⁶²Home Builders Institute IRS Form 990, 2016, retrieved via <http://foundationcenter.org/find-funding/990-finder>. Brent Booker, Secretary-Treasurer, North America's Building Trades

Unions. October 11, 2017. Statement Before the Subcommittee on Highways and Transit Committee on Transportation and Infrastructure, United States House of Representatives. https://transportation.house.gov/uploadedfiles/2017-10-11_-_booker_testimony.pdf.

⁶³Barbosa, Felipe et al. February 2017. "Reinventing construction: a route to higher productivity." McKinsey Global Institute, Box E1, p. 4. Available via <https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/reinventing-construction-through-a-productivity-revolution>

⁶⁴U.S. BLS. 1987-2016 Nonmanufacturing Multifactor Productivity. Downloaded in 2018 via <https://www.bls.gov/mfp/mprload.htm>. BLS cautions users that measuring output and input for nonmanufacturing industries often is difficult and can produce productivity measures of inconsistent quality. A team of BLS economists has attempted to disaggregate the construction sector and measure productivity, using several different output price deflators. They estimate that productivity growth for single-family and multi-family housing production between has been positive, albeit it at rates that still lag total and manufacturing sector average productivity growth. The construction housing productivity estimates take into account a rough estimate of the influence of housing business cycles on housing cycles.

⁶⁵U.S. Bureau of Labor Statistics, Nonfarm Business Sector: Real Output Per Hour of All Persons [OPHNFB], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/OPHNFB>, July 17, 2018.

⁶⁶Barbosa, Felipe et al. February 2017. *supra note* 45, Exhibit E3, p. 5

⁶⁷U.S. Census Bureau, Annual Survey of Manufactures: General Statistics: Statistics for Industry Groups and Industries, Table AM0631GS101. Accessed via factfinder.census.gov. Figures are in current dollars, unadjusted for inflation.

⁶⁸Doherty, Conor. 2018. "Piece by Piece, a Factory-Made Answer for a Housing Squeeze." New York Times, June 7, 2018.

⁶⁹Reid, Carolina and Hayley Raetz. January 2018. "Perspectives: Practitioners Weigh in on Drivers of Rising Housing Construction Costs in San Francisco," p. 7. Available via http://ternercenter.berkeley.edu/uploads/San_Francisco_Construction_Cost_Brief_-_Terner_Center_January_2018.pdf

⁷⁰Author's analysis of U.S. Census Bureau Public Use Microdata Sample data processed and distributed by IPUMS-USA.

⁷¹See, for example, National Women's Law Center. 2014. "Women in construction: still breaking ground." https://www.nwlc.org/sites/default/files/pdfs/final_nwlc_womeninconstruction_report.pdf

⁷²Günsell Berik, Cihan Bilginsoy, (2006) "Still a wedge in the door: women training for the construction trades in the USA", International Journal of Manpower, Vol. 27 Issue: 4, pp.321-341

⁷³See, for example, "LA Metro looks to increase hiring of women for construction jobs," December 5, 2017, <http://www.metro-magazine.com/management-operations/news/726594/la-metro-looks-to-increase-hiring-of-women-for-transportation-construction-jobs>

⁷⁴Author's analysis of data downloaded via U.S., QWI Explorer application qwexplorer.ces.census.gov/exp-r/10583d.html. Rates for nonresidential building contractors and building equipment contractors (NAICS 2382, which includes electrical and plumbing contractors) fall between the all sector rate and the other two subcontractor groups' rates.

⁷⁵California Department of Finance. "Population Projections (Baseline 2016): P-1 State Population Projections (2010-2060),

Total Population by Age." <http://doef.ca.gov/Forecasting/Demographics/Projections/>

⁷⁶Basic building specialty trades are defined here to include building foundation, structure, exterior and finishing contractors (NAICS 2381 and 2383). Workers below the age of 35 experienced the largest drop in total male employment between 2006 and 2011, the nadir of the recession for the construction sector recession, accounting for nearly two-thirds of all net male employment loss. Workers under the age of 35 accounted for only 30 percent of the net male employment gains between 2011 and 2017.html. Author's calculations based on data obtained via the QWI Explorer application, U.S. Census Bureau, qwexplorer.ces.census.gov/exp-r/10b97f.

⁷⁷U.S. Census Bureau, Longitudinal Employer-Household Dynamics (LEHD) program. <https://lehd.ces.census.gov/data/>

⁷⁸Excludes average earnings of construction sector-origin job-to-job switchers. All ownership; limited to male workers.

⁷⁹Residential Building and Structure & Building Finishing contractors (NAICS industries 2361, 2381 and 2383) "new hire" earnings include workers who came from other construction firms and include only workers who were hired into stable (full-quarter) employment.

⁸⁰Edwards, R and F Ortega. 2017. "The economic contribution of unauthorized workers: An industry analysis," *Regional Science and Urban Economics*, 67:119-134. This estimate may be upwardly biased by the inclusion of all occupations within the construction industry. U.S.-born employees are more concentrated in higher paying white-collar construction industry occupations, while unauthorized immigrants are.

⁸¹Author's analysis of 2005-2016 1-year U.S. Census Bureau American Community Survey (ACS) Public-Use Microdata Sample, processed and distributed by IPUMS-USA, University of Minnesota, www.ipums.org.

⁸²Yvonne Yen Lieu, Daniel Flaming, Patrick Burns. 2014. "Sinking underground: the growing informal economy in California construction." Economic Roundtable. Available via <http://www.economicrt.org>

⁸³Warren, R and J R Warren. 2013. "Unauthorized immigration to the United States: Annual estimates and components of change, by state, 1990 to 2010." *International Migration Review*, 47 (2): 296-329.

⁸⁴Author's estimate based on U.S. Census American Community Survey Public Use Microdata Sample data processed and distributed by IPUMS-USA, University of Minnesota, www.ipums.org. Census household survey estimates likely undercount immigrants living in the United States without authorization.

⁸⁵Ibid.

⁸⁶Ibid.

⁸⁷For a review and original data analysis, see Hanson, G, C Liu, and C McIntosh. Spring 2017. "Along the watchtower: The rise and fall of US low-skilled immigration." *Brookings Papers on Economic Activity*,

⁸⁸U.S. Department of Commerce, Bureau of Economic Analysis. Methodology: https://www.bea.gov/sites/default/files/methodologies/RPP2016_methodology.pdf; Data may be downloaded via <https://apps.bea.gov/itable/itable.cfm?ReqID=70&step=1>

⁸⁹Prices and earnings vary regionally within California. While median construction worker 12-month earnings are 19 percent higher than the national median, overall price levels in the San Jose-San Francisco-Oakland Bay Area are almost 25 percent

higher than national average prices. Hence the median Bay Area construction worker's purchasing power is lower than typical construction workers who live in average-price areas. See U.S. Census Bureau 2017 American Community Survey 1-Year Estimates, Tables B24011, B24012 and B24022 and U.S. Bureau of Economic Analysis 2016 Regional Price Parities by Metro Area.

⁹⁰ Author's analysis of 2012-2016 5-year U.S. Census Bureau American Community Survey Public-Use Microdata Sample, processed and available for download via IPUMS-USA, University of Minnesota, www.ipums.org

⁹¹ See section 2 but note that construction industry employers nationwide, according to an index of "recruitment intensity," have recruited with less intensity per job vacancy on average between 2011 and 2017 than they did during the expansionary period between 2002 and 2006. The recruitment intensity index, its creators say, captures relative changes in advertising expenditures, screening methods, hiring standards, and the attractiveness of compensation packages. See DHI Group, Inc., DHI-DFH Index of Recruiting Intensity per Vacancy by Industry: Construction (DISCONTINUED) [DHIDFHRVIC], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/DHIDFHRVIC>, October 9, 2018. Index values for dates between January 2001 and April 2018 are publicly accessible; the data series has since been discontinued.

⁹² Turnover of construction employees remains high relative to other major sectors. See ADP Research Institute. 2018. "Revelations from workforce turnover: A closer look through predictive analytics." Accessed via https://www.adp.com/-/media/RI/pdf/ADP_PredictingTurnOver_White_Paper.ashx

⁹³ Employer strategies for addressing labor shortages are listed and discussed in Barnow, Burt s., John Trutko and Jaclyn Schede Piatak, Occupational Labor Shortages: *Concepts, Causes, Consequences, and Cures*. Kalamzoo: W.E. Upjohn Institute for Employment Research, 2013.

⁹⁴ Philips, Peter. 2003. *Op. cit.* p. 169

⁹⁵ California's requirements for private contractors seeking to provide construction services on public works projects are accessed via <https://www.dir.ca.gov/Public-Works/Contractors.html>

⁹⁶ Littlehale, S. 2017. Revisiting the Costs of Developing New

Subsidized Housing: The Relative Import of Construction Wage Standards and Nonprofit Development. *Berkeley Planning Journal*, 29(1). Retrieved from <https://escholarship.org/uc/item/9js5d61m>

⁹⁷ Morantz, Alison. 2009. "The Elusive Union Safety Effect: Toward a New Empirical Research Agenda." *LERA 61st Annual Proceedings*. Retrieved via <http://www.lerachapters.org/OJS/ojs-2.4.4-1/index.php/LERAMR/article/view/1322>

⁹⁸ *Ibid.*, p. 19.

⁹⁹ Manzo, Jill. May 2017. "The \$5 Billion Cost of Construction Fatalities in the United States: A 50 State Comparison." Midwest Economic Policy Institute. Retrieved via <https://midwestepi.files.wordpress.com/2017/05/mepi-construction-fatalities-nationwide-final.pdf>

¹⁰⁰ Waddoups. 2014. *Op. cit.* Table 3 at p. 545. Control variables included race, ethnicity, age, worker tenure with current employer, nativity, and firm size.

¹⁰¹ Bilginsoy, Chihan. 2003. "Wage Regulation and Training: The Impact of State Prevailing Wage Laws on Apprenticeship." Working Paper No: 2003-08. University of Utah Department of Economics.

¹⁰² Haxhiu, Eilrd and Peter Philips. 2017. The Role of Collective Bargaining, Remuneration Strategies and Regulations in Fostering Apprenticeship Training in US Construction. Unpublished manuscript.

¹⁰³ Duncan, Kevin and Russell Ormiston. 2017. "Prevailing wage laws: what do we know?" Institute for Construction Economic Research, pp. 16-19. Retrieved via <http://iceres.org/wp-content/uploads/2014/10/prevailing-wage-review-duncan-ormiston.pdf>

¹⁰⁴ Reed, D., *et al.* 2012. *Op cit.*

¹⁰⁵ Hall *et al.* found that "undocumented workers are rewarded less for employment in hazardous settings, receiving low or no compensating differential for working in jobs with high fatality, toxic materials, or exposure to heights." Hall M, Greenman E. 2015. The occupational cost of being illegal in the United States: legal status, job hazards, and compensating differentials. *Social Forces*. 49(2):406-42

¹⁰⁶ Kim, Jaehan and Peter Philips. 2010. "Effect of Multiemployer Collective Bargaining on Employer-Provided Health Insurance

in the Construction Industry." *Journal of Labor Research*. 31:322-331.

¹⁰⁷ Ghilarducci, Teresa and Michael Reich. 1998. "Training and Pensions: Substitutes or Complements?" IRLE Working Paper No. 68-98. <http://irle.berkeley.edu/workingpapers/68-98.pdf>

¹⁰⁸ Haxhiu, E. and P. Philips. 2017. *Supra* at note 82.

¹⁰⁹ More detailed citations are available upon request.

¹¹⁰ Ari Fenn, Zhi Li, Gabriel Pleites, Chimedkham Zorigtbaatar, & Peter Philips. 2018. "The Effect of Prevailing Wage Repeals on Construction Income and Benefits." *Public Works Management and Policy* 1-19.

¹¹¹ Philips. 2003. *Op. cit.*

¹¹² Author's analysis of state-level 2012 Economic Census data for heavy and civil construction industries (NAICS 237) excluding land subdivision and excluding the states of Alaska and Hawaii. The comparison of materials per hour was narrowed to the heavy and civil construction sector due to that sector being most dependent on public works contracts. States were divided into "weak and no law" states and "average and strong law state" as illustrated in Manzo, J. 2018, *supra* at note 80.

¹¹³ Duncan and Ormiston. 2017. *Supra* note 96.

¹¹⁴ See discussion of issues that compromise the estimates of a study by Dunn, Quigley and Rosenthal in Littlehale, S. 2017. Revisiting the Costs of Developing New Subsidized Housing: The Relative Import of Construction Wage Standards and Nonprofit Development. *Berkeley Planning Journal*, 29(1). Retrieved from <https://escholarship.org/uc/item/9js5d61m>

¹¹⁵ *Ibid.* The revised multivariate regression models provided a superior fit to the California low income housing project cost data than the model that informed the official State of California affordable housing cost study published in 2014.

¹¹⁶ Duncan, Kevin, Peter Philips & Mark Prus. 2009. "The Effects of Prevailing Wage Regulations on Construction Efficiency in British Columbia," *International Journal of Construction Education and Research*, 5:2, 63-78

¹¹⁷ Philips, P. 2003. *Supra* at note 4.

¹¹⁸ *Ibid.*, p. 185.