# VALUING PROFESSIONAL LICENSING IN THE US

A REPORT FOR THE ALLIANCE FOR RESPONSIBLE PROFESSIONAL LICENSING

JANUARY 2021






ARPL Alliance for Responsible Professional Licensing

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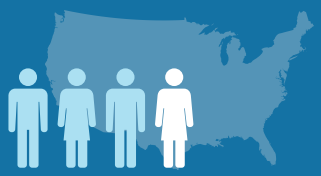
# EXECUTIVE SUMMARY

Professional licensing is the process to become credentialed in a profession. Its main purpose is to indicate that a practitioner is capable of performing a certain type of work safely and competently, in order to protect public health, safety, and welfare. To become licensed, workers need to meet education, examination, and experience requirements, which differ by profession.

**1 in 4 workers**

**holds a certificate or license in 2019 in the US**



Over the past decades, the proportion of US workers holding an occupational license or certification has increased from about 5% of workers in the 1950s to about one in four (24%) workers holding a certificate (2%) or license (22%) in 2019, according to the Bureau of Labor Statistics. Licensing can provide significant safeguards and advantages to consumers, protecting them from low-quality providers and overpriced services. Nevertheless, critics and some legislators argue that the US licensing systems also create substantial costs, by artificially increasing licensing requirements beyond the skills needed for the job and in turn raising the price for the consumer.

Calls for deregulation, however, are often not narrowly tailored to address specific trades and vocations. Many of the current draft bills instead propose to discard licensing systems for all occupations—weakening or eliminating licensing standards for professions including **engineers, surveyors, architects, landscape architects, and certified public accountants (the licensed professions represented by ARPL members and evaluated in this study).** Interestingly, unlike these blanket calls for deregulation, consumers seem to have a much clearer understanding of the difference between occupational and professional licensing. Some 75% of the respondents to a Benenson Strategy Group survey were supportive of licensing regulations for highly technical professions that have a direct impact on public health and safety.[1]

Against this backdrop, **the Alliance for Responsible Professional Licensing (ARPL) is seeking to deepen understanding of the full impact of professional licensing.** ARPL is composed of four national associations that represent the above-mentioned highly complex, technical professions, and their state licensing boards. Its mission is to promote a responsible approach to professional licensing, and this is achieved by educating policymakers and the public on the importance of high standards within their professions, as well as offering best practices and advocating for uniform qualifications and standards. To pursue this mission, ARPL commissioned Oxford Economics to undertake independent research to review the evidence base in this field, analyze characteristics of the professional workforce, and empirically show the effects of occupational licensing across the skill spectrum.

## LITERATURE REVIEW

The academic literature on professional licensing is extensive. On the one hand, theory suggests that licensing has the potential to protect the public against incompetent practitioners and create clear career paths for workers. It can also

[1] Benenson Strategy Group (BSG) and ARPL, "Exploring Public Opinion of Professional Licensing", available at: http://www.responsiblelicensing.org/new-research-exploring-public-opinion-of-professional-licensing/

help consumers distinguish high- and low-quality providers. On the other hand, scholars have argued that licensure reduces employment in the licensed occupation, and hence competition, in turn driving up the price of goods and services. This study reviews the impact of licensing on wages, mobility, and its effects on women and minorities.

The impact of licensure on salaries has been studied extensively. Most studies find that unlicensed workers earn 10% to 15% lower wages than licensed workers with similar levels of education, training, and experience. **Licensing can yield wage premia** for two theoretical reasons: 1) it functions as a signal of high productivity, similar to a university degree; and 2) it increases barriers to entry, thereby reducing the availability of practitioners and increasing wages. Koumenta and Pagliero (2019) estimate that the latter channel accounts for about one-third of the wage effect and the remaining is attributed to signaling. This finding suggests that the barriers posed by licensing programs play a much smaller role than many critics may think compared to the stronger productivity effect.

Several scholars have attempted to determine **how licensing impacts different demographic groups.** The majority of the findings tend to find greater wage premia from licensing for female and minority workers, suggesting that entering a licensed occupation could help level the playing field for these groups, and even narrow or close wage gaps. For example, Bailey and Belfield (2018) find that, across college-educated workers, a license is associated with gains in earnings of 20% and 8% for female and male workers, respectively.

Another widespread subject in the licensing literature is **worker mobility.** The professions of interest in this study have made significant efforts to harmonize the system and make it easier for professionals to migrate across states. Architects with a National Council of Architectural Registration Boards (NCARB) Certificate, for example, can apply for reciprocal licensure in all 55 US jurisdictions. Literature on the subject finds that regulatory harmonization increases cross-border labor migration, suggesting that it is not the licensing system per se that potentially discourages mobility, but rather the different state-level requirements.

**10-15%** **lower wages paid to unlicensed workers compared with licensed workers with similar levels of education, training, and experience**

## WORKFORCE CHARACTERISTICS

This study goes beyond literature reviews and dives deeper into the professions of interest to ARPL. We show that, across all professions, women and ethnic minorities (here defined as non-white) still tend to be underrepresented. Encouraging signs, however, come from the gender and ethnic composition of students and graduates in the relevant disciplines. Across the board, the intake of new talent appears to be much more diverse than the current stock of licensed workers, suggesting the future of the licensed workforce is likely to be more balanced across genders and races.

**Greater returns from licensing for female and minority workers**

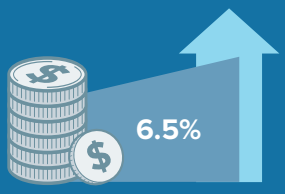
Clearly, occupational characteristics and competencies vary widely across different professions. Implications on socio-demographic access and equity, as well as broader public safety associated with very high-skilled professions, **require an approach that goes beyond much of the "one size fits all" found throughout much of the literature.**

## EMPIRICAL ANALYSIS

In the final section of this study, we therefore show that **licensing has very different effects for professions with high skill requirements and public impact compared to low skill occupations.** We first analyze how the wages of those with licenses or certifications compare with those without, across all occupations. In our baseline specification, the estimates suggest licensing is associated with approximately 6.5% higher hourly earnings, even after accounting for educational attainment, demographic, and occupational characteristics.

**6.5%**

**increase in hourly earnings from having a license**




We then look at the wage effects of licensing and certification by occupational skill level. We find that, while licensing and skills both increase wages, **licensing has a stronger wage effect at the bottom of the skill distribution.** This implies that both barbers and engineers are better off with a license, but to a very different extent, suggesting that equalizing all licensed occupations under one single regulatory framework could have potentially dangerous and unintended consequences.

**5.6%-7.4%**

**License premium for men and women, respectively**

Next, we estimate the occupational license premium across all occupations, allowing for heterogeneity by gender and race. We estimate the license premium for men is 5.6%, whereas the license premium for women equals 7.4%, suggesting **the returns to occupational licensing are higher for women than men.** On the other hand, we find that licenses do not seem to significantly contribute to narrowing the race-driven wage gap among Black and Hispanic professionals across all occupations.

Finally, we attempt to account for differences in the licensing premia due to both gender/race and skill level. We find that a female engineer (an example of a high skill licensed profession) can expect better wage returns to gaining a license than a male engineer, all else equal. The opposite is true among low-skill workers, where men see better licensing returns than women. This finding suggests that **professional licensing among highly skilled professions** (such as that provided by ARPL members) **positively contributes to narrowing the gender-driven wage gap.** Similarly, highly skilled minority workers are found to receive greater returns from licensing than high-skill non-minorities, suggesting that professional licensing among highly skilled professions (including the ARPL professions) **can also positively contribute to narrowing the race-driven wage gap.**

Overall, this study points to the fact that professional licensing of highly skilled workers should be understood and regulated separately from occupational licensing of trades and vocations. This is because:

- Its wage impact is different in size from that of lower-skill vocations;
- It appears to substantially support women and minorities move toward wage parity, and this is only true among highly skilled workers according to our model findings; and
- The level of risk and responsibilities involved in these professions calls for greater scrutiny over these roles and the repercussions of blanket deregulation for public safety and welfare could be considerable.

# 1. INTRODUCTION

Over the past decades, the proportion of US workers holding an occupational license has increased from about 5% of workers in the 1950s to nearly one in four workers holding a certificate or license in 2019.[2] This increase was driven by a **dramatic increase in the number and the range of occupations requiring a license.** The importance of an increase in the number of licensed occupations suggests that licensing has expanded considerably into sectors that were not historically associated with it. For example, specialty hair braider licensing requirements first appeared in the nineties, and some states have first introduced pet grooming licenses in the 2010s.

Highly skilled professions such as architects, instead, have been regulated and licensed for over a century.[3] It is therefore important to acknowledge that the driver for the growth in licensed workers has been the increasing number of occupations with licensing programs, rather than the rising numbers of licensed practitioners within historically licensed occupations and professions.

Licensing can provide significant safeguards and advantages to consumers. Nevertheless, critics argue that the US licensing systems also create substantial costs, by artificially increasing licensing requirements beyond the skills needed for the job and in turn raising the price for the consumer. These criticisms, however, tend to apply to low skill occupations, whereby licensing requirements are perceived as excessively regulating entry into a profession. This study instead focuses on a set of highly complex professions that have a direct impact on public health, safety, and welfare. These include:

- Certified public accountants (CPAs);
- Architects and landscape architects; and
- Engineers and surveyors.

In 2019, the US was home to 674,000 certified public accountants, 116,000 architects, 19,000 landscape architects, 492,000 engineering licensees, and nearly 38,000 surveying licensees. These highly educated workers help people and companies plan their finances, design the places we live and work in, and supervise the construction of roads and bridges. To better understand the skills and education demanded in these professions, we examined their respective O*NET's Job Zones.[4]

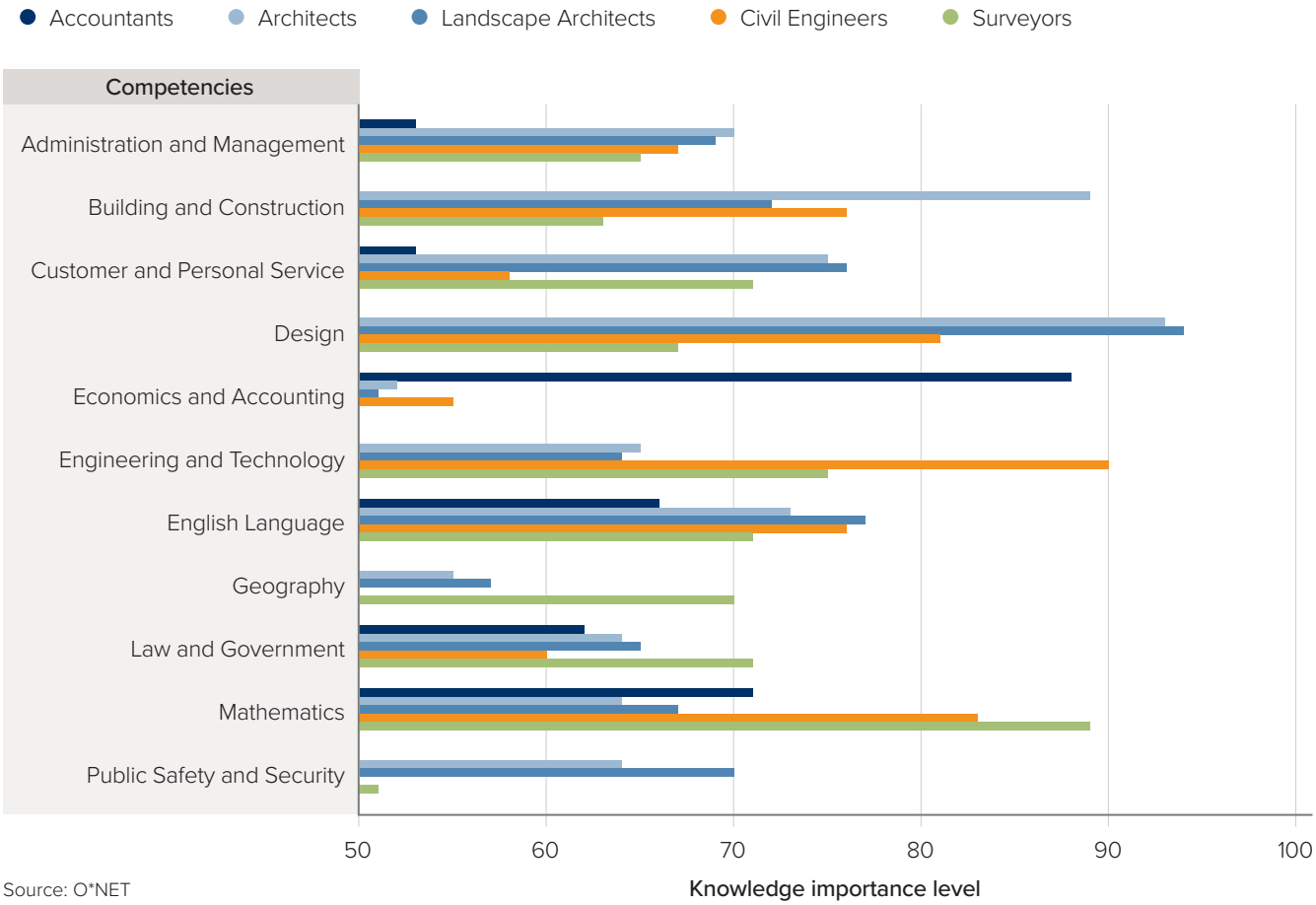
All the occupations of interest in this study are classified under Job Zone Four: Considerable Preparation Needed, indicating the need, typically, for formal higher education and several years' experience to gain the ability to practice, irrespective of licensure requirements. In particular, Fig. 1 shows the key competencies perceived as most important for each profession and this gives an idea of the high level of skills required to successfully carry out the job, while protecting the public. Economics and Accounting is the most important skill area for practicing the accounting profession, while Design is the most crucial for architects and landscape architects. Engineering and Technology are fundamental in the civil engineering profession, while Mathematics ranks first among surveyors.

[2] BLS, Certification and licensing status of the civilian non-institutional population 16 years and over by employment status, 2019 annual averages. https://www.bls.gov/cps/cpsaat49.pdf. A license grants legal authority to practice a profession. A certification is typically a voluntary process and is often issued by a private organization for the purpose of signalling individuals who have successfully met all requirements for the credential and demonstrated their ability to perform their profession competently.

[3] In 1897, Illinois became the first US jurisdiction to regulate the architecture profession.

[4] A Job Zone is a group of occupations that are similar in how much education people need to do the work, how much related experience people need to do the work, and how much on-the-job training people need to do the work.

**Fig. 1. Top competencies by profession, level of importance**




Source: O*NET

In comparison, other heavily licensed occupations include plumbers and pet groomers, classified as Job Zone Three (Medium Preparation Needed) and Two (Some Preparation Needed), respectively. This suggests that grouping all licensed occupations together may fundamentally misrepresent the additional importance that competencies and training play in performing job functions. For example, supporting all-embracing legislation to deregulate licensing wholesale, without accounting for either the skills required or the level of responsibility involved, could have potentially dangerous and unintended consequences.

In this report, we first examine existing literature on the subject in chapter 2. We summarize studies assessing the impact of licensing on wages, labor market outcomes for minorities, and mobility. We additionally illustrate and articulate the features of the US workforce in these professions, by providing an analysis of the people who work within them. In chapter 3, we present the respective findings for each profession. Chapter 4 describes the results from our empirical analysis, showing the substantial differences among occupations across the skill spectrum. The final section summarizes the key takeaways and concludes.

# 2. LITERATURE REVIEW

The academic literature on professional licensing is extensive. On the one hand, the theory suggests that licensing improves the quality of the service and protects the public against incompetent practitioners. It can also help consumers distinguish high- and low-quality providers. On the other hand, scholars have argued that licensure reduces employment in the licensed occupation, and hence competition, in turn driving up the price of goods and services for consumers.

This section divides the evidence into three main categories; section 2.1 evaluates the impact of licensing on wages and highlights the various methodologies used to approximate a causal relationship between licensure status and earnings. We explore the heterogeneity of impacts across demographic groups in section 2.2, with a focus on female workers and ethnic minorities. Finally, the effects of licensure on worker geographic and occupational mobility are evaluated in section 2.3. Our review attempts to focus predominantly on the highly technical professions covered by ARPL, although this is often challenging as we will discuss in more detail later in this chapter. Details about the occupations covered and data sources used by each article are summarized in Fig. 2.

**Fig. 2. Literature review summary table**

| Author and year | Occupations | Source of data | Economic variable |
|---|---|---|---|
| Koumenta and Pagliero (2019) | 10 ISCO 1-digit professional groups | EU Survey of Occupational Regulation | Wages |
| **Main findings:** Licensing is associated with 4% higher wages (one third attributed to rents; two-thirds attributed to signalling). Occupational licensing increases wage inequality; wage gains differ by occupation and level of education attainment. | | | |
| Kleiner and Vorotnikov (2017) | All occupations | Workforce survey conducted by Harris Poll Interactive, a subsidiary of the Nielsen Company | Wages |
| **Main findings:** The national estimates suggest that occupational licensing raises wages by about 11% after controlling for human capital and other observable characteristics. | | | |
| Gittleman and Kleiner (2016) | All occupations | National Longitudinal Survey of Youth (NLSY79) from 1979 to 2010 | Wages |
| **Main findings:** Using longitudinal data and a rich set of labour market controls, they find wage effects considerably lower than previous estimates (of about 7.5%). | | | |
| Kleiner and Krueger (2013) | All licensed occupations | PDII survey | Wages |
| **Main findings:** Licensing is associated with about 18% higher wages, but the effect of governmental certification on pay is much smaller. | | | |
| Law and Marks (2013) | Registered and practical nurses | Individual-level census data | Wages |
| **Main findings:** The shift from certification to mandatory licensing had little to no effect on the wages or the participation rate of practical and registered nurses. | | | |

**Fig. 2. Literature review summary table (continued)**

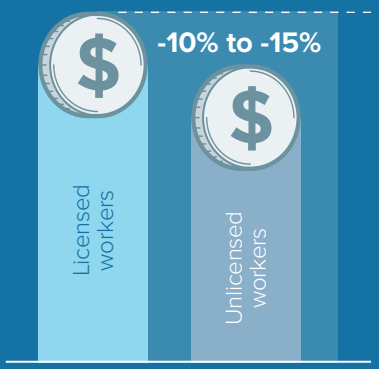
| Author and year | Occupations | Source of data | Economic variable |
|---|---|---|---|
| Han and Kleiner (2016) | 3 major universally licensed occupation | Council of State Governments (1952) report | Wages, labor market outcomes |
| **Main findings:** The authors find that duration years of occupational licensure are positively associated with wages for continuing and grandfathered workers. | | | |
| Redbird (2017) | 300 census-identifed occupations | Current Population Survey | Wages, hours and participation |
| **Main findings:** Licensure, instead of increasing wages, creates a set of institutional mechanisms that enhance entry into the occupation, particularly for historically disadvantaged groups. | | | |
| Blair and Chung (2017) | All occupations | Survey of Income and Program Participation (SIPP) | Wages, minorities |
| **Main findings:** Occupational licensing reduces the racial wage gap among men by 43% and the gender wage gap between women and white men by 36-40%. | | | |
| Law and Marks (2009) | A range of skilled and semiskilled occupations | Integrated Public Use Microdata Samples (IPUMS) of the Census of Population | Wages, minorities |
| **Main findings:** The authors find that licensing laws seldom harmed minority workers. In fact, licensing often helped minorities, particularly in occupations for which information about worker quality was difficult to ascertain. | | | |
| Blair and Chung (2018) | All occupations | Wave 13 to Wave 16 of the SIPP 2008 Panel | Wages, minorities |
| **Main findings:** The authors show that an occupational license serves as a job market signal, similar to educational qualifications. In the presence of occupational licensing, they find evidence that firms rely less on observable characteristics such as race and gender in determining employee wages. As a result, licensed minorities and women experience smaller wage gaps than their unlicensed peers. | | | |
| Nunn (2018) | All licensed occupations | Current Population Survey | Wages, minorities |
| **Main findings:** Men tend to receive smaller licensing premia than women, while black and Hispanic men receive relatively higher wage premia. | | | |
| Cassidy and Dacass (2019) | All occupations | CPS and the SIPP | Wages, minorities |
| **Main findings:** The wage premia to having a license are much larger for women than men but seem to be the same for natives and immigrants after controlling for English language ability. | | | |
| Ghani (2019) | Nurses | Census Bureau's job-to-job flows | Mobility |
| **Main findings:** Mutual recognition of occupational licenses, at least in the health sector, can boost job-related migration across state boundaries. Joining the Compact does not have an impact on migration flows within the state, but may divert some flows to non-Compact states. | | | |
| Johnson and Kleiner (2017) | 22 professions | IPUMS-USA Survey | Mobility |
| **Main findings:** Between-state migration rate for individuals in occupations with state-specific licensing exam requirements is 36% lower relative to members of other occupations. | | | |
| Kleiner and Xu (2020) | All occupations | CPS and SIPP data | Mobility |
| **Main findings:** Occupational licensing has significant negative effects on labor market fluidity. Specifically, licensed workers are 5% less likely to switch occupation, and 1% less likely to enter non-employment in the following month. | | | |

## 2.1 WAGE GAP

**Licensing can yield wage premia for two theoretical reasons: 1) it functions as a signal of high productivity; and/or 2) it creates a rent by adding a barrier to entry and in turn restricting supply.** Koumenta and Pagliero (2019) use decomposition techniques to estimate that rent accounts for about one-third of the wage effect and the remaining is attributed to signaling.[5] In other words, the difference in wages between licensed and non-licensed workers is decomposed into the part that is due to characteristics of the workers (such as productivity) and that due to labor supply restriction. The authors find the former is twice as important as the latter, suggesting that the barriers posed by licensing programs play a much smaller role than many critics may think compared to the stronger productivity effect.

**10-15%**
**lower wages**

**paid to unlicensed workers compared with licensed workers with similar levels of education, training, and experience**




**A factor common to much of the wage gap literature is the "one size fits all" approach,** whereby researchers pool together low-skilled occupations with highly technical professions and end up generalizing the findings to all licensed occupations. In this section, we present some of the key findings of this literature, while describing its limitations where relevant.

Perhaps the most apparent example of the "one size fits all" approach is the Kleiner and Vorotnikov 2018 study "At what cost?," which attempts to estimate the cost to society of all licensing systems, from plumbers to property surveyors.[6] The undertaking is ambitious and therefore relies on pooling all occupations together to come up with generalized state-specific wage premia, job losses, and monetary societal losses across all licensed occupations. While the results certainly give an indication for the potential monetary benefits of relaxing some of the systems currently in place, they provide no guidance on where to start, as all occupations are combined.

Data from Kleiner and Krueger (2013) show that, on average, licensed workers earn 28% more than their unlicensed peers.[7] This gap, however, partly mirrors other dissimilarities between these two groups that can contribute to better wages for licensed workers. Researchers have adopted a number of techniques to account for these differences and get a better estimate of the true impact of licensing on wages. Estimates that control for differences in education, training, and experience, for example, find that licensing is associated with 10%-15% higher wages relative to unlicensed workers.[8]

More sophisticated studies attempt to identify similar groups of workers, who differ merely with regard to their licensure status. One method is to match workers in the same occupation, but with different licensing status. This can be done, for example, when some states license an occupation while others do not, or when states only require some practitioners within a certain occupation

[5] Maria Koumenta and Mario Pagliero, "Occupational Regulation in the European Union: Coverage and Wage Effects", *British Journal of Industrial Relations,* 57:4 (2019): 818-49.
[6] Morris M. Kleiner and Evgeny S. Vorotnikov, "At What Cost? State and National Estimates of the Economic Costs of Occupational Licensing" (unpublished thesis, Institute for Justice, 2018).
[7] Morris M. Kleiner and Alan B. Krueger, "Analyzing the Extent and Influence of Occupational Licensing on the Labor Market", *Journal of Labor Economics,* 31(2) (2013): 173-202.
[8] Department of the Treasury Office of Economic Policy, Council of Economic Advisers, and Department of Labor, "Occupational licensing: a framework for policy makers", July 2015.

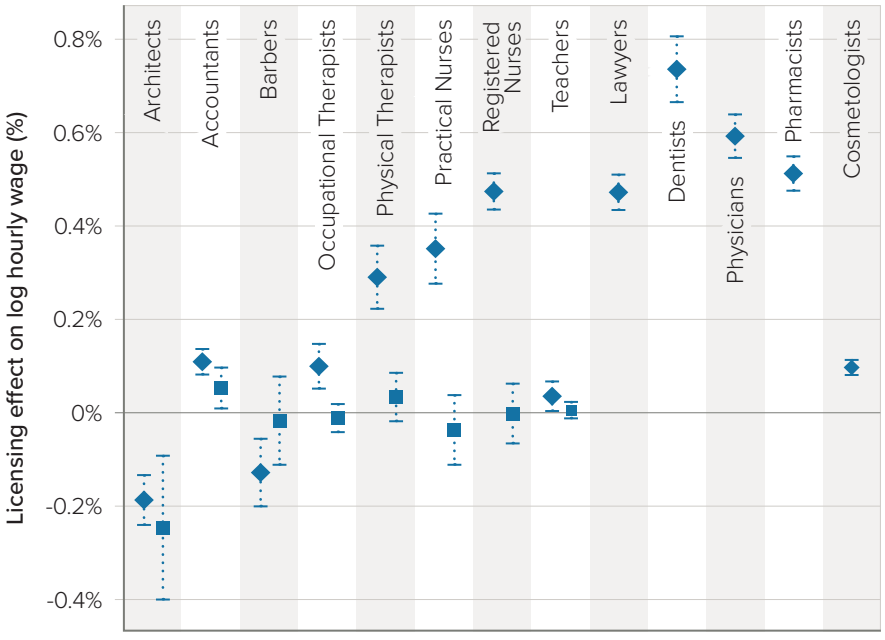
to hold a license. In these studies, identification comes from within-occupation comparisons, which may be across states with different licensing requirements or within a state between those who have attained a license and those who have not. A second methodology is to contrast wages for the same workers, as they switch into (or out of) a licensed profession.

These methods typically find more modest effects—below 10%—of licensing on earnings, with some studies finding no impact at all. Despite these attempts, interpreting the relationship between licensure and wages as causal is often inaccurate, as licensed workers could differ from unlicensed workers in ways unobserved by the researcher and this can bias the results.

In a study of universally licensed occupations (including architects and accountants, among others), Han and Kleiner (2017) use a difference-in-differences (DID) causal model that takes into account the different times at which each of the occupations initially became licensed in each of the 50 states.[9] DID is typically used to estimate the effect of a specific intervention (such as the enactment of a policy) by comparing the changes in outcomes over time between a population that is affected by the policy, and a population that is not (the control group). The authors show there is a wage effect, but also find that this varies across the occupations examined. Fig. 3 suggests that physicians, for example, obtain much higher wages as a consequence of occupational licensing, while for architects the premium is even negative, and for accountants, it is positive but small.

Interestingly, not all the articles find positive wage premia from licensing. Redbird (2017) finds that licensure does not increase wages across 300 census-identified occupations by looking at wage changes in each occupation, within each state, in the years following enactment of licensing laws.[10] Law and Marks (2013) also find that the shift from certification to mandatory licensing had little to no effect on the wages of practical and registered

**Fig. 3. Heterogeneity of the effect of licensing on hourly wage determination, Han and Kleiner (2017)**[a]




**Note:** Point estimate ◆ represents the licensing effect relative to hourly wage of individuals in occupations that are unlicensed throughout our period of analysis. Point estimate ■ represents the licensing effect relative to hourly wage of individuals in the same occupation prior to states passing licensing statutes.

[a] Han and Kleiner (2017) use the logarithm of hourly wage as dependent variable, similar to what we do in chapter 4. This is a very common practice in wage regressions, whenever a model seeks to estimate the percentage increase in wages attached to a certain change in the explanatory variable. More details are provided in the Appendix.

[9] Morris M. Kleiner and Suyoun Han, "Analyzing the Influence of Occupational Licensing Duration and Grandfathering on Labor Market Outcomes", *Federal Reserve Bank of Minneapolis,* Staff Report 556 (2017). Note: universally licensed in this article is intended to mean licensed in all states (and not that all workers in the occupation are required to be licensed).

[10] Beth Redbird, "The New Closed Shop? The Economic and Structural Effects of Occupational Licensure", *American Sociological Review,* 82(3) (2017): 600-24.

nurses.[11] They use individual-level census data, taking advantage of the fact that, at the beginning of their sample, all states had certification in place while during the subsequent decade some states switched from certification to a mandatory licensing requirement. Similarly, Klee (2013) finds limited evidence of a licensing wage premium among accountants, attorneys, cosmetologists, and teachers.[12] For accountants specifically, the author finds that overall licensing policy has a statistically insignificant effect on wages and that more stringent graduate education requirements do not restrict entry among potential accountants, but rather they stimulate entry.

## 2.2 LICENSING AND MINORITIES

As discussed in the previous section, an important limitation of much of the licensing literature is the "one size fits all" approach, whereby the effect of licensure is the same across very different professions. It is important to note, however, that some scholars have attempted to determine whether licensing impacts different communities differently. In this section, we review the findings that have attempted to shed some light on this heterogeneity. **The majority of the findings in this area find greater returns from licensing for female and minority workers.** This suggests that entering a licensed occupation could help to level the playing field and even close wage gaps.

Several articles have looked at the effect on female labor market participation, for instance. Most notably, Law and Marks (2009) empirically test the impact of licensing on female participation using individual-level data spanning nine decades

**Greater returns from licensing for female and minority workers**

(1870–1960).[13] They find that **licensing increased the employment of female workers in skilled professions, including engineers, pharmacists, and registered and practical nurses.** The authors take advantage of a quasi-experiment afforded by the introduction of state-level licensing regulation during the late nineteenth and mid-twentieth centuries to identify the effects of licensing on female workers and find that licensing laws seldom harmed women. In fact, licensing often helped them, particularly in occupations for which information about worker ability was difficult to ascertain. Another example is Blair and Chung (2019), who find that licensing reduces the relative labor supply of white and Black men, whereas the labor supply effects for women are statistically insignificant and close to zero. This result suggests that licensing only distorts the labor supply of men.[14]

Other studies have looked at gender-specific impacts of licensing on wages. Blair and Chung (2018), for example, show that an occupational license serves as a job market signal, similar to education.[15] In the presence of occupational licensing, the authors find evidence that firms rely less on observable characteristics, such as race and gender, in determining employee wages. As a result, licensed minorities and women experience smaller wage gaps than their unlicensed peers. Similarly, after adjusting for observable differences

[11] Marc T. Law and Mindy S. Marks, "From Certification to Licensure: Evidence from Registed and Practical Nurses in the United States, 1950-1970", *The European Journal of Comparative Economics,* 10(2) (2013): 177-98.

[12] Mark A. Klee, "How Do Professional Licensing Regulations Affect Practitioners? New Evidence", *SEHSD Working Paper,* 2013-30 (2013). AICPA data suggests the vast majority of certified accountants are actually CPAs. However, this article refers to certified accountants and not explicitly to CPAs.

[13] Marc T. Law and Mindy S. Marks, "Effects of Occupational Licensing Laws on Minorities: Evidence from the Progressive Era", *The Journal of Law and Economics,* 52(2) (2009): 351-66.

[14] Bobby W. Chung and Peter Q. Blair, "Job Market Signaling through Occupational Licensing", *National Bureau of Economic Research,* Working Paper No. 24791 (2019).

[15] Peter Q. Blair and Bobby W. Chung, "How Much of Barrier to Entry Is Occupational Licensing?", *National Bureau of Economic Research,* Working Paper No. 25262 (2018).

between workers, Nunn (2018) finds that men tend to receive smaller licensing premia than women, suggesting gender wage gaps are smaller among licensed occupations than for the population as a whole.[16] Lastly, Bailey and Belfield (2018) find that, across all college-educated workers, a license is associated with gains in earnings for 20% and 8% for female and male workers, respectively.[17]

**Across all college-educated workers, a license is associated with gains in earnings of**

**20% and 8%**

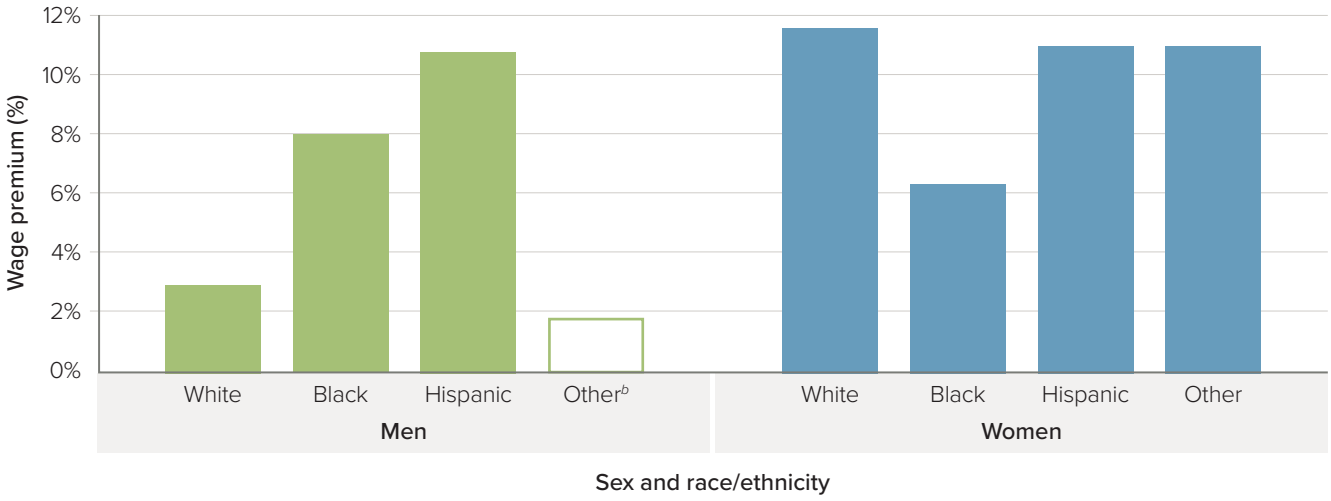
**for female and male workers, respectively.**

*—Bailey and Belfield (2018)*

**Ethnic minorities also appear to gain more from licensing than other workers.** Law and Marks (2009) find that licensing increased the employment of Black workers in skilled occupations and Blair and Chung (2019) find that the negative labor supply effects of occupational licensing are particularly large for white workers and comparatively smaller and insignificant for Black workers. On wages, Blair and Chung (2018) show that licensed minorities experience smaller wage gaps than their unlicensed peers, and Nunn (2018) shows that Black and Hispanic men receive relatively higher wage premia (Fig. 4).

Interestingly, Cassidy and Dacass (2019) find that wage premia seem to be the same for US natives and immigrants after controlling for English language ability, suggesting that the main distinguishing factor is not country of birth, but rather language proficiency.[18] They also show

**Fig. 4. Licensing wage premium, by race and gender**




Source: Current Population Survey, Bureau of Labor Statistics 2016–17 and author's calculations.

Note: Estimates are derived from median regressions with controls consisting of quadratic expressions of both age and years of education, union coverage, geographic region, and public sector status. The sample consists of 25–64 year old employed workers with wages between $5 and $100 per hour. Robust standard errors (not shown) are clustered at the state level. Categories are mutually exclusive.

[b] Hollow bars indicate estimates that are not significant at the 5% level.

[16] Ryan Nunn, "How occupational licensing matters for wages and careers" (unpublished thesis, Brookings, 2018).
[17] Thomas Bailey and Clive R. Belfield, "The Impact of Occupational Licensing on Labor Market Outcomes of College-Educated Workers", *Community College Research Center,* Working Paper No. 104 (2018).
[18] Hugh Cassidy and Tennecia Dacass, "Occupational Licensing and Immigtants", *Center for Growth and Opportunity,* Working Paper 2019.009 (2019).

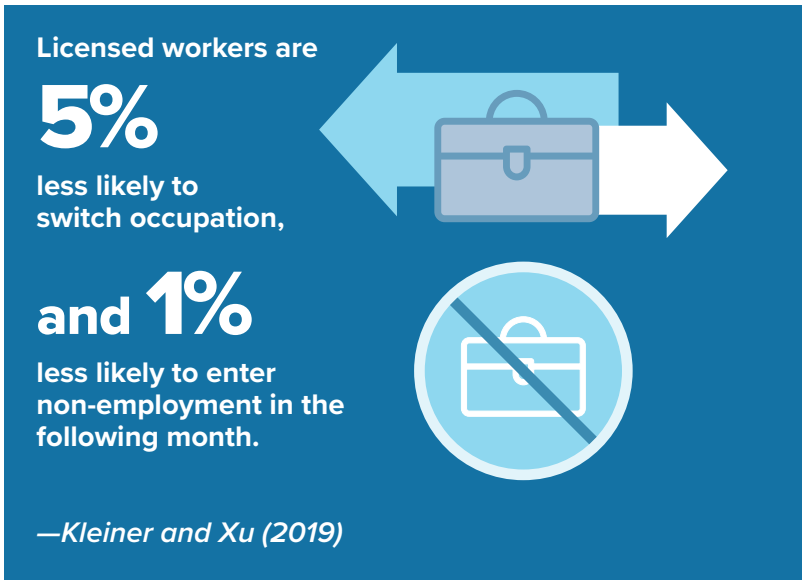
that immigrants are much less likely to have a license than similarly qualified and experienced natives, but the licensing rate increases with years since migration.

As a potential explanation for the evidence shown so far, Redbird (2017) argues that licensure creates a set of institutional mechanisms that enhance entry into a profession, particularly for historically disadvantaged groups.[19] To the extent that job entry in an unlicensed environment depends on informal networks, individuals who lack social connections can be at a disadvantage. In a regulated environment, the relationship between licensure and associated institutions can provide workers not only with occupation-specific education but also with mentors and career services workers, all of which can help overcome initial disadvantages. For example, several accounting organizations, including the American Institute of Certified Public Accountants (AICPA) and state CPA societies, offer their members online and in-person mentorship programs.

## 2.3 WORKER MOBILITY

**Among the professions represented by ARPL members, significant efforts have been made to harmonize the licensing system and make it easy for professionals to migrate across states.** In the case of accountants, for example, the Uniform Certified Public Accountant Examination is a requirement in all 55 jurisdictions to become a CPA. Similarly, having an NCARB Certificate gives architects the flexibility to apply for reciprocal licensure in all 55 US jurisdictions.[20]

**Occupations that are not highly specialized or technical, however, still struggle with highly fragmented regulations, which often mean that licensees need to obtain a new license when they relocate across states.** This is associated with bureaucratic obstacles, such as paying fees, filling forms, presenting a request, and waiting for it to be handled. In addition, when each state can determine its licensing requirements, these can differ across state borders, and practitioners who are willing to relocate may need to meet new criteria (education, experience, or examination) if they want to continue working in the profession. The subsequent time and monetary costs can dissuade licensed individuals from moving or lead them to leave the profession altogether. Depressed mobility gives rise to labor market inefficiency, with practitioners discouraged from performing the jobs in which they are most productive.




**The evidence presented in this section shows that it is not the licensing system per se that potentially discourages mobility, but rather the different state-level requirements.** ARPL acknowledges that responsible professional licensing should help facilitate reciprocity across states, making it possible for practitioners to move from one state to another and have their license acknowledged.

[19] Beth Redbird, "The New Closed Shop? The Economic and Structural Effects of Occupational Licensure", *American Sociological Review,* 82(3) (2017): 600-24.
[20] Architects are licensed and regulated in all 50 states, DC, and the US territories. It is one of the few professions licensed through the entire US.

In the recent White Paper "Licensed to move: pathways, principles, and pitfalls for interstate practice" ARPL has explored several examples of how states can accomplish flexibility and encourage mobility.[21] Three guiding principles were identified as a roadmap for interstate practice reform:

- Recognize mobility and reciprocity systems that work;
- Develop substantially equivalent requirements for education, examination, and experience—the "three Es"; and
- Provide adequate public protection.

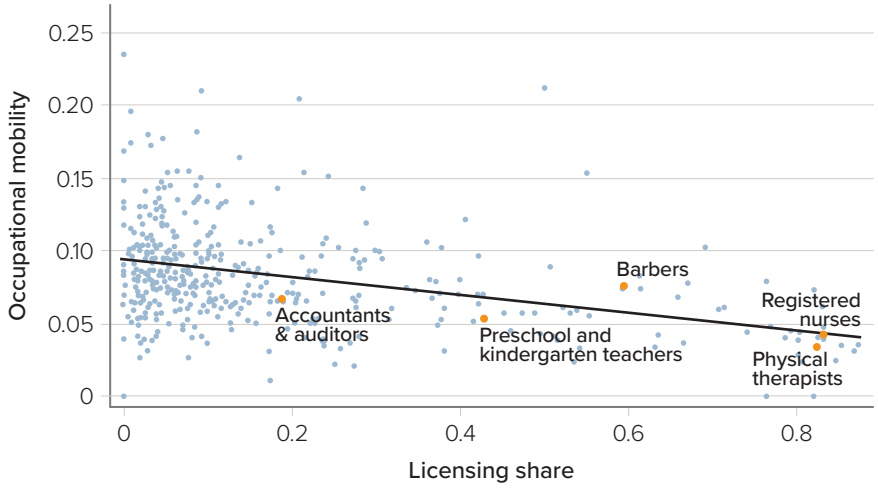
Literature on the subject appears to support this view. For instance, the US Nurse Licensure Compact has been found to increase job movements of nurses across compact states (Ghani, 2019).[22] Similarly, Johnson and Kleiner (2017) find that the adoption of reciprocity agreements, which lower relicensure costs, increases the interstate migration rate of lawyers in the US.[23]

Another relevant article in the mobility space focuses on occupational (rather than geographical) mobility. Kleiner and Xu (2019) study the impact of licensing on the set of universally licensed occupations, which encompasses accountants, architects, and engineers, but also teachers and truck drivers.[24] The authors find that workers who have a government-issued license experience significantly lower churn rates than non-licensed workers, where churn measures labor market transition decisions (Fig. 5). Specifically, licensed workers are 5% less likely to switch occupations, and 1% less likely to enter non-employment in the following month. The latter finding highlights that being licensed could provide stronger insurance against unemployment than similar unlicensed jobs.

After considering all the above, it is nevertheless important to stress that there are cases where a state may choose not to accept other states' licenses for very good reasons. This is typically the case when state-specific requirements need to be stricter than those of other states as a result of unique conditions or qualities in that state. For example, a licensed civil engineer moving to California would need to know earthquake faults and the state's unique terrain for road construction approvals and examinations.

**Fig. 5. Licensing share vs. occupational mobility**[c]

[c] Using occupational level data from the CPS, the figure shows the relationship between occupational licensing shares and the switching out rates. The negative correlation between occupational licensing shares and occupational churn rates suggests that licensing has a negative impact on individual labor market transition decisions.



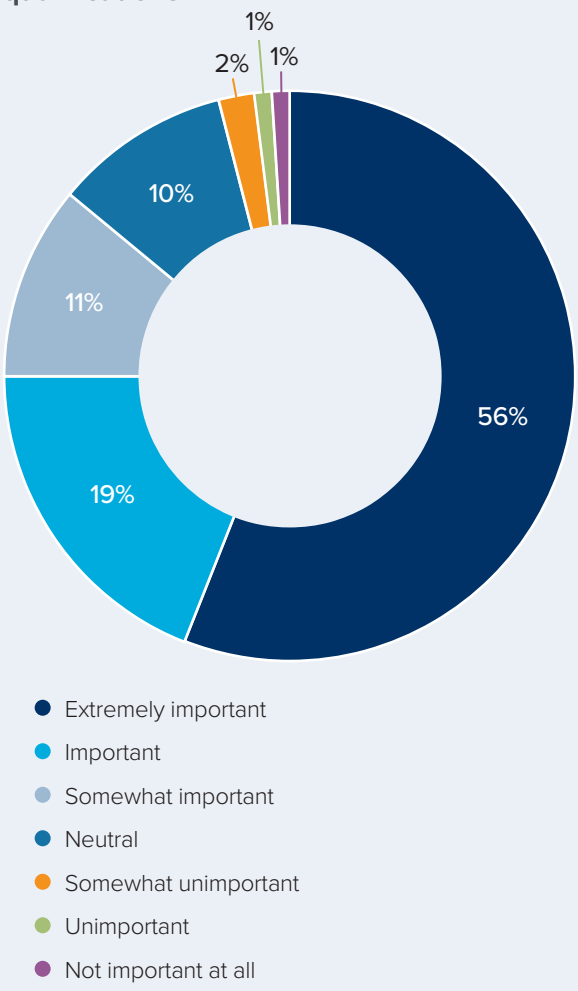

[21] ARPL, "Licensed to move: pathways, principles, and pitfalls for interstate practice", 2020.
[22] Ghani, A. (2019), "The Impact of the Nurse Licensing Compact on Inter-State Job Mobility in the United States", in OECD Economic Survey of the United States: Key Research Findings, OECD Publishing, Paris
[23] Janna E. Johnson and Morris M. Kleiner, "Is Occupational Licensing a Barrier to Interstate Migration?", *National Bureau of Economic Research,* Working Paper No. 24107 (2017).
[24] Morris M. Kleiner and Ming Xu, "Occupational Licensing and Labor Market Fluidity", *National Bureau of Economic Research,* Working Paper No. 27568 (2020).

## PUBLIC OPINION ON LICENSURE

In 2019, Benenson Strategy Group (BSG) conducted a national study to understand public perceptions of professional licensing.[25] Among the 952 registered voters surveyed, 75% were supportive of licensing regulations for highly technical professions that have a direct impact on public health and safety. Over two-thirds of respondents also felt that professional licensing should be required unless evidence shows that its elimination would not negatively impact public health and safety. Among respondents, 76% agree that professional licensing makes consumers feel safer. Additionally, 56% of respondents suggest that it is extremely important to them that these professionals have reached the minimum qualifications to practice (see Fig. 6).

The Benenson study also took a deeper dive into the architecture profession; some 88% of respondents indicated that they believe architects should be regulated. One explanation for this, as suggested by the Benenson report, is that respondents clearly distinguish architecture as a profession rather than an occupation. In fact, upon learning more about the process of obtaining an architecture professional license, even more voters (94%) believe it to be important that architects are professionally licensed (as opposed to the 89% of voters who indicated so prior to learning about the process).

**Fig. 6. How important it is to respondents that professionals met minimum qualifications**




Source: Benenson Strategy Group (2019)

[25] Benenson Strategy Group (BSG) and ARPL, "Exploring Public Opinion of Professional Licensing", available at: http://www.responsiblelicensing.org/new-research-exploring-public-opinion-of-professional-licensing/

# 3. PROFESSIONAL DEEP DIVES

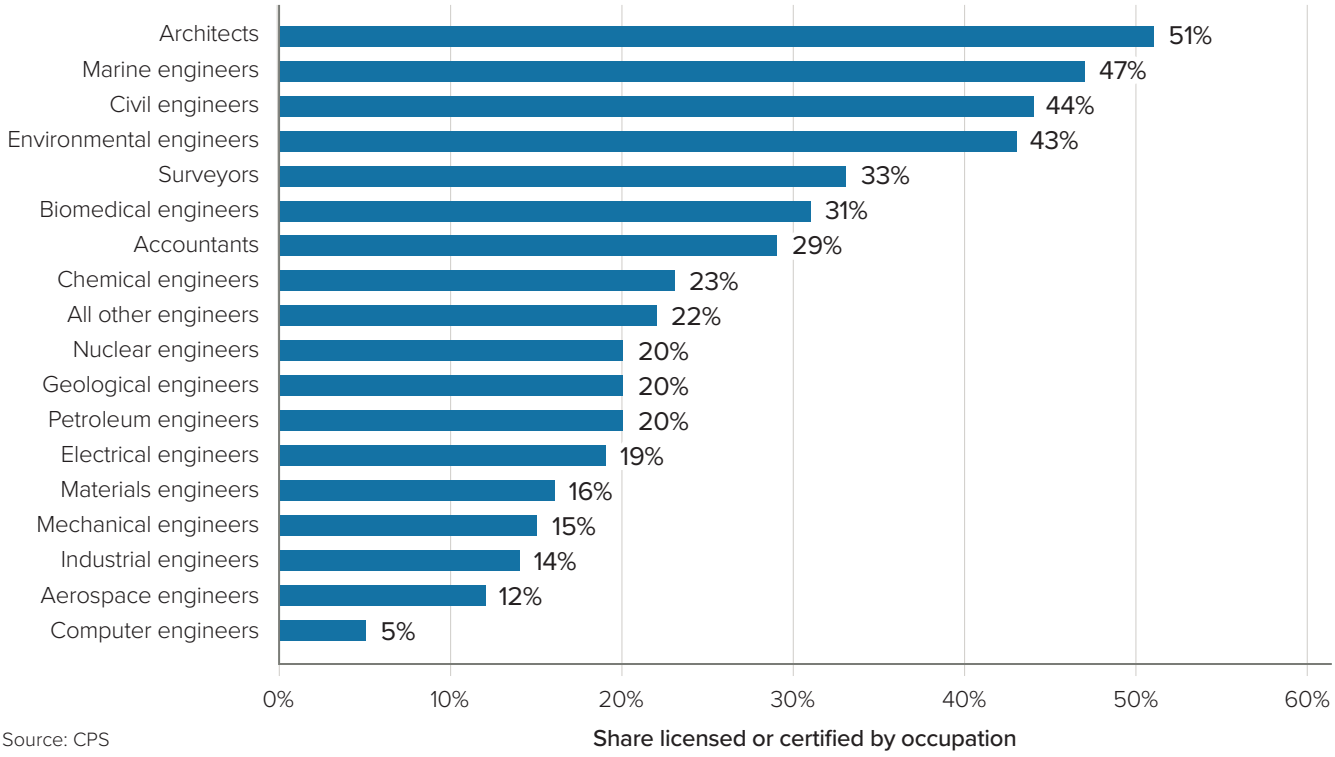
This chapter explores the empirical evidence surrounding the impacts of licensing on four specific focus professions: CPAs, architects, landscape architects, and engineers/surveyors. We specifically focus on the demographic composition and geographical dispersion of these occupations, as well as evaluating the composition of the body of graduates in their respective disciplines.

The Current Population Survey (CPS) is the principal data source for licensing studies in the US. Since 2015, the CPS has asked three questions relating to licensing of employed respondents:

- Do you have a currently active professional certification or a state or industry license? Do not include business licenses, such as a liquor license or vending license.
- [If yes to 1]: Were any of your certifications or licenses issued by the federal, state, or local government?
- [If yes to 1, only since 2017]: Is your certification or license required for your job?

Using the first question, we profile workers with licenses by occupation. Fig. 7 shows the percentage of workers within each occupation that answered yes to the first of the questions above. These results draw from pooled CPS data from 2015 to 2019.[26] For example, we find that 43% of environmental engineers report having a certification or license.

**Fig. 7. Share of licensed or certified workers, by occupation, 2015-19**




Source: CPS

[26] See appendix for a description of this pooled methodology

We also find that half of the respondents who reported being employed as architects (here including landscape architects) stated they were licensed. This raises important questions about the self-reported licensing status of CPS respondents, as architects and landscape architects require a license in order to practice the professions in all US states.[27] Those who report being unlicensed architects or landscape architects, therefore, are either incorrect about their license status or are incorrect about their occupation. For example, architectural assistants may inflate their job titles and so be recorded as unlicensed architects. Alternatively, they could also be practitioners in the process of obtaining a license, who could also self-identify as licensed practitioners.

Researchers have tested how the probability of self-reported licensing differs between occupations that are and are not universally licensed.[28] In occupations that are universally licensed, such as architects (here inclusive of landscape architects), researchers find a much larger percentage of workers report being licensed, as compared with workers in all other occupations. The difference is highly significant and in the desired direction, suggesting that self-reported license status is correlated with the true license status. A considerable fraction of workers do, however, self-report as unlicensed in occupations that require a license, and it is hard to determine whether or not such self-reports are mis-responses. In this study, therefore, we chose to disregard such responses (for example, unlicensed architects).

The remainder of this section takes a deeper dive into four of the professions of interest to ARPL. We start from certified public accountants (section 3.1), then proceed to architects (section 3.2.1) and landscape architects (section 3.2.2), and conclude with engineers and surveyors (section 3.3).

## 3.1 CERTIFIED PUBLIC ACCOUNTANTS

**There were nearly 674,000 certified public accountants (CPAs) in the US in 2019** according to statistics by the American Institute of Certified Public Accountants (AICPA) and the National Association of State Boards of Accountancy (NASBA).[29] According to these sources, some 15% of CPAs are estimated to be self-employed, while the remainder are employed by private or governmental bodies, in industries ranging from accounting and tax preparation to real estate.

Bureau of Labor Statistics' (BLS) data suggest 1.3 million people were employed as accountants and auditors in the US in 2019, excluding self-employed workers.[30] Combining these two estimates would imply that some 45% of non-self-employed US accountants and auditors hold a CPA license, and it points to the fact that the CPS-implied license rate (29% from Fig. 7) is likely to be an underestimate for the accounting profession.

**AICPA/NASBA data suggests that women make up almost half of the CPA workforce** (Fig. 8) This is confirmed in the analysis of CPS data, which suggests some 48% of licensed accountants are female, as compared to 65% of unlicensed accountants. In addition, several indicators point to the important progress the industry has been making over the years. In 2018, for example, 51% of new accounting graduates hired into accounting/finance functions of US CPA firms were women, according to AICPA data.[31]

[27] Landscape architecture practice is regulated in 48 states, while the profession's title is protected in 50 states, suggesting there are only three states that only regulate the use of the landscape architect title, but not its practice.

[28] Morris M. Kleiner & Evan J. Soltas, 2019. "A Welfare Analysis of Occupational Licensing in U.S. States," NBER Working Papers 26383, National Bureau of Economic Research, Inc. In this context, universally licensed means that all practitioners in these occupations must obtain a license to practice. This is a different definition of "universally licensed" professions than that used in other research referenced earlier in this document.

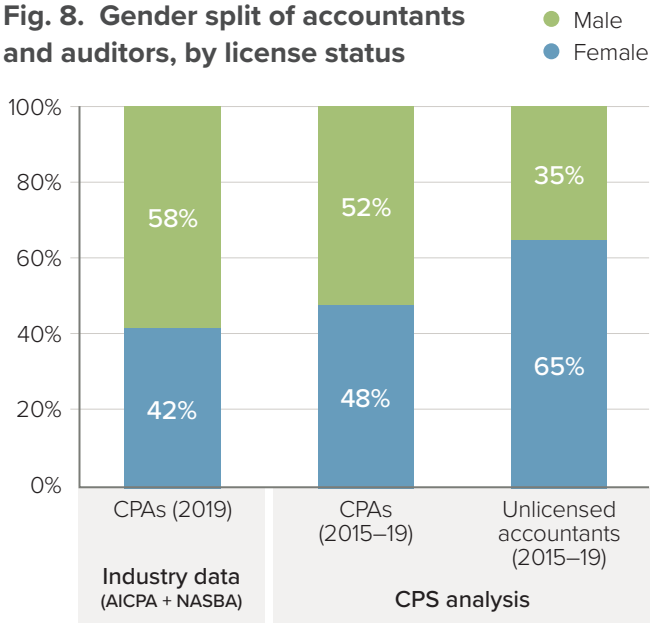
[29] This only includes active license holders.

[30] U.S. Bureau of Labor Statistics, May 2019 Occupational Employment Statistics (OES). We source the occupation-wide statistics on employee counts and wages from the OES, as opposed to the CPS, because the former is employer reported and hence more reliable for occupation counts. The downside of using OES is that is excludes self-employed workers. CPS is the source for the licensing data used in this section.

[31] AICPA, 2019 Trends

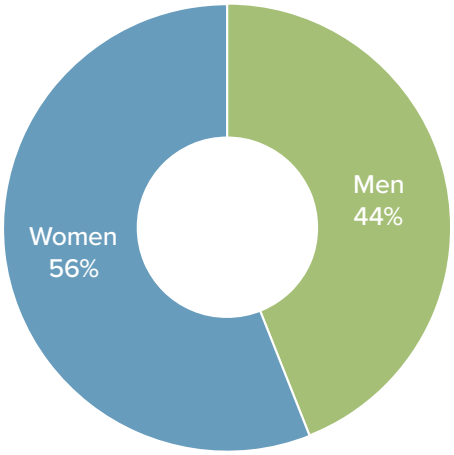
In addition, more young women are entering the accounting profession, as suggested by the gender split of the 2018/19 cohort of graduates with a first major in accounting and related services (Fig. 9).[32]

**Fig. 8. Gender split of accountants and auditors, by license status**




Source: NASBA, AICPA, CPS

**Fig. 9. Gender of 2018/19 graduates in accounting and related services**




Source: IPEDS

**CPA firms are also embracing formal initiatives to help enhance their ability to attract, retain, and advance women,** according to the 2019 AICPA CPA Firm Gender Survey.[33] For instance, more CPA firms are offering modified work arrangements (MWAs) to allow employees to integrate their personal and professional lives. A total of 94% of the CPA firms surveyed offered some type of MWA and the survey shows that, while these are traditionally an important option for women, more men are also taking advantage of them. Mentoring is another often used and valuable initiative, which can also help organizations spot and promote talented women and minorities.

**AICPA/NASBA and CPS data also point to a relatively smaller role played by ethnic minorities in the CPA workforce, compared with their uncertified counterparts** (Fig. 10). To counteract these results, the 2019 AICPA CPA Firm Gender Survey finds that 15% of the large CPA employers have some sort of ethnic minority initiatives in place and 69% of survey respondents think these programs help to attract new talent.

In addition, AICPA supports a number of scholarships to provide support to students from diverse backgrounds. These range from AICPA Scholarship Award for Minority Accounting Students, which offers financial support to outstanding minority students to encourage their study of accounting, to the Fellowship for Minority Doctoral Students, which provides funds to doctoral students to bolster racial and ethnic diversity among accounting educators at colleges and universities. The program has contributed to increasing the number of minority CPAs who serve as role models and mentors to young people in the academic environment and university classrooms. For the next academic year, AICPA is awarding nearly $1 million in scholarships.

[32] Integrated Postsecondary Education Data System (IPEDS), Awards/degrees conferred by program (2010 CIP classification), award level, race/ethnicity, and gender, 2018/19

[33] AICPA, 2019 CPA Firm Gender Survey

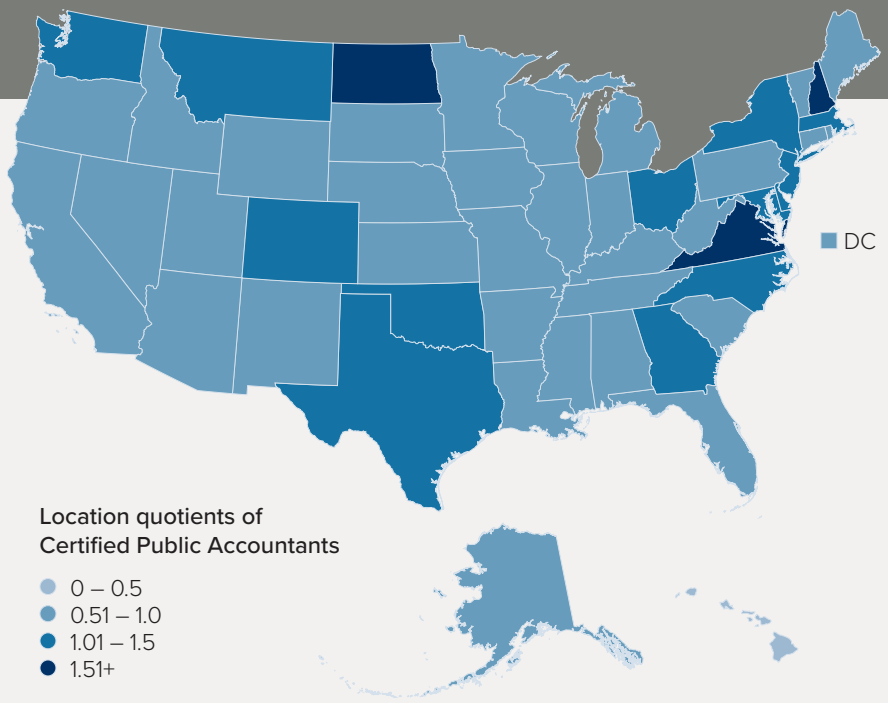
## BECOMING A CPA

**Education:** Five years / 150 semester credit hours

**Experience:** One year under the supervision of a licensed CPA (in most states)

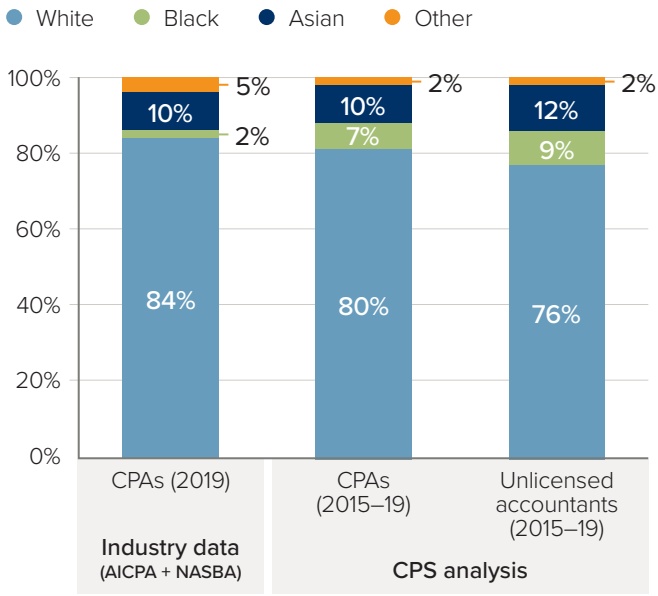
**Exam:** Uniform CPA Examination

**CPA Location Quotient (LQ):**[d] New Hampshire and Virginia are the states with the greatest relative concentration of CPAs. In other words, in these states CPAs make up a greater share of the workforce compared with the rest of the US. On the other hand, Nevada and Hawaii are the states with the lowest concentration of CPAs.




[d] LQ signifies the concentration of a specific industry/occupation when compared with a larger geographic context (e.g., nation). The metric quantifies economically important industries/occupations that comprise a larger share of employment than what is generally expected at the national level. An LQ of one would indicate that the concentration of jobs in the industry/occupation is the same as the national average. LQs greater than one signal higher levels of concentration compared with the national average, while LQs less than one indicate that there is a lower level of concentration compared with the nation. The source for the CPA state-level information was AICPA/NASBA, while US-wide employment data came from BLS.

**Fig. 10. Ethnicity split of accountants and auditors, by license status**




Source: NASBA, AICPA, CPS

Some additional positive signs come once again from the 2018/19 cohort of graduates in accounting and related services, showing a much lower share of white degree holders compared with the existing stock of workers (Fig. 11).

**CPAs appear much more likely to be self-employed than their uncertified counterparts in the same occupation.** According to AICPA/NASBA analysis, some 15% of CPAs were self-employed, while CPS analysis suggests only 3% of unlicensed accountants were. For example, many tax preparers are self-employed CPAs and they use the certification as a signal for their skill level and ability.

# OKORIE RAMSEY, CPA

An accountant today frequently takes on tasks more complex than creating a general ledger, producing a cash flow statement, or reconciling inventories and receivables.

Just ask Okorie Ramsey, CPA.

Mr. Ramsey, 50, is vice president of Sarbanes/Oxley (SOX) for the Kaiser Foundation Health Plan, Inc in Oakland, CA, where he uses the skills he developed while studying to become a Certified Public Accountant to lead Kaiser Permanente's SOX Program.

Responsible for SOX Program implementation, testing and evaluating internal controls, assessing business risk, and helping build effective internal controls over financial reporting in a complex health care organization Mr. Ramsey's career trajectory illustrates how the competence gained in studying for a CPA license can help forge a path towards a variety of related and highly-valued professions.

"In today's environment, it's not enough to just make sure the numbers are accurate. You must tell a story with the numbers to help support sound business decisions," Mr. Ramsey says, in describing how the role of licensed CPAs has evolved in recent years. "Today, CPAs are more than number crunchers. We are strategic financial advisors that analyze the numbers, frame the story, and support our organizations and clients in making better business decisions."

Mr. Ramsey said he knew he wanted to join the accounting profession ever since high school when he was assigned the challenge of starting his own business in his accounting seminar. "I had to develop a general ledger, create financial statements and manage the operations for the business," he recalls. By the time he entered San Francisco State University, he knew he wanted to get an accounting degree.

Earning his license as a CPA was a meaningful step on the way to building a career, Mr. Ramsey says. "The CPA title helps to credentialize you and demonstrates your expertise in the field of accountancy... If you don't have it, it can stand in the way of your career progression in finance and accounting. It's sort of table stakes. It tells people that you have the technical expertise to provide thought leadership or advisory services" across industries and sectors.

Demonstrating the variety of career options available to CPAs, Mr. Ramsey worked for three international public accounting firms before moving into health care. He has worked with Kaiser Permanente, a leading health care provider that includes not-for-profit health plans, hospitals, and medical groups for some 12 years.

Like many who hold a CPA license, Mr. Ramsey does not apply traditional accounting skills in his daily activities. However, holding the license demonstrates that "I understand accounting concepts and principles, which I apply to my work routinely."

"I don't close the books or ledgers anymore," Mr. Ramsey adds, "but in the work that I do now, the knowledge I gained training to be a CPA is still very relevant." He notes that getting a CPA certification is "foundational" to the higher-level management thinking he does now. "If you have been in the field for many years, it's expected that you are a CPA and if you are not, it becomes a question of why?" he notes.

*Continued on next page.*

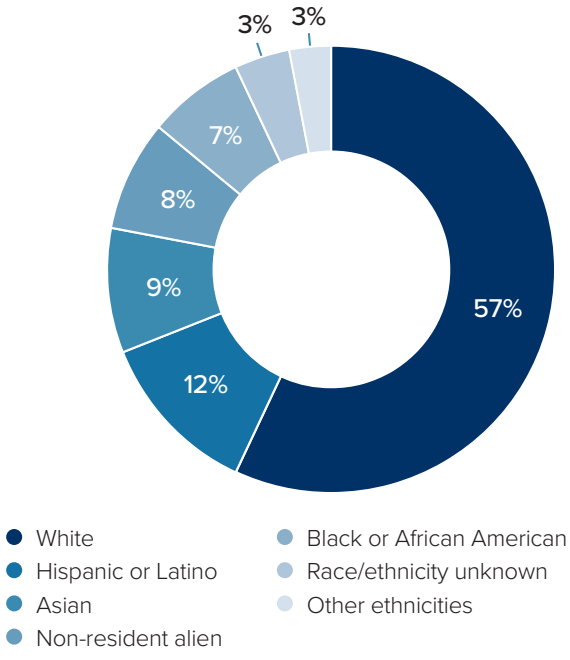
### OKORIE RAMSEY, CPA *(continued)*

Today, amid the Covid-19 pandemic, Ramsey helps senior leaders and their teams think through changes in business processes and controls that might be required as a result of the public health crisis. "In my role, it's important to serve as an advisor and sounding board as changes are being considered within business processes to help influence appropriate outcomes," he notes.

"For example, if you thought you were going to lag in your receivables because of Covid-19 [because members might fall behind in paying their insurance premiums] you may need to adjust your reserves for uncollectable accounts," he explains. "Covid-19 could also have an impact on physical inventories due to social distancing, or you may have new employees performing controls that require additional support or supervision due to deployment of other resources to Covid-19 response teams. Those are the sort of questions we have to ask."

By developing a SOX response to Covid-19, Ramsey helps top managers consider, "How will the business change? How should we be reacting to changes? Do I have the right internal controls?" Mr. Ramsey says. "In addition to testing and evaluating the effectiveness of internal control over financial reporting, I see my role as helping leaders across our organization think through what could go wrong, and how does it impact the control environment and risk to the financial statements?" ■

**Fig. 11. Ethnicity of 2018/19 graduates in accounting and related services**




Source: IPEDS

## 3.2 ARCHITECTS AND LANDSCAPE ARCHITECTS

This section describes the current and projected workforce characteristics of **architects and landscape architects.** The latter are often erroneously understood as a sub-set of the former, but in fact, the two professions are **fully distinct in terms of the kind of design work they concentrate on.** Architects produce plans for buildings such as homes or offices, whereas landscape architects design multimodal transportation corridors, parks and outdoor recreation spaces, water and stormwater management projects, and plans that help communities prepare for, and recover from the impacts of climate change. Acknowledging the different nature of the two professions, this section is further divided into a subsection about architects (3.2.1) and one about landscape architects (3.2.2).

The two professions, however, also have a lot in common. Practitioners in these fields are highly skilled professionals with at least a bachelor's

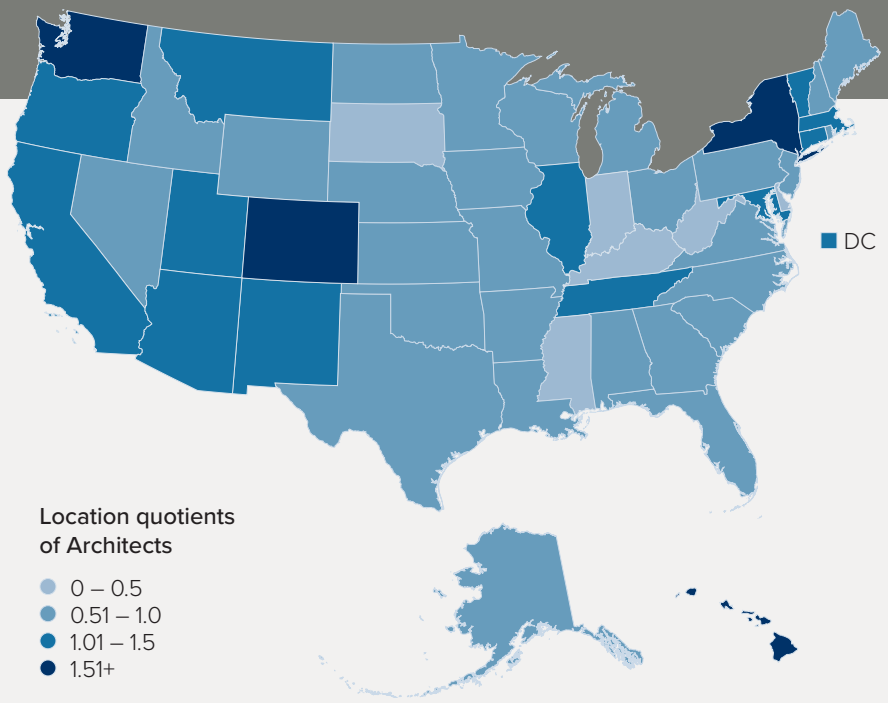
## BECOMING AN ARCHITECT

**Education:** Professional degree from a program accredited by National Architectural Accrediting Board (NAAB)

**Experience:** 3,740 hours. The average time to complete the program is 4.4 years

**Exam:** Architect Registration Examination (ARE)

**Architects LQs:**[e] Colorado and Hawaii are the states with the greatest concentration of architects, while South Dakota and West Virginia are the states with the lowest concentration of architects.




[e] The source for the architect state-level information was NCARB, while US-wide employment data came from BLS.

degree and training in environmental regulations and building codes. **Both professions need to be licensed across all US states in order to practice as architects or landscape architects.** For both professions, it is therefore not possible to identify an unlicensed control group, as a license is required to be able to practice. Also, up until 2020, the CPS did not distinguish between architects and landscape architects.

### 3.2.1 Architects

**There were over 116,000 licensed architects across the US in 2019** according to statistics from the National Council of Architectural Registration Boards (NCARB). This is roughly in line with BLS data, which suggests 106,000 people were employed as architects (excluding landscape and naval architects) in the same year, excluding self-employed workers.[34]

Fig. 12 shows **the share of female workers among licensed architects was 22% in 2019,** using NCARB data. As explained above, one needs to hold a license to practice as an architect. Therefore, unlicensed workers who self-identify as architects in the CPS are unlikely to be real architects (or they have incorrectly reported their licensure status). We therefore only employ data provided by NCARB and other profession-specific data sources throughout this section.

**The pipeline of talent in the architecture profession is becoming more and more gender balanced.** NAAB data suggest that the gender breakdown of enrolled students was 51% males and 49% females in 2018/19, from a 54%-46% split in 2017/18.[35] In addition, NCARB data indicates that nearly two in five new architects are women, suggesting the new influx of license holders will likely increase the female share of the workforce.[36]

[34] U.S. Bureau of Labor Statistics, May 2019 Occupational Employment Statistics.
[35] National Architectural Accrediting Board, 2019 Annual Report on Architecture Education
[36] NCARB, NCARB by the Numbers 2020

# GLORIA KLOTER
## ARCHITECT

As a working architect who trained in her native Dominican Republic, Gloria Kloter faced a harsh reality when she married an American and emigrated to Florida: her foreign architectural credentials would not allow her to work as a licensed architect in the United States.

"When I found out my architect's license wasn't valid, I realized I wouldn't be allowed to go out and start a business. I couldn't even call myself an architect," Mrs. Kloter explains. "It was a bit of shock, because I trained so hard to get my license back in the Dominican Republic and I don't think I really understood before I came that my previous license wouldn't be accepted here."

Mrs. Kloter soon learned, however, that the National Council of Architectural Registration Boards (NCARB) offers programs that allow foreign-educated architects to take a series of steps to earn valid architectural licenses to work in their respective states. Just as the current interstate practice rules allow an architect licensed in Montana to sign off on plans in Mississippi by creating reciprocity across state lines, the NCARB programs offer a pathway for foreign-trained architects to earn their accreditation and obtain valid work licenses within the 55 US jurisdictions that regulate the profession.

After learning about the licensing process in the United States, Mrs. Kloter discovered that most of the academic training and work experience she received in Santo Domingo would be counted towards the experience requirement in her licensing application. However, since the architecture profession offers one national exam for aspiring US candidates, she had to pass the Architect Registration Examination (the examination required by all licensing boards) to demonstrate her technical expertise in order to qualify for her license in the United States.

"The first time I took an architect's registration exam I passed it," says Mrs. Kloter, age 36, acknowledging that she failed two other sections of the licensing exams the first time she attempted them. Last year she finally passed all the divisions of the exam, and received her Florida architectural license.

"The first thing that happened [after receiving the license] is that I got promoted," and received a 20% boost in salary, she recalls.

"I was able to call myself an architect again. That was the biggest advantage, especially because I'm proud of my profession. Before I couldn't sign off on any architectural plans because I didn't have the license. Now, with a license, my title changed to Project Architect. Before, I could take projects in my company and design and manage them, but I couldn't be the formal Project Architect... Without a license it's hard to grow in an architectural firm," she notes.

Looking back, she sees that studying for the licensing exams on subjects like building codes and materials and systems was worthwhile. "Studying for the tests

*Continued on next page.*

## GLORIA KLOTER, ARCHITECT *(continued)*

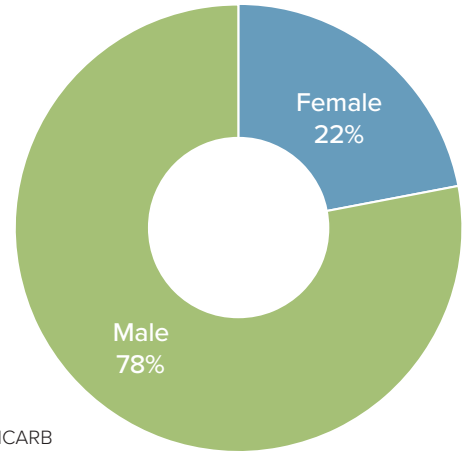
gives you a lot of knowledge and confidence, and in the end, it makes you a better architect," she says. "It really opens your eyes to the liabilities you face as an architect and how you have to take into consideration things like Architect-Owner agreements, building codes and systems—like installing heating and ventilation systems. That isn't always emphasized in school."

After giving birth to her first child last summer, Mrs. Kloter has since decided to leave her former firm and strike out on her own, setting up her own independent studio. Holding the architectural license makes this feasible, she says. "Having the license gives you the power to make your own decisions on what is best for you, and your vision for your career and your family. You get to choose.

"Now I have my own architectural studio. I like having my own business, being my own boss, and owning my projects. Having a license gives you the ability to go out on your own if you want to. You don't have something limiting you because you don't have a license." ■

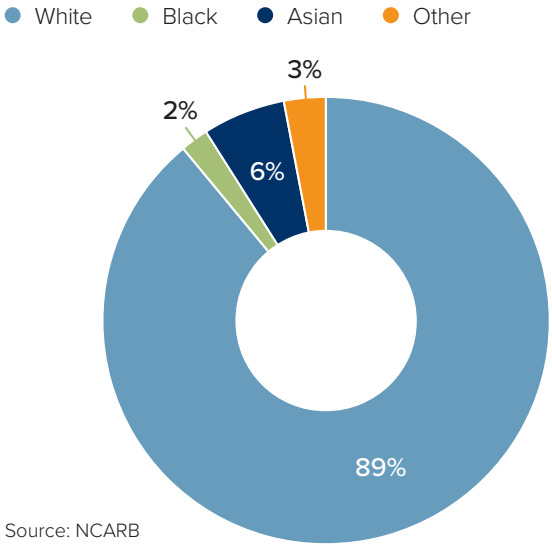
Fig. 13 shows **the ethnic composition of the architecture profession is still very much white dominated.** On the bright side, however, 60% of students enrolled in NAAB accredited programs in 2018/2019 identified as non-white.[37] In addition, racial and ethnic diversity is increasing at nearly every career stage, with the most growth being seen in the proportion of people of color who completed the experience program and began the examination. In 2019, the proportion of individuals who identify as non-white or Hispanic completing core requirements and becoming new NCARB Certificate holders both increased by 2 percentage points from the previous year.

**Fig. 12. Gender split among architects, 2019**




Source: NCARB

**Fig. 13. Ethnicity split of architects, 2019**




Source: NCARB

[37] Non-white students include non-resident aliens.

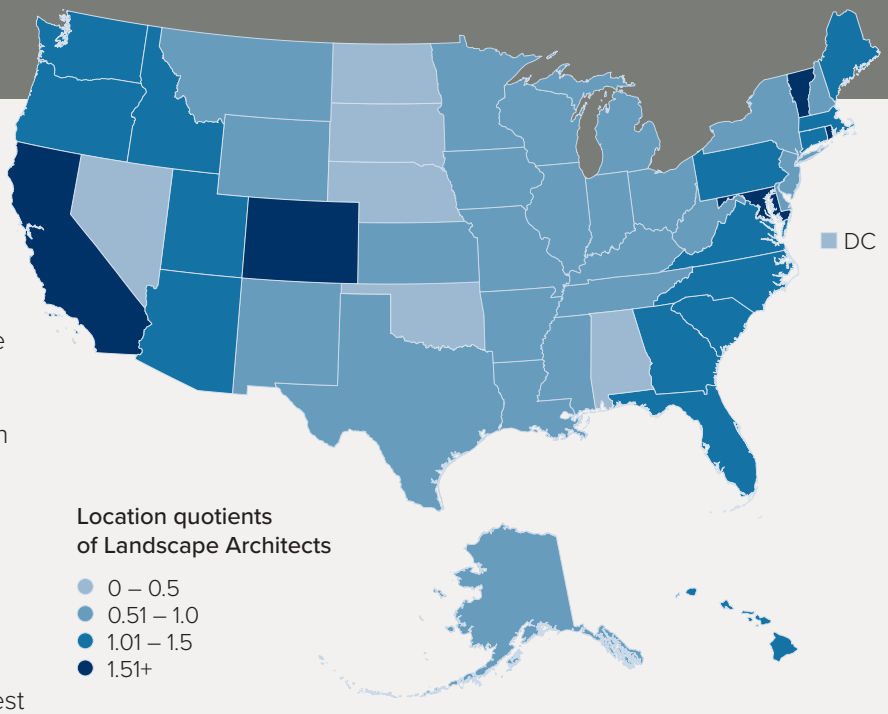
## BECOMING A LANDSCAPE ARCHITECT

**Education:** Professional degree from a program accredited by the Landscape Architectural Accreditation Board (LAAB).

**Experience:** Varies by state. The average number of years of experience is currently just over two and a half.

**Exam:** Landscape Architect Registration Examination (LARE)

**Landscape Architects LQs:**[f] ASLA data suggest Colorado and Vermont are the states with the greatest relative concentration of landscape architects. North Dakota and Oklahoma, on the other hand, are the states with the lowest concentration of landscape architects.



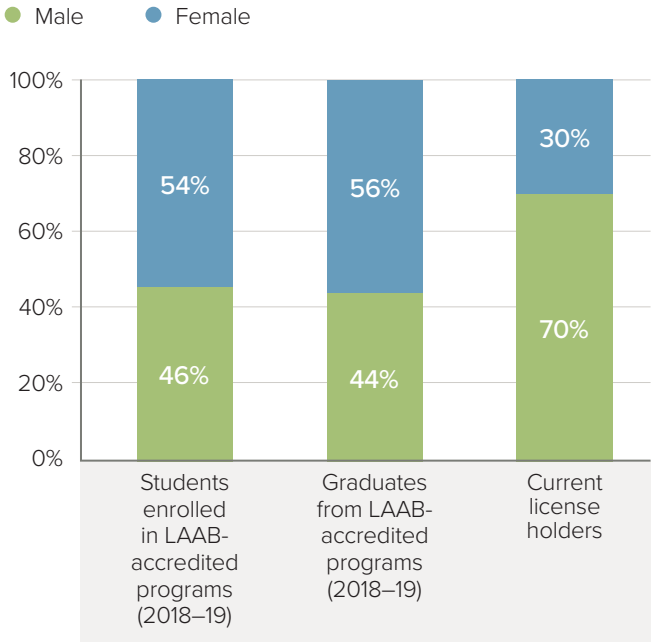

[f] The source for landscape architect by state was ASLA, while total state-level employment came from BLS.

### 3.2.2 Landscape architects

**The American Society of Landscape Architects (ASLA) estimates there are currently about 19,000 workers with a landscape architect license in the US.**[38] This is roughly on par with the latest BLS estimate, which suggests just over 20,000 people were employed as landscape architects in the same year, excluding self-employed workers.

Council of Landscape Architectural Registration Boards (CLARB) data suggest **the share of female workers among currently licensed landscape architects is 30%** (Fig. 14). The talent pipeline, however, suggests the profession is making progress towards gender parity. In 2018/19, 54% of the students enrolled in accredited landscape architecture programs were female, with female students particularly prevalent among graduate students (65%).[39] Even among graduates, female

**Fig. 14. Gender split of students enrolled and graduating from LAAB-accredited programs, and current license holders**




Source: CLARB, LAAB

[38] 2019 ASLA state-level statistics.
[39] American Society of Landscape Architecture, "Summary of 2019 Annual reports".

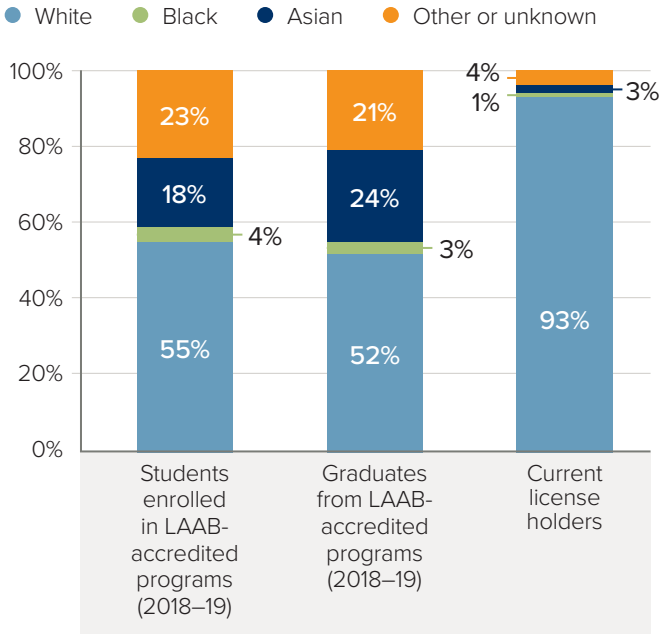
students outnumber males in accredited landscape architecture programs by 12 percentage points (56% to 44%).

**This trend has gained particular traction over the last few years.** In 2015, just five years earlier, the share of female enrolled students and graduates in LAAB-accredited programs was 48% (Fig. 15).

Fig. 16 shows that, while the ethnic composition of the **landscape architect profession is still white dominated, this is likely to change in the near future,** as the proportion of non-white students is significantly higher than that of current license owners. Up to 45% of students enrolled in and 48% of students who graduated from LAAB-accredited programs in 2018/19 identify as non-white. This is significantly higher than the share of license holders that are non-white (currently at 7%). Asians are the second largest ethnic group among students and graduates of LAAB-accredited programs, accounting for 18% of students and 24% of graduates.

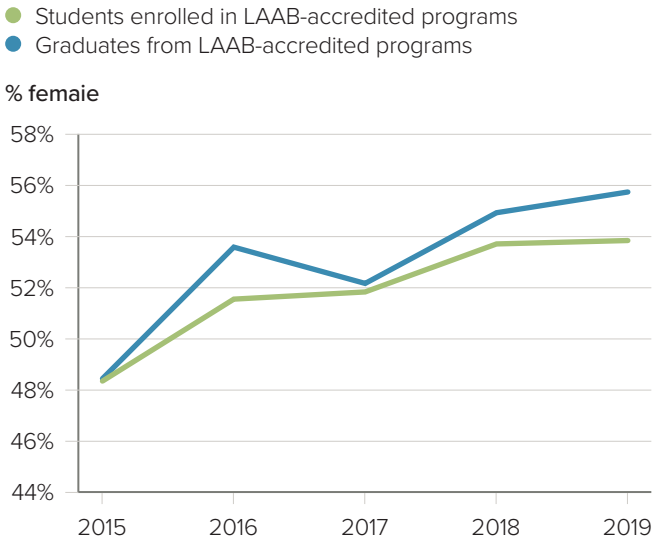
**Ethnic diversity is rising among students enrolled in LAAB-accredited programs,** as the share of non-white students has risen from 41% in 2015 to 45% in 2019 (Fig. 17). A similar trend can be observed among graduates from these programs, as non-white students went from accounting for 38% of all graduates in 2015 to 48% in 2019.

**Fig. 16. Ethnicity split of students enrolled and graduating from LAAB-accredited programs, and current license holders**



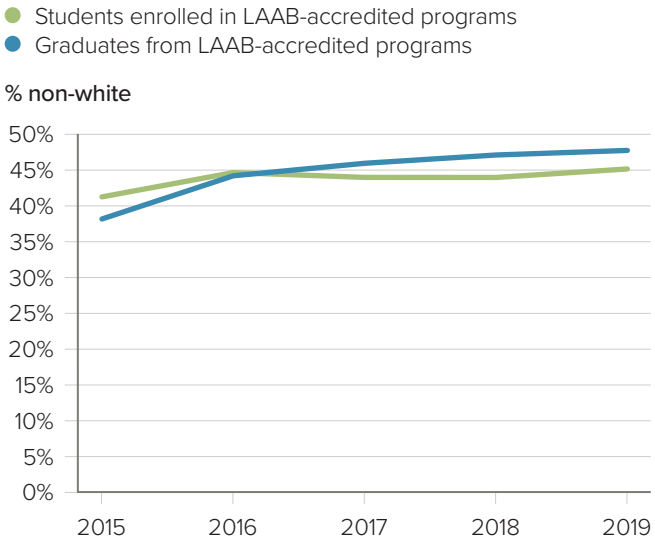

Source: CLARB, LAAB

**Fig. 15. Share of female students and graduates in LAAB-accredited programs**




Source: LAAB

**Fig. 17. Share of non-white students and graduates in LAAB-accredited programs**




Source: LAAB

# KINDER BAUMGARDNER

## LANDSCAPE ARCHITECT

For a licensed landscape architect, every potential project brings its own complications.

"Unlike architects who design buildings which today have become an assembly of off-the-shelf systems and product, a landscape architect is dealing with a specific site, and every site is completely different," explains Kinder Baumgardner, 57, a principal in the Houston office of SWA Group, a global landscape architecture practice. A project, he says, could be proposed for a "flood plain, or have endangered species you need to protect. That adds a layer of complexity and problem-solving to the process that certain other professions may not have."

This reality often means landscape architects must organize large teams, perhaps bringing in hydrologists, structural engineers, material fabricators, and other experts to design and draw technical specifications for, say, an ambitious public works project that enhances the environment while ensuring usability and safety. For this level of work, holding a landscape architectural license is vital, as it signifies technical competence and academic achievement, as well the right to sign off on technical documents and plans.

"When you begin a project, there's a lot of design thinking that goes on at a high level," Mr. Baumgardner says. There may be a lot of detailed documentation and technical prowess required to turn that vision into a rigorous series of landscape architectural plans. "We have an idea and we're trying to solve a community's problem. At some point they have to become a set of technical drawings… and that's when having that license is relevant."

The range of complex technical issues landscape architects must tackle is vividly illustrated by the work of Mr. Baumgardner's office enhancing the Buffalo Bayou Park, a 160-acre green space that lies just west of downtown Houston. Because the area includes one of the rare active floodways in Houston that has not been channelized with concrete, his firm's mission was to increase the flow of water through the system during storms, while creating a flood-friendly infrastructure that could accommodate bikers, strollers, and recreation while enhancing public safety. Now completed, the park features bike rentals, a play area, picnic grounds, a restaurant, a concert venue, and other activities.

"There's a parkway, so you have issues with vehicular traffic and how they arrive and where they park," Baumgardner explains. "There's a trail network. All these things make design very complicated when you want to solve these issues in a beautiful way." To accomplish the $70 million rejuvenation of the bayou, Mr. Baumgardner assembled a broad team to address a unique set of design challenges, including how best to move large quantities of water through the bayou; how best to forecast where silt would build up; which trees to plant; how to build sidewalks that could best withstand erosion; and determining the best form of flood-tolerant lighting for the park system.

"You need to create something useful, sustainable, beautiful, and delightful—but a project that also meets engineering criteria," Baumgardner notes. Having a license builds credibility, he says, when working with a diverse team of experts.

A graduate of Louisiana State University, Mr. Baumgardner acknowledges waiting some seven years before sitting for the licensing exam and

*Continued on next page.*

### KINDER BAUMGARDNER, LANDSCAPE ARCHITECT *(continued)*

failed one section the first time he took it. But eventually, he recognized that the license helped build his career. "As a young person, having a license is very empowering."

When working with hydrologists or structural engineers, "you need to make sure the public safety is protected, but you also want to elevate the profession, pulling together a whole lot of experts to create a technically challenging, beautiful and rewarding place," Mr. Baumgardner says. In an era of climate change, the challenges facing landscape architects are "becoming more complicated," and that means "pulling together a team to make great decisions".

Mr. Baumgardner's next big project Is to restore a lake area near his alma mater in Baton Rouge, where a century ago, a bayou swamp was dammed and turned into a lake without being designed, he says, "for anything you might actually want to do on a lake." Amid fish kills and the rise of invasive grasses, Mr. Baumgardner's team hopes to improve the quality of the water in the lake and build the infrastructure to accommodate runners and bikers, among other uses.

"We don't want a putrefied lake full of dead fish," Mr. Baumgardner says, so one approach might require lowering the volume of water in the lake, as well as increasing the wetlands surrounding the lake to help purify runoff.

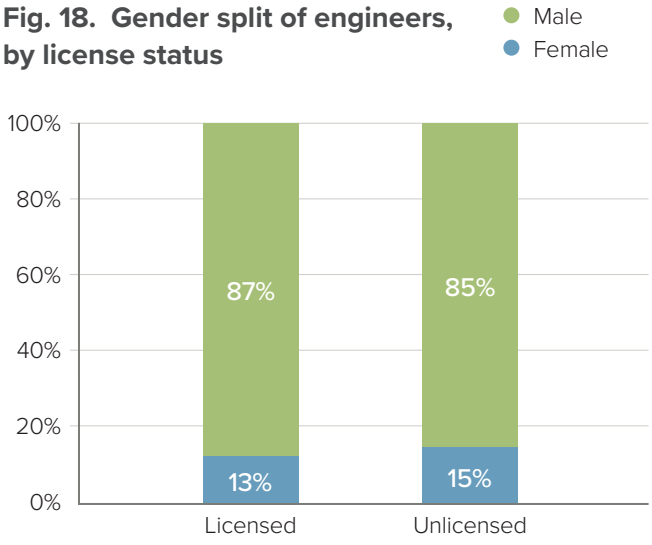
"There's going to be a lot of design thinking at a high level" on the lakes project, he says. "Ultimately there will be a lot of detailed documentation and technical prowess required to make this work.... There's an intangible value that is brought by having a licensed landscape architect engaged in projects like these." ■

## 3.3 ENGINEERS AND SURVEYORS

**There were over 492,000 resident engineering licensees and nearly 38,000 resident surveying licensees across the US in 2019,** according to statistics by the National Council of Examiners for Engineering and Surveying (NCEES). Not all engineering (and surveying) disciplines maintain the availability of professional licensure, and licensing requirements are not mandatory and vary by state.[40]

Analysis of CPS data suggests that **women are heavily under-represented among engineers and surveyors, regardless of their licensing status.** Only 13% of licensed engineers and surveyors (and a similar share for civil engineers) were women in 2019, compared with 15% among unlicensed engineers (Fig. 18). This is

**Fig. 18. Gender split of engineers, by license status**




Source: CPS, Oxford Economics

[40] The following disciplines are covered by non-mandatory professional licensing: Agricultural and Biological Engineering; Architectural Engineering; Chemical; Civil; Control Systems; Electrical and Computer; Environmental; Fire Protection; Industrial and Systems; Mechanical; Metallurgical and Materials; Mining and Mineral Processing; Naval Architecture and Marine; Nuclear; Petroleum; and Structural. To give a sense of scale, only about half of civil engineers are licensed in the US, according to statistics provided by the American Society of Civil Engineers.

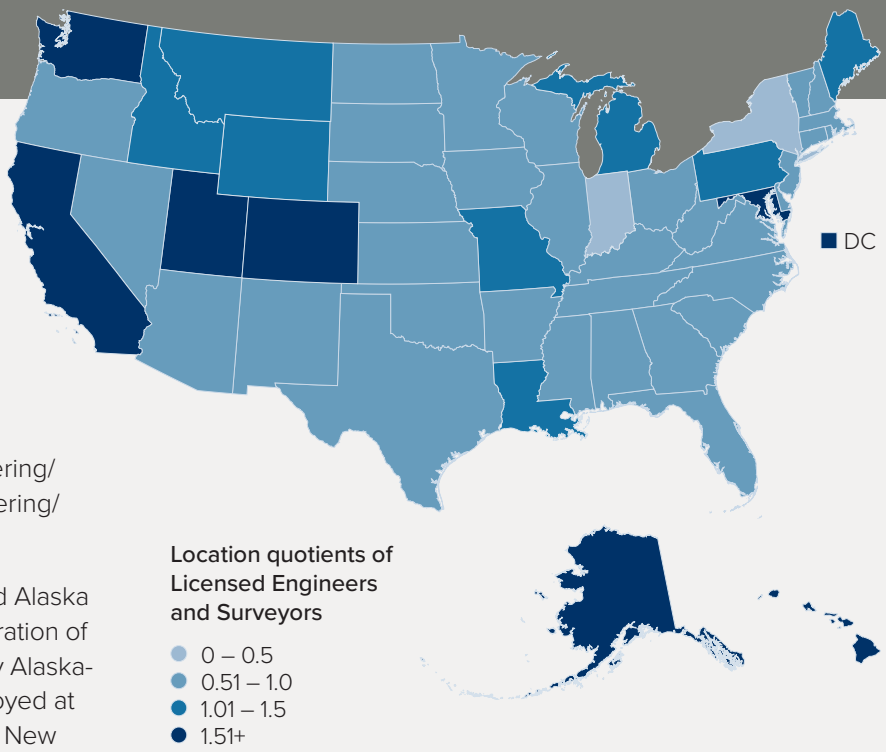
## BECOMING A LICENSED ENGINEER OR SURVEYOR

**Education:** Accreditation Board for Engineering and Technology (ABET) accredited four-year degree for engineers, two to four years of schooling for surveyors

**Experience:** Varies by state, but the general rule is four years of qualifying engineering/surveying experience

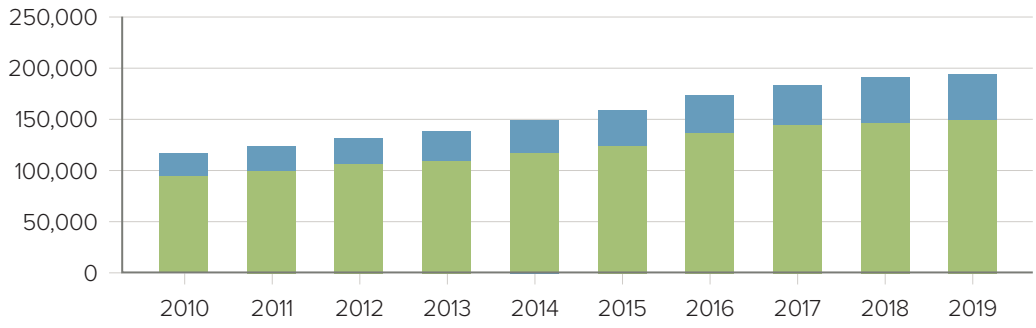
**Exam:** FE/FS (Fundamentals of Engineering/ Surveying), PE/PS (Professional Engineering/ Surveying Licensure)

**Engineers and surveyors' LQs:**[g] DC and Alaska are the states with the greatest concentration of licensed engineers and surveyors. Many Alaska-resident licensees are likely to be employed at the state's biggest oilfield, Prudhoe Bay. New York and Indiana are the states with the lowest concentration of these professions.




[g] The source for the engineer/surveyor state-level information was NCEES, while US-wide employment data came from BLS.

**Fig. 19. Gender of graduates in engineering majors, 2009-19**



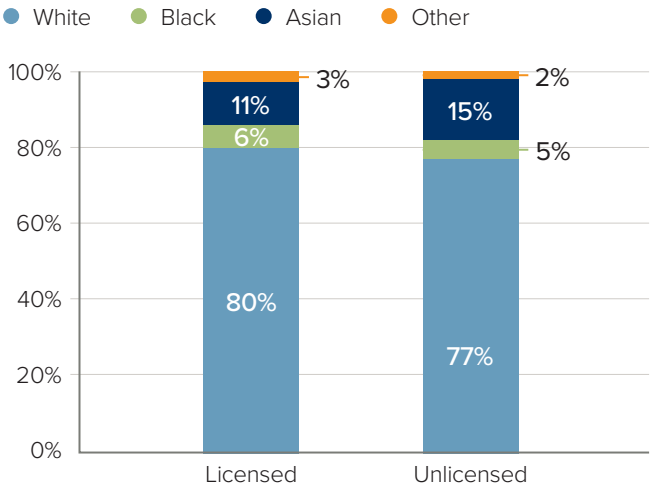

Source: IPEDS

an extremely low share compared with other developed countries, such as the UK and Sweden (where 41% and 48% of engineers are women, respectively).[41] Given the very minor differences in the licensed and unlicensed gender split, it is important to emphasize that **the licensing process per se is unlikely to be the driver for the low female participation in the engineering and surveying professions.**

However, some slightly positive signs come from higher education data, suggesting that 23%

[41] World Economic Forum, "Building a more sustainable world will need more women engineers", 4 March 2020

**Fig. 20. Ethnicity split of engineers, by license status**




Source: CPS

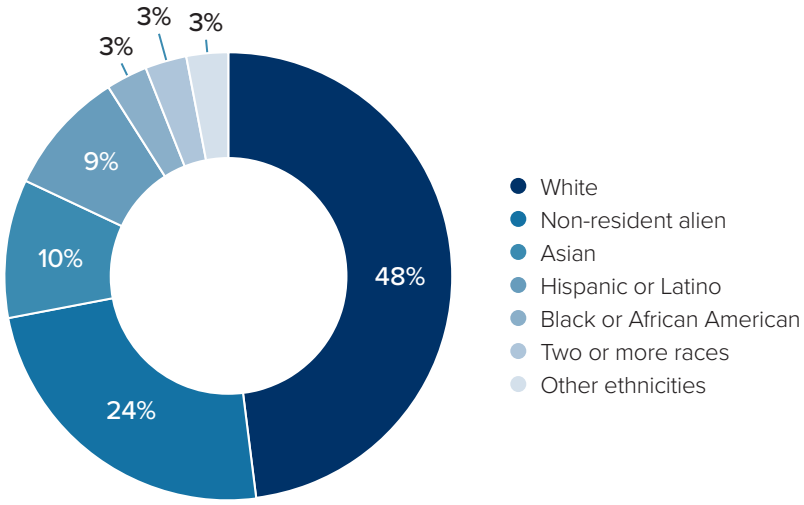
of 2018/19 engineering major graduates were women, an increase from the 20% reported 10 years before (Fig. 19).

In terms of ethnic composition, licensed engineers and surveyors are more likely to be white, although the share of Black workers is slightly larger among licensed professionals (Fig. 20).

Demographic statistics of university graduates suggest that in 2018/19 less than half of the cohort was made up of white Americans, although the share of Black and African American graduates remains very low (Fig. 21).

**Fig. 21. Ethnicity split of 2018/19 graduates in engineering major**

Source: IPEDS



# 4. EMPIRICAL ANALYSIS

As discussed earlier in this report, opponents of licensing have argued that professional licensing has gone too far. They often use examples such as the plumbers and cosmetologists who are licensed to work in one state but upon relocating to another state learn that their license is not valid. In response to these cases, there has been an uptick in calls to deregulate professional licensing in numerous states, with bills drafted and at times even passed. The problem with "one-size-fits all" bills is they are not narrowly tailored to solve the problem of the plumber or the cosmetologist but would rather dismantle licensing systems for nearly all professions—not just for trades and vocations.

In this section, we show that licensing has very different effects for professions with high skill requirements and public impact compared to lower-skill occupations. An argument often used by licensing opponents predicts that entry requirements limit supply and create monopoly rents within the licensed occupation. We, therefore, test the effect of licensing and certifications on hourly wages, using regression analysis applied to CPS data over the period 2015-19.[42] Regression analysis is the tool we use to mathematically clarify which variables show statistical relationships with wages.

We first analyze how the wages of those with licenses or certifications compare with those without (section 4.1). Then we look at how these results change for occupations across the skill spectrum (section 4.2). Next, we evaluate the effect of licensing on female and ethnic minorities in the general population (section 4.3), and lastly, we assess the effect of licensing on female and minority workers, by occupational skill level (section 4.4).

## 4.1 LICENSES, CERTIFICATIONS AND HOURLY EARNINGS

In order to correctly estimate the licensing and certification wage premium, we regress the logarithm of hourly wages over dummy variables that indicate if an individual is licensed or certified.[43] We also include controls such as educational endowments and demographic characteristics in our regression model. More details on the model specification are presented in the Appendix.

In our baseline specification, the estimates suggest licensing is associated with approximately 6.5% higher hourly earnings, even after accounting for human capital (proxied by educational attainment), demographic, and occupational characteristics (Fig. 22). This is the average effect across all occupations, from barbers to nuclear engineers.

Our estimate is broadly in line with existing literature on the subject, as presented in section 2.1. In particular, our estimated effect is:

- lower than the 15-18% found by Kleiner and Krueger (2010, 2013) and the 11% found by Kleiner and Vorotnikov (2017);[44]

[42] Correlation does not imply causation. The relationship between licensure and wages identified in this work shows that these variables are indeed related, but this link should not be interpreted as causal.

[43] As explained in Chapter 1, a license grants legal authority to practice a profession, while a certification is typically a voluntary process and is often issued by a private organization for the purpose of signalling individuals who have successfully met all requirements for the credential and demonstrated their ability to perform their profession competently.

[44] Morris M. Kleiner and Alan B. Krueger, "The Prevalence and Effects of Occupational Licensing", *British Journal of Industrial Relations,* 48:4 (2010): 676–87. Morris M. Kleiner and Alan B. Krueger, "Analyzing the Extent and Influence of Occupational Licensing on the Labor Market", *Journal of Labor Economics,* 31(2) (2013): 173-202. Morris M. Kleiner and Evgeny Vorotnikov, "Analyzing occupational licensing among the states", *Journal of Regulatory Economics,* 52 (2017): 132–58.

- very similar to the 7% found by Kleiner and Gittleman (2016);[45] and
- larger than the 4% found by Koumenta and Pagliero (2019).[46]

In our model, we also find that licensing has a lower influence on earnings than certification. A certification is associated with approximately 7.6% higher earnings (Fig. 22). The influence of variables such as race, age, education, and unionization on hourly earnings is significant and consistent with the economic literature.

**Fig. 22. Impact of licensing and certification on hourly wages**[h]

| Variables | Coefficients |
|---|---|
| Licensed | +0.063*** |
| Certified | +0.073*** |
| Female | -0.147*** |
| Hispanic | -0.075*** |
| Black | -0.103*** |
| Education | +0.133*** |
| Age | +0.034*** |
| $Age^2$ | -0.000*** |
| Union member | +0.111*** |
| Private sector | +0.019*** |
| Children | +0.028*** |
| Married | +0.047*** |
| Constant | -11.41*** |
| Occupation fixed effects | Yes |
| State fixed effects | Yes |
| Industry fixed effects | Yes |

Source: Oxford Economics

* indicates statistically significant at 10%; ** significant at 5%; and *** significant at 1%

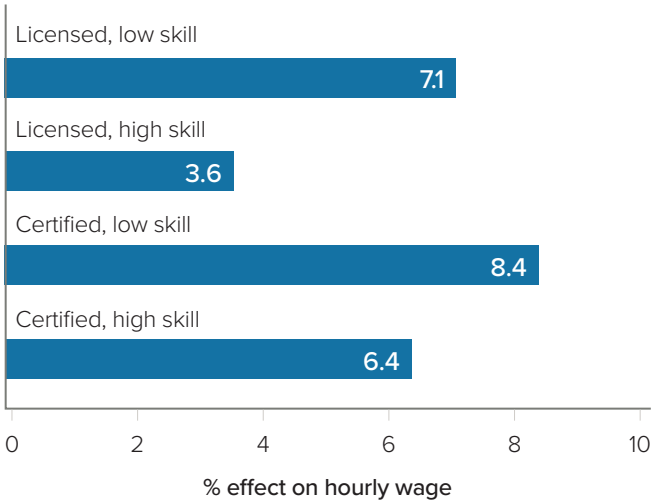
[h] The table reports unadjusted coefficients. Because the dependent variable was in logs, we make the appropriate adjustments when we discuss the magnitude of the economic impact of the dummy variables: 100×(exp(β)−1). The constant term in regression analysis is the value at which the regression line crosses the y-axis.

## 4.2 THE EFFECT OF LICENSING AND CERTIFICATION BY SKILL LEVEL

In this section, we disaggregate the wage effects of licensing and certification by occupational skill level. In particular, we divide the Current Population Survey sample between high- and low-skilled occupations. We define high skill as all occupations in job zone four or five (this group includes all the professions of interest covered by ARPL and many more), and all other jobs are treated as lower skill and/or require less job preparation.[47]

We find that the effect of licensing on salaries is lower for highly skilled individuals (Fig. 23). In other words, while licensing and skills both increase wages, licensing has a stronger effect at the bottom of the skill distribution. Similarly, the coefficient of certification is also lower among highly skilled workers. Consistently with our findings from section 4.1, across the skill spectrum certifications seem to have greater earnings returns than licenses.

**Fig. 23. Effect of licensing and certification by skill level**




Source: Oxford Economics

[45] Maury Gittleman & Morris M. Kleiner, "Wage Effects of Unionization and Occupational Licensing Coverage in the United States", *ILR Review,* 69(1) (2016): 142–72.
[46] Maria Koumenta and Mario Pagliero, "Occupational Regulation in the European Union: Coverage and Wage Effects", *British Journal of Industrial Relations,* 57:4 (2019): 818-49.
[47] In other words, this residual group includes all occupations in job zones one (occupations usually not requiring any education, but with some requiring a high school diploma or GED certificate), two (occupations usually requiring a high school diploma) and three (occupations usually requiring training in vocational schools, related on-the-job experience, or an associate's degree).

For example, the median hourly wage of an unlicensed barber (an example of a relatively low skill occupation) is $14.68 from CPS data and the typical working hours are 40. Our estimated coefficient suggests that a licensed barber could earn $15.72 per hour instead, and this maps very closely to the median hourly wage of licensed barbers in the CPS, equivalent to $15.57 per hour. Over a year, the barber could make an extra $2,200 with a license, equivalent to a 7.1% uplift assuming no changes in working hours.

At the other end of the skill spectrum, CPS data suggest unlicensed marine engineers and naval architects earn $83,100 per annum.[48] Our model predicts this could grow to $86,100 when gaining a license, reflecting a $3,000 or 3.6% annual uplift. This prediction matches almost perfectly the median salary reported by licensed individuals in this same occupation.

In essence, both barbers and marine engineers are better off with a license, but to a very different extent, suggesting that equalizing all licensed occupations under one single regulatory framework could have unintended consequences.

## 4.3 THE EFFECT OF LICENSING ON FEMALE AND ETHNIC MINORITIES

The goal of this section is to estimate the occupational license premium across all occupations, allowing for heterogeneity by gender and race. In other words, in this analysis, we test whether occupational licensing narrows the wage gap between men and women and between white and minority workers. In modeling terms, we estimate the following wage regressions:

1. $\log(\text{hourly wage}) = \alpha(\text{licensed}) + \beta(\text{female}) + \gamma(\text{licensed} \times \text{female}) + \delta(\text{other control variables}) + \varepsilon$
2. $\log(\text{hourly wage}) = \alpha(\text{licensed}) + \beta(\text{ethnic minority}) + \gamma(\text{licensed} \times \text{ethnic minority}) + \delta(\text{other control variables}) + \varepsilon$

In Fig. 24 we present the results from these two wage regressions. First, we find that the coefficients on both the female and minority variables are negative and highly statistically significant. This indicates that falling into one of those groups puts these workers at a wage disadvantage, a finding that is sadly all too well known.

However, the model also shows that the attainment of a license can help to mitigate that disadvantage. On the left-hand side, we estimate the license premium for men is 5.6%, whereas the license premium for women equals 7.4% (the sum of the licensed and the licensed × female coefficients), suggesting the returns to occupational licensing are higher for women than men.[49] The right-hand side panel, instead, shows that licenses do not seem to significantly contribute to narrowing the race-driven wage gap among Black and Hispanic professionals across all occupations. This is shown by the insignificant interaction term.

**Fig. 24. Licensing premia for women and minority workers**

| Variables | Coefficients |
|---|---|
| Licensed | +0.055*** |
| Female | -0.151*** |
| Licensed × female | +0.017*** |
| All other control variables | Yes |

| Variables | Coefficients |
|---|---|
| Licensed | +0.062*** |
| Ethnic minority | -0.092*** |
| Licensed × ethnic minority | 0.006 |
| All other control variables | Yes |

Source: Oxford Economics

* indicates statistically significant at 10%; ** significant at 5%; and *** significant at 1%

[48] This is slightly lower than the median salary reported in the BLS' Occupational Outlook Handbook for the same occupation.

[49] As for the coefficients in Fig. 22, the unadjusted coefficients from Fig. 24 were adjusted using the formula $100\times(\exp(\beta)-1)$ to be able to convert the log-lin coefficient into a percentage increase.

## 4.4 THE EFFECT OF LICENSING ON FEMALE AND MINORITY WORKERS, BY SKILL LEVEL

In this final analytical section, we attempt to account for heterogeneity in the licensing premia due to both gender (or race) and skill level. We start by disaggregating the wage effects of licensing by gender and skill level.

The coefficient of licensure among female workers is 6.1% and is highly statistically significant (Fig. 25). No significant differences were detected in the returns to licensing between highly skilled and low skill female workers (see the top two bars in the figure). Among male workers, instead, the returns to licensing are much greater among low-skill individuals (see the bottom two bars in the figure), suggesting that the significant differences between high and low-skill workers mainly stem from male workers.

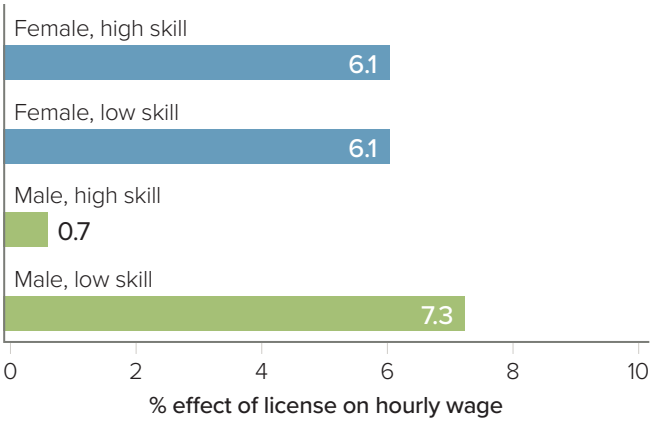
Cutting the data by skill level, highly skilled female workers have greater returns from licensing than high-skill males (see first and third bar from the top). In other words, a female engineer can expect better returns to gaining a license than a male engineer, all else equal. The opposite is true among low-skill workers, where men see better licensing returns than women. In other words, a male barber can expect greater returns from licensing than his female counterpart, all else equal.

This finding suggests that professional licensing among highly skilled professions (such as that provided by ARPL members) positively contributes to narrowing the gender-driven wage gap because female workers see greater returns from this process. The same cannot be said for the lower end of the skill spectrum, whereby licensure does not seem to help women.

We now turn to disaggregating the wage effects of licensing by race and skill level. The coefficient of licensure among highly skilled minority (Black or Hispanic) workers is 8.1%, while the estimated return to licensing of low-skill minority workers is 6.2% (Fig. 26). Among non-minority workers, the returns to licensing are much greater among low-skill individuals (see bottom two bars in the figure).

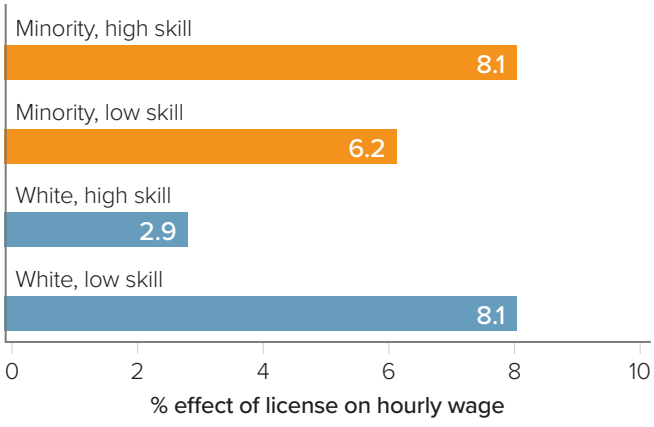
Cutting the data by skill level, highly skilled minority workers have greater returns from licensing than high-skill non-minorities. The opposite is true among low-skill workers, where white workers see better licensing returns than minorities. This result shows that professional licensing among highly skilled professions (including the ARPL professions) positively contributes to narrowing the race-driven wage gap because minority workers see greater returns from this process. The same cannot be said for the lower end of the skill spectrum, whereby licensure does not seem to help Black and Hispanic workers.

**Fig. 25. Licensing premia for women and men, by skill level**




Source: Oxford Economics

**Fig. 26. Licensing premia for minority and white workers, by skill level**




Source: Oxford Economics

# 5. CONCLUSION

The aim of this study was to provide a sound, data-driven perspective on the true impacts of professional licensing. We have found that licensing is associated with approximately 6.5% higher hourly earnings across all occupations. When evaluating this result by the level of skill required to perform a specific role, we estimate that the effect of licensing on salaries is lower for highly skilled individuals (3.6%). This compares with a 7.1% return for licensed low skill workers.

This has important implications for a policy debate that has focused heavily on deregulating all licensed occupations, from plumbers to nuclear engineers. Our findings suggest instead that it is crucial to distinguish between professions with high skill requirements and public impact from trades and vocations.

Second, this study has found that across all occupations the returns to licensing are higher for women than men. It is estimated that the license premium for men is 5.6%, whereas the license premium for women equals 7.4% on average. This result, however, is driven by the subset of highly skilled technical professions. It suggests that professional licensing among highly skilled professions (such as that provided by ARPL members) positively contributes to narrowing the gender-driven wage gap because female workers see greater returns from this process. The same cannot be said for the lower end of the skill spectrum, whereby licensure does not seem to help women more than men.

Finally, our analysis has pointed to the fact that highly skilled minority workers have greater returns from licensing than high-skill non-minorities. This implies that, on average, a black engineer can expect better returns to gaining a license than a white engineer, all else equal. The opposite is true among low-skill workers, where non-minority workers see better licensing returns than minorities. In other words, a white barber can expect greater returns from licensing than his/her non-white counterpart, all else equal.

In conclusion, this study points to the fact that professional licensing of highly skilled workers should be understood and regulated separately from occupational licensing of trades and vocations. This is because:

- It does not have a wage impact that is comparable in magnitude with that of low skill vocations;
- It appears to substantially support women and minorities achieve wage parity, and this is only true among highly skilled workers according to our model findings; and
- The level of risk and responsibilities involved in these professions calls for greater scrutiny over these roles and the repercussions of blanket deregulation for public safety and welfare could be considerable.

# APPENDIX

The Current Population Survey (CPS) is a monthly survey of approximately 130,000 individuals. Respondents are interviewed eight times, first for four consecutive months, then they are out of the survey for eight months, and then return to the survey for four additional months. Respondents in their fourth and eighth month in the sample are referred to as the "Outgoing Rotation Group" (ORG) and receive additional questions on topics such as wages. Thus, while there are roughly 1.6 million person-observations per year (130,000 per month times 12 months), each individual is interviewed eight times, implying a sample size of unique individuals of around 200,000 a year.

This analysis pools CPS microdata from January 2015, when licensure and certification questions were first asked, through December of 2019, to avoid any complications from Covid-19. To ensure unique individuals, we include respondents in their eighth month in sample, as well as those in their fourth month in sample in 2019. This results in a sample size equivalent to six half-ORGs (i.e., one each from 2015-2018, and two in 2019). To account for this, we divide outgoing rotation group sample weights by 36 (i.e., by three to account for the pooling of multiple ORGs, and by 12 to account for multiple months of data). All wage data are inflation-adjusted using CPI data to 2019 dollars.

The dependent variable in our regression analysis is the logarithm of hourly wages. By doing so, we are saying that a one-unit change in the explanatory variable *x* leads to a constant percentage change in the dependent variable (hourly wages). This model specification is known as the semilog or log-lin functional form. For example, educational attainment and wages follow a relationship of this nature (one more year of education increases wages by a percentage, rather than a unit, value). Another reason for using the logarithmic transformation is hourly wages have a right-skewed distribution (mean > median). Taking the log makes the distribution of the transformed variable more symmetric.

Fig. 22 reports unadjusted coefficients for our baseline model specification. Because the dependent variable was in logs, we make the appropriate adjustments when we discuss the magnitude of the economic impact of the dummy variables. With β being the unadjusted model coefficient, the relative percentage change in hourly wage is calculated as $100\times(\exp(\beta)-1)$.

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