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Analyzing the Labor Market Outcomes of Occupational Licensing*

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Recent assessments of occupational licensing have shown varying effects of the institution on labor-market outcomes. This study revisits the relationship between occupational licensing and labor-market outcomes by analyzing a new topical module to the Survey of Income and Program Participation. Relative to previously available data, the topical module offers more detailed information on occupational licensing attainment, with larger sample sizes and access to richer sets of person-level characteristics. We find that those with a license earn higher pay, are more likely to be employed, and have a higher probability of employer-sponsored health insurance offers.

Introduction

There are often disagreements in economics over the appropriate role of governmental regulation of occupations (Kleiner 2000; Smith 1937). Neoclassical economists have viewed occupational licensing as a form of rent-seeking (Friedman 1962; Friedman and Kuznets 1945). More recently, theory has suggested occupational licensing provides incentives for workers to enhance their human capital through greater investments in their work life by limiting low-skilled substitutes who claim to be able to do the work but have not passed tests or shown an ability to do the required tasks (Shapiro 1986).

As an empirical issue, occupational licensing has become an increasingly important factor in the regulation of services in the United States. The number

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of occupations that require a license from government has grown since the 1970s, and the percentage licensed has been increasing as well (Greene 1969; Kleiner 2006). The number of studies analyzing the labor-market institution of occupational regulation, however, has not been growing proportionately.

One of the largest barriers standing in the way of analyzing occupational licensing has been that there was no well-organized national dataset available for the examination of the influence of attaining an occupational license on wages. New data to address important licensing issues have, however, recently become available. Specifically, we analyze the 2008 panel of the Survey of Income and Program Participation (SIPP). This panel is a large, nationally representative dataset covering the period May 2008 through November 2013. This was the first time a large government survey specifically asked questions about licensing and certification attainment.[1]

In two studies examining the influence of occupational licensing attainment on wage determination, Kleiner and Krueger (2010, 2013) used special small survey databases to estimate the effect of occupational licensing on hourly wage determination in 2006 and 2008. Initially, our estimates use the new larger governmental survey data from the SIPP to determine wage returns to licensing; however, we make a number of additional contributions to the literature. We examine whether there are heterogeneous wage effects by the education level of the license holder's occupation. More importantly, we move beyond just wage determination to consider other labor-market outcomes. We assess the impact of licensing on the incidence of key nonwage benefits, and are the first to consider its effect on the generosity of a benefit (employer-provided health care). Moreover, ours is the first micro-level analysis to assess the influence of licensing on the likelihood of being employed.

Our empirical analysis finds that after controlling for observable heterogeneity, including occupational status, those with a license earn higher pay, are more likely to be employed, and have a higher probability of receiving employer-sponsored health insurance offers. According to our estimates, where a government-issued license is required for the job, such a credential raises hourly wages by about 7.5 percent. In addition, in contrast to labor unions, licensing does not appear to reduce wage inequality, overall, and may, in fact, increase it in the bottom quartile. The main implications of our results are that occupational regulation appears to raise the wages and benefits of government-licensed workers and to provide greater opportunities for employment for workers who attain a governmental license or certificate.

[1] Beginning January 2015, the Current Population Survey (CPS) included three questions on certification and licensing. The data collected in 2015 from two of those questions were made available for public use beginning in April 2016.

Rationale for Our Study

In January 2015, the Bureau of Labor Statistics began to ask a portion of the sample of the Current Population Survey (CPS) about certification and licensing (Allard 2016). However, the module on this topic in the SIPP is more detailed than the three questions in the CPS, and we think that the use of the SIPP allows for an examination of a wider range of labor-market outcomes than would be the case by examining only the CPS. Although occupational associations, such as the American Bar Association and the American Dental Association, collected wage and salary data, as well as the number of new entrants and pass rates by state through the early 1980s, the state pass rate information is no longer tabulated or released to the public. Moreover, state licensing boards either do not have reliable data to provide to researchers or, if they do, they are often reluctant to provide it.

Consequently, because estimates about the potential costs and benefits of licensing are difficult to obtain, our ability to use these new data should advance knowledge about the labor market effects of certification and licensing. For the most part, economists interested in studying occupational licensing have needed to find ways to pull together their own data and approaches (Kleiner and Krueger 2010, 2013). An example of one approach is examining why states or countries have different occupational licensing requirements. Why does Iowa license more than twice as many workers as Indiana (Kleiner and Vorotnikov 2017)? Is occupational licensing endogenous to the industrial, occupational, demographic, or political composition of a state? Empirical work in political economy suggests that political influence and funding of licensing initiatives by the professions are the most important factors influencing whether an occupation becomes regulated by the states (Graddy 1991; Wheelan 1999).

Another approach to examining licensing might be to find ways to examine the actual skill levels of certain occupations. Although regulated occupations routinely require license holders to attend continuing education seminars, examinations on the contents are rarely given to the persons that attend, and denial of permission to work in the occupations once an individual passes the initial licensing exam is highly unusual. Finally, in thinking about the policy implications of empirical research in this area, it is important to keep in mind the policy option of certification. This potential substitute for licensing allows consumers or employers to choose whether they are willing to pay a higher wage for someone with greater state- or private-documented skills. It is plausible to think that certification would have lesser effects on labor-market outcomes within an occupation, because it would not restrict supply as tightly, and also that it would have lesser effects on quality. Thus, certification offers

an intermediate choice between the extremes of no state or private role in qualifications at all and the absolute requirement of having a license before working at certain occupations. Our study also examines the influence of certification.

Prior to 2006, the data available on occupational licensing in the United States were restricted to classifications as to whether various occupations were licensed at the state level, often based on the America's Career InfoNet data (Kleiner and Krueger 2010, 2013). These classifications could be linked to Census Bureau occupational employment data to derive estimates of the proportion of workers in licensed jobs. Although informative, such data have clear limitations. First, compliance with state licensing requirements could be less than complete; some of those classified as working in licensed occupations may not in fact be licensed. Moreover, many of the workers may be covered by occupational licensing statutes but not have attained a license (Gittleman and Kleiner 2016). Second, some occupations have a trial period during which workers can perform a job before becoming licensed. For example, accountants may work in an accounting firm prior to obtaining their license. Third, and probably most important, the state data miss licensing that takes place at the local and federal level. Kleiner and Krueger (2013) reported that restricting analysis to state licensing would miss 10.5 percent of licensed workers, and that 49.8 percent of licensed workers have a credential that was issued by the state in addition to some other jurisdiction.

As employment in the United States shifted from manufacturing to service industries, the members of the occupations established a formal set of standards that governed members of the occupation. Wheelan (1999) argued that, for a professional association, obtaining licensing legislation meant raising funds from members to lobby the state legislature, particularly the chairs of appropriate legislative committees. In addition, the occupation association often solicits volunteers from its membership to work on legislative campaigns. With both financial contributions and volunteers, the occupational association has a significant ability to influence legislation and its administration, especially when opposition to regulatory legislation is absent or minimal.

Occupational regulation refers to mechanisms to impose minimum standards (often educational standards) for entry and for the ability to continue working in an occupation. These regulations range from less restrictive (e.g., requirements to register their names, addresses, and qualifications with a government agency), having an exclusive right to a title, known as certification, to very restrictive (e.g., licensure, where it is illegal to practice an occupation for pay without meeting government standards). We are able to examine these concepts with the data we use from the SIPP.

We contrast the results from the SIPP with those obtained from the Princeton Data Improvement Initiative (PDII) (Kleiner and Krueger 2013).[2] The PDII used the results of a telephone survey of the workforce conducted by Westat that asked detailed questions on occupational regulation as well as questions on the labor-market status of individuals in 2008. These questions probe the kind of government regulation required to perform a job, the process of becoming licensed, and the level of education and tests necessary to become licensed. The results of the Westat survey, as well as separate validation results from a related Gallup survey, indicate that occupational licensing can be reasonably well measured in labor-force surveys. However, the small sample of slightly more than 2200 individuals and the resulting lack of representativeness for some groups may bias some of those results. We expect that using the SIPP with its larger sample size and more detailed set of labor-market questions will further our analysis of the role of occupational licensing in the labor market. We next, however, provide a background for our empirical results by examining the rationale for occupational regulation within different institutional frameworks.

Theories of Occupational Licensing

Here we review the evolution of theories of occupational licensing, ranging from the mechanistic ones to those that utilize human capital theory. We begin by outlining the simplest theory of occupational licensing, which draws more heavily on administrative procedures than on economics. We then incorporate insights from more complex theoretical models that challenge some of the straightforward assumptions of the simple theory and which thereby provide richer insights into the operation and effects of regulation.

A simple theory of occupational licensing envisions a costless supply of unbiased, capable gatekeepers and enforcers. The gatekeepers screen entrants to the occupation, barring those whose skills or character suggest a tendency toward low-quality output. The enforcers monitor incumbents and discipline those whose performance is below standard with punishments that may include revocation of the license needed to practice. Assuming that entry and performance are controlled in these ways, the quality of service in the profession

[2] We devote considerable attention to Kleiner and Krueger (2013) because of its similarity to our approach in estimating returns to licensing using an economywide sample. We would be remiss, however, if we did not mention the literature that seeks to estimate a causal effect of licensing on wages by focusing on specific occupations. Exemplars of this approach include Kleiner and Kudrle (2000); Law and Marks (2013); Thornton and Timmons (2013); Timmons and Thornton (2008); and Kleiner et al. (2016).

will almost automatically be maintained at or above standards that are set by the gatekeeper to the profession. Within this approach, only those who have the funds to invest in training and the ability to do the work are able to enter the occupation.

We introduce economics to this otherwise mechanical model by noting that a key discipline on incumbents—the threat of revoking one's license—may not mean much if incumbents can easily reenter the profession, such as by moving to a new firm, or by shifting to an alternative occupation with little loss of income. Since grandfathering (i.e., allowing current workers to bypass the new requirements) is the norm when occupations seek to become licensed, incumbent workers are usually supportive of the regulation process. In the absence of grandfathering, lower skilled workers in the occupation may have to seek alternative employment. For example, if sales skills are the key to both providing licensed sales of heart monitors and the unlicensed selling of shoes or cars, then individuals may shift between these lines of work with little loss of income.

Under these circumstances, meaningful discipline for license holders may require deliberate steps to ensure that the loss of license entails significant financial loss. Such additional steps could include imposition of fines, improved screening to prevent expelled practitioners from reentering the occupation, or requiring all incumbents to put up capital that would be forfeited upon loss of the license. To offset the possibility that incumbents could shift to other occupations with little loss of income, entry requirements could be tightened to limit supply and create monopoly rents within the licensed occupation. The threat of losing these monopoly rents could, in principle, give incentives to incumbents to maintain quality standards. This may also result in some increases in human capital investments in order to attain the additional requirements. The rents could also motivate potential entrants to invest in high levels of training in order to gain admittance. This suggests that licensing can raise quality within an industry by restricting supply, thereby raising labor wages.

State-regulated occupations can use political institutions to restrict supply and raise the wages of licensed practitioners. There is assumed to be a once-and-for-all income gain that accrues to current members of the occupation who are grandfathered in and do not have to meet the newly established standard (Perloff 1980). Generally, workers who are grandfathered in are not required to ever meet the standards of the new entrants. Individuals who attempt to enter the occupation in the future will need to balance the economic rents of the field's increased monopoly power against the greater difficulty of meeting the entrance requirements.

Once an occupation is regulated, members of that occupation in a geographic or political jurisdiction can implement tougher statutes or examination pass rates and may gain relative to those who have easier requirements by

further restricting the supply of labor and obtaining economic rents for incumbents. Restrictions would include lowering the pass rate on licensing exams, imposing higher general and specific requirements, and implementing tougher residency requirements that limit new arrivals in the area from qualifying for a license. Moreover, individuals who have finished schooling in the occupation may decide not to go to a particular political jurisdiction where the pass rate is low because both the economic and shame costs may be high.

One additional effect of licensing is that individuals who are not allowed to practice at all in an occupation as a consequence of regulation may then enter an unlicensed occupation, thereby shifting the supply curve outward and driving down wages in these unregulated occupations. If licensing requirements contain elements of required general human capital, then these workers may possibly raise the average skill level in their new occupation.

Data

To analyze a range of labor-market effects of occupational regulation, we employ data from the 2008 panel of the Survey of Income and Program Participation (SIPP). This panel is a large, nationally representative dataset covering the period May 2008 through November 2013. Every 4 months, respondents answer a core group of questions about the preceding 4 months. These responses provide detailed monthly information about demographics, employment situations, earnings, and a variety of other characteristics. Respondents also answer a separate group of topical questions that vary from one interview, or wave, to the next. We primarily utilize the Professional Certifications, Licenses, and Educational Certificates topical module linked with Core data from the thirteenth wave of the 2008 panel, collected between September and December 2012. In addition, we refer to previous topical modules to the SIPP in order to estimate the impact of license and certification attainment on nonwage benefits. Specifically, we exploit the Employer-Provided Health Benefits topical module in the sixth wave and the Retirement and Pension Plan Coverage topical module in the eleventh wave.

Professional Certifications, Licenses, and Educational Certificates topical module. The Professional Certifications, Licenses, and Educational Certificates topical module offers data about the most recent license or certification that a respondent earned (Ewert and Kominski 2014).[3] To begin, all

[3] The Federal Interagency Working Group on Expanded Measures of Enrollment and Attainment developed and tested the survey questions that constitute this topical module (Allard 2016; Bielick et al. 2013).

respondents aged 16 and over answered the question "Do/Does you/he/she have a professional certification or a state or industry license?"

Responses to this question are of primary interest for our analysis because they enable us to investigate how labor-market outcomes differ for those who obtain these credentials. Individuals who had attained a professional certification or license then answered the question "Who awarded this certification or license?"

Finally, these respondents replied whether the awarding body required three common minimum standards in order to earn and maintain the credential: taking courses or training, demonstrating skills while on the job or passing a test or exam, and taking periodic tests or continuing education classes or earning CEUs (continuing education units).

Our data bear several important advantages over previous examinations of these issues for our analysis. First, the topical module contains a direct measure of credential attainment, which, at the time was not true of any other large, nationally representative dataset.[4] Studies that employ these datasets infer license attainment from occupational affiliation and, sometimes, state. If regulations require a license to perform tasks within an occupation, then any respondent in that occupation is imputed to have achieved a license. Consequently, previous examinations of the labor-market impacts of licensing in large, nationally representative datasets limit themselves to relatively few institutional settings, thereby diminishing their external validity.[5] A second issue with this imputation strategy is evidence of substantial measurement error in occupational affiliation (Kambourov and Manovskii 2008). Measurement error in occupational affiliation could create measurement error in licensure status.

Kleiner and Krueger (2013) also emphasized the importance of direct measures of license and certification attainment. In explaining the relative

[4] As noted in an earlier footnote, the CPS, as of January 2015, includes three questions on certification and licensing directed to a portion of the sample, but the data from these questions were not made available to the public until April 2016.

[5] Law and Marks (2009) used the decennial census to document how the introduction of licensing regulations during the Progressive Era affected outcomes in eleven detailed occupations. Kleiner (2006) and Klee (2013) exploited variation across states and over time in the stringency of licensing regulations to analyze wage effects for four detailed occupations in the decennial census and CPS, respectively. Kleiner (2000) compared average earnings across four licensed occupations and similar unlicensed occupations. Kleiner (2006) presented average wage changes from the National Longitudinal Study of Youth, 1979 (NLSY79) respondents who moved into and out of licensed occupations. One notable exception is Gittleman and Kleiner (2016). They constructed a comprehensive list of licensed occupations and categorized each state-by-occupation pair along two dimensions: whether no, some, or all workers must have a license and how long this licensing policy has been in effect. They estimated the licensing wage effect using the NLSY79. Although their regulatory data improve external validity, a direct measure of license attainment would facilitate identifying the licensing wage premium in occupations that were only partially licensed. In the absence of such a direct measure, the authors report a range of wage effects under extreme assumptions about the fraction of workers in the occupation that has a license and the starting date of the licensing regulation.

inattention given to these prevalent policies, they claimed "a major reason for the lack of empirical work has been the absence of national data that clearly defines whether a worker is regulated and the extent of regulation" (p. S174). Our data help fill that void. Kleiner and Krueger (2013) found that attaining a license confers a significant wage premium. This relationship persists when they attempted to mitigate selection bias by using only within-occupation wage variation to identify this effect. However, their sample size was relatively small, about 2200 respondents, with a low response rate compared with government labor force surveys. The SIPP's large sample size, its second advantage, allows for more externally valid and more precise estimates of the wage benefits of professional licenses. Increased precision is especially advantageous when estimating models that include occupation fixed effects.

A third advantage of the SIPP is that the core data include a breadth of information about individuals and their labor-market outcomes. This improves our ability to control for observable heterogeneity that might be correlated with both attainment and labor-market outcomes.[6] The variety of data also expands the ability to analyze how the attainment of licenses and certifications relates to nonwage benefits. Most surveys lack information about these forms of compensation, perhaps explaining why this relationship remains an understudied topic.[7]

The data also have some limitations for our analysis. First, the Professional Certifications, Licenses, and Educational Certificates topical module does not allow us to distinguish as confidently as we would like between respondents who have earned licenses and respondents who have earned certifications.[8] Both credentials signal a worker's quality to potential employers in markets

[6] On average, workers who have attained a license are older, more educated, more likely to belong to a union, more likely to work for a public employer, and more likely to work in the services sector (Kleiner and Krueger 2010, 2013). Licenses and certifications are also more common among individuals who are non-Hispanic white, aged 30 through 49, native born, and employed (Ewert and Kominski 2014).

[7] To our knowledge, Gittleman and Kleiner (2016) is the only previous examination of the relationship between licensing and nonwage benefits, though their analysis, because it used the NLSY79, is cohort-specific and does not cover the entire prime working age range.

[8] It may be noted that this limitation is true for the CPS as well. By contrast, the PDII does distinguish confidently between licensed and certified workers utilizing the question "Would someone who does not have a license or certificate be legally allowed to do your job?" The SIPP topical module does include the following question: "Is this certification or license required for your/his/her current or most recent job?" Some respondents might have interpreted this question as asking whether the credential was a legal requirement. Differences in legal requirements would allow us to distinguish licensed from certified workers. Other respondents might have interpreted this question as asking whether the credential was an informal requirement. Examples of such informal requirements occur when employers require the credential to consider a job candidate qualified or when completing a task requires some proficiency that only credentialed workers possess. To the extent that informal requirements and legal requirements do not align, this interpretation would not allow us to distinguish licensed from certified workers. We lack sufficient information to determine the relative prevalence of these two interpretations and, consequently, do not use this question to define licensing status.

characterized by asymmetric information. The fundamental difference between a license and a certification is that a licensed worker may not practice by law without a license, whereas a certified worker may practice by law without a certification but may not use the title held by those who have the certification.

Our main explanatory variable of interest indicates whether an individual had attained either a license or a certification. We refer to this classification as "Definition 1," and classify individuals as "credentialed" or not. We also use characteristics of respondents' credentials to construct a classification of licensed and certified workers. In particular, we assume that a respondent had attained a license if a federal, state, or local government issued that respondent's credential ("licensed"). By contrast, we assume that a respondent had attained a certification if a private agency issued that respondent's credential ("certified").[9] We refer to this classification as "Definition 2." This definition assumes that licensing regulations may require practitioners to obtain only government-issued credentials, and that privately issued credentials may not serve as a legal basis for restricting the right to practice. Although this assumption is likely invalid for some occupations, it is generally consistent with the current institutional context across the United States. One disadvantage of this criterion is that the topical module only asked respondents about the characteristics of their newest credential. Therefore, our classification will suffer from measurement error to the extent that workers obtained both a license and a certification. In addition, some respondents may incorrectly answer that a private entity issued their credentials when in fact it was a government agency, or vice versa.

A second limitation of our data is that the SIPP collects information on up to two jobs and up to two businesses, but respondents did not indicate the job or business for which their credential was relevant.[10] We assume that the credential was relevant only for the job or business in which a respondent earned the highest hourly wage (derived from monthly earnings, usual weekly hours worked, and weeks worked) during a particular reference month, which we refer to as the "main" job or business in that month. We drop all other jobs and businesses in that month, regardless of a respondent's licensure or certification status. Regression estimates include job- or business-level information on hourly wages, union status, occupation, broad industry affiliation, establishment size, and employer type.[11] These variables will suffer from measurement

[9] Private organizations that issue credentials in our data include industries, businesses, companies, nonprofit organizations, professional associations, and other private associations.

[10] By contrast, the PDII specifically asked about licenses and certifications that were relevant for respondents' main job.

[11] Monthly earnings include regular hourly pay and salary, tips, overtime, commissions, bonuses, and cash awards. For business owners, monthly earnings also include profits.

error to the extent that respondents held credentials that were not relevant for main jobs or businesses.

Demographics, job- or business-level information, and employment status come from Core data in the same wave of the SIPP. We also use these Core data to derive an employer-sponsored health insurance outcome that we employ to examine the impact of licenses and certifications on nonwage benefits. Specifically, respondents with employer-sponsored health insurance indicate whether their employer paid all, part, or none of that plan's premium. We use this question to create a variable that takes a value of 1 for respondents whose employers paid at least some of the health insurance premium and 0 for all other respondents who had health insurance through their employer.[12] One problem with this variable is that respondents with multiple jobs or businesses did not identify which employer sponsored their health insurance plan. Consequently, this variable will suffer from measurement error to the extent that workers provided information about health insurance obtained through jobs or businesses for which their licenses and certifications were irrelevant.

Our sample contains respondents aged 18 through 64 who worked in the civilian labor force. For all analyses, we restrict our sample to individuals who provided valid data for the dependent variable.[13] When we classify a worker's licensure or certification status according to Definition 1, we restrict the sample to respondents who provided valid data about credential attainment. When we classify a worker's licensure or certification status according to Definition 2, we also restrict the sample to respondents who provided valid data about the source of their credential.[14] Finally, in models that include occupation fixed effects, we restrict the sample to respondents who provided valid data on their occupational affiliation.

Table 1 reports summary statistics for licensed and certified civilian workers. Of civilian workers aged 18 through 64, 28.0 percent had attained a license or certification in the fall of 2012. Sample attrition likely biases this estimate

[12] Note that this variable is undefined for respondents with health insurance coverage through a spouse's plan only.

[13] Because we drop observations with imputed dependent variables, our results are not representative of the entire U.S. population of civilian workers aged 18 through 64. The Census Bureau does not account for licensure or certification status in the imputation process. Including observations with imputed dependent variables without modeling nonresponse would bias estimates toward zero (Hirsch and Schumacher 2004). Future work should consider more carefully the impact of nonresponse on the estimated wage benefits and nonwage benefits accruing to licensed and certified workers.

[14] Typically, the Census Bureau imputes data for individuals who provided no valid response to a question in SIPP. This process fills in missing data for individuals who refused to answer a question, for example. However, these invalid responses remain in the Professional Certifications, Licenses, and Educational Certificates topical module. Item nonresponse rates were relatively small at 2.5 percent for the direct measure of credential attainment and 1.4 percent for the source of the credential.

TABLE 1

CHARACTERISTICS OF LICENSED AND CERTIFIED WORKERS[a]

Variable	Definition 1			Definition 2				
	Percent Licensed or Certified	SD	*N*	Percent Licensed	SD	Percent Certified	SD	*N*
Total	28.0	44.9	25,704	19.7	39.8	8.0	27.1	25,602
Gender:								
Male	26.1	43.9	13,036	16.8	37.4	8.9	28.5	12,972
Female	30.1	45.9	12,668	23.0	42.1	6.9	25.4	12,630
Education level:								
Less than high school	8.4	27.7	1672	5.0	21.8	2.9	16.9	1665
High school	15.3	36.0	6220	9.7	29.6	5.4	22.6	6197
Some college	29.7	45.7	9017	19.9	39.9	9.5	29.4	8970
College (BA)	32.4	46.8	5669	24.1	42.8	8.1	27.2	5655
Postgraduate	49.6	50.0	3126	38.5	48.7	10.9	31.2	3115
Race and Ethnicity:								
White[b]	31.4	46.4	18,011	22.4	41.7	8.7	28.2	17,944
Hispanic	16.8	37.4	2652	11.1	31.4	5.4	22.6	2640
Black	24.7	43.2	2540	17.3	37.9	6.9	25.4	2523
Other	23.3	42.3	2501	15.7	36.4	7.4	26.2	2495
Age:								
25 or under	14.5	35.2	3318	9.5	29.3	4.8	21.3	3310
26–54	29.8	45.7	17,443	20.9	40.6	8.7	28.1	17,376
55 or older	31.3	46.4	4943	23.3	42.3	7.7	26.6	4916
Union status:								
Union	43.1	49.5	2712	34.6	47.6	8.2	27.5	2698
Nonunion	26.2	43.9	22,298	17.9	38.4	8.0	27.1	22,219
Private or public:								
Private company	25.7	43.7	21,549	16.9	37.5	8.5	27.9	21,463
Public	40.8	49.2	3973	35.7	47.9	4.9	21.7	3957
Industry[c]:								
Service-providing	30.2	45.9	20,674	22.0	41.4	7.9	27.0	20,590
Goods-producing	18.7	39.0	4794	10.0	30.0	8.4	27.7	4777

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of at least one reference month. Summary statistics exclude imputed values and are computed at the person level. The reference period is May through November 2012.

[b]"White," "Black," and "Other" categories include both Hispanic and non-Hispanic workers.

[c]Union status, public or private employer, and type of work represent characteristics of workers' main job or business. We determine the main job in a particular month as the primary source of earnings in that month. Industry represents supersector according to industries in the 2000 Census industry classification system.

upward. By Wave 13, a considerable portion of initial respondents had exited the sample.[15] Sample attrition was more likely among respondents of the 1990 SIPP panel who were unemployed or out of the labor force in the previous wave

[15] Of the 105,663 respondents who participated in Wave 1 of the SIPP, only 66,034 participated in Wave 13 of the SIPP. An additional 10,954 Wave 13 respondents entered the sample after Wave 1.

(Zabel 1998). Respondents who were unemployed or out of the labor force for each of the previous 4 months were less likely to have attained a license or certification (Ewert and Kominski 2014).[16] Table 1 also presents summary statistics when we classify licensure and certification status according to Definition 2. Under this assumption, 19.7 percent of civilian workers aged 18 through 64 had attained a license, and 8.0 percent of this population had attained a certification.

Credentialed workers are in all twenty-two nonmilitary 2-digit Standard Occupational Classification (SOC) codes, with the proportion of such individuals ranging from 10.5 percent among farming, forestry, and fishing occupations; 11.4 percent in food preparation and serving-related occupations; and 11.8 percent in production at the bottom to 57.8 percent in education, training, and library occupations; 58.7 percent in legal occupations; and 79.4 percent in health-care practitioners and technical occupations at the top. Even if one examines 3-digit occupations, credentialed workers are in 393 of 474 occupations or 82.9 percent. At this level, with estimates more susceptible to both sampling and measurement error, the share of those credentialed runs the gamut from 0 to 100 percent.

Table 2 describes who issued the credential and how workers achieved the credential. Among licensed or certified workers, 64.1 percent received their

TABLE 2

REQUIREMENTS FOR BECOMING LICENSED OR CERTIFIED[a]

	Definition 1			Definition 2				
Variable	% of Licensed or Certified Workers Facing Requirement	S.D.	*N*	% of Licensed Workers Facing Requirement	S.D.	% of Certified Workers Facing Requirement	S.D.	*N*
Requirement:								
Courses or training	93.0	25.4	7211	93.4	24.8	92.1	26.9	7133
Skills or exam	91.9	27.3	7183	91.9	27.2	91.8	27.4	7111
Continuing education	69.5	46.1	7080	73.4	44.2	60.3	48.9	7019
Level of government:								
Federal only	4.8	21.4	7160	6.8	25.1	0	0	7160
State only	64.1	48.0	7160	89.9	30.1	0	0	7160
Local only	2.3	15.1	7160	3.3	17.8	0	0	7160
Private only	28.7	45.3	7160	0	0	1	0	7160

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of at least one reference month and who report license or certification attainment. Summary statistics exclude imputed values and are computed at the person level. The reference period is September through December 2012.

[16] Beginning with Wave 1 of the 2014 panel, the SIPP offered a direct measure of credential attainment and information about who issued these credentials. Consequently, it is possible to estimate the percentage licensed and certified based on a sample that minimizes attrition bias.

credential from the state. In order to obtain their credential, 93.0 percent of workers needed to complete courses or training.[17,18]

Topical modules in earlier waves of 2008 SIPP. As noted, another advantage of our data is the capability to link the Professional Certifications, Licenses, and Educational Certificates topical module to other topical modules that accompanied previous waves of the SIPP. This substantially expands the set of outcomes that we can analyze. For instance, Core SIPP data contain very little information about access to employer-sponsored retirement and pension plans.[19] To improve upon this information, we utilize data from the Retirement and Pension Plan Coverage topical module, collected between January and April 2012 in Wave 11 of the SIPP. The availability of previous topical modules also enables us to expand our estimation sample for some analyses. Core SIPP data contain information on employer-sponsored health insurance offers only for respondents who have no coverage. To expand our

[17] Appendix Table 1 lists the most common occupations for licensed or certified individuals in our data. Appendix Table 2 lists the analogous occupations when we classify licensure and certification status according to Definition 2. The most commonly regulated occupations in our data are commonly regulated in practice, which suggests that our data are reliable. Nevertheless, the relatively low percentage of workers in some universally licensed occupations who report having a credential suggests that the data remain imperfect. Consider the 138 individuals whose responses classify them as physicians or surgeons on their main job or business. Absent measurement error in occupational affiliation, regulations predict that all of these respondents had obtained a professional license. Of the 138 physicians or surgeons, some 107 reported that they had attained a license or certification. Of these 107 respondents, Definition 2 would classify 86 as licensed. All physicians and surgeons in the PDII had attained a license, though that data contained only fourteen of them. This deviation from predicted attainment in the SIPP data likely reflects measurement error in attainment data in some cases. However, direct measures of attainment could help us identify measurement error in occupational affiliation in other cases.

[18] One potential source of measurement error is proxy response. If a household member is absent at the interview, the SIPP allows a household member who is present at the interview to answer on behalf of the absent household member. This form of data collection is known as a proxy interview. Proxy respondents might have relatively poor knowledge of other household members' occupations or credential attainment status. To gauge the degree to which proxy response explains the deviation from predicted attainment that we observe in the data, we compared the incidence of proxy response across workers with and without a credential in various universally licensed occupations. While 43.0 percent of physicians and surgeons with a license or certification resulted from a proxy response, 32.3 percent of physicians and surgeons with no license or certification resulted from a proxy response. This evidence seems inconsistent with the hypothesis that proxy responses play a disproportionate role in explaining the deviation from predicted attainment. We also found a generally comparable incidence of proxy response among cosmetologists, lawyers, and registered nurses with a credential and those without a credential

[19] In the Core SIPP, there is no direct information on retirement and pension plan offers. We can infer that respondents who received income from retirement or pension plans must have been offered such a plan. However, we cannot distinguish those who were not offered a retirement or pension plan from those who chose not to participate. Moreover, Core SIPP data include no characteristics of the job or business that sponsored respondents' plans. Consequently, we cannot infer whether a respondent's credential was relevant for this job or business.

estimation sample, we utilize data from the Employer-Provided Health Benefits topical module, collected between May and August 2010 in Wave 6 of the SIPP.

The Retirement and Pension Plan Coverage topical module asked all respondents aged 15 and over who held a job or owned a business as of the end of the reference period whether their main job or business offered a pension or retirement plan to anyone.[20] If a respondent replied affirmatively, the topical module then asked whether the respondent participated in one of these plans. Respondents who did not participate then selected all of the reasons why they had no coverage. Several of these reasons indicate ineligibility to receive a retirement or pension plan offer.[21] We use these responses to derive a variable that takes a value of 1 for respondents who participated in or were eligible for a retirement or pension plan through their main job or business and a value of 0 for all other respondents aged 15 and over who worked in the civilian labor force at the end of the reference period. We link this variable to licensing and certification variables from Wave 13 and to demographics and characteristics of the main job or business from Wave 11 Core SIPP data.

Our expanded measure of employer-sponsored health insurance offers stems from both Core SIPP and the Employer-Provided Health Benefits topical module. Core SIPP asked all respondents whether they had health insurance coverage in their own name or in someone else's name. Respondents with health insurance then replied whether a current employer sponsored this health insurance plan. The topical module asked working respondents aged 15 and over without health insurance sponsored by their current employer whether their employer offered health insurance to anyone. Respondents answering affirmatively then chose the reason why they did not participate. One of these reasons indicates ineligibility to receive a health insurance offer. We use these responses to derive a variable that

[20] This topical module defines the respondent's main job or business according to the following algorithm. For respondents who held multiple jobs at the end of the 4-month reference period, the main job is the one on which the respondent worked the most weeks during the reference period. The topical module designates the main business using the same criterion for respondents who owned multiple businesses at the end of the reference period. If a respondent worked an equal number of weeks at two or more jobs, the main job is the one on which the respondent usually worked the most hours. If a respondent worked an equal number of weeks at two or more businesses, the main business is the one on which the respondent earned the most during the reference period. If a respondent held a job and owned a business at the end of the reference period, the topical module asks about retirement plans associated with the largest earnings source during the 4-month reference period.

[21] The reasons that indicate ineligibility are: the employer offered no plan to anyone in the respondent's type of job, the respondent was not working at the job long enough to qualify, the respondent was too old or too young to qualify, and the respondent was ineligible by virtue of being a part-time or temporary employee.

takes a value of 1 for respondents who participated in or were eligible for an employer-provided health insurance plan and a value of 0 for all other respondents aged 15 and over who worked in the civilian labor force at the end of the reference period. We link this variable to the licensing and certification variables from Wave 13 and to demographics and characteristics of jobs or businesses from Wave 6 Core SIPP data.

Although these previous topical modules afford the benefit of expanding the set of labor-market outcomes that we can examine, one key obstacle impedes our use of these data. Specifically, the Professional Certifications, Licenses, and Educational Certificates topical module does not offer data regarding when respondents attained their credentials. Consequently, we can observe licensure and certification status as of September through December 2012, but this information is unobservable as of January through April 2012 and May through August 2010. One potential solution is to assume that workers' licensure and certification status remained unchanged across all three reference periods. This assumption seems more likely to hold for the reference period January through April 2012 than for May through August 2010. Under this assumption, our primary explanatory variable of interest would suffer from measurement error to the extent that respondents attained credentials or allowed credentials to lapse between these three reference periods.

We pursue an alternative solution that restricts the estimation sample, likely resulting in less measurement error but also diminished external validity. In particular, we assume that a worker's licensure and certification status in Wave 13 matched that worker's status in a previous wave if the respondent's "main" occupational spell in Wave 13 was ongoing in that preceding wave. Workers in a licensed occupation may not practice by law without the credential, so workers whose licenses lapse likely change occupations. Similarly, employers might view a certification as a signal of a worker's quality, so workers whose certifications lapse may be more likely to change occupations. Thus, we restrict our sample to include only those workers whose main occupational spell in Wave 13 was ongoing in the relevant previous wave. For the Retirement and Pension Plan Coverage topical module, we further require that a worker's occupation on the main job or business was the same in Wave 13 and Wave 11. Note that the Employer-Provided Health Benefits topical module collects information about benefits on any job or business. Consequently, our indicator variable for health insurance offers will suffer from measurement error to the extent that workers provide information about health insurance plans on jobs or businesses for which their licenses and certifications were irrelevant.

Empirical Approach

Before turning to our results, we briefly sketch the empirical approach that we take. The main goal of this study is to assess the impact of holding a license on important labor-market outcomes. The first question we will address is whether those obtaining a license earn a wage premium. To do so, we will estimate regressions of the following form:

$$InWage_{mi} = \beta_0 + \beta_1 License_i + \beta_2 X_i + \beta_3 Z_{mi} + \varepsilon_{mi}, \quad (1)$$

where the dependent variable, $InWage_{mi}$, is the log of hourly wages in month m for individual i, $License_i$ indicates whether individual i holds a license (under Definition 1 or Definition 2), X_i is a vector of independent variables that does not vary by month, Z_{mi} is a vector of explanatory variables that does vary by month, and ε_{mi} is the error term.

Besides hourly wages, as noted, we are also interested in assessing the impact of licensing status on other outcomes, including the probability of employment, of being offered employer-sponsored health insurance, and of being offered a retirement plan. Representing these 1–0 outcomes as Y_i, we estimate regressions of the following form:

$$Y_{mi} = \beta_0 + \beta_1 License_i + \beta_2 X_i + \beta_3 Z_{mi} + \varepsilon_{mi}. \quad (2)$$

If ε_{mi} is drawn from a normal distribution, then equation (2) implies a probit. Regardless of whether we are estimating a wage regression or a regression for a limited dependent variable, sample weights are used, and standard errors are estimated via balanced repeated replication (BRR) in order to take into account the complex survey design of the SIPP.

One must be cautious about interpreting the coefficient β_1 as causal, given that those with a license may differ from those without a license in ways unobserved by the econometrician. With our cross-sectional data, we control for observable heterogeneity within the limits of the data. For each of our outcomes, we estimate specifications with no occupation controls, with 2-digit occupation fixed effects and then with 3-digit occupation fixed effects. In these cases, identification is coming 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. It should also be noted that to the degree there is measurement error in determining

licensing status, the coefficient on licensing will be biased toward zero.[22] Although the SIPP module likely has less measurement error in licensing status than would be the case if we imputed licensing status on the basis of regulations, we have noted anomalies that suggest the presence of measurement error nonetheless.

While an instrumental variables strategy is often used in cases when the aforementioned econometric issues—unobserved heterogeneity and measurement error—are present, such an approach will not be used here for two reasons. First, especially when one is considering economy-wide licensing, it is difficult to come up with appropriate instruments (Kleiner and Krueger 2013). Second, instrumental variables (IV) estimation is upwardly biased when the mismeasured variable is binary, because measurement error in such a case must be correlated with the true value (Frazis and Loewenstein 2003).

Results

In this section, we assess the benefits accruing to workers with a professional license or certification. We first report the wage gains associated with these credentials. We then examine whether the source of a credential or the requirements to earn or maintain a credential matter for wages. Next, we consider the nonwage benefits of license and certification attainment. We study these effects both in Wave 13 Core data and in data from previous topical modules. After documenting the average impact of professional licenses and certifications on wages and nonwage benefits, we close by analyzing the distributional effects of these credentials.

Wages. We begin in Tables 3 through 7 by performing a wage analysis similar to that in Kleiner and Krueger (2013). We restrict the sample to person-month observations from respondents who were employed in the civilian labor force at the end of the month. We include only observations from respondents who provided valid data on union status and whose implied hourly wages fell between $5 and $100. Kleiner and Krueger (2013) employed sample selection criteria that differ from ours along two dimensions: they set a

[22] To gauge an aspect of this attenuation bias, we estimate average wage differentials across workers with and without a credential in various universally licensed occupations. Physicians and surgeons without a license or certification do not earn significantly less than physicians and surgeons with a license or certification, although this coefficient was estimated relatively imprecisely (standard error 16.6 percent). However, registered nurses without a license or certification earn 24.7 percent (standard error 8.3 percent) lower wages than registered nurses with a license or certification after controlling for observable characteristics. We find qualitatively similar results when we classify license attainment status according to Definition 2.

TABLE 3

EFFECT OF LICENSING AND CERTIFICATION ON WAGES[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Licensed or certified[b]	0.236***	0.080***	0.076***	0.065***	0.057***
	(0.010)[c]	(0.010)	(0.009)	(0.009)	(0.010)
R^2	0.033	0.340	0.441	0.514	0.509
N	77,294	75,793	75,605	75,605	66,984
Panel B: Definition 2					
Licensed	0.217***	0.061***	0.067***	0.050***	0.038***
	(0.010)	(0.010)	(0.009)	(0.009)	(0.011)
R^2	0.022	0.338	0.440	0.513	0.508
N	77,059	75,562	75,374	75,374	66,786
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, and union status. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. The reference period is May through November 2012.

[b]The estimates in this table result from ordinary least squares (OLS) regressions. The dependent variable is hourly wage on the main job as implied by monthly earnings and profits, weeks worked at the main job in that month, and usual weekly hours worked on the main job. We determine the main job in a particular month as the primary source of earnings in that month. Other controls in columns (2)–(5) include a quadratic in age, years of education, union status, a government worker indicator, a service worker indicator, a self-employed indicator, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, and region fixed effects. Union status, government worker, service worker, self-employed worker, and occupation represent characteristics of workers' main job or business. Column (3) uses 2-digit occupational affiliation and columns (4) and (5) use 3-digit occupational affiliation according to the 2000 Census occupational classification system.

[c]We employed 160 balanced repeated replicate weights using a Fay's adjustment factor of 0.5 to estimate the standard errors listed in parentheses. Standard errors take into account multiple observations at person level.

different standard for outliers in the upper tail of the hourly wage distribution, and they allowed for almost no imputed data. Although the estimation sample in Kleiner and Krueger (2013) contains only one wage observation per respondent, our sample contains up to four. We also control for the same set of observables to the extent possible; our explanatory variables do not include measures of math and reading skills, we replace a quadratic in work experience with a quadratic in age, and we create a service worker indicator variable based on industry codes. Finally, we assume that a worker's licensure and certification status remained unchanged over the reference period of May through November 2012.

First, we estimate the impact of professional license and certification attainment on wages.[23] Panel A of Table 3 presents the results of regressions that do not distinguish between licensed and certified workers.[24] Column (1) illustrates that credentialed workers earn approximately 23.6 percent higher wages on average.[25] Columns (2) through (4) document that, once we account for observable heterogeneity, the wage premium associated with these credentials falls. Estimates in column (4) suggest that credentialed workers earn approximately 6.5 percent (standard error 0.9 percent) higher wages on average controlling for detailed occupation. By comparison, union workers earn approximately 18.2 percent (standard error 1.1 percent) higher wages on average than nonunion workers after accounting for observable heterogeneity including detailed occupation. Gittleman and Kleiner (2016) also concluded that the union wage effect outstrips the licensing wage effect.

The estimates in column (4) exploit only wage variation within 3-digit occupations to identify the effect of a credential, thereby mitigating potential selection bias. This strategy yields a comparable interpretation of the estimated wage premium relative to the corresponding estimate in existing studies that focus on a more limited set of occupations. Since our identification strategy relies on variation in credential attainment within 3-digit occupations, we do not interpret the estimate of 6.5 percent as the wage premium accruing to all credentialed individuals.[26] In the absence of measurement error, wage variation within universally licensed 3-digit occupations would not contribute to the identification of our preferred estimate of the effect of a credential. As some

[23] The dependent variable is hourly wage on the main job or business implied by monthly earnings, usual weekly hours worked, and number of weeks worked during that month.

[24] Unless otherwise stated, all comparisons in the text are significant at the 90-percent level. The estimates discussed here are based on responses from a sample of the population and may differ from the actual values because of sampling variability and other factors. For information on sampling and nonsampling error, see United States Census Bureau, Survey of Income and Program Participation, "Source and Accuracy Statements," http://www.census.gov/programs-surveys/sipp/tech-documentation/source-accuracy-statements.html.

[25] Throughout, as an approximation, we equate log points with percentage differences.

[26] Note that the variation in credential attainment that we exploit in this paper may be either within-state variation or across-state variation. We also estimated the regressions in Tables 3, 4, 9, 10, 11, and 12 including state fixed effects to exploit only within-state variation in credential attainment. No coefficient estimate changed in sign. Only three coefficient estimates changed in statistical significance. After controlling for observables including detailed occupation and before dropping universally licensed occupations, certified individuals were no more likely to be employed than unlicensed and uncertified individuals (see Panel B of Table 9). After controlling for observables including detailed occupation and before dropping universally licensed occupations, credentialed workers were no more likely than uncredentialed workers to work for employers who pay at least some of the employer-sponsored health insurance premium (see Panel A of Table 10). After controlling for observables including detailed occupation and before dropping universally licensed occupations, licensed workers were more likely than unlicensed and uncertified workers to receive employer-sponsored health insurance offers (see Panel B of Table 12). Estimates are available upon request.

TABLE 4

EFFECT OF LICENSING AND CERTIFICATION ON WAGES[a]

Variable	(1)	(2)	(3)	(4)	(5)
Definition 2:					
Licensed[b]	0.240***	0.072***	0.078***	0.062***	0.048***
	(0.011)[c]	(0.010)	(0.010)	(0.010)	(0.011)
Certified	0.229***	0.100***	0.075***	0.073***	0.075***
	(0.018)	(0.015)	(0.013)	(0.013)	(0.014)
R^2	0.033	0.340	0.441	0.514	0.509
N	77,059	75,562	75,374	75,374	66,786
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, and union status. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. The reference period is May through November 2012.

[b]The estimates in this table result from OLS regressions. The dependent variable is hourly wage on the main job as implied by monthly earnings and profits, weeks worked at the main job in that month, and usual weekly hours worked on the main job. We determine the main job in a particular month as the primary source of earnings in that month. Other controls in columns (2)–(5) include a quadratic in age, years of education, union status, a government worker indicator, a service worker indicator, a self-employed indicator, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, and region fixed effects. Union status, government worker, service worker, self-employed worker, and occupation represent characteristics of workers' main job or business. Column (3) uses 2-digit occupational affiliation and column (4) and (5) use 3-digit occupational affiliation according to the 2000 Census occupational classification system.

[c]We employed 160 balanced repeated replicate weights using a Fay's adjustment factor of 0.5 to estimate the standard errors listed in parentheses. Standard errors take into account multiple observations at person level.

error in measuring licensing status in universally licensed occupations does exist, we drop person-months with a reported occupation in which all practitioners must obtain a license in an effort to identify the wage effect of a credential based on only wage variation within certified or partially licensed 3-digit occupations (e.g., accountants and auditors).[27] We then re-estimate the model specification from column (4) on this reduced sample and present the results in column (5). Dropping individuals in universally licensed occupations results in an estimated 5.7 percent (standard error 1.0 percent) licensing wage premium, which is not statistically different from the estimated effect when

[27] This list of universally licensed occupations was drawn from Summers (2007) and the CareerOneStop website (http://www.careeronestop.org). We verified that all practitioners in these occupations must obtain a license using the Occupational Outlook Handbook (http://www.bls.gov/ooh/). We report this list of universally licensed occupations in Appendix Table 3.

these individuals are included. Given the benefits of the sample selection criteria, the specification in column (5) better identifies our effect of interest.[28]

Our inability to distinguish confidently between licensed and certified workers according to Definition 1 implies that the estimated wage premium in Panel A of Table 3 is a weighted average of the gains accruing to licensed and certified workers. Kleiner and Krueger (2013) failed to reject the hypothesis of no certification wage premium, although they do show evidence that workers with a license earn a wage premium. These conclusions suggest that the wage premium according to Definition 1 underestimates the wage effect of a license. This might explain why our estimate falls below the consensus range of licensing wage premia between 10 percent and 15 percent (Kleiner and Krueger 2013). In Panel B of Table 3, we utilize the source of a worker's credential to distinguish between licensed and certified workers. Column (5) implies that, according to Definition 2, licensed workers earn approximately 3.8 percent higher wages on average relative to workers who have no credential and workers who have a certification.

Table 4 summarizes the results of regressions that include indicators for licensed and certified workers according to Definition 2. Column (5) notes that after controlling for observable heterogeneity including detailed occupation and dropping universally licensed occupations, licensed workers earn approximately 4.8 percent (standard error 1.1 percent) higher wages on average than unlicensed and uncertified workers. Certified workers earn approximately 7.5 percent (standard error 1.4 percent) higher wages on average than unlicensed and uncertified workers. One potential reason why these results differ from those in Kleiner and Krueger (2013) is that the SIPP yields relatively precise estimates of certification wage effects, owing to its large sample size.

Over the period 2000 through 2009, using data from the American Community Survey, licensing for massage therapists has a somewhat larger and a generally more prevalent statistically significant influence on earnings than does certification for this occupation (Thornton and Timmons 2013). However, for nurses, the wage effects for licensing are similar to our findings (Law and Marks 2017). Occupations, such as interior designers and massage therapists,

[28] To assess the impact of various biases from measurement error, we perform a number of additional sensitivity exercises. We reran the model of column (4), restricting the sample to universally licensed occupations, not only for wages but for three other dependent variables as well. The coefficient on licensing is significantly positive in half the cases, a result that may be attributable to occupation mismeasurement or to correct reporting being correlated with certain unobservables with returns in the labor market. We also reran the same four models, this time using both definitions of licensing and restricting the sample to the 128 three-digit occupations that are not required to have a license in any state. These occupations account for about 14 percent of the regression sample from column (4) of Table 3 (10,322 out of 75,374 person-month observations). Of these observations, some 7.5 percent (unweighted) come from individuals who are characterized as licensed according to Definition 2. The results are not significant in six out of eight cases, and when significant, the coefficients are negative.

are licensed in some states and certified in the others. We, however, cannot reject the hypothesis that the coefficient estimates on the indicators for licensed and certified workers are equal. These estimates should differ only because licenses are required for entry into an occupation, whereas certifications are not. To the extent that we accurately classify workers' licensure and certification status, this finding suggests that the signal that a credential sends might influence wages more than the labor-supply restrictions that licensing policies impose. Nonetheless, as noted, the presence of measurement error in the source of the credentials, and thus in correct classification as licenses or certifications, necessitates caution about making definitive statements about the relative returns to credential type.

Tables 5, 6, and 7 decompose the wage effects of professional licenses and certifications. In particular, Table 5 analyzes how the wage gain varies with

TABLE 5

EFFECT OF LICENSING AND CERTIFICATION GOVERNMENTAL JURISDICTION ON WAGES[a]

Variable	(1)	(2)	(3)	(4)	(5)
Federal government[b]	0.287***	0.144***	0.114***	0.089***	0.114***
	(0.031)[c]	(0.030)	(0.028)	(0.027)	(0.030)
State government	0.244***	0.071***	0.077***	0.061***	0.040***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)
Local government	0.040	–0.033	0.046	0.036	0.060*
	(0.048)	(0.040)	(0.039)	(0.034)	(0.036)
Private	0.229***	0.100***	0.075***	0.073***	0.075***
	(0.018)	(0.015)	(0.013)	(0.013)	(0.014)
R^2	0.034	0.340	0.441	0.514	0.509
N	77,059	75,562	75,374	75,374	66,786
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, credential status, source of credential, and union status. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. The reference period is May through November 2012.

[b]The estimates in this table result from OLS regressions. The dependent variable is hourly wage on the main job as implied by monthly earnings and profits, weeks worked at the main job in that month, and usual weekly hours worked on the main job. We determine the main job in a particular month as the primary source of earnings in that month. Other controls in columns (2)–(5) include a quadratic in age, years of education, union status, a government worker indicator, a service worker indicator, a self-employed indicator, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, and region fixed effects. Union status, government worker, service worker, self-employed worker, and occupation represent characteristics of workers' main job or business. Column (3) uses 2-digit occupational affiliation and columns (4) and (5) use 3-digit occupational affiliation according to the 2000 Census occupational classification system.

[c]We employed 160 balanced repeated replicate weights using a Fay's adjustment factor of 0.5 to estimate the standard errors listed in parentheses. Standard errors take into account multiple observations at person level.

TABLE 6

Effect of Licensing Requirements on Wages[a]

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Definition 1						
Licensed or certified	0.109***	0.070*	−0.061*	−0.069**	−0.034	−0.035
	(0.030)	(0.042)	(0.036)	(0.030)	(0.028)	(0.027)
Courses or training	0.137***	0.097***	0.069**	0.093***	0.066***	0.053**
	(0.030)	(0.029)	(0.028)	(0.025)	(0.023)	(0.026)
Skills or exam		−0.023	0.009	0.017	0.007	0.006
		(0.035)	(0.029)	(0.024)	(0.021)	(0.025)
Continuing education		0.145***	0.103***	0.071***	0.055***	0.065***
		(0.018)	(0.016)	(0.014)	(0.014)	(0.016)
R^2	0.034	0.038	0.343	0.443	0.516	0.510
N	77,226	76,831	75,342	75,158	75,158	66,607
F-test: all requirements = 0 (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
Panel B: Definition 2						
Licensed	0.030*	0.003	−0.046***	−0.014	−0.020*	−0.035**
	(0.016)	(0.017)	(0.014)	(0.012)	(0.012)	(0.013)
Courses or training	0.223***	0.133***	0.052**	0.061***	0.054***	0.046**
	(0.015)	(0.027)	(0.024)	(0.021)	(0.019)	(0.022)
Skills or exam		0.007	−0.006	−0.009	−0.003	−0.001
		(0.025)	(0.023)	(0.020)	(0.018)	(0.023)
Continuing education		0.147***	0.108***	0.070***	0.056***	0.068***
		(0.019)	(0.016)	(0.015)	(0.014)	(0.016)
R^2	0.034	0.038	0.343	0.443	0.516	0.510
N	77,022	76,669	75,184	75,000	75,000	66,474
F-test: all requirements = 0 (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
Controls?	N	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	N	2-digit	3-digit	3-digit

Source: 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, licensing requirements, and union status. Regressions in columns (4), (5), and (6) also exclude observations with imputed occupation. Regression in column (6) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. The reference period is May through November 2012.

TABLE 7

EFFECTS OF REQUIRED LICENSING AND CERTIFICATION ON WAGES[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Licensed or certified	0.151***	0.016	0.012	0.017	0.013
	(0.017)	(0.015)	(0.013)	(0.012)	(0.013)
Licensed or certified × Required	0.109***	0.083***	0.088***	0.068***	0.066***
	(0.019)	(0.016)	(0.015)	(0.014)	(0.015)
R^2	0.035	0.341	0.442	0.515	0.509
N	77,190	75,689	75,501	75,501	66,884
Panel B: Definition 2					
Licensed	0.114***	−0.024	−0.010	−0.002	−0.006
	(0.022)	(0.021)	(0.018)	(0.016)	(0.017)
Licensed × Required	0.152***	0.117***	0.112***	0.084***	0.075***
	(0.023)	(0.021)	(0.018)	(0.018)	(0.020)
Certified	0.205***	0.070***	0.044**	0.045**	0.040**
	(0.028)	(0.023)	(0.022)	(0.020)	(0.020)
Certified × Required	0.039	0.049*	0.054*	0.049*	0.060**
	(0.034)	(0.029)	(0.028)	(0.025)	(0.025)
R^2	0.035	0.341	0.443	0.515	0.509
N	76,994	75,497	75,309	75,309	66,725
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, credential requirement, and union status. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. The reference period is May through November 2012.

the level of the jurisdiction that issues the credential. We restrict the estimation sample to individuals who provided valid data about the source of their credential. Respondents selected only one issuing body, so we cannot determine how levels of jurisdiction interact to have an impact on wages.[29] Occupations such as cab drivers, ride-sharing operators, and tour guides are most often licensed at the city or county level rather than at the state level. In contrast, commercial pilots and stockbrokers are licensed at the federal level. There is

[29] By contrast, the PDII allowed respondents to select all relevant levels of jurisdiction. Kleiner and Krueger (2013) showed how each type of jurisdictional interaction affects wages. They concluded that, after controlling for observable heterogeneity including detailed occupation, only state-issued credentials have any wage effect in isolation. They estimated significant wage premia associated with credentials that were issued by both the state and federal government and credentials that were issued by both the state and local government.

some evidence of measurement error when respondents answer which level of government issues their credential, but it is difficult to assess how much and the source. For instance, if a respondent says the federal government issued a credential but s/he is in an occupation for which that level of government does not issue a license, it is possible the respondent is answering this question incorrectly, but it is also possible that s/he is referring to a credential unconnected to the present occupation or that occupation has been miscoded.

With that caveat in mind, Table 5 reports evidence that credentials issued by federal and state governments and private organizations are associated with higher wages on average, regardless of whether we control for observable heterogeneity. Estimates in column (5) control for detailed occupational affiliation and exclude universally licensed occupations. Relative to workers with no credential, workers with a federally issued credential earn 11.4 percent (standard error 3.0 percent) higher wages, workers with a state-issued credential earn 4.0 percent (standard error 1.2 percent) higher wages, and workers with a privately issued credential earn 7.5 percent (standard error 1.4 percent) higher wages on average. Similarly, workers with a locally issued credential earn 6.0 percent (standard error 3.6 percent) higher wages relative to workers with no credential, although these credentials do not appear to yield a wage premium when we include universally licensed occupations. Thus, we join Kleiner and Krueger (2013) in concluding that federally issued and state-issued credentials exert a significant influence on wages. However, our data also reveal that credentials issued by private organizations and local governments are associated with a comparable wage premium relative to federally issued credentials and state-issued credentials. This underscores an advantage of the SIPP topical module relative to the PDII, as that survey did not request information about privately issued credentials.

With a couple of exceptions, once we include occupation fixed effects in the regressions, we cannot reject the hypothesis of equality of coefficients by source of credential. The results stem not only from the general closeness of the coefficients, but also from the fact that the federal and local coefficients are estimated imprecisely owing to the small number with such credentials and, presumably, from measurement error.

Table 6 investigates how various requirements to attain a credential have an impact on wages. We restrict the estimation sample to individuals who provided valid data about these requirements. Column (6) of Panel A shows that after controlling for observable heterogeneity including detailed occupation and omitting universally licensed occupations, workers who take courses or training to achieve the credential earn 5.3 percent (standard error 2.6 percent) higher wages on average. Similarly, workers who take periodic exams or continuing education classes to maintain the credential earn 6.5 percent (standard

error 1.6 percent) higher wages on average. Panel B reports that these requirements are also associated with a wage premium when we classify licensed workers according to Definition 2. Workers who demonstrate skills on the job or pass an exam to obtain their credentials do not seem to earn higher wages on average. We reject the hypothesis that none of these three licensing requirements helps determine wages. Moreover, column (4) of Panel A suggests that workers with a credential who do not need to meet any of these three requirements earn lower wages than workers with no credential. Columns (5) and (6) of Panel B yield a corresponding inference when we classify licensed workers according to Definition 2. Kleiner and Krueger (2013) found no evidence of higher wages among workers who must meet these requirements to attain their licenses. They failed to reject the hypothesis that no licensing requirement helps determine wages in models that control for observable heterogeneity. The contrast in our inferences relative to those of Kleiner and Krueger (2013) might stem from the relative precision with which we estimate the wage effects of licensing requirements.

One concern with the results in Tables 3 and 4 is that, in some cases, individuals may have earned credentials and subsequently changed careers. To the extent that the credentials are irrelevant in the present occupation, the estimates in Tables 3 and 4 will underestimate the wage effects of interest. We address this concern in Table 7, by examining the relationship between wages and whether or not a respondent indicated that a license was required for the current job. Although we do not know if respondents are interpreting this as a legal requirement, the exercise is the closest to an analysis in Kleiner and Krueger (2013). The results in Table 7 suggest that having a license when it is not required has no influence on wage determination, but, when it is required, licensing raises wages by 7.5 percent. This may be a measure of the potential monopoly estimates of the requirement. This wage premium is larger than the one associated with a certification requirement, which was 6.0 percent, although the difference is not statistically significant. These results resemble the estimates found by Kleiner and Krueger (2013), who suggested that having an occupational license that is required to work results in a substantial wage premium.[30]

Some policymakers and policy analysts claim that licenses and certifications are particularly important for individuals with lower levels of traditional educational attainment. For example, a credential might signal high quality especially effectively in labor market segments in which potential service providers

[30] The questions asked in the Westat survey were "Do you have a license or certification that is required by a federal, state or local government agency to do your job?" and "Would someone who does not have a license or certificate be legally allowed to do your job?"

have lower than average levels of traditional educational attainment. To evaluate this hypothesis, Table 8 allows for heterogeneous licensing wage effects by quartile in the distribution of average education levels by occupation.[31] We

TABLE 8

HETEROGENEOUS EFFECTS OF LICENSING AND CERTIFICATION ON WAGES[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Credentialed × 1st (bottom) quartile[b]	−0.049**	−0.085***	0.037*	0.053**	0.042*
	(0.022)	(0.021)	(0.022)	(0.021)	(0.024)
Credentialed × 2nd quartile	−0.075***	−0.086***	0.007	0.060***	0.062***
	(0.018)	(0.015)	(0.015)	(0.016)	(0.017)
Credentialed × 3rd quartile	0.231***	0.135***	0.069***	0.059***	0.053***
	(0.016)	(0.015)	(0.014)	(0.015)	(0.017)
Credentialed × 4th (top) quartile	0.495***	0.219***	0.165***	0.082***	0.064***
	(0.013)	(0.015)	(0.015)	(0.018)	(0.020)
R^2	0.080	0.353	0.443	0.514	0.509
N	77,294	75,793	75,605	75,605	66,984
Panel B: Definition 2					
Licensed × 1st (bottom) quartile	−0.099***	−0.131***	0.003	0.005	−0.011
	(0.026)	(0.027)	(0.026)	(0.025)	(0.028)
Licensed × 2nd quartile	−0.116***	−0.107***	−0.001	0.056***	0.058***
	(0.022)	(0.019)	(0.019)	(0.018)	(0.019)
Licensed × 3rd quartile	0.186***	0.103***	0.049***	0.030*	0.018
	(0.018)	(0.017)	(0.016)	(0.016)	(0.018)
Licensed × 4th (top) quartile	0.462***	0.185***	0.154***	0.081***	0.060**
	(0.013)	(0.016)	(0.016)	(0.019)	(0.024)
R^2	0.057	0.347	0.442	0.513	0.508
N	77,059	75,562	75,374	75,374	66,786
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, union status, and occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. The reference period is May through November 2012.

[b]The estimates in this table result from OLS regressions. The dependent variable is hourly wage on the main job as implied by monthly earnings and profits, weeks worked at the main job in that month, and usual weekly hours worked on the main job. We determine the main job in a particular month as the primary source of earnings in that month. Quartiles reflect position in the distribution of average education levels by 3-digit occupational affiliation according to the 2000 Census occupational classification system. Quartile cutoffs for this distribution are 12.74, 13.68, and 15.07 years of education.

[31] To our knowledge, no existing study has allowed explicitly for heterogeneous licensing wage effects by occupation. Credentials by own education do appear to have heterogeneous wage effects (Ewert 2014).

restrict the estimation sample to individuals who provided valid occupation data. Column (5) of Panel A reveals that credentialed workers in each quartile of the distribution of average education levels by occupation earn more on average relative to workers with no credential.[32] We cannot reject the hypothesis that the coefficient estimates for each quartile are equal. On the other hand, Column (5) of Panel B reports that according to Definition 2, licensed workers in the second and fourth quartiles earn, respectively, 5.8 percent and 6.0 percent more than unlicensed workers. In testing for the presence of heterogeneous effects, we reject the hypotheses that the coefficients on the fourth and first quartiles are equal and that the coefficients on the second and first quartiles are equal.

Nonwage benefits from Wave 13 Core data. While the literature has concentrated on labor-market returns to licensing in the form of higher wages, it is also possible that other aspects of compensation could be affected. We next exploit SIPP data on nonwage benefits in order to determine whether licenses and certifications confer gains along these dimensions as well. In this section, we discuss the results of analyses for the reference period of May through November 2012 using Wave 13 Core data. These analyses assume that a worker's licensure and certification status remained unchanged over the reference period.

Does having credentials make it more likely that an individual is employed? Such a situation could come about if those with credentials have higher levels of human capital and if credentials serve as a signal of quality, but also, particularly in the case of licensing, if they serve as a barrier to entry into occupations. Table 9 presents the estimated coefficients and marginal effects of a probit regression that explains monthly employment status as a function of person-level and job-level observables. We restrict the estimation sample to respondents aged 18 through 64 who worked in the civilian labor force in Wave 13 and those who did not work in Wave 13 but were on layoff, looked for work, or were unable to find work. Estimation sample members who did not work in Wave 13 worked in at least one previous wave of the 2008 SIPP panel. The dependent variable takes a value of 1 for individuals who were employed during a particular reference month and 0 for all other individuals. Although existing studies have examined the relationship between licensing and employment at the macroeconomic level (Adams, Jackson, and Ekelund 2002), we are aware of no examinations of this relationship at the microeconomic level. Panel A reports that individuals with a credential are 1.4 percent

[32] Sample weights were used to calculate average education levels by occupation. The quartile cutoffs for this distribution are located at 12.74, 13.68, and 15.07 years of education.

TABLE 9

EFFECT OF LICENSING AND CERTIFICATION ON THE LIKELIHOOD OF EMPLOYMENT[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Licensed or certified[b]	0.331***	0.244***	0.231***	0.234***	0.218***
	(0.044)	(0.049)	(0.054)	(0.058)	(0.063)
	[0.024][c]	[0.014]	[0.013]	[0.014]	[0.014]
N	102,948	101,046	99,784	83,046	72,640
Panel B: Definition 2					
Licensed	0.372***	0.303***	0.291***	0.303***	0.318***
	(0.054)	(0.062)	(0.068)	(0.071)	(0.075)
	[0.027]	[0.017]	[0.016]	[0.018]	[0.021]
Certified	0.258***	0.163**	0.155*	0.160*	0.117
	(0.067)	(0.080)	(0.082)	(0.090)	(0.095)
	[0.019]	[0.009]	[0.008]	[0.010]	[0.008]
N	102,552	100,650	99,392	82,750	72,401
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who worked in Wave 13 and those who did not work in Wave 13 but were on layoff, looked for work, or were unable to find work. Sample members who did not work in Wave 13 worked in at least one previous wave of the 2008 SIPP panel. Regressions exclude person-month observations with imputed licensure status and employment status. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. Regressions also exclude individuals who were contingent workers on their main job and individuals who responded that their usual number of hours worked varied on the main job. The reference period is May through November 2012.

[b]The estimates in this table result from probit regressions. The dependent variable takes value 1 for employed person-month observations and 0 for unemployed observations and not-in-the-labor-force observations according to the CPS definitions. Other controls in columns (2)–(5) include a quadratic in age, years of education, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, region fixed effects, a married indicator, a disabled indicator, a school enrollment indicator, an indicator for any own children in the household, number of own children in the household, number of own children in the household under age 18, union status, a government worker indicator, a service worker indicator, a self-employed indicator, establishment size effects, and a full-time worker indicator. Union status, government worker, service worker, self-employed worker, establishment size, full-time worker, and occupation represent characteristics of workers' main job or business. For respondents who did not work any month in the reference period, these variables represent characteristics of the most recent job or business.

[c]We present marginal effects in brackets.

more likely on average to be employed in a particular month, controlling for observable characteristics of the current or most recent job including detailed occupation and excluding universally licensed occupations. Panel B decomposes this result by licensure and certification status according to Definition 2. Only licensed individuals have a significantly higher likelihood of employment on average than individuals with no credential. We reject the hypothesis that the coefficient estimates on the indicators for licensed and certified workers are equal.

Finally, we investigate in Table 10 whether licensed or certified workers benefit from a greater likelihood of having their employer pay for some or all of their employer-provided health insurance premiums. We restrict the sample to respondents who were employed at the end of any reference month. Among the set of civilian workers aged 18 through 64 who had health insurance coverage through their employer, our dependent variable indicates whether this employer paid for at least some of the health insurance premium.[33] Panel A reveals that workers with a credential are no more likely on average to receive contributions toward premiums after controlling for observable heterogeneity and excluding universally licensing occupations. Panel B decomposes this result by licensure and certification status according to Definition 2. Licensed workers are no more likely to receive health insurance premium contributions relative to workers without a credential. Certified workers are actually less likely to receive such contributions after controlling for observable heterogeneity including detailed occupation. We cannot reject the hypothesis that the coefficient estimates on the indicators for licensed and certified workers are equal.

Nonwage benefits from previous topical modules. We now link the Professional Certifications, Licenses, and Educational Certificates topical module to previous topical modules in order to expand the set of nonwage benefits and broaden our estimation sample. Recall that we restrict the sample to individuals whose main occupational spell in Wave 13 was ongoing in the relevant previous wave.[34] We then assume that a respondent's observed licensure or certification status in Wave 13 matched the unmeasured, corresponding status in that previous wave. Regressions include demographics and the characteristics of jobs or businesses using Core SIPP data from that previous wave. Our examination of the Retirement and Pension Plan Coverage topical module and the

[33] Given that respondents indicated whether their employers paid all, some, or none of the premium, it may seem natural to treat this as an ordered outcome measuring the generosity of employer-provided health insurance plans. Generosity may be measured by the amount of the employer's contribution to health insurance premiums, and this is the product of the share of the premium paid times the premium itself. If an employer is more likely to pay the entire premium for low-cost plans, that employer's contribution might be smaller than the contribution of an employer that pays only some of the premium for a costlier plan. Since SIPP does not offer information on employer contributions to health insurance plans, we cannot determine confidently whether employers that pay the entire premium are more generous than employers that pay only some of the premium. Instead, we assume that employers that pay at least some of the health insurance premium are more generous than employers that pay none of the premium.

[34] Restricting the estimation sample to individuals who had the same occupation on the main job or business in Wave 13 and Wave 11 reduces the sample size from 39,822 to 17,963. Restricting the estimation sample to individuals whose main occupational spell in Wave 13 was ongoing in Wave 6 reduces the sample size from 53,849 to 13,577.

TABLE 10

EFFECT OF LICENSING AND CERTIFICATION ON THE LIKELIHOOD OF AN EMPLOYER MAKING A CONTRIBUTION TOWARD HEALTH INSURANCE PREMIUMS[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Licensed or certified[b]	−0.047	−0.077	−0.047	−0.110*	−0.086
	(0.054)	(0.058)	(0.061)	(0.064)	(0.069)
	[−0.003][c]	[−0.005]	[−0.003]	[−0.009]	[−0.007]
N	13,368	13,342	12,770	9,803	8,227
Panel B: Definition 2					
Licensed	−0.032	−0.059	−0.014	−0.077	−0.032
	(0.058)	(0.060)	(0.064)	(0.070)	(0.083)
	[−0.002]	[−0.004]	[−0.001]	[−0.006]	[−0.003]
Certified	−0.089	−0.126	−0.115	−0.183*	−0.179*
	(0.087)	(0.089)	(0.089)	(0.094)	(0.104)
	[−0.006]	[−0.008]	[−0.008]	[−0.014]	[−0.014]
N	13,324	13,298	12,729	9,769	8,201
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of at least one reference month and who had employer-sponsored health insurance. Regressions exclude person observations with imputed licensure status and health insurance premium information. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of occupations licensed in all states. Regressions also exclude individuals who were contingent workers on their main job and individuals who responded that their usual number of hours worked varied on the main job. The reference period is May through November 2012.

[b]The estimates in this table result from probit regressions. The dependent variable takes value 1 if a respondent's employer paid all or part of the health insurance premium and 0 for all other respondents with employer-provided health coverage. We determine the main job in a particular month as the primary source of earnings in that month. Other controls in columns (2)–(5) include a quadratic in age, years of education, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, region fixed effects, a married indicator, union status, self-employed status, establishment size effects, a full-time worker indicator, an indicator for any own children in the household, number of own children in the household, and number of own children in the household under age 18.

[c]We present marginal effects in brackets.

Employer-Provided Health Benefits topical module assumes a reference period of January through April 2012 and May through August 2010, respectively.

Table 11 details results from the Retirement and Pension Plan Coverage topical module from Wave 11 of the SIPP. Among the set of individuals aged 18 through 64 who were employed in the same civilian occupation on the main job or business in Wave 13 as in Wave 11, the dependent variable indicates whether respondents received a retirement or pension plan offer. Panel A documents that workers with a professional license or certification are 10.7 percent more likely to receive retirement and pension plan offers on average. Workers with these credentials are 2.3 percent more likely to receive such

offers on average after we control for observable heterogeneity including detailed occupation and exclude universally licensed occupations. Panel B of Table 11 decomposes this estimate by licensure and certification status according to Definition 2. Only certified workers are statistically significantly more likely to receive retirement or pension plan offers than workers without a credential. Similarly, Gittleman and Kleiner (2016) find no evidence that workers

TABLE 11

EFFECT OF LICENSING AND CERTIFICATION ON THE LIKELIHOOD OF EMPLOYER-PROVIDED RETIREMENT AND PENSION PLAN OFFERS[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Licensed or certified[b]	0.278***	0.078***	0.106***	0.129***	0.087**
	(0.022)	(0.028)	(0.032)	(0.036)	(0.037)
	[0.107][c]	[0.022]	[0.030]	[0.034]	[0.023]
N	17,963	16,738	16,657	16,302	14,237
Panel B: Definition 2					
Licensed	0.285***	0.072**	0.101***	0.121***	0.053
	(0.024)	(0.031)	(0.037)	(0.043)	(0.047)
	[0.110]	[0.021]	[0.028]	[0.032]	[0.014]
Certified	0.255***	0.097**	0.120**	0.146***	0.155***
	(0.042)	(0.048)	(0.048)	(0.052)	(0.054)
	[0.098]	[0.028]	[0.033]	[0.039]	[0.041]
N	17,906	16,686	16,607	16,255	14,192
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 11 Core and Topical Module and Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force at the end of the reference period and who worked in the same occupation on the main job in Waves 11 and 13. We determine the main job in a particular month of Wave 13 as the primary source of earnings in that month. SIPP determines the main job in the Wave 11 topical module according to the following algorithm. For respondents who held multiple jobs at the end of the 4-month reference period, the main job is the one on which the respondent worked the most weeks during the reference period. The topical module designates the main business using the same criterion for respondents who owned multiple businesses at the end of the reference period. If a respondent worked an equal number of weeks at two or more jobs, the main job is the one on which the respondent usually worked the most hours. If a respondent worked an equal number of weeks at two or more businesses, the main business is the one on which the respondent earned the most during the reference period. If a respondent held a job and owned a business at the end of the reference period, the topical module asks about retirement plans associated with the largest earnings source during the 4-month reference period. Regressions exclude person observations with imputed licensure status and retirement and pension plan offers. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. Regressions also exclude individuals who were contingent workers on their main job in Wave 11 and individuals who responded that their usual number of hours worked varied on the main job in Wave 11. The reference period is January through April 2012.

[b]Other controls in columns (2)–(5) include a quadratic in age, years of education, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, region fixed effects, a married indicator, union status, self-employed status, establishment size effects, a full-time worker indicator, an indicator for any own children in the household, number of own children in the household, and number of own children in the household under age 18.

[c]We present marginal effects in brackets.

who are covered by a licensing law have better access to retirement or pension plans. Nevertheless, we cannot reject the hypothesis that the coefficient estimates on the indicators for licensed and certified workers are equal.

Table 12 contains evidence from the Employer-Provided Health Benefits topical module to Wave 6 of the SIPP on whether some of the returns to credentials are received in the form of better nonwage benefits. Among the set of individuals aged 18 through 64 whose main civilian occupational spell in Wave 13 was ongoing in Wave 6, the dependent variable indicates whether respondents received an employer-provided health insurance offer. Recall that Core SIPP data include information on such offers only for respondents who had no health insurance coverage. Utilizing a previous topical module more than doubles the sample size. This revised estimation sample yields different inferences about the impact of credentials on employer-provided health insurance offers.[35] Panel A of Table 12 notes that workers with a license or certification are 5.1 percent more likely to receive employer-provided health insurance offers on average. This advantage is 2.7 percent after controlling for observable heterogeneity including detailed occupation and excluding universally licensed occupations. Panel B of Table 12 analyzes how this effect varies by licensure and certification status according to Definition 2. Both licensed and certified workers appear more likely to receive these nonwage benefits than workers without a credential. By contrast, Gittleman and Kleiner (2016) found no evidence that workers who are covered by a licensing law have better access to employer-provided health insurance plans. While it is possible that our result stems from the fact that credentialed workers earn higher wages and that higher-waged workers tend to be more likely to be offered health insurance, when we include controls for wages (not shown here), our point estimates change little and our results remain unchanged qualitatively. We cannot reject the hypothesis that the coefficient estimates on the indicators for licensed and certified workers are equal.

Our decision to restrict the sample to occupation stayers would bias the preceding estimates if workers with a license or certification were differentially likely to change occupations in response to nonwage benefits. Two countervailing tendencies might give rise to such behavior. First, to the extent that nonwage benefits are distributed uniformly across workers in occupations, we expect credentialed workers without these benefits to be less likely to change occupations relative to uncredentialed workers without these benefits. Higher average nonwage benefit offer rates suggest that credentialed workers would

[35] When we use Core SIPP data only, we find no evidence that licensed or certified individuals are differentially likely to receive employer-sponsored health insurance offers. Estimates are available upon request.

TABLE 12

EFFECT OF LICENSING AND CERTIFICATION ON THE LIKELIHOOD OF EMPLOYER-PROVIDED HEALTH BENEFIT OFFERS[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A: Definition 1					
Licensed or certified[b]	0.163***	0.042	0.108**	0.120**	0.138**
	(0.031)[c]	(0.043)	(0.048)	(0.050)	(0.054)
	[0.051][d]	[0.008]	[0.021]	[0.023]	[0.027]
N	13,577	12,361	12,338	11,489	9,696
Panel B: Definition 2					
Licensed	0.143***	0.006	0.075	0.086	0.108*
	(0.033)	(0.044)	(0.051)	(0.055)	(0.062)
	[0.045]	[0.001]	[0.014]	[0.016]	[0.021]
Certified	0.206***	0.130*	0.175**	0.185**	0.181**
	(0.047)	(0.068)	(0.069)	(0.073)	(0.077)
	[0.065]	[0.026]	[0.033]	[0.035]	[0.035]
N	13,525	12,315	12,292	11,446	9,661
Controls?	N	Y	Y	Y	Y
Universally licensed?	Y	Y	Y	Y	N
Occupation fixed effects?	N	N	2-digit	3-digit	3-digit

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 6 Core and Topical Module and Wave 13 Core and Topical Module.

*denotes significant at the 10% confidence level, **denotes significant at the 5% confidence level, and ***denotes significant at the 1% confidence level.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force at the end of the reference period and whose occupation in the main job in Wave 13 was also ongoing in Wave 6. We determine the main job in a particular month as the primary source of earnings in that month. Regressions exclude person observations with imputed licensure status and health insurance offers. Regressions in columns (3), (4), and (5) also exclude observations with imputed occupation. Regression in column (5) also excludes observations for which all practitioners in the reported occupation must attain a license. See Appendix Table 3 for the full list of universally licensed occupations. Regressions also exclude individuals who were contingent workers on their job in Wave 6 and individuals who responded that their usual number of hours worked varied on the job in Wave 6. The reference period is May through August 2010.

[b]The estimates in this table result from probit regressions. The dependent variable takes the value 1 for workers who received employer-provided health insurance offers and 0 for workers who did not receive these offers. Other controls in columns (2)–(5) include a quadratic in age, years of education, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, region fixed effects, a married indicator, union status, self-employed status, establishment size effects, a full-time worker indicator, an indicator for any own children in the household, number of own children in the household, and number of own children in the household under age 18. Union status, establishment size effects, full-time worker, self-employed worker, and occupation represent characteristics of workers' main job or business in Wave 6.

[c]We employed 160 balanced repeated replicate weights using a Fay's adjustment factor of 0.5 to estimate the standard errors listed in parentheses. Standard errors take into account multiple observations at person level.

[d]We present marginal effects in brackets.

be more likely to gain access to these benefits by switching employers; switching occupations might require abandoning the credential. Second, to the extent that nonwage benefits are distributed disproportionately within occupations to workers with high ability, we expect credentialed workers without these benefits to be more likely to change occupations relative to uncredentialed workers without these benefits. Higher average nonwage benefit offer rates suggest that credentialed workers without nonwage benefits fall lower in the within-occupation distribution of ability relative to uncredentialed workers without these benefits.

Workers who are relatively low or relatively high in the within-occupation distribution of wages are more likely to change occupations than workers in the middle of this distribution (Groes, Kircher, and Manovskii 2015). This finding suggests that among those with no nonwage benefits, credentialed workers are more likely to change occupations than uncredentialed workers. Consequently, the direction of any sample selection bias is ambiguous *a priori.*

Distributional effects. We have documented that professional licenses and certifications are associated with significant wage and nonwage benefits on average. We also consider whether these credentials affect workers differentially across the wage distribution. To that end, our final exercise examines the distributional effects of credentials, following Kleiner and Krueger (2013). Tables 13 and 14 present the results when we classify workers' licensure and certification status according to Definition 1 and Definition 2, respectively. In particular, we compute the predicted log wage and squared error for each person-month observation. We then compare the conditional mean log wage and mean squared error both overall and within quartiles of the predicted wage distribution resulting from a regression that omits licensure and certification status.[36] We refer to this distribution as the predicted uncredentialed wage distribution in Table 13 and the predicted unlicensed wage distribution in Table 14. As a benchmark, we report these findings in tandem with the results of an analogous analysis of the distributional effects of unions.[37]

Panel B of Table 13 demonstrates that licensed or certified workers have significantly larger conditional log wages overall than workers who do not have these credentials. This trend is also evident within each quartile of the predicted uncredentialed wage distribution. Note that licenses and certifications are associated with the largest (smallest) conditional log wage gain for person-

[36] While this thought experiment strongly resembles an analysis from Kleiner and Krueger (2013), our approaches differ in one key respect. Specifically, we relax the assumption from Kleiner and Krueger (2013) that the wage effect of a credential does not vary across the predicted wage distribution. If the wage effect of a credential does not vary across the predicted wage distribution, then the difference in conditional mean log wages by credential status varies across the predicted wage distribution only to the degree that the difference between credentialed and uncredentialed workers' observables other than credential status vary across this distribution. In this case, conditional mean log wage comparisons would serve as evidence for heterogeneous effects of credentials only if the requirements to attain a credential bind differentially across the predicted wage distribution. The conditional mean log wage comparisons in Tables 13 and 14 additionally reflect any heterogeneous returns to a license across the predicted wage distribution. For ease of comparison with Kleiner and Krueger (2013), we have also replicated Tables 13 and 14 assuming that the estimated wage effect of a credential does not vary across the predicted wage distribution. Estimates are available upon request.

[37] One commonly noted effect of unions is to reduce wage dispersion (Card 1996; Freeman 1982). Freeman and Medoff (1984) argued that unions view reducing wage variance as a stated objective. Neither professional associations nor regulatory officials aim to explicitly reduce wage dispersion (Kleiner 2006).

TABLE 13

DISTRIBUTIONAL WAGE EFFECTS OF LICENSING AND UNIONIZATION: DEFINITION 1[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A[b]					
	Predicted Nonunion Wage Quartile[e]				
	(1)	(2)	(3)	(4)	Total
Conditional mean ln(wage)[d]:					
Nonunion	2.386	2.687	2.962	3.402	2.856
Union	2.621	2.942	3.195	3.417	3.078
Total	2.403	2.724	3.005	3.404	2.884
Union-non	0.236	0.256	0.233	0.014	0.222
p-value[f]	0.000	0.000	0.000	0.092	0.000
Conditional mean squared error Ln(wage):					
Nonunion	0.142	0.195	0.230	0.221	0.233
Union	0.181	0.157	0.150	0.165	0.178
Total	0.145	0.189	0.215	0.216	0.226
Union-non	0.039	−0.038	−0.079	−0.056	−0.054
p-value	0.003	0.002	0.000	0.001	0.000
Observations:					
Nonunion	16,907	16,566	15,596	17,230	66,299
Union	1,370	2,739	3,484	1,713	9,306
Total	18,277	19,305	19,080	18,943	75,605

Panel B[c]

	Predicted Uncredentialed Wage Quartile				
	(1)	(2)	(3)	(4)	Total
Conditional mean ln(wage):					
Uncredentialed	2.372	2.687	2.981	3.387	2.818
Credentialed	2.524	2.800	3.095	3.431	3.054
Total	2.398	2.714	3.021	3.403	2.884
Credentialed-uncredentialed	0.153	0.113	0.114	0.045	0.237
p-value	0.000	0.000	0.000	0.000	0.000
Conditional mean squared error Ln(wage):					
Uncredentialed	0.136	0.194	0.220	0.208	0.221
Credentialed	0.169	0.211	0.219	0.207	0.237
Total	0.142	0.198	0.219	0.208	0.226
Credentialed-uncredentialed	0.033	0.017	−0.001	−0.001	0.016
p-value	0.001	0.181	0.901	0.945	0.012
Observations:					
Uncredentialed	15,139	14,623	12,296	12,007	54,065
Credentialed	3,237	4,561	6,809	6,933	21,540
Total	18,376	19,184	19,105	18,940	75,605

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of a reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, union status, and occupation. The reference period is May through November 2012.

[b]Panel A presents the distributional impact of unions on both wages and wage dispersion. Columns (1) through (4) present mean conditional log wages and mean squared errors within the first through fourth quartiles of the nonunion wage distribution. Column (5) presents these statistics for the entire sample.

[c]Panel B presents the distributional impact of licenses and certifications on both wages and wage dispersion. Columns (1) through (4) present mean conditional log wages and mean squared errors within the first through fourth quartiles of the uncredentialed wage distribution. Column (5) presents these statistics for the entire sample.

[d]Conditional mean log wage and mean squared error of log wage result from averages of predicted values from an OLS regression that controls for a quadratic in age, years of education, union status, licensure and certification status, a government worker indicator, a service worker indicator, a self-employed indicator, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, and region fixed effects. In columns (1) through (4), coefficient estimates of this OLS regression are assumed to vary across quartiles of the predicted nonunion and uncredentialed wage distributions. Implied hourly wage, union status, government worker, service worker, self-employed worker, and occupation represent characteristics of workers' main job or business. We determine the main job in a particular month as the primary source of earnings in that month.

[e]The predicted nonunion wage quartile results from a regression that drops union status from the set of controls and adds 2-digit occupation fixed effects. The predicted uncredentialed wage quartile results from a regression that drops licensure and certification status from the set of controls and adds 2-digit occupation fixed effects.

[f]We employed 160 balanced repeated replicate weights using a Fay's adjustment factor of 0.5 to estimate *p*-values. Standard errors take into account multiple observations at person level.

month observations in the bottom (top) quartile of the predicted uncredentialed wage distribution. Panel B of Table 14 leads to the same qualitative inferences. Panel A in Tables 13 and 14 illustrates that union members also appear to have larger conditional mean log earnings than nonunion workers, both overall and within each quartile of the predicted nonunion wage distribution (Freeman and Kleiner 1990). Our conclusions generally corroborate the evidence of Kleiner and Krueger (2013).

Panel B in Tables 13 and 14 reveals a more nuanced impact of credentials on wage dispersion. Contrasting the mean squared error across workers with a license or certification and workers without these credentials, Table 13 suggests that these credentials increase wage dispersion overall. However, this statistic obscures the differential impact of a credential on wage dispersion across the predicted uncredentialed wage distribution. In particular, wage dispersion and credentials only appear to be related in the bottom quartile of this distribution, where wage dispersion is higher among workers with a license or certification. Table 14 documents the same qualitative effect of licensing on wage dispersion when we classify workers' licensure status according to Definition 2, except licensing seems not to have an impact on wage dispersion overall. Panel A in Tables 13 and 14 yields the anticipated inference that unions are associated with less wage dispersion both overall and at the top of the predicted nonunion wage distribution. Kleiner and Krueger (2010, 2013) found no evidence that licensing has an impact on wage dispersion, either overall or in any quartile of the predicted unlicensed wage distribution.

Conclusions

Taking advantage of new data on the Professional Certifications, Licenses, and Educational Certificates topical module in the thirteenth wave of the 2008 SIPP, we have examined a number of important labor market

TABLE 14

DISTRIBUTIONAL WAGE EFFECTS OF LICENSING AND UNIONIZATION: DEFINITION 2[a]

Variable	(1)	(2)	(3)	(4)	(5)
Panel A[b]					
	Predicted Nonunion Wage Quartile				
	(1)	(2)	(3)	(4)	Total
Conditional mean ln(wage)[d]:					
Nonunion	2.386	2.691	2.958	3.401	2.856
Union	2.626	2.937	3.192	3.428	3.078
Total	2.404	2.727	3.001	3.404	2.884
Union-non	0.241	0.246	0.234	0.026	0.222
p-value[f]	0.000	0.000	0.000	0.003	0.000
Conditional mean squared error Ln(wage):					
Nonunion	0.141	0.195	0.234	0.221	0.233
Union	0.174	0.162	0.150	0.161	0.179
Total	0.143	0.190	0.218	0.215	0.227
Union-non	0.033	−0.033	−0.084	−0.059	−0.054
p-value	0.008	0.006	0.000	0.001	0.000
Observations:					
Nonunion	16,902	16,452	15,540	17,210	66,104
Union	1352	2766	3481	1671	9270
Total	18,254	19,218	19,021	18,881	75,374

Panel B[c]

	Predicted Unlicensed Wage Quartile[e]				
	(1)	(2)	(3)	(4)	Total
Conditional mean ln(wage):					
Unlicensed	2.379	2.701	2.994	3.395	2.840
Licensed	2.534	2.780	3.091	3.432	3.059
Total	2.398	2.714	3.019	3.405	2.884
Licensed-unlicensed	0.155	0.079	0.097	0.037	0.218
p-value	0.000	0.000	0.000	0.000	0.000
Conditional mean squared error Ln(wage):					
Unlicensed	0.137	0.198	0.224	0.209	0.225
Licensed	0.175	0.201	0.208	0.210	0.234
Total	0.141	0.198	0.220	0.209	0.227
Licensed-unlicensed	0.038	0.003	−0.016	0.001	0.010
p-value	0.002	0.839	0.138	0.906	0.160
Observations:					
Unlicensed	16,093	16,017	14,140	13,890	60,140
Licensed	2178	3119	4950	4987	15,234
Total	18,271	19,136	19,090	18,877	75,374

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of at least one reference month with implied hourly wages on the main job between $5 and $100. Regressions exclude person-month observations with imputed implied hourly wage, licensure status, union status, and occupation. The reference period is May through November 2012.

[b]Panel A presents the distributional impact of unions on both wages and wage dispersion. Columns (1) through (4) present mean conditional log wages and mean squared errors within the first through fourth quartiles of the nonunion wage distribution. Column (5) presents these statistics for the entire sample.

[c]Panel B presents the distributional impact of licenses on both wages and wage dispersion. Columns (1) through (4) present mean conditional log wages and mean squared errors within the first through fourth quartiles of the unlicensed wage distribution. Column (5) presents these statistics for the entire sample.

[d]Conditional mean log wage and mean squared error of log wage result from averages of predicted values from an OLS regression that controls for a quadratic in age, years of education, union status, licensure status, a government worker indicator, a service worker indicator, a self-employed indicator, a female indicator, a Hispanic indicator, a black indicator, an Asian indicator, and region fixed effects. In columns (1) through (4), coefficient estimates of this OLS regression are assumed to vary across quartiles of the predicted nonunion and unlicensed wage distributions. Implied hourly wage, union status, government worker, service worker, self-employed worker, and occupation represent characteristics of workers' main job or business. We determine the main job in a particular month as the primary source of earnings in that month.

[e]The predicted nonunion wage quartile results from a regression that drops union status from the set of controls and adds 2-digit occupation fixed effects. The predicted unlicensed wage quartile results from a regression that drops licensure status from the set of controls and adds 2-digit occupation fixed effects. We determine the main job in a particular month as the primary source of earnings in that month.

[f]We employed 160 balanced repeated replicate weights using a Fay's adjustment factor of 0.5 to estimate *p*-values. Standard errors take into account multiple observations at person level.

outcomes to see whether they differ by licensing status. The use of the SIPP offers a number of advantages over other datasets, including a direct measure of attainment, a large sample size, and a rich set of explanatory variables. The ability to link to previous topical modules has also enabled us to extend the analysis beyond merely estimating a wage premium. Nonetheless, the SIPP topical module does have an important limitation in that it is sometimes difficult to distinguish between those who have a license and those who have a certification. As a result, throughout our analysis we have used two definitions for licensing status: one in which we try to distinguish between license and certification holders and one in which we do not. The results are broadly consistent across the two definitions. After controlling for observable heterogeneity, including occupational status, those with a license earn higher pay, are more likely to be employed, and have a higher probability of receiving employer-provided health insurance offers. In addition, licensing does not appear to have much effect on reducing wage inequality among various categories, but licensed workers in the bottom quartile seem to gain relative to similar workers.

While the SIPP data enable us to say much about the direction and magnitude of the impact of credentials on various labor-market outcomes, unavoidably, in part because of the difficulty in distinguishing between the licensed and the certified, we have less to say about the mechanisms that lead to our results. As a result, other researchers, using a variety of datasets and approaches, have ample scope to continue trying to better understand this important labor-market institution.

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APPENDIX TABLE 1

MOST COMMON OCCUPATIONS FOR CREDENTIALED WORKERS: DEFINITION 1[a]

Rank	Occupation[b]	*N*[c]	Percent Licensed or Certified
1	Registered nurses	1854	85.7
2	Elementary and middle school teachers	1783	75.2
3	Nursing, psychiatric, and home health aides	845	56.1
4	Driver/sales workers and truck drivers	767	41.0
5	Secondary school teachers	719	77.6
6	Lawyers	598	77.2
7	Managers, all other	526	23.6
8	Hairdressers, hairstylists, and cosmetologists	437	89.4
9	Physicians and surgeons	421	81.4
10	Accountants and auditors	363	33.3

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of at least one reference month. Summary statistics exclude imputed values. The reference period is May through November 2012. Definition 1 does not distinguish between workers who have a certification and workers who have a license.

[b]Occupations represent characteristics of workers' main job or business. We determine the main job in a particular month as the primary source of earnings in that month.

[c]Most common occupations have the largest number of person-month observations with a license or certification within the occupation. These estimates are representative of SIPP data and not of the U.S. population in general.

APPENDIX TABLE 2

MOST COMMON OCCUPATIONS FOR CREDENTIALED WORKERS: DEFINITION 2[a]

Rank	Occupation[b]	*N*[c]	Percent Licensed	Occupation	*N*	Percent Certified
1	Elementary and middle school teachers	1683	71.1	Registered nurses	279	13.0
2	Registered nurses	1563	72.7	Managers, all other	226	10.1
3	Secondary school teachers	693	75.2	Driver/sales workers and truck drivers	194	10.4
4	Nursing, psychiatric, and home health aides	636	42.8	Nursing, psychiatric, and home health aides	189	12.7
5	Driver/sales workers and truck drivers	560	30.1	Automotive service technicians and mechanics	141	22.8
6	Lawyers	491	63.7	Electricians	129	26.9
7	Hairdressers, hairstylists, and cosmetologists	351	71.8	Retail salespersons	125	5.3
8	Physicians and surgeons	337	66.2	Computer scientists and systems analysts	116	17.4
9	Managers, all other	300	13.4	Lawyers	103	13.4
10	Accountants and auditors	264	24.3	Insurance sales agents	100	24.0

SOURCE: Authors' calculation from the 2008 panel of the Survey of Income and Program Participation, Wave 13 Core and Topical Module.

[a]Sample includes all respondents aged 18–64 who were employed in the civilian labor force as of the end of at least one reference month. Summary statistics exclude imputed values. The reference period is May through November 2012. Definition 2 identifies a worker as licensed if a governmental body issued the credential and certified if a private body issued the credential.

[b]Occupations represent characteristics of workers' main job or business. We determine the main job in a particular month as the primary source of earnings in that month.

[c]Most common occupations have the largest number of person-month observations with a license or certification within the occupation. These estimates are representative of SIPP data and not of the U.S. population in general.

APPENDIX TABLE 3

List of Universally Licensed Occupations

- Architects, except naval (all jurisdictions but the District of Columbia, Illinois, Maine, and Massachusetts),
- Audiologists,
- Barbers,
- Bus drivers,
- Chiropractors,
- Dental hygienists,
- Dentists,
- Driver/sales workers and truck drivers,
- Emergency medical technicians and paramedics,
- Funeral directors (all jurisdictions but Colorado),
- Hairdressers, hairstylists, and cosmetologists,
- Insurance sales agents,
- Lawyers,
- Licensed practical and licensed vocational nurses,
- Occupational therapists,
- Optometrists,
- Pest control workers,
- Pharmacists,
- Physical therapists,
- Physician assistants,
- Physicians and surgeons,
- Podiatrists,
- Real estate brokers and sales agents,
- Registered nurses,
- Respiratory therapists (all jurisdictions but Alaska),
- Taxi drivers and chauffeurs,
- Teachers (all but private sector),
- Veterinarians, and
- Water and liquid waste treatment plant and system operators.