The New Closed Shop? The Economic and Structural Effects of Occupational Licensure

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Abstract
During the past few decades, licensure, a state-enforced mechanism for regulating occupational entry, quickly became the most prevalent form of occupational closure. Broad consensus among researchers holds that licensure creates wage premiums by establishing economic monopolies. This article demonstrates that, contrary to established wisdom, licensure does not limit competition, nor does it increase wages. Results are based on a new occupational dataset, covering 30 years, that exploits interstate variability in licensure across the 300 census-identified occupations. I argue that licensure, instead of increasing wages, creates a set of institutional mechanisms that enhance entry into the occupation, particularly for historically disadvantaged groups, while simultaneously stagnating quality.

Over the past few decades, occupational closure, and particularly licensure, quietly became the norm for a broad swath of U.S. occupations. Where only a small set of "traditional" professions once determined entry through regulation, today the practice governs a much wider range of occupations, from doctors to engineers, carpet layers to massage therapists, agricultural inspectors to wilderness guides, and fortune tellers to legal document assistants. The most substantial growth has been in blue-collar occupations, and particularly the production and transportation sector, which more than doubled its licensed workforce over the past 30 years (see Table 1). As of 2012, over 32 percent of workers were required to hold a license to work in their chosen occupation.

Occupational licensure creates a right to practice, legislatively carving out tasks that can be performed only by authorized practitioners, and reserving an occupational title for the sole use of those practitioners. The authority to practice can be obtained only from the state, and unauthorized practice can result in criminal and civil penalties. For example, since 1953, real estate brokers have been required to register with the Ohio Real Estate Commission before practicing. Any person who works or advertises as a real estate broker or salesperson, without registration, can face up to six months in jail.[1] This is a typical example of a real estate broker license, found today in all 50 states.

Prerequisites to licensure generally include some combination of (1) professional or academic educational requirements; (2) on-the-job apprenticeship or tenure; (3) formal examination; (4) good moral character; and (5) citizenship or residency (Kleiner 2006). Licensing authorities may set further terms for continued maintenance of a license, including periodic fees and ongoing educational requirements, although the choice of which agency will oversee a license is highly diverse and depends on the state and type of occupation. Licensing differs from voluntary certification, which workers may use as an additional credential despite the lack of a legal requirement.

The dramatic increase in licensure is comparable, in scale and possibly consequences, to other contemporaneous trends, such as de-unionization, the decline of the manufacturing sector, and the rise of the college wage premium. In fact, more workers are subject to licensing requirements now than were members of unions at the peak of collective bargaining.

Licensure is thought to create a wage premium via the development of rents. Rents develop when licensure creates barriers artificially limiting the supply of workers into an occupation (for a broader discussion of rents, see Congleton, Hillman, and Konrad 2008, 2010). Many scholars argue that occupational elites use licensing at the expense of consumers[2] (Dorsey 1983; Gellhorn 1976; Gross 1984; Moore, Pearce, and Wilson 1981; Rottenberg 1962): architects draft guidelines for other architects; standards for hairdressers are styled by instructors in cosmetology schools; and frog farmers must leap over barriers imposed by fellow amphibious agriculturalists.[3]

This study focuses on licensure for two main reasons. First, licensure is occupational closure in its strictest form, where no path exists into an occupation except through the state.[4] Researchers have argued that more stringent forms of closure produce greater monopoly effects and thus higher wage premiums (Kleiner 2006; Manza 1992; Weeden 2002). If this is true, the broad distinction between licensed and unlicensed environments should result in the most easily demonstrable wage premium.

Second, because licensure is state-mandated, it has the greatest and most lasting effect on other institutions. Other forms of closure come and go, responding to trends in hiring practices and market forces, but licensure is a bright-line requirement that, once imposed, seldom recedes or diminishes in effect, and thus should result in the strongest institutional presence.

The centerpiece of this project is a new occupational dataset, covering 30 years, that exploits interstate variability in licensure across the approximately 300 census-identified occupations. Using longitudinal and fixed-effects modeling, I demonstrate that licensure results in an overall *increase* in the supply of labor into an occupation and subsequently produces no wage premium.

Table 1. Growth in Licensed Workers and Licensing Laws, 1983 to 2012

	Proportion of Workers Licensed		Proportion of Occupations Licensed		Number of Licensing Laws	
Occupational Group	1983	2012	1983	2012	1983	2012
Management and Professional	.542	.565	.338	.458	1,545	2,136
Management	.547	.436	.148	.130	89	89
Business and Financial Operations	.507	.536	.223	.324	129	184
Computer and Mathematical	.000	.000	.000	.000		
Architecture and Engineering	.708	.798	.781	.836	418	442
Life, Physical, and Social Science	.165	.268	.111	.185	61	94
Community and Social Services	.230	.757	.218	.550	42	105
Legal	.849	.860	.500	.778	65	77
Education, Training, and Library	.630	.693	.461	.536	191	226
Arts, Design, Entertainment, Sports, and Media	.014	.184	.006	.126	3	67
Healthcare Practitioner and Technical	.770	.931	.606	.856	547	852
Service	.133	.251	.182	.254	278	407
Healthcare Support	.115	.386	.223	.415	44	83
Protective Services	.256	.402	.202	.281	70	104
Food Preparation and Serving Related	.016	.014	.014	.023	4	7
Building and Grounds Cleaning and Maintenance	.150	.267	.236	.286	52	65
Personal Care and Service	.189	.328	.228	.291	108	148
Sales and Office	.018	.035	.034	.058	72	116
Sales and Related	.039	.063	.103	.172	51	85
Office and Administrative Support	.004	.011	.013	.020	21	31
Construction and Maintenance	.158	.318	.112	.192	247	386
Farming, Fishing, and Forestry	.165	.226	.111	.083	9	9
Construction and Extraction	.229	.340	.143	.248	154	245
Installation, Maintenance, and Repair	.096	.298	.080	.144	84	132
Production and Transportation	.026	.078	.045	.092	134	211
Production	.014	.030	.014	.049	30	79
Transportation and Material Moving	.065	.234	.127	.196	104	132
Total	.212	.324	.170	.258	2,276	3,256

Note: Means are based on respondents included in the sample who have no missing values on all other covariates. Sample is limited to individuals who are over age 18 and currently employed.

THE ANATOMY OF OCCUPATIONAL CLOSURE

In its simplest and most complete form, *closure* is a monopoly created when a group closes off opportunities and resources to others to maximize its own rewards, and thus provides advantage to itself at the expense of others (Weber [1922] 1978). However, these gains are not permanent, as excluded groups may respond by trying to regain rewards, leaving the landscape of group advantages in a state of constant flux (Abbott 1988; Parkin 1979; Witz 1990).

Closure is closely related to the concept of *rent*, in which the rewards attached to a position are gained solely by achieving and holding that position, and not as a product of the attributes or efforts of the holder (Sørensen 1996). Rents exist wherever demand for an asset (e.g., labor) exceeds supply, because supply is artificially restricted through social or political barriers (Congleton et al. 2008, 2010; Tollison 1982; Tullock 1967). These barriers can be created by governments, organizations, trade unions, industry associations, occupational groups, or other social actors (Weeden 2002).

In advanced industrial societies, social closure occurs widely in the occupational context, where members of an occupation may see the construction of a monopoly as a means to achieve market control (MacDonald 1985). Of all the available tools for attaining occupational closure, licensure has become the most prevalent.

The dominant view holds that licensure raises wages through two complementary mechanisms. First, it limits the supply of labor, because even at its least stringent, licensing requirements prohibit some aspiring practitioners from entering the occupation. This creates an artificial scarcity of services (for further discussion, see Akerlof 1970; Leland 1979; Shaked and Sutton 1981; Shapiro 1986).[5] As supply declines, wages increase.

Generally, when price increases, demand declines, so an occupation that drives up wages via artificial scarcity risks a reduction in demand (Weeden 2002). Several theorists argue that licensure enhances demand by improving quality and creating a monopoly over certain occupational tasks (Akers 1968; Gross 1984; Kleiner 2006; MacDonald 1985; Weeden 2002; Zhou 1993). Licensure increases the perceived quality of practitioner services by establishing a minimum quality standard, and simultaneously makes it illegal for other occupations to engage in protected tasks, thus driving consumers to the licensed occupation. A person needing a tooth pulled can no longer patronize the local barber or blacksmith, but instead must visit a dentist, who has a monopoly over all dental tasks.

In this view, licensure creates two simultaneous shifts in the price curve for occupational labor. Reducing supply likely results in some reduction in demand (Kleiner 2006), and increased quality and task exclusion help funnel the remaining demand to occupational incumbents. Licensing theory thus harkens back to early theorizing in closure, where groups are seen as struggling not only to monopolize resources, but also to exclude others from jurisdictions (Abbott 1988) or tasks (Larson 1977). Licensing can be viewed as the capstone to a professional project, the desired outcome of which is a "monopoly of competence legitimized by officially sanctioned 'expertise', and a monopoly of credibility with the public" (Larson 1979:38). Viewed this way, licensure is an institution because it helps define the nature and scope of professional authority (Meyer 1977).

In industrial societies, the interdependent division of labor results in occupations gaining legitimate control over many tasks prior to the existence of any regulation. Durkheim (1992) called this the "moral community." Engineers are not in competition for the tasks performed by high school teachers, and neither is likely to seek a license to operate a nudist society (Stolzenberg 1975).[6] When professional associations and organizations help licensing models spread, they also increase the likelihood that these new regulatory frameworks will mirror current market standards (DiMaggio and Powell 1983) and preexisting occupational norms and constraints (Meyer 2008). This conformity may smooth the way for the enactment of licensing laws (Weber [1922] 1978).

PRIOR EMPIRICAL EXAMINATIONS

Across a long tradition of empirical testing of wage effects, with a diversity of methodological approaches, past licensing studies have two major limitations. The first is that available data on the timing and geography of licensing laws is scarce. As a result, the majority of these studies rely on cross-sectional estimates of a single occupation or state, such as nurses (White 1980), dentists (Kleiner 2000, 2006; Kleiner and Kudrle 2000; Shepard 1978), optometrists (Bond et al. 1980), doctors (Anderson et al. 2000; Kugler and Sauer 2002), teachers (Angrist and

Guryan 2003; Kleiner and Petree 1988), cosmetologists, or barbers (Kleiner 2000; Rottenberg 1962). Estimates of the resulting wage premium range widely—from zero to 35 percent, depending on the occupation and jurisdiction examined.

This variation in findings is not surprising. The effectiveness of closure mechanisms will differ across different licensing schemes. The ability of a license to limit supply or enhance quality, when the only requirement is a filing fee, will be significantly smaller than the exclusion caused by multiyear education and testing requirements.

The second major limitation is that, without sufficient data on licensure, it is difficult to construct an appropriate comparison group. To conclude that licensing raises wages, licensed workers must be compared to at least some form of unlicensed worker. Researchers have utilized several methods to circumvent this limitation, without great success. Kleiner (2000, 2006) compares licensed workers in a few occupations with unlicensed workers in different occupations that are listed in the same job family category by the Census. Barbers are compared to bartenders; hairdressers to health care aids; and lawyers to economists. Using this method, Kleiner finds a licensing premium of between 0 and 64 percent, depending on the comparison occupation.

As an alternative approach, a few studies in the United States and Israel examine "switchers"—individuals who move in and out of licensed work by changing either occupations or geographies (Gittleman and Kleiner 2016; Kleiner 2006). With this method, each individual can be used as their own control, and the measured wage change derives in shifts from licensing status and occupation change over time.

A more precise approach is to exploit geographic variation in licensure and use a fixed-effect approach to compare licensed workers to their unlicensed counterparts in the *same* occupation. This method has been applied to study librarians (Kleiner 2006), dentists (Kleiner and Kudrle 1997), barbers (Thornton and Weintraub 1979), respiratory therapists (Kleiner 2006), nurses (White 1980), and dietitians and nutritionists (Kleiner 2006). Again, the estimated wage premium differs substantially, between 5 and 25 percent across examined occupations.

A few studies encompass the entire labor market and to some extent address the lack of historically available cross-jurisdictional data. Most estimate the effect of licensure by classifying each occupation as simply unlicensed or licensed on a national level (Gittleman and Kleiner 2016; Kleiner and Krueger 2013). However, this can be problematic, because unlicensed practitioners in occupations that are commonly licensed receive a "licensed" designation, and licensed practitioners in a commonly unlicensed occupation receive an "unlicensed" designation. Using data from 1992 to 1999, Weeden (2002) found a 9 percent wage premium across all states by estimating the proportion of workers nationwide who held a license, without distinguishing between jurisdictions.

Studies of licensing across the occupational spectrum suffer from another significant limitation. To the extent that occupational characteristics might be related to licensure but have their own effect on wages, these characteristics can create biased estimates if not properly accounted for. For example, because licensure is highly correlated with skill (Kleiner and Krueger 2013), and skill is highly related to wages, a wage effect that appears to result from licensure might actually stem from unmeasured skill. To address this, some researchers include controls for occupational skill (Gittleman and Kleiner 2016; Kleiner 2000; Kleiner and Krueger 2013; Moore et al. 1981; Weeden 2002).

In all these studies, the size of the wage premium is highly dependent on the occupation examined and the method of comparison. Studies that compare different occupations tend to find a higher wage premium than do those that compare within the same occupation. Overall, the issue of whether licensure results in positive wage premiums is far from settled.

Testing Closure Mechanisms

Several studies have tried, with varying levels of success, to measure the impact of licensure on labor demand and supply. In general, labor market demand is unobservable, because it is difficult to know the amount of labor consumers would demand if supply was unlimited. Some studies therefore use quality, generally measured as the level of human capital, as a proxy for demand. However, these studies yield mixed results, with no clear evidence that licensure actually improves quality (Gross 1984; for a review, see Kleiner 2006). Licensure has been found to

have little to no effect on the quality of teachers (Kleiner and Petree 1988), dentists (Kleiner and Kudrle 2000), electricians, plumbers, optometrists, and veterinarians (Carroll and Gaston 1981).

Studies seeking to verify the exclusionary aspects of licensure are equally diverse. In a study of progressive-era licensing legislation passed between 1880 and 1930, Law and Kim (2005) found that licensing did not significantly restrict entry into any of 11 occupations studied. In the years following enactment, the proportion of people in the state working in the occupation actually increased in three of the occupations. Because obtaining a license requires capital outlay, the effect of supply restrictions should most significantly affect groups with fewer resources. An analysis of funeral directors in the United Kingdom, for example, found that the imposition of greater licensing requirements was associated with 18 to 24 percent fewer women holding these jobs relative to men (Cathles, Harrington, and Krynski 2010). The advent of licensing requirements has also reduced minority participation among cosmetologists (Dorsey 1983) and reduced occupational mobility broadly (Koumenta et al. 2014; Prantl and Spitz-Oener 2009).

Present Work

This article presents a new examination of licensure-wage effects, relying on two important innovations. First, the development of a unique historical dataset allows for a far more comprehensive analysis. By tracking licensing legislation across all 50 states, via an exhaustive search of statutes and administrative codes, I assign respondents a status of "licensed" or "unlicensed" in every occupation-state-year combination, nationwide and across all census occupations, thus more accurately capturing the jurisdictional level at which licensure frequently exists. Gittleman and Kleiner (2016) suggest this type of analysis is necessary for accurate assessment of the licensing premium, and it is currently missing from research on occupational licensure. Specifically assembled to address this deficit, the data presented here span 30 years, making this the most exhaustive study of occupational wage premiums to date.

The development of this extensive data allows for two analytic strategies more rigorous than those available to previous researchers. The first, an occupation-year fixed-effects approach, makes it possible to control for differences between occupations without relying on skill controls or other comparison groups, thus exploiting jurisdictional differences to isolate a pure licensing effect, instead of a licensing-skill effect or any other composite effect that might exaggerate the wage premium. The second, a longitudinal analysis, allows for examination of wage changes in each occupation, within each state, in the years following enactment. By using a causal strategy, I can identify the effect of licensure on wages when an unlicensed occupation becomes licensed for the first time and measure the lasting impact of that transition.

DATA AND METHOD

An ideal wage premium test would reveal the difference between an occupation's actual wage in any state-year versus the wage that would have prevailed if licensure had not been enacted. Unfortunately, no such observable counterfactual exists. To address this, the key methodological contribution of this study is the direct comparison of licensed occupations to their unlicensed counterparts. Licensed hairdressers in one state are compared to unlicensed hairdressers in another state within the same year, licensed occupational therapists are compared to unlicensed occupational therapists, and so on, while controlling for state main effects on wages. I use occupation-year fixed-effects to control for occupational characteristics, thus eliminating threats to causal inference caused by the omission of key variables.

The benefit of a fixed-effects structure is the ability to control for time-invariant, geographically constant characteristics of an occupation, even if those characteristics are correlated with the error term. Thus, the effect of licensure can be interpreted as the increase in wages a licensed practitioner experiences compared to an unlicensed practitioner *in that same occupation and that same year*. This is advantageous when there are concerns of omitted variable bias. Because the comparison of interest is between licensed and unlicensed respondents within the same occupation, analyses are limited to occupations that are licensed in some states, but not all states, in any given year. It is not possible to include other measures of occupational characteristics in fixed-effects models, in order to look at differences across skill level or other occupational factors.

The fixed-effect specification aggregates across-state within-occupation variation in wages caused by licensure, after controlling for state-level main effects, in any given year. This allows for control of occupational wage growth over

time; as a result, the wages of licensed massage therapists will be compared to unlicensed massage therapists, whether that license was enacted the previous year or at any other time within the data observation period. Of course, if occupations that eventually become licensed are in some meaningful way different from their unlicensed counterparts (e.g., if licensing laws are more likely to be enacted in states where the occupation makes up a significant proportion of the labor force compared to unlicensed jurisdictions), then that systematic difference may also bias estimates. To address this, I also track wage change within each occupation-state, comparing pre- and post-enactment wages, while simultaneously controlling for other occupational trends. This longitudinal-effects analysis exploits variation within the occupation-state over time to assess the impact of licensing on a specific occupation in the years following enactment.

Model Specifications

This study utilizes two forms of analysis, the first of which is a multilevel fixed-effects model, in the general form:

$$Y_{it} = \alpha_t + \boldsymbol{\beta}'_t \boldsymbol{X}'_{it} + \varepsilon_{it} \quad (1)$$

where Y_{it} is the logged weekly earnings for person *i* in year *t,* and $\boldsymbol{\beta}'_t$ is a vector of coefficients estimating the effects of individual-level characteristics, $\boldsymbol{X}'_{it}$, on earnings. The model includes a control for state-level main effects. The mean-zero individual-level error term, ε_{it}, represents the remaining variance in wages, unexplained by individual-level characteristics. This first-level model is estimated by year, creating a vector of time-varying Betas, to allow changes in the effect of covariates on wages over time.

The error term is modeled in two different ways. First, I replicate previous work by using a skill-control model. In this model, the error term, ε_{it}, takes the following form:

$$\varepsilon_{it} = \alpha + \gamma LICENSE_o + \boldsymbol{\delta}' \boldsymbol{Z}'_o + \mu_o \quad (2)$$

where γ is the effect of licensure; $\boldsymbol{Z}'_o$ is a vector of occupation-level characteristics; $LICENSE_o$ is the proportion of workers in the occupation who are required to hold a license nationwide; and μ_o is the occupation-level error term. The second-level model is run on the pooled dataset.

The second method utilizes the occupation-year fixed-effect modeling discussed above. In this specification, the error term, ε_{it}, takes the form:

$$\varepsilon_{it} = \alpha + \gamma LICENSE_{os} + \boldsymbol{\delta}' \boldsymbol{Z}'_{\text{os}} + \mu_{os} \quad (3)$$

where $\boldsymbol{Z}'_{\text{os}}$ is a vector of fixed-effect dummy coefficients for every occupation-year. Here, $LICENSE_{os}$ is a dummy variable representing the requirement that a respondent hold a license in their occupation-state-year. Because the outcome variable is the natural log of weekly wages, the quantity (1 – γ), when exponentiated, is interpreted as the percent change in earnings due to licensure. All coefficients presented are exponentiated.

Longitudinal Models

One of the most significant concerns of fixed-effects modeling is geographic heterogeneity. If there is something unique about the occupational characteristics of a state that licenses the occupation, compared to states that do not, then that distinction may pervade estimates and bias conclusions. Therefore, I examine *changes* longitudinally in occupational wage within that state in the years following enactment, while controlling for changes that simultaneously occur in unlicensed jurisdictions. The goal is to remove any heterogeneity caused by differences between states at the time licensing legislation is adopted, while taking into account changes that occur in the whole occupation over time. Because it is also possible that individuals anticipate upcoming licensing laws and shift behavior, longitudinal models allow examination of trends in the five years leading up to enactment.

Closure theory makes predictions about the effects of licensure on labor supply and labor quality, so I also examine these outcomes. The longitudinal model is multilevel and takes the form:

$$Y_{it} = \alpha_o + \boldsymbol{\beta}'_o \boldsymbol{W}'_{it} + \zeta_o YEAR_{it} + \varphi_o LICENSE_{it} + \boldsymbol{\psi}'_o YEAR_{it} \times LICENSE_{it} + \varepsilon_{it} \quad (4)$$

where Y_{it} is the outcome variable for person *i* in year *t,* and $\boldsymbol{\beta}'_o$ is a vector of coefficients estimating the effects of individual-level characteristics, $\boldsymbol{W}'_{it}$, in that occupation.[7] The first-level model also contains a dummy variable for licensed status and each year, as well as a license-by-year interaction. I estimate the model separately for each occupation. Of interest is the matrix of coefficient $\boldsymbol{\psi}'_o$, which can be interpreted as the change in the licensing premium over time for that particular occupation. The second-level equation then forces these state-by-year terms to operate as a function of time of enactment in a given state-year. It takes the form:

$$\boldsymbol{\psi}'_o = \alpha + \tau\, TIME\ ENACT_{ost} + \mu_{it} \quad (5)$$

where τ estimates changes in the licensing premium in the years before and after legislation enactment. Time since enactment is treated as a vector of dummy variables to avoid assumptions about the structure of the licensing change.

Individual-Level Data

Wages and other individual-level data come from the 1983 through 2012 Current Population Survey (CPS) outgoing rotation sample, a nationally representative survey that captures income from employment sources. The outcome variable is the natural log of usual weekly earnings, in 2012 dollars, including wages, tips, and bonuses. Individuals with top-coded earnings, composing 1.92 percent of the sample, are multiplied by 1.5.

In 1995, CPS began imputing earnings non-responses, utilizing hot-deck imputation of individuals within the same occupational group. The Census uses major occupation categories (which contain 14 occupational groups), rather than the approximately 500 detailed occupations analyzed here. As Hirsch and Schumacher (2004) note, a downward bias on the main effect may be introduced when the outcome variable of interest is not included in the imputation matching process. In this case, for example, the missing wages of a real estate broker may be imputed using the wages of a telemarketer—provided both share the same race, gender, age, and education—because both occupations are "sales and related" occupations. Mouw and Kalleberg (2010) directly study the impact of such imputations on occupational differences in wage inequality. They argue persuasively that the omission of imputed responses, and the use of multiple imputation from detailed occupation, produce similar estimates that are less biased than imputation based on broad occupational categories. In this analysis, matching on detailed occupations requires matching respondents across state boundaries, where licensing laws may differ in scope and content. I thus omit respondents with an earnings non-response from this analysis.

Coding of individual-level descriptive data is relatively straightforward. Table 2 presents summary statistics. The final weighted sample contains 4,591,084 civilian wage and salary workers, ages 18 to 64. Of this, 2,165,189 respondents worked in occupations that, during the year sampled, existed in both licensed and unlicensed states. Wage information is collected only for workers who are not self-employed.[8] Measures of human capital include years of education, labor force experience, and experience-squared. Experience is approximated by age minus years of education minus six, with negative results set to zero. Although it would be preferable to have a more direct measure of work experience, none is available in the CPS. Labor market attachment is approximated by the usual number of hours worked per week. The models also include measures of gender, race, marital status, union affiliation, industrial sector, and main effects for state.

Table 2. Descriptive Statistics for Individual- and Occupation-Level Variables

	Unlicensed Occupations		Licensed Occupations		Full Sample	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Individual-Level Variables						
Weekly Earnings	721.193	(562.558)	1,058.882	(753.033)	812.833	(637.983)
Female	.500		.478		0.494	
Race						
White[a]	.762		.802		.773	
Black	.094		.075		.088	
Hispanic	.095		.072		.088	
Asian	.031		.035		.032	
Other	.018		.017		.018	
Married, Spouse Present	.581		.659		.603	
Years of Labor Force Experience	30.735	(12.408)	31.380	(11.308)	30.914	(12.117)
Years of Education	13.207	(2.237)	14.601	(2.349)	13.592	(2.352)
Typical Weekly Work Hours	37.742	(10.781)	40.043	(9.940)	38.378	(10.606)
Union Member	.133		.192		.150	
Industry						
Agriculture, Forestry and Fishing[a]	.014		.003		.011	
Mining	.007		.006		.007	
Construction	.049		.074		.056	
Manufacturing	.179		.104		.158	
Wholesale and Retail	.188		.056		.151	
Transportation and Utilities	.055		.059		.056	
Information	.029		.020		.027	
Financial Activities	.067		.082		.071	
Professional and Business Services	.065		.092		.072	
Educational and Health Services	.167		.358		.220	
Leisure and Hospitality	.093		.033		.077	
Other Services	.042		.033		.040	
Public Administration	.044		.081		.054	
Occupation-Level Variables						
Skill and Context Measures						
Cognitive Skills	134.606	(82.705)	222.471	(76.745)	158.894	(90.120)
Nurturing Skills	172.984	(91.150)	236.934	(81.243)	190.661	(93.028)
Workplace Authority	163.899	(96.977)	214.564	(88.454)	177.904	(97.371)
Physical Activity	125.781	(97.688)	148.762	(79.437)	132.133	(93.568)
Number of Respondents	3,321,997		1,269,087		4,591,084	
	.724		.276			

Note: Means are based on respondents included in the sample who have no missing values on all other covariates. Sample is limited to individuals who are over age 18, currently employed, and not self-employed. Skill and context measures are constructed by ranking each occupation's skill level against all others.
[a]Reference category in analyses.

Whether licensure restricts or enhances labor supply, both theories suggest that individuals entering an unlicensed occupation are not the same as those who would enter the licensed version. Because these selection effects can introduce bias (to the extent that individual characteristics can affect occupation and wage simultaneously), the individual-level wage model (Equation 1) includes a Heckman-style selection correction.[9]

Occupation-Level Data

This study uses the detailed occupational categories utilized by the Census and CPS. In 1983, there were 503 occupations, but by 2012, some had been removed and a nearly identical number had been added, resulting in a total of 502. During this period, 40 occupations are "empty" in at least one year, amounting to .04 percent of the sample, and thus are excluded from analysis in those years. Because Census occupational codes changed three times during the sample period, codes from different years were crosswalked using a specially constructed composite of occupational code crosswalks from the Census Bureau and the National Crosswalk Service Center.[10]

Unfortunately, licensing legislation does not correspond perfectly with Census occupational categories. In some cases, occupations that are licensed share a Census category with unlicensed workers. For example, California regulates "welding contractors," but the corresponding Census category includes "welding, soldering, and brazing workers." Fortunately, legislators tend to draft licensing regulations with a broad scope, and thus most licenses map neatly onto one or more Census occupation categories. When occupations do not map perfectly onto corresponding Census occupational codes, I utilized data from the Bureau of Labor Statistics (BLS), using the Standard Occupational Classification (SOC), a more detailed codification of occupations that tend to match license definitions much more closely. The BLS keeps data on the number of people in each Census occupation that fall into each SOC category. Using this comparison data, I constructed a coverage rate, based on the percent of each Census occupation that falls into licensed SOC occupations. Where the coverage rate exceeds 50 percent, practitioners in the occupation-state were assigned a "licensed" value. Where coverage falls below this cutoff, practitioners were assigned an "unlicensed" value. This slippage will dilute any effects of closure on earnings in these occupations. Only 6.66 percent of respondents were affected by slippage issues, thus making any potential bias small.[11]

I derived licensing data from an exhaustive census of actual occupational regulations, reviewing statutes and codes from all 50 states. Observations are left-censored at 1970, due to limitations in the availability of older legislative materials. Respondents are categorized as licensed if their occupation required workers to hold a license in that state that year.[12] This method may bias estimates of wage benefits, because we cannot know the actual licensing status of individual respondents. This is a limitation existing in all studies of licensing and wages.

Between 1983 and 2012, 975 new licensing laws were passed. Professional and managerial occupations have the most licensing laws (see Table 1), and more than 3,000 laws exist nationwide. The average state had 46 licensing laws in 1983 and today has 64, having passed slightly more than one new law every two years.

Because not every interested worker is able to meet licensing requirements, regulation can create an underground market for services provided by unlicensed workers. The effect of such markets on wages can be difficult to discern. To attract business, underground practitioners may be forced to charge less for their services (Dorsey 1983), driving down the average wage. Alternatively, because unlicensed practitioners may face criminal penalties (including jail time), they may decide to avoid signaling their status through underpricing, and instead charge the going market rate for services. Rottenberg (1962) argues that underground markets are more likely to develop in high-paying occupations. However, because such occupations require greater skill, unlicensed practitioners may be easier to detect.

The effects of slippage issues and underground markets cannot be fully measured, but misestimation of license-holding in this study appears quite small. Using direct surveying of 3,982 respondents in 2006, Kleiner and Krueger (2010) found that 29 percent of respondents reported holding an occupational license. Comparably, I estimate that 30.86 percent of individuals were licensed in that year. Results here should be interpreted as the impact of licensure on wages for *all* members of an occupation, in *states* where there is a license requirement.

To test specific hypotheses derived from the theories discussed earlier, as to the impact of licensing on occupational outcomes, I created several composite occupational measures. As a measure of labor supply, I follow Blundell and

Macurdy (1999) and measure the total labor hours supplied by all workers in a particular occupation-state-year, as a proportion of all labor hours for all occupations in the state that year.

Finally, the skill-control models used in my comparisons to earlier work include several measures of occupational skill and context, constructed from the 2011 Occupational Information Network (O*NET) database. O*NET, a replacement for the Dictionary of Occupational Titles, is a survey of job characteristics of workers from 974 SOC occupations, administered by the Department of Labor. Unfortunately, although the Dictionary of Occupational Titles is available for multiple years, spanning the same time period consistent with this analysis, earlier versions of the data are collected and coded in different ways. Liu and Grusky (2013) note that bias can be introduced if this change in measurement practice is simply ignored.

To avoid this, I transform skill measures into rankings, where each occupation's skill level is measured against all others, and I then apply this ranking method to each year. This method assumes that, while the labor market may have undergone a general increase in skill level, the position of occupations relative to one another is stable. Thus, the cognitive skill level required to practice medicine remains consistently higher than that needed for a retail clerk position. This is clearly an oversimplification, and the accuracy of skill measures deteriorates as the analysis reaches further back in time. Table 2 presents the occupation-level variables and their descriptive statistics.

FINDINGS

Examining Table 2, it is immediately clear that licensed occupations have higher mean weekly earnings than do unlicensed occupations, by a factor of about 1.5. Previous studies report the same result, but they also found licensed occupations tend to be more skilled, and therefore those works sought to use skill controls to remove the effect of skill on wage. In the most comprehensive previous examination of this nature, Weeden (2002) used O*NET characteristics of skill and job context. Additionally, like the present study, which uses CPS data from 1983 through 2012, Weeden used CPS data from 1992 through 1999. Thus, to assess the degree to which omitted variable bias drives up the estimated benefits of licensure, I begin by running multilevel models that adjust for a variety of occupational skill dimensions defined by the O*NET rubric. Furthermore, to remain consistent with Weeden's method, this test uses the national proportion of workers in the occupation-year who hold a license (unlike the fixed-effects model discussed in the next section, which treats licensure as a dummy variable).

The results, presented in Table 3, show a positive effect of licensure across all four decades. This model shows a 9.2 percent wage premium for occupations where all workers were required to hold a license in the 1990s, similar to the 8.9 percent found by Weeden for occupations licensed in all states, in her all-occupation analysis, during a similar time period.

The Fixed-Effects Approach

Next, I turn to the key question of whether this standard model, and earlier studies deploying similar models, exhaust the range of potentially relevant occupational characteristics that may be correlated with licensure. I use a fixed-effects model, which compares the wages of licensed workers in each occupation to the body of unlicensed workers in their same occupation. As such, each occupation functions as its own control for occupational characteristics, and bias caused by omitted characteristics is mitigated.

The results of a fixed-effects model are surprising. Table 3 shows *no positive effect from licensure*. Because exponentiated coefficients are indicative of a percentage increase in typical weekly wage due to licensure, the model shows that licensure affects wages by between –.19 and –1.23 percent—in other words, not at all. Pooled across all years, 1983 to 2012, the mean effect of licensure is a .94 percent wage decrease (coef. .9906; s.e. .0019; $p \leq .001$). The median weekly wage of a licensed worker in the sample is $815.86, so the license *penalty* measured here amounts to approximately –$7.67 dollars weekly, or only about –$383.45 yearly. Overall, there is no substantive wage effect of licensure.

Table 3. Modeling the Effect of Licensure on Residual Weekly Wage

	Skill-Control Models									
	(1) 1980s		(2) 1990s		(3) 2000s		(4) 2010s		(5) All Years	
Coefficient	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)
Proportion of Occ. Licensed	1.0790***	(.0005)	1.0922***	(.0004)	1.0755***	(.0005)	1.0673***	(.0000)	1.0773	(.0424)
Cognitive Skills	1.0017***	(.0000)	1.0018***	(.0000)	1.0023***	(.0000)	1.0025***	(.0000)	1.0020***	(.0003)
Nurturing Skills	1.0003***	(.0000)	1.0001***	(.0000)	1.0001***	(.0000)	1.0001***	(.0000)	1.0002	(.0002)
Workplace Authority	.9995***	(.0000)	.9996***	(.0000)	.9994***	(.0000)	.9993***	(.0000)	.9995***	(.0001)
Physical Activity	.9994***	(.0000)	.9994***	(.0000)	.9993***	(.0000)	.9994***	(.0000)	.9994**	(.0002)
Proportion of Occ. Female	.9587***	(.0006)	.9479***	(.0005)	.9067***	(.0007)	.9436***	(.0000)	.9437	(.0642)
Constant	.8755***	(.0004)	.8606***	(.0004)	.8520***	(.0006)	.8210***	(.0000)	.8569*	(.0614)
Observations	1,163,857		1,432,926		1,141,373		347,025		4,085,181	
Adj. R^2	.5709		.6051		.6134		.6273		.5917	

	Fixed-Effect Models									
	(6) 1980s		(7) 1990s		(8) 2000s		(9) 2010s		(10) All Years	
	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)
Licensed Occupation	.9964	(.0028)	.9981	(.0028)	.9884***	(.0033)	.9877*	(.0061)	.9906***	(.0019)
Constant	1.0899***	(.0099)	1.0909***	(.0061)	.9572***	(.0083)	.9993	(.0130)	1.1029***	(.0048)
Observations	536,119		677,945		452,062		132,687		1,798,813	
Adj. R^2	.8142		.7509		.6465		.6517		.7122	

Note: Outcome variable in all models is the second-level residual log weekly wage. Independent variable in skill-control models is the proportion of the occupation nationwide required to hold a license in the year. Eicker-Huber-White robust standard errors are included in parentheses to account for clustering at the occupation. Independent variable in fixed-effects models is a dichotomous variable indicating respondent works in a licensed occupation-state. Fixed-effects models also include fixed effects for detailed census occupation, state, and year. Eicker-Huber-White robust standard errors are again included in parentheses to account for clustering at the occupation-state. Fixed effects are limited to respondents working in occupations that are partially licensed after 1970.

*$p \leq .05$; ** $p \leq .01$; ***$p \leq .001$

Table 3. Modeling the Effect of Licensure on Residual Weekly Wage

	Skill-Control Models									
	(1) 1980s		(2) 1990s		(3) 2000s		(4) 2010s		(5) All Years	
Coefficient	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)
Proportion of Occ. Licensed	1.0790***	(.0005)	1.0922***	(.0004)	1.0755***	(.0005)	1.0673***	(.0000)	1.0773	(.0424)
Cognitive Skills	1.0017***	(.0000)	1.0018***	(.0000)	1.0023***	(.0000)	1.0025***	(.0000)	1.0020***	(.0003)
Nurturing Skills	1.0003***	(.0000)	1.0001***	(.0000)	1.0001***	(.0000)	1.0001***	(.0000)	1.0002	(.0002)
Workplace Authority	.9995***	(.0000)	.9996***	(.0000)	.9994***	(.0000)	.9993***	(.0000)	.9995***	(.0001)
Physical Activity	.9994***	(.0000)	.9994***	(.0000)	.9993***	(.0000)	.9994***	(.0000)	.9994**	(.0002)
Proportion of Occ. Female	.9587***	(.0006)	.9479***	(.0005)	.9067***	(.0007)	.9436***	(.0000)	.9437	(.0642)
Constant	.8755***	(.0004)	.8606***	(.0004)	.8520***	(.0006)	.8210***	(.0000)	.8569*	(.0614)
Observations	1,163,857		1,432,926		1,141,373		347,025		4,085,181	
Adj. R^2	.5709		.6051		.6134		.6273		.5917	

	Fixed-Effect Models									
	(6) 1980s		(7) 1990s		(8) 2000s		(9) 2010s		(10) All Years	
	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)
Licensed Occupation	.9964	(.0028)	.9981	(.0028)	.9884***	(.0033)	.9877*	(.0061)	.9906***	(.0019)
Constant	1.0899***	(.0099)	1.0909***	(.0061)	.9572***	(.0083)	.9993	(.0130)	1.1029***	(.0048)
Observations	536,119		677,945		452,062		132,687		1,798,813	
Adj. R^2	.8142		.7509		.6465		.6517		.7122	

Note: Outcome variable in all models is the second-level residual log weekly wage. Independent variable in skill-control models is the proportion of the occupation nationwide required to hold a license in the year. Eicker-Huber-White robust standard errors are included in parentheses to account for clustering at the occupation. Independent variable in fixed-effects models is a dichotomous variable indicating respondent works in a licensed occupation-state. Fixed-effects models also include fixed effects for detailed census occupation, state, and year. Eicker-Huber-White robust standard errors are again included in parentheses to account for clustering at the occupation-state. Fixed effects are limited to respondents working in occupations that are partially licensed after 1970.

*$p \leq .05$; ** $p \leq .01$; ***$p \leq .001$

To determine the impact of licensure on wages, as well as on labor supply and occupational demand, I begin by using longitudinal models to assess the effect of licensing in the years following regulation enactment.

First among these, licensure, to the extent it affects wages, might have an impact only until equilibrium is reestablished, and thus any rent generated by licensure is temporary at best. To test this proposition, I look at workers in states where a license is newly enacted, to determine whether they experience a wage premium following enactment. Since 1971, 1,075 new licenses have been created across 156 distinct occupations. An initial concern here was that states that regulate occupations may do so because they differ systematically from their unlicensed counterparts. To control for such a concern, this analysis examines the effect of licensure longitudinally, modeling the percent *change* in wage since legislative enactment, compared to the percent *change* among the same unlicensed occupations averaged across years in all other states. Including the unlicensed occupation allows one to account for national trends that may affect the occupation during the study but are not related to licensure.

Figure 1 tracks the wage change compared to enactment year, within occupation-states, netting out unlicensed wage growth in that same occupation during the same period.[13] To account for any wage shifts that might occur in anticipation of new regulations, I compare pre-enactment wages to post-enactment wages. The figure shows that licensure does not affect wages at all. At approximately 18 years after enactment, wages dip about 2 percent, and then increase slightly a couple of years later, but none of these changes ever significantly differ from zero. This argues against the claim that licensure causes *any* major disequilibrium.

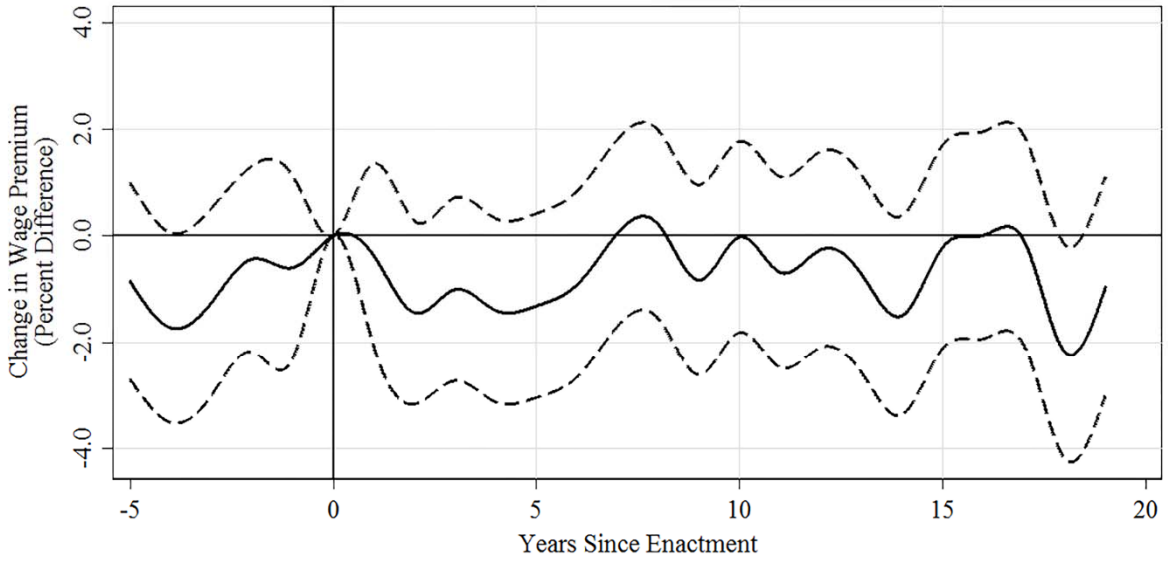

Figure 1. Mean difference between licensed and unlicensed occupational wages (with 95% CI), as percent, during time since regulation enactment.

Note: Line is smoothed. Y-axis is interpreted as marginal effect for level two (Year Since Enactment x Licensing) interaction.

The main rents-generating mechanism put forth by some neoclassical economists and closure theorists is that licensure restricts entry into an occupation and maintains wages at artificially high levels. Therefore, I next turn to the impact of licensing on labor supply.

I posit that no wage premium should exist if there is no scarcity of supply. Measuring labor supply as the proportion of labor hours supplied by all workers in a particular occupation-state-year, out of all labor hours for all occupations in the state that year, Figure 2 shows results from the longitudinal multilevel model, comparing current labor supply to supply at the time of enactment, as percent change, net trends in unlicensed occupations. Surprisingly, Figure 2 shows the opposite of a scarcity effect. The supply of labor increases dramatically in the years following enactment, reaching over 7 percent more than original levels. This suggests that not only is there no scarcity of supply, but in

fact, licensure *increases* labor supply. The figure also provides little indication that workers alter their behavior in anticipation of enactment.

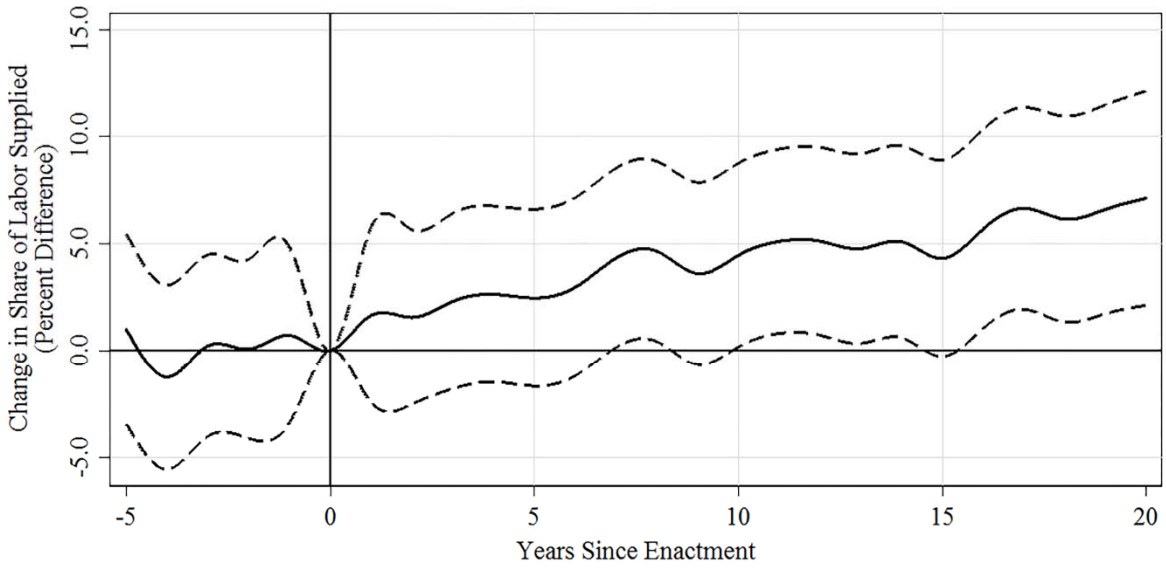

Figure 2. Mean difference between licensed and unlicensed hours of labor supplied (with 95% CI), as percent, during time since regulation enactment.

Note: Line is smoothed. Y-axis is interpreted as marginal effect for level two (Year Since Enactment x Licensing) interaction.

Model 11 in Table 4 presents a supplemental test of this model, in which I apply a cross-sectional multilevel fixed-effects model to the hours worked at the individual level, similar to the fixed-effects models presented in Table 3. The model shows that respondents in licensed occupations work slightly fewer hours per week than do their unlicensed equivalents. This suggests that the increase in hours supplied in the state is due to growth in number of entrants, rather than a change in hours worked by incumbents.

Third, I noted earlier that existing theory proposes an increasing effect of licensure on quality, which might prompt an increase in demand. Demand remains unobservable, but I examine the impact of licensure on the quality of a licensed occupation, measured in terms of increases in worker levels of human capital. As with other longitudinal multilevel models, the coefficient can be interpreted as change in the average difference between licensed and unlicensed levels of educational attainment averaged across all occupations, states, and years. Results, shown in Figure 3, reveal that the level of education in a licensed occupation actually tends to *decrease* marginally following enactment.

Table 4. Modeling Hypothesized Effects of Licensure

	(11) Typical Weekly Hours		(12) Years of Education		(13a) Proportion Female		(13b) Proportion Black		(14) Hours Supplied	
Coefficient	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)	Coef.	(SE)
Licensed Occupation	–.0887*	(.0354)	–.0113	(.0090)	.0048***	(.0010)	.0068***	(.0019)		
Licensed x Proportion of States Licensing									.0061***	(.0004)
Constant	43.4963***	(.1525)	14.3237***	(.0251)	.3273***	(.0035)	.0905***	(.0111)	.0144***	(.0004)
Observations	1,798,813		1,798,813		1,798,813		1,798,813		1,798,813	
Adj. R^2	.1667		.4098		.9179		.7054		.0733	

Note: Outcome variable for Model 11 is the respondent's typical weekly hours of work. Outcome variable for Model 12 is the respondent's total years of education. Outcome variable for Models 13a and 13b is the proportion of women or black workers in the occupation. Outcome variable for Model 14 is the labor supply measured as the proportion of labor hours supplied by all workers in a particular occupation-state-year, out of all labor hours for all occupations in the state that year. All models contain fixed effects for detailed census occupations. Eicker-Huber-White robust standard errors are included in parentheses to account for clustering at the occupation-state. All models are limited to respondents working in occupations that are partially licensed after 1970.

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

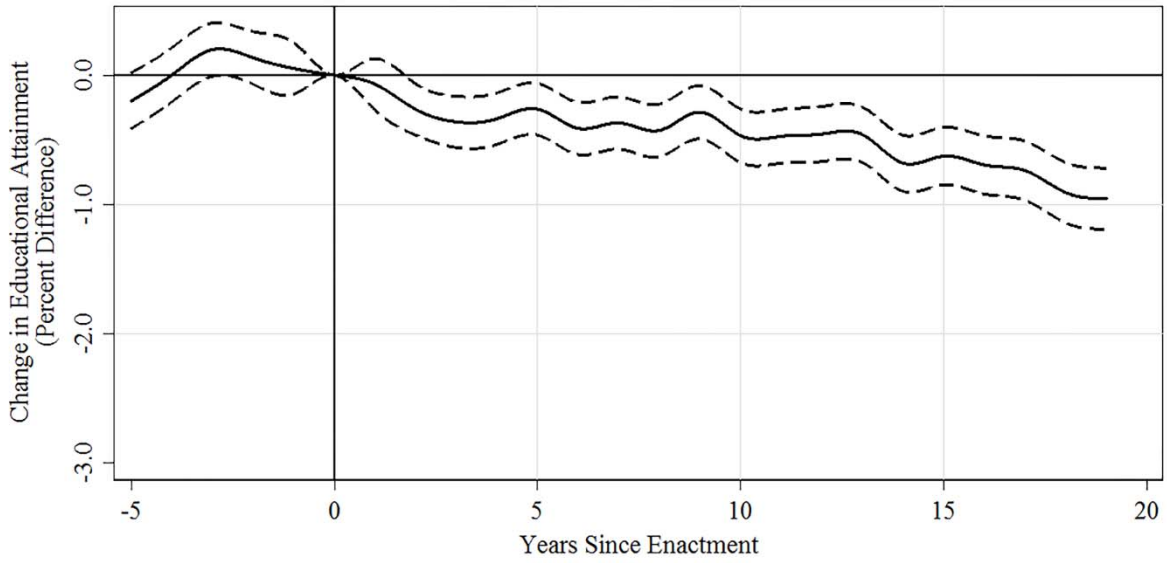

Figure 3. Mean difference between licensed and unlicensed years of educational attainment (with 95% CI), as percent, during time since regulation enactment.

Note: Line is smoothed. Y-axis is interpreted as marginal effect for level two (Year Since Enactment x Licensing) interaction.

Another supplemental multilevel analysis shows the basic distinctions between licensed and unlicensed individuals. Model 12 in Table 4 reveals that licensed workers have slightly lower educational attainment than do their unlicensed counterparts.

Because licensing requirements lead persons to spend resources (frequently money and time), the effect of supply restrictions should be most easily detectable among traditionally excluded populations (e.g. women and racial minorities). Results, shown in Figure 4, reveal that the composition of licensed occupations shifts following enactment. The proportion of women working in the occupation increases by approximately 2 percent, and the proportion of black workers increases by over 3 percent. Similarly, Models 13a and 13b reveal that licensed occupations have a higher proportion of women and blacks than do their unlicensed counterparts.

Additionally, a certain level of diffusion is necessary before a license gains the ability to bestow legitimacy and enhance entry. Model 14 shows this is indeed the case. The supply of labor increases in a licensed occupation as the license is adopted by a greater number of states.

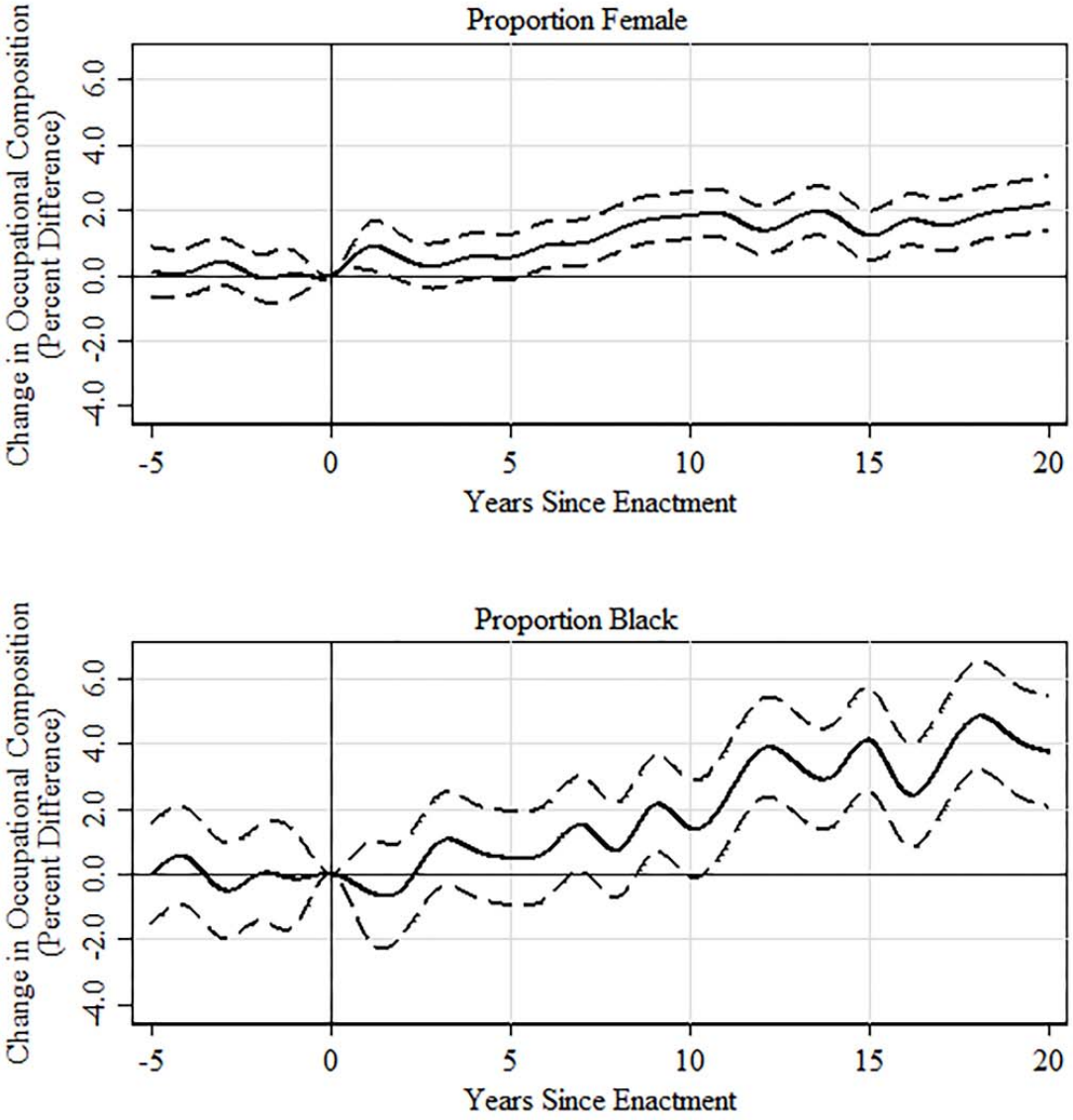

Figure 4. Mean difference between licensed and unlicensed worker characteristics (with 95% CI), as percent, during time since regulation enactment.

Note: Line is smoothed. Y-axis is interpreted as marginal effect for level two (Year Since Enactment x Licensing) interaction.

Unique Attributes of Historically Privileged Occupations

One of the main reasons that skill-control models in previous studies show a high wage premium from licensure is that these comparisons include occupations such as lawyers and doctors. These professions, high-earning and licensed in every jurisdiction for a long time, have been scrutinized by theorists as unique and special for nearly as long.

For obvious reasons, the fixed-effects model cannot be used to compare these licensed workers to their nonexistent unlicensed counterparts. Skill-control models simply show that these professions are high-earning occupations, a fact that is already well-established. Nonetheless, an important question remains—can the unique status of these occupations be attributed in any way to their standing as completely licensed nationwide?

It is possible that licensure does not effectively generate rent until an occupation is at near or total closure, because consumers purchase cheaper unlicensed services in a nearby state. Alternatively, consumers may be unwilling to pay an increased cost for licensed labor until the license has gained widespread acceptance. If full licensure has an effect on wages, we would expect wage growth to increase substantially near the year when licensure becomes total, followed by a plateau as the premium becomes entrenched.

Since 1983, 35 occupations have achieved full licensure nationwide. These occupations include funeral directors, cartographers, aerospace engineers, elementary school teachers, social workers, and massage therapists, to name a few. Examining all such occupations over the past 30 years, I find no evidence of an increase in wages following total closure. Following full licensure, these occupations experience a temporary 8 percent increase in wages around year six, but the effect reverses thereafter until no wage premium exists (Figure 5).

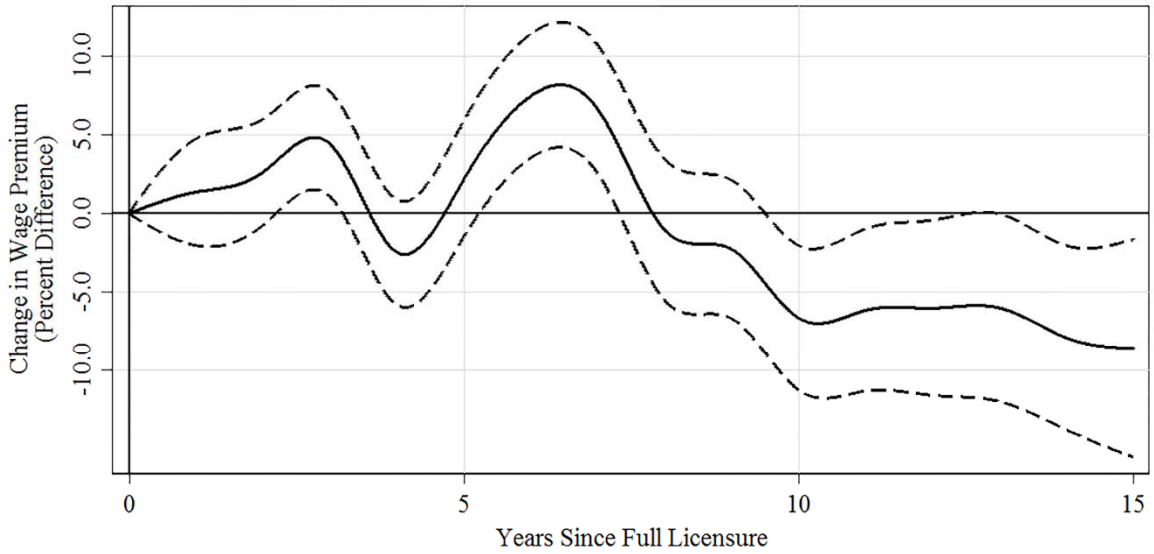

Figure 5. Mean growth in occupational wages (with 95% CI), as percent, during time since occupation became fully licensed.

Note: Line is smoothed. Y-axis is interpreted as marginal effect for level two (Year Since Enactment x Licensing) interaction.

Of course, it would be naive to assume that universal licensing for occupations that have been historically closed for more than a century operates in the same way as universal licensing for occupations that recently closed. Indeed, the fact that such occupations were fully licensed before licensure became prevalent suggests something unique about these occupations. Regardless, the important finding here is that there is nothing magical about full licensure. Achievement of complete market closure does not seem to be a catalyst for wage growth. This is a small subset of occupations, but it provides some evidence that sociologists' preoccupation with the professions is not solely a product of their regulatory status, but rather there is something else idiosyncratic about these long-regulated, highly paid occupations. Notwithstanding the emphasis in prior work on professions that have obtained full licensure, labeling them as either the most socially responsible (Wilensky 1964) or the most monopolistic and self-interested (Gellhorn 1976; Gross 1984), I submit there is little or no evidence that these occupations' specific characteristics are the products of universal licensure.

For decades, sociologists have been concerned with the special place that the classic professions hold in society, arguing that licensure helped professionals, and particularly doctors and lawyers, achieve their rank in society by securing a permanent position as high earners through economic monopolies. These occupations do hold a special place because of their regulatory status, but I submit it is not an economic position—many professions make money—but rather a unique space in the division of labor, gained through a historic state of complete licensure and an accompanying status. From this vantage, these privileged few have developed into culturally unique labor groups that seem indispensable to modern society, in part because they have monopolized certain tasks and their affiliated status, and thus they fascinate scholars even today.

Abbott (1988) documented occupations jockeying for resources, status, and prestige. Occupations that obtain these things are then able to obtain licensure, which in turn helps them secure control over noneconomic benefits, which can be just as important to an occupation as enhanced earnings. In fact, Weber ([1922] 1978) believed that prestige, status, and ethical standards were just as likely as material interests to be motives for closure.

CONCLUSIONS AND DISCUSSION

Occupational regulation is one of the most significant labor market shifts of the past three decades. Licensure is slowly saturating the labor landscape, replacing other forms of closure and bringing more occupations under state control. Theorists tend to be critical of licensure, seeing it as a means by which workers profit through the use of monopoly power. Yet, as I demonstrated, there is no aggregate wage benefit to licensure, either through limitation of supply or through a quality-driven increase in demand.

Earlier studies, using skill-control models, show a positive wage benefit to licensure, in part because they include professional occupations that are licensed in every state and have a lengthy history of high earnings. I replicate this result, but I also demonstrate that more rigorous controls on occupational differences undermine the standard finding, and in fact, completely negate it.

The modern view of occupational closure as monopolistic derives from the earliest views on the subject. However, the occupational regulation that pervades today's legislative and economic landscape only marginally resembles the structures envisioned by Adam Smith and other early critics. Early closure denied access through entirely different mechanisms, requiring network connections and the right demographic make-up to secure apprenticeship or educational access. In contrast, modern licensing mechanisms include state-administered exams, school or training requirements, criminal background checks, and a variety of other impersonal processes.

Additionally, modern theorists argue that licensing increases the quality of workers, measured in terms of education level, which could drive demand up. However, results show that the level of education in licensed occupations actually declines, relative to their unlicensed counterparts. This might mean workers are exchanging higher education for the vocational schooling or training requirements necessary to obtain licensure.

Licensing as an Institution

The absence of a wage premium does not mean licensure has no labor market effects. The revelation here, that an exclusionary process increases supply, presents a new puzzle in need of additional research.

One possibility is that licensure restructures the method of occupational entry. Although often characterized as a market process, licensure displays many of the hallmarks of an institutional process. Occupations are deeply embedded in social and political environments (Powell 2007), and changing regulations can have strong cascading effects that result in the development of new organizations and stronger social relationships (Meyer 2008; Powell and DiMaggio 1991; Scott 2001).[14] This means licensure can be more than a shift in the supply-demand curve. Rather, it also has wider implications for how an occupation operates.

Development of secondary institutions. The enactment of a licensing law promotes the development of other institutions in a state, such as vocational schools designed to train applicants for the new license. Licensees have access to support systems specific to their occupations, such as exam-oriented coursework, licensure application assistance, career counseling, job fairs, and networking opportunities, all of which are designed to make licensure requirements and employment outcomes manageable and attainable.

To the extent that job entry in an unlicensed environment depends on informal networks, individuals who lack social connections can be at a disadvantage. In a regulated environment, the symbiotic relationship between licensure and associated institutions can provide workers not just with an occupation-specific education, but also with mentors and career services workers. These aid in the attainment of occupation-specific cultural and social capital, while simultaneously socializing new workers into occupational norms, thus helping classify and allocate individuals into positions in society (Meyer 1977). These secondary institutions may provide specific barriers to entry (in the form of monetary, time, and intellectual investment), but they may also help overcome any problems of exclusion created by lack of social or cultural capital, resulting in a net gain for historically excluded workers that might explain, in part, why licensure increases supply.

Meritocratic method of entry. Overall, the major shortcoming in past research is the assumption that, in an unlicensed environment, all prospective entrants have an equal opportunity to enter any given occupation. This assumption, and the corresponding theory of supply restriction, might be more tenable if licensure established *new* or more restrictive boundaries, instead of codifying existing ones. If unlicensed environments truly offered equal access, then it might follow logically that the introduction of a licensing requirement reduces that access. However, informal barriers to entry pervade the labor market, many so closely guarded that individuals in that occupation are significantly likely to share multiple background characteristics. Because this filtering of entrants occurs without the presence of licensing, it is more appropriate to think of licensure not as the introduction of closure, but as a shift in the *type* of closure that entrants face.

Occupational entry in an unlicensed environment requires a prospective practitioner to obtain employment, for the first time, with no experience and no signals of credibility or competence. Absent institutional assistance into the profession (i.e., educational requirements), entry is most likely the result of social networks or employer preferences.

In contrast, licensed applicants can take advantage of a codified path of entry, following a publicized set of steps that, by state law, lead to licensure. The would-be practitioner can refer to the appropriate publication or contact the licensing authority for the official requirements. Such processes might be particularly helpful for historically excluded groups, allowing them to bypass informal barriers. Increased supply, particularly among traditionally disadvantaged groups, is thus an understandable outcome from licensure.

This is not to say that licensure is a cure for all problems of exclusion—to the contrary, bureaucracies and their procedures can be critiqued as "smokescreens for oppression" (Baron et al. 2007), legitimating rational and "meritocratic" forms of inequality and segregation (Acker 1990; Burris 1996; Ferguson 1984). Seen in this light, bureaucracy can be a method of preserving privilege for those who have already attained it (Witz 1990). This seems to be a reasonable criticism—licensure may minimize arbitrary and subjective criteria for occupational entry, but it would be unreasonable to suppose it creates a completely objective process.

Enhancing legitimacy. Attainment of a license transforms an individual into a member of a discrete class of workers (e.g., "paralegal") (Meyer 1977). This classification then becomes part of the worker's identity in the same way "college graduate" becomes central to the identity of someone who attains a degree (Meyer 1977).

The external authority of the license grants legitimacy to the classification, which is then passed on to the practitioner. Upon achieving licensure, newly credentialed workers become entitled to use a state-endorsed signal of quality, a device that helps them bypass initial questions of employability and also partially overcome problems of fit, such as a race, gender, or age mismatch, that might otherwise keep a qualified worker from being selected. This "sheep-skin" effect provides value to a credential beyond the knowledge and skills gained (Arrow 1973; Spence 1975; Stiglitz 1975). For example, faced with informal market norms indicating that only men can competently serve as construction contractors, women who obtain a license have a legitimized mechanism to signal quality and competence.

After it is institutionalized, licensure can legitimize roles for more than just entering practitioners. The state-endorsed authority and institutional systems of licensure build into society certain rules that all actors take for granted and incorporate into their decisions and actions (Meyer 1977). Social gatekeepers adhere to these rules when interacting with practitioners.[15] Occupational incumbents regard only their fellow *licensed* practitioners as

legitimately practicing in the occupation. Similarly, consumers seek to purchase labor from only legitimated practitioners. Other occupations interact with official workers through licensing boards and professional associations. Thus, licensing alters how practitioners interact with incumbents, other occupations, and the broader labor market.

The effect of institutional mechanisms extends beyond licensing to other closure processes sharing similar traits. Voluntary certification, the process of credentialing in which employers, rather than the state, function as exclusionary gatekeepers, is also accompanied by the development of classes, training, testing, and network development. Thus, certification may have some of the supply-enhancing effects that licensure does. In contrast to licensing however, voluntary certification is not state-mandated, and thus its ability to convey legitimacy and bestow credibility will depend on the employer, and it will likely be more market driven than licensure. Similar arguments can be made for representation by professional associations, which promote the development of some secondary institutions but lack the state-endorsement of licensure.

Of course, the simple existence of one license in one state is not going to provide broad legitimization. To the contrary, it takes a certain level of adoption before an institution gains the ability to bestow legitimacy (Meyer and Rowan 1977), so the ability of a license to signal quality and enhance entry will increase as an occupation becomes licensed across a greater number of states. The Louisiana license for equine dentistry, for example, may lack a certain measure of legitimacy, at least until other states catch on to the budding trend.[16]

The effect of any of these institutional processes will also depend on the degree to which closure is embedded in existing legal and structural forms. Even when using the same analytic method, comparison across the United Kingdom, France, Germany, and the United States (for a review, see Kleiner 2006) revealed vastly different wage premiums. These nations differ in labor market structure and how other closure mechanisms, such as educational credentialing and certification, interact with licensing. The overall structure of closure can have important effects on the ultimate outcomes it generates (Bol and Weeden 2015; Murphy 1988).

Rigidifying Effect of Licensing

In addition to shifting methods of entry, licensing may also create broader changes that social scientists have yet to elucidate. For as long as it remains legitimate, the license will continue to function as an important signal and may insulate practitioners against shifts in perception and other market effects. Bell (1973) noted that, as the supply of educated labor increases, individuals must improve their human capital simply to defend their current income position. In this environment, education becomes a defensive investment, no longer raising income above a hypothetical uneducated income potential, but instead merely protecting the educated worker from being left at a disadvantage.

Licensure helps insulate practitioners from this educational arms race. States codify the appropriate content and level of training necessary to be the right type of practitioner, and thus free licensed workers to obtain only the specified level of education, while workers in unlicensed jurisdictions continue to compete along educational lines.

The stagnation of education after licensing enactment suggests that workers in unlicensed occupations continue to increase their educational credentialing, while skill-based innovation becomes less critical in a regulated environment. On a broader scale, this formalization may make the reward structure of the labor market more rigid, solidifying the occupational hierarchy.

Licensure also carves out specific territories for occupations, formalizing the allocation of tasks within the division of labor, outlining the correct methods of practicing, and creating a “legal monopoly” (MacDonald 1985) or “skill monopoly” (Larson 1979). Additionally, practitioners do not get to freely choose which rules and laws they follow; for example, one cannot decide to be a paralegal in a different way (Meyer and Rowan 1977; Powell and DiMaggio 1991). Both of these effects create uniformity in occupational practice, but they may slow response to market change. In the division of labor, an aspect of industrial society that already exhibits significant demarcation, licensure adds further rigidity via state endorsement and legal demarcation.

Through licensure, occupational elites can define the proper way to practice, because license requirements are comprehensive lists of ways to be excluded or removed. However, this may also limit innovation, reduce

experimentation, and perhaps hinder growth in knowledge (Friedman [1962] 2002). Practitioners in unlicensed markets are free to compete on all aspects of their occupations, but licensed workers must obey legal limitations on the universe of available tasks and the manner in which those tasks are performed.

Conclusion

There are three important aspects to closure theory. Closure is the erection of *boundaries* between groups that struggle for the *exclusion* of others in order to *monopolize resources*. In focusing on resource monopolization, theorists have neglected the first two, even though these can significantly influence the way closure operates.

The codification of boundaries can alter the structure of groups. First, the simple act of creating a boundary can have significant effects on who enters the group. I find no scarcity of supply, but this does not mean the same people are selecting into the occupation. In fact, the increase in supply, particularly among women and minorities, demonstrates this is not the case. This shift in group composition can have an impact on collective identity (Lamont and Molnár 2002) and group culture (Grusky and Galescu 2005). Second, the emphasis of licensing on rules of conduct may significantly alter the way practitioners interact with one another, customers, and the market. Third, because a license generally comes into existence as the result of collective lobbying action by members (Zhou 1993), and because the result is often a governing board made up primarily of members, licensure can alter the way the occupation manages itself.

The absence of a wage premium does not mean licensure has no effect. It is beyond the scope of this article to examine under what circumstances occupational licensure will produce change, but further research may illuminate how the effects of licensing reach into the nature and structure of work, tasks, and status, and may well shape the relationship between occupations, the selection of members, and the distribution of rewards. Taking these effects together, the simple conclusion is that closure is much more than a monopoly mechanism—it is transformative.

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Notes
1. For regulations governing real estate brokers in Ohio, see Ohio Revised Code, Title 47, Chapter 4735, Sections 1, 2, and 99, adopted October 1, 1953, available at http://codes.ohio.gov/orc/4735.

2. In this context, “consumers” includes anyone purchasing services directly from a practitioner *and* anyone acting as an employer of practitioners.

3. For the reservation of frog farming/breeding tasks in Missouri, see Missouri Code of State Regulation, Title 3, Division 10, Chapter 9, Section 353, adopted August 18, 1970, available at http://www.sos.mo.gov/cmsimages/adrules/csr/current/3csr/3c10-9.pdf.

4. This distinguishes licensure from other forms of occupational closure, such as voluntary certification, in which workers seek credentialing from state or private entities to improve their standing with prospective employers, but they are not required to obtain credentials simply to work (Friedman [1962] 2002). With credential-based closure, market norms discourage employers from hiring workers without the right background (Weeden 2002). For example, professors at four-year universities are not legally required to hold a license, but one rarely secures employment without completion of a doctorate. Other forms of closure derive from resources or a privileged position in the means of production (Murphy 1983). For chief executive officers, who are unlicensed and often own part or all of their businesses, resource requirements may act as a type of closure, keeping would-be participants out unless they can gather sufficient assets to start operating.

5. Such scarcity has been the subject of economic deliberation for more than two centuries. In *Wealth of Nations*, Smith ([1776] 1863: Book I, Chapter 10, Part 1, Paragraph 60) described the trend toward longer apprenticeship terms as a means of reducing supply into the occupation and thus inflating earnings for members.

6. For information on lawfully operating a nudist camp in Kentucky, see Kentucky Revised Statutes, Title XIX, Chapter 232, Section 21, adopted 1968, available at http://www.lrc.ky.gov/KRS/232-00/021.pdf.

7. The vector $\boldsymbol{W}'_{it}$ is equal to $\boldsymbol{X}'_{it}$ when modeling difference in wages, a subset of $\boldsymbol{X}'_{it}$ when modeling labor quality (measured as the educational attainment of individual workers in the occupation), and omitted when modeling labor supply (measured as a proportion of the state's total labor hours performed by workers in the occupation).

8. Exclusion of self-employed respondents may suppress the licensing effect if licensing provides differential rent opportunities beyond owning the means of production. Unfortunately, comparable wage data are not available in the CPS for self-employed respondents. To test for a counterfactual where self-employed workers differentially benefit from licensing, I conducted a robustness check by imputing wages for the self-employed. In an unlicensed environment, these wages are assumed to be the median for workers in that occupation-state-year cell; in a licensed environment, self-employment wages are imputed from the top 25th percentile of earners, making these respondents consistently high earners. Under this counterfactual specification, the licensing coefficient changes from .9906 to .9909, a small shift that does not alter the conclusions presented here. This is likely because self-employed workers make up such a small proportion of the total sample (7.93 percent of unlicensed workers and 5.64 percent of licensed workers).

9. The structure for the correction is,

$$D_{it} = \boldsymbol{\sigma}'_t \boldsymbol{V}'_{it} + \nu_{it} \qquad (6)$$

where $\nu_{it} \sim N(0,1)$ and $\text{corr}(\varepsilon_{it}, \nu_{it}) = \rho$; D_{it} is a dichotomous variable representing selection of individual *i,* at time *t,* into the current occupation in the current state; $\boldsymbol{V}'_{it}$ is a vector of observed individual-level variables that determine selection into an occupation (in this case, $\boldsymbol{V}'_{it}$ is a subset of $\boldsymbol{X}'_{it}$); and ν_{it} is an error term that represents systematic unobserved determinants of selection and completely random idiosyncratic determinants of selection. Again, the model is estimated separately for each year. The model assumes a bivariate normal distribution between the error terms, with a zero mean and a correlation ρ.

The predicted value (d_{it}) of the probit equations is transformed into a hazard rate using the equation: $\lambda(d_{it}) = \phi(d_{it}) + \Phi(d_{it})$. The hazard rate for each observation represents the instantaneous probability of being excluded from selection, conditioned on being in the pool at risk. When the hazard rate is included in the individual-level model, it captures the non-random and unobservable effects of selection on wage. For more information, see Morgan and Winship (2007:129–42).

10. For more information, see "Code Lists and Crosswalks" in the "Industry and Occupation" Section, U.S. Census Bureau, last accessed October 5, 2016, http://www.census.gov/people/io/methodology/; and "Crosswalks" National Crosswalk Service Center, last accessed October 5, 2016, http://www.xwalkcenter.org/index.php/classifications/crosswalks.

11. Exclusion of occupations with slippage issues does not alter the results.

12. Supplemental appendix material is available for download at WEBSITE. Licensure data are available for download at http://www.bethredbird.com.

13. Noise increases in the graph as the years since enactment increases, due to smaller sample sizes. This is because this portion of the analysis does not consider any license with an enactment date prior to 1971, because such dates are left-censored. Thus, the only respondents who might be able to show a time since enactment of 30 years are in years 2001 through 2012; the only respondents who might report 20 years are in 1991 through 2012; and so forth.

14. Licensure is commonly generated (Meyer 2008), externally legitimated (Finnemore 1996), infused with cultural meaning (Meyer 2008), and a major influence on actors through "coercive" legal action (DiMaggio and Powell 1983). As with other institutions, practices in the licensure framework "consist of easily identifiable roles, coupled

with collections of rules or conventions governing relations among the occupants of those roles" (Powell and DiMaggio 1991:8). Regulatory enactment moves occupations from a normative structure to a coercive legal structure (Powell 2007).

15. As Meyer (1977) notes, legitimation of the role of doctor did not simply result in others becoming non-doctor. Rather, they too experienced a role shift and became patients.

16. See Louisiana Annotated Statutes, Title 37, Chapter 18C, Section 1563, adopted 1999, available at http://legis.la.gov/lss/lss.asp?doc=93381.

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