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Analyzing the Influence of Occupational Licensing Duration on Labor Market Outcomes*

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Abstract

We analyze the labor market influence of the duration of occupational licensing statutes for eleven major universally licensed occupations in the U.S. Time from the start of state occupational licensing (i.e. licensing duration) may matter in influencing the labor market outcomes. States usually enact grandfather clauses and ratchet up requirements that protect existing workers, and increase costs to new entrants. In addition, adding to or raising the entry barriers are likely easier once an occupation is established in a political jurisdiction. We find that duration years of occupational licensure are positively associated with wages and hours worked, but negatively related to participation in the labor market. Consequently, unlike other labor market public policies, occupational licensing would likely influence labor market outcomes the longer it is in place.

Introduction

Occupational licensure is the legal process by which governments (mostly the states in the U.S., but also local governments and the Federal government) identify the legal qualifications required to become licensed to practice a trade or profession, after which only licensed practitioners are allowed by law to receive pay for doing the work in the occupation. This form of labor market regulation has rapidly become one of the most significant factors affecting labor markets in the United States and other industrialized countries. Over the past several decades, the share of U.S. workers holding an occupational license has grown sharply. Estimates suggest that over 1,100 occupations are regulated in at least one State, but fewer than 60 are regulated in all 50 States, showing substantial differences in which occupations States choose to regulate (U.S. Executive Office of the President, 2015) To illustrate funeral attendants are licensed in nine States and florists are licensed in only one State Estimates find that unlicensed workers earn 10 to 15 percent lower wages than licensed workers with similar levels of education, training, and experience (Kleiner, 2006, Kleiner and Krueger, 2013). More specifically, Kleiner and Krueger (2013) find that licensing at the State level confers a wage premium of around 17 percent, and the combination of State and either Federal or local licensing has an estimate effect of around 25 percent. Local licenses by themselves are not associated with higher wages, and certification has a smaller effect on wages (Gittleman, Klee and Kleiner, 2015).

Using other data and methods, the wage premium from licensing is more modest, and is sometimes estimated as zero. For example, Gittleman, Kleiner and Klee (2015) find that workers with a license earn around 8.4 percent higher wages on average controlling for detailed occupation, but that licensing also confers better employment opportunities and health and pension benefits. Moreover, being covered by a union contract provides better benefits than state licensing coverage (Gittleman and Kleiner, 2016). Unlike the minimum wage which requires all employers that are

covered by the law to pay the new wage immediately, occupational licensing allows individuals who are working in the occupation, but do not meet the current licensing requirements to continue working. This is called "grandfathering". In addition, the regulated occupation generally has the ability to ratchet up the requirements with minimal constraints from policy makers (Wheelan, 1999). Again, individuals who do not meet the current requirements are allowed to keep working with permission from the government. In our analysis we examine how time from initial licensure, which we call duration, influences key labor market outcomes such as wages, hours worked, and participation in the workforce.

In our examination of the influence of occupational licensing duration on the labor market we initially review the literature of other studies of duration effects and show that ours is the first comprehensive examination of the issue using more than one occupation. We also present evidence that goes beyond looking at wage determination to examine hours worked and participation in the regulated occupation. Consistent with other findings we show occupational licensing raises wages in the regulated occupations, and that the duration of state licenses also is associated with higher wages. In addition, we show that the duration of state licensing is associated with an increase in the yearly hours worked by those in the occupation of between 2 and 6 percent, but that participation in the occupation declines over time following the implementation of licensing suggesting some limiting of labor supply. These results are consistent with a monopoly model of regulation that results in gains to those in the occupation through higher wages and hours, but which may restrict new entry into the occupation.

Duration in the Labor Market for Licensed Occupations

The duration of occupational statutes has been identified in other studies as a factor that may raise wages (Timmons and Thorton and, 2008, Law and Marks , 2009). In both studies the

authors examined one occupation and focused on wage determination. Our study expands on these studies by examining 11 universally licensed occupations (i.e. licensed in all states), some of which have been regulated for over a 100 years and others that just became universally licensed during the past decade. The number of workers in these occupations represent the vast majority of universally licensed workers in the U.S. These occupations were chosen because the date of initial licensure was available with the resources available to us, or there were sufficient observations in the Census for statistical analysis. Also, the states that licensed these occupations regulated them at different times.

The role of different institutions on wage determination and labor market outcomes

A helpful analogy of the influence of institutions in the labor market can be drawn from unions. When unions first organize a firm or establishment the wage increases are generally small (Freeman and Kleiner, 1990, DiNardo and Lee, 2004, and Mas and Lee, 2012). However, cross-sectional estimates of the impact of unions is between 15 to 20 percent (Hirsch and Mcpherson, 2013). Estimates of the additional cost of having a union worker is approximately $ 40,500 over the course of that worker's employment with the firm (Mas and Lee, 2012). Moreover, unions appear to raise the wages and benefits in a robust manner the longer they are in an establishment (Freeman and Kleiner, 1990). We examine whether these outcomes are also the case for occupational licensing.

Unions may raise wages through collective bargaining and withholding their labor services through concerted activities to gain wages and benefits. On the other hand, occupational licensing could raise wages by choosing the right set of regulations to restrict supply and limit tasks of unlicensed workers, and enhance demand by signaling that they are providing a higher quality service (Friedman, 1962, Spence, 1973). In a manner similar to unions, the institutional mechanism

and design that occupational licensing uses also takes time to implement and the full effects may only reach fruition over several decades of enhancing these rules (Hurwicz, 1973).

Background on Grandfathering and Ratcheting Requirements

Initially, the influence of licensing duration on labor market outcomes was identified in an NBER Volume published in 1945 by Milton Friedman and Simon Kuznets (Friedman and Kuznets, 1945). They noted that the American Medical Association in 1911through the implementation of the Flexner Report ratcheted up requirements for becoming a doctor through tougher admissions requirements, length of education in medical school, and limiting the number of new openings for medical education (Beck, 2004). While increasing the requirements for graduation from medical school, and pushing for tougher licensing, the Flexner Report did not require currently working doctors to meet the same higher requirements, and this was the classic case of grandfathering (Beck, 2004). Friedman and Kuznets went on to examine the influence of the regulations more than twenty years later in the late 1930s, and they found that doctors were able to raise their wages by more than 17 percent more than dentists, who did not substantially change their requirements. This is an illustration of how an occupation can raise their wages that involved rents to those who were in the occupation and where the entry requirements to get into the occupation were raised for just new entrants.

More recent estimates of the influence of the length of licensing statutes on wage determination include results for massage therapists, nurses, lawyers, and barbers (Law and Marks, 2009, Pagliero, 2010, Timmons and Thornton, 2010. Timmons and Thornton 2013). The main results suggest that for specific occupations such as massage therapists and barbers, the length of time that a licensing statute has been in place enhances the earnings of these practitioners, but little evidence of the influence of duration was found for nurses. However, the estimates are limited to

these occupations over a relatively short time period. Our estimates expand upon and provide evidence beyond just wage determination of the effects of licensing duration on labor market outcomes.

Although not explicitly addressed, the process occurs by allowing current practitioners to avoid the explicit general and specific education requirements, internships, tests, and continuing education mandates assuming that they were in "good standing" prior to the new licensing laws. Also, it takes many years for the individuals who did not meet these requirements to leave the occupation or retire, and as a result, the educational quality of the new entrants is higher, and they dominate the members of the occupation only after many years. Moreover, the longer the occupation is licensed the greater the ability of the members of the occupation to lobby the legislature and licensing boards to ratchet up requirements for entry within the occupation for those who might enter from unregulated states or occupations. For example, accountants increased the years of university schooling from 4 to 5 years in the 1990s in order to attain a Certified Public Accountants (CPA) license (Carpenter and Stephenson, 2006). In addition, physical therapist raised their education requirements from a bachelor's degree in the 1990s to a doctor of physical therapy license by 2016 (Cai and Kleiner, 2015). In both cases the national professional association promoted these enhanced requirements or ratchetting up through the state boards of licensing or through the state legislature. Although the policies may have enhanced the educational quality of the new workers, they could have also reduced access to the occupation by practitioners and consumers and limited the supply of labor to the occupation.

A Licensing Model with Duration

The model uses a framework where the work of one occupation or individual cannot legally be done without the inputs of the other occupation. The focus of the model serves as a basis to

inform and develop hypotheses about the empirical work, rather than as a fully specified general equilibrium model of production of services under regulation. The model uses a modified standard production function:

$$Q_{pt} = HH = f(P(z),K)_t \quad (1)$$

$$Q_{nt} = HL = f(P(z), N(z),K)_t, \quad (2)$$

where Q_{pt} is the output produced by the licensed practitioner over time t, which we will refer to as "high-skilled services (*HH*)." Q_{nt} is the output produced by the unlicensed worker (NP) over time t, which we will refer to as "low-skilled services (*HL*)." $P(z)$ represents the licensed worker's labor, recognizing that output relies on their decision of personal input, and $N(z)$ represents the NP's labor, recognizing that output relies on their decision of personal input. K represents the quantities of capital inputs used in a service production function (Reinhardt, 1972).

By law, however, the technology needed for NPs to produce *HL* is tied to supervision of entry by the licensed practitioner by law. Nevertheless, within a profit function, the NP wage is tied to the decisions of the licensed practitioner to use the labor input and technology mix to the high-skilled provider, *HH*. Regulation acts as a shifter of both the supply and demand curves with long time lags for full implementation over time t due to grandfathering and ratcheting up of skills. For example, a licensed engineer or architect can restrict the work of an unlicensed interior designer reducing their earnings, hours worked, or the number of workers who may chose that occupation over time. Regulated practitioners, who are generally in control of the production of these services, can allocate relatively low-skilled work to unlicensed workers, while taking on higher-skilled and value-added services for themselves and thus increasing their hours worked and earnings, but still restricting the number of workers who may enter the occupation. These theoretical issues are empirical questions that the rest of the paper examines.

The Rationale for Grandfathering and Ratcheting

As noted in the literature review and theory background above, the time from the passage of occupational licensing laws may be important in analyzing regulation's influence on the labor market. One rationale is that states often enact "grandfather clauses" that protect existing workers by allowing them to practice following new regulations, even though they may not meet the current requirements, whereas new entrants must have higher entry standards than the existing members of the occupation. A model of grandfathering is presented by Shavell where he assumes that if the best standard in period 1 exceeds the level of risk that would be appropriate for the expected harm, and in this case grandfathering may be desirable. If in period 2 the known harm is below a threshold, grandfathering is optimal – parties who engaged in the activity in period 1 can maintain their period 1 level of risk in period 2– but parties who enter the activity in period 2 should take the new conventionally optimal precaution for the known harm, and they have certainty of the outcome in the second period (Shavell, 2007).

For the labor market, the process of older lesser trained workers leaving the workforce or moving to other occupations, and newer workers with higher entry requirements coming into the job takes many years or decades to work its way through the labor market resulting in higher wages. However, the process may limit the supply of labor in the long run by increasing entry and mobility requirements, and allow those in the occupation to gain economic benefits by limiting employment growth. In addition, occupations could also ratchet up the requirements for already licensed occupations. Therefore, licensing duration, the time from the implementation of occupational licensing legislation matters, because it may take years for the full effects of occupational licensing to be realized in the labor market, and for the analyst to observe these changes on wages, hours, and employment.

To illustrate these changes in Figure 3 we show the theoretical impact of grandfathering and ratcheting up requirements over three periods. The first period, when there is the initial implementation of licensing, the second is the time when unregulated workers retire or change jobs, and the third period when full implementation of the statute has occurred and there is a management of the optimal number of individuals who are allowed to work. A similar effect of regulation would occur when the occupation ratchets up the requirements for entry such as the increase in accounting or physical therapy with licensing going from four to five years or the addition of an advanced degree for licensure

The Empirical Model

In order to develop a model with a sufficient time line to analyze how duration may influence labor market outcomes, we use all available data from the Census and the American Community Survey (ACS) for years from 1950 to 2013 for a sixty three year time period to measure duration effects. We begin with 1940 since that was the first year data for individuals was available through the Census for income, employment and hours worked, and we are in the process of implementing these estimates. We restrict the sample to individuals who worked in eleven major universally licensed occupations which included more than 11 million workers which more than 10 percent of the U.S. workforce. One set of our controls were individuals who worked in occupations that were unlicensed during our period of analysis We limit our analysis to those occupations that have sufficient observations in the Census and were licensed in all states by the end of our period of analysis 2013. An illustration of the licensed occupations that are in our sample and the time line, are presented in Figure 1 during the period 1950 to 2013 (Meyer and Osborne, 2005). Finally, our sample includes individuals who were either in one of the major universally licensed occupations when they became regulated or an unlicensed occupations for the period. Our

analysis is limited because we can only include individuals who are coved by licensing statutes, but some may not have attained a license (Gittleman and Kleiner, 2016). Also, we cannot cover the same individuals over their career as in smaller data sets such as the National Longitudinal Survey of Youth (NLSY). However, we define individuals who worked in major licensed occupations as a treatment group after they received a license, and individuals who worked in all other unlicensed occupations or were unlicensed prior to their state passing a licensure exam as a comparison or control group[1].

Next, we include standard human capital variables from the Census and for more recent years the ACS, such as gender, age, education, and potential experience. In order to generate a reliable sample for our analysis, individuals whose education are "below 12th grade without a diploma" for dentists, lawyers, accountants, and pharmacists were dropped. In addition, individuals whose age is greater than 65 and whose years of potential experience are estimated to be below zero also were deleted.

Finally, hourly real earnings were determined by dividing the annual earnings by annual hours worked, measured by the 2013 Consumer Price Index (CPI). Annual hours worked were calculated by multiplying the usual working hours by the number of weeks for the past 12 months. We eliminated from the sample those with more than 60 hours of work in a week. In addition to these restrictions, the original sample was trimmed by excluding individuals with wages below the federal minimum wage level in that year. The resulting sample consists of 994,142,141 observations from 1950 to 2013 using the Census and the ACS sample. In Table one we show the

[1] We also estimate a propensity matching approach using the nearest neighbor method to implement further robustness checks of the estimates we provide in our analysis in the tables and find similar results.

means and standard deviations of the licensed and unlicensed workers in our sample with wage data adjusted by the 2013 consumer price index to standardize our results.

Implementing Descriptive and Causal Estimates

The following sections present both descriptive and causal estimates of our empirical models using initially a kernel estimation approach for a descriptive approach, and then using a difference in difference model causal model that takes into account the different times for each of the occupations in our model that initially became licensed in each of the 50 U.S. states over the time period of the analysis.

Nonparametric Kernel Estimation

In order to provide basic descriptive data for our analysis for new and older licensed occupations we developed a nonparametric kernel estimation procedure. The estimates for the effects of the occupational licensing duration on wage determination, the kernel estimation procedure is shown in Figure 2[2]. The estimates are a form of data smoothing. We try to visually inspect whether the longer duration of licensing exhibits wider variance in earnings in the distribution of earnings. The figure in the black line represent the wage distribution for the unlicensed workers, the pink one is the distribution for the licensed workers whose licensing duration are less than 10 years and the blue one is the distribution for the licensed workers whose licensing durations are more than 10 years. Our non-parametric Kernel estimation results suggests that it takes at least 10 years to fully realize the full economic effects of occupational licensing on wage determination.

[2] The kernel estimation procedure develops and uses an auto regressive approach to predict observed outcomes and is an atheoretical way to provide basic forecasts of observed phenomena.

Empirically Modeling Duration Effects

In order to more fully model the influence of occupational licensing on wage determination, hours worked, and participation in the labor market we use a basic difference in difference approach. Since each of the states implemented their new statute at different times, we are able to develop a background of causal inference for the influence of duration on labor market outcomes. We would expect the relationship to initially move slowly as both new more skilled workers enter, but less skilled grandfathered workers continue in the occupation. When grandfathered workers retire or leave the occupation, then wages would increase more rapidly. Further, when workers more fully control the supply of labor by ratcheting up requirements, this would also result in wages increasing. This hypothesized relationship between time of first licensure and wage determination over time is shown in Figure 4.

To causally link occupational licensing and labor market outcomes, we employ a difference in difference (DID) strategy using data on changes in state licensing requirements for the eleven occupations in our sample. Such changes affect the ability of someone to work in a licensed occupation in a particular state without needing to fulfill additional licensing requirements. For estimation purposes, our model would take the following general form:

$$Y_{is} = \beta_0 + \boldsymbol{\delta} D_{is} + X_{is}\beta + \eta_s + \alpha_t + \theta_k + \varepsilon_{is}$$

where Y_{is} is an indicator of a labor market outcome such as earnings, hours worked, or participation in the occupation, D_{is} is duration of an initial occupational licensing statute, and δ is the DID estimate of the effect of the change on difference in difference (DID) strategy using data on changes in state licensing requirements for the eleven occupations in our sample, X_{is} is individual characteristics (education level, male, race, potential experience), α_t include year fixed effects, μ_s include state fixed effects and θ_k to include the size of the occupation in the industry.

Such changes could affect the ability of someone to be able to work in a licensed in that state. We use the difference-in-difference (DID) strategy exploiting changes in state licensing laws and requirements over time in each of the tables presented in the rest of the paper. Our source of identification are the changers in states that adopted occupational licensing laws over time relative to the non-adopters, individuals who were licensed in the same occupation in comparison to those who did not achieve licensure, and any individual who was licensed relative to those who were not licensed, In order to focus just on changers we develop separate estimates for occupations that were licensed during the 1950 to 2013 period. However, we also present estimates of all 11 occupations in our sample many of whom were initially regulated prior to either 1940 or 1950. Moreover, since we do not assume a linear relationship between licensing adoption and their labor market effects, consequently we also present nonlinear estimates.

In Table 2 we show the influence of duration of the passage of a licensing statute and licensing on earnings using clustered standard errors. We show both a linear and quadratic specification in the table. In addition, we show in Panel A estimates using all the occupations in our sample. In panel B, we show estimates for just those occupations that changed their licensing status over the period of our analysis. Finally panel C shows estimates for those occupations that did not change their regulation status from 1940 or 1950 to 2013 as a basis of sensitivity analysis. In the first column we show the influence of the duration of the passage of a licensing law on wage determination with no occupation controls as a benchmark for our other specifications. The estimates suggest that for every 10 years that an occupation is licensed wages increase by a statistically significant 3 percent. Moreover, in column 4 becoming licensed raises earnings by almost 18 percent which is at the high range of estimates shown by Kleiner and Krueger (2010 and 2013). We estimate our models using two digit occupation controls, but we do not introduce more

detailed occupational controls because they would result in identification taking place largely through individuals who were in the occupation, but were not licensed in comparison those who were regulated and licensed. Since our objective is to examine the influence of the change in laws over various time periods, adding detailed occupation controls would not be an appropriate strategy for identification or for policy purposes. Our estimates across the three specifications or groups of occupations that were older regulated occupations versus those who were regulated more recently found relatively small differences across the three specifications as a robustness test of our estimates.

In Table 3 we present estimates of the influence of duration of occupational licensing on hours worked per year using clustered standard errors. Using a similar approach to the one shown in Table 2, we begin by estimating the influence of duration with no occupation controls and a simple linear relationship. We also show estimates of the three panels for all the occupations in our sample, the ones that experienced changes, and for those that did not experience any changes in licensing status during our period of data analysis. We find that duration is associated with increases in the hours of work. A simple linear interpretation of column one shows that for every 10 years an occupation is licensed it increases yearly hours of work by approximately 31 hours or almost 2 percent. When two digit occupation controls are introduced the number of hours worked per year is reduced to 9 hours per year when an occupation becomes licensed or about one percent. Also, the estimates of increasing the hours worked due to becoming licensed is more than 73 hours per year. The increase in hours worked per year could be due to greater demand for the licensed occupation because consumers perceive those services to be of higher quality or the reduction in the number of practitioners. As our theory suggests licensed workers also could be reallocating the work of unlicensed practitioners to themselves over time. Our estimates are consistent with the

substitution effect being dominant, because workers want to work more hours at a higher wage. Again, we show the influence of becoming licensed using the occupations that were regulated during our period of analysis and those who were licensed during earlier periods. To the extent that there is a growth in hours worked, it could be that there is a reduction in the number of practitioners, we turn our attention to these issues in Table 4 that focuses on labor market participation.

Perhaps one of the most speculated, but little researched areas of occupational licensing focuses on the role of the regulated institution on the labor supply of regulated practitioners. In table 4 we estimate the influence of the duration of an occupational license statute on the relative number of practitioners in the occupation in comparison to individuals in unregulated occupations, again using our three different ways of categorizing the occupations in our sample from all, changers and non-changers. Without occupation controls the participation effect is positive, but the coefficient is effectively zero. However the passage of a licensing statute is negative and having a licensing law reduces the relative number of practitioners by about 1 percent for every 10 years the occupation is licensed. Similarly, adding two digit occupation controls reduces participation by .1 percent for every ten years of licensing. The overall effect of licensing is to reduce the relative number of workers by about 8 percent for every 10 years the occupation is licensed. These declines in the number of workers may be the reason that wages go up and the number of hours worked by practitioners also increases as shown in Tables 2 and 3. Consistent with the theoretical section occupational licensing statutes can provide the basis for regulated practitioners reallocating work toward members in their own occupation, thus reducing the number of workers in the occupation. The result could be the higher observed pay.

In order to provide a further robustness check on the estimates shown in Tables 2 through 4, in Figure 5 we show the slope of the hourly wage curve before and after the change to licensure. Wages in the regulated occupations are relatively flat before the introduction of licensing, but increase slightly immediately following regulation, perhaps due to signaling, and then go down right after licensing perhaps as more new workers enter the occupation that have less experience. After about 10 years, hourly wages increase as duration of licensing grows, perhaps due to workers who were grandfathered leaving the occupation, and the ability of occupations to ratchet up the legal requirements for entry. The statistically significant different slopes of the wage lines before and after the change to licensure presented in Figure 5, and the similarities between the eleven universally licensed and never licensed group shown in Table 1 suggests that the difference in difference approach of identification has validity for our empirical model.

From a policy perspective, our estimates are consistent with the decision of the U.S. supreme court in holding that dentists were operating as monopolists in reallocating tasks to themselves when the State of North Carolina Board outlawed the work of "teeth whiteners" (North Carolina Board of Dentistry v. FTC, 2014). Our results suggest that occupational licensing works slowly over time as older less skilled workers retire or move to other occupations, and the state boards or legislatures that regulate the professions ratchets up the requirements for entry. Our ability to document these changes show how important labor market institutions work with deliberate speed to enhance the work and pay arrangements for their members (Kleiner, 2015).

Conclusions

Since new occupational licensing statutes takes time to fully implement, duration should matter in influencing labor market outcomes. For example, states often enact grandfather clauses

or ratchet up the requirements for entry that protect existing workers, and new entrants must have higher entry standards than those already in the occupation. The process of older lesser educated workers leaving, and newer workers with higher entry requirements coming into the occupation takes time to work its way through the labor market. Our results show that wages rise and hours worked per year increases, but that the relative number of workers in the occupation declines using data covering a sixty-three year period. The results of our study should allow policy analysts and makers to develop and implement more informed decisions on the rapidly growing labor market institution of occupational licensing.

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Figure 1

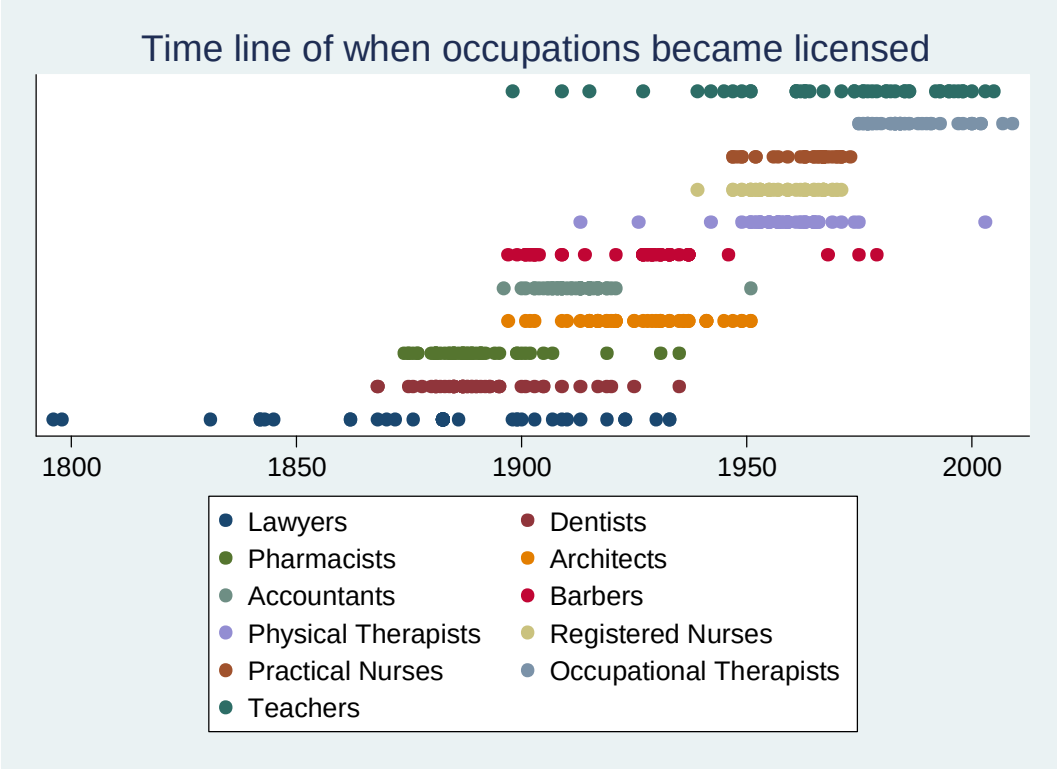

Time line of when occupations became licensed
1800
1850
1900
1950
2000
Lawyers
Pharmacists
Accountants
Physical Therapists
Practical Nurses
Teachers
Dentists
Architects
Barbers
Registered Nurses
Occupational Therapists

Figure 2

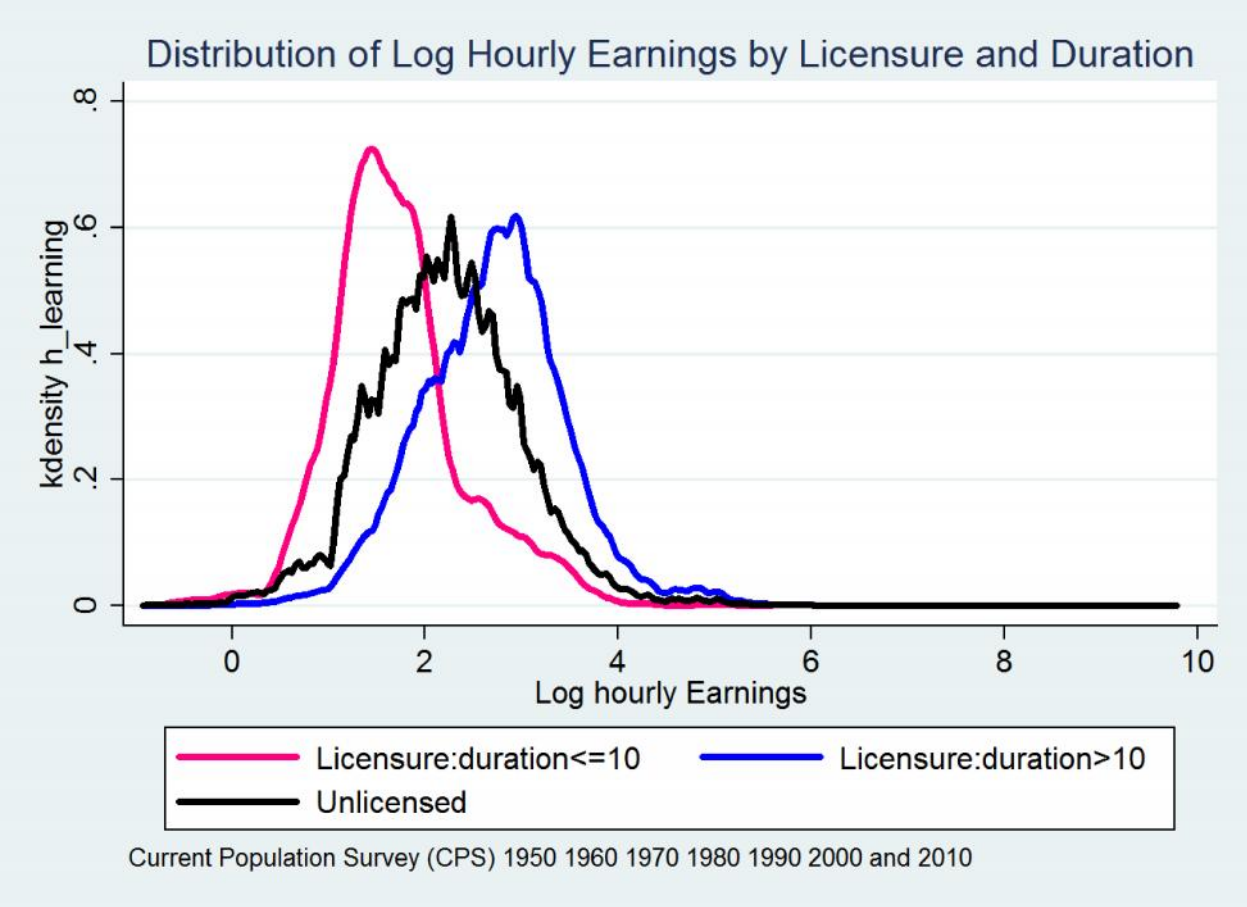

Distribution of Log Hourly Earnings by Licensure and Duration
kdensity h_learning
0
.2
.4
.6
.8
0
2
4
6
8
10
Log hourly Earnings
Licensure:duration<=10
Licensure:duration>10
Unlicensed
Current Population Survey (CPS) 1950 1960 1970 1980 1990 2000 and 2010

Figure 3 Illustration of the Effects of Grandfathering New Regulations

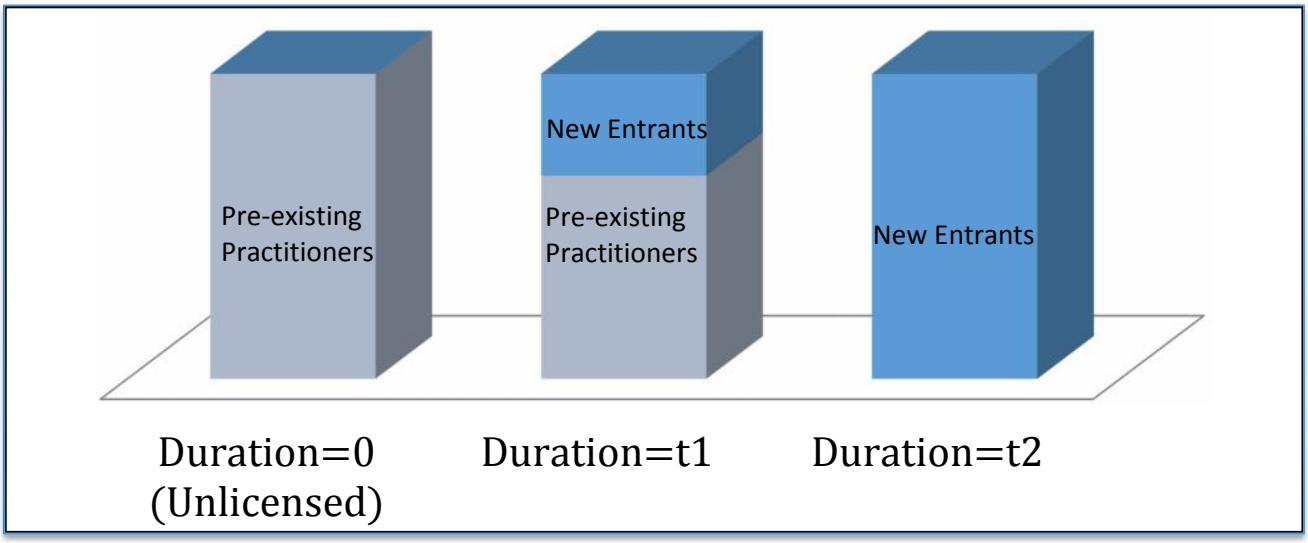


Figure 4: Hypothesized Functional Form of Relationship between Earnings and Duration of Licensing

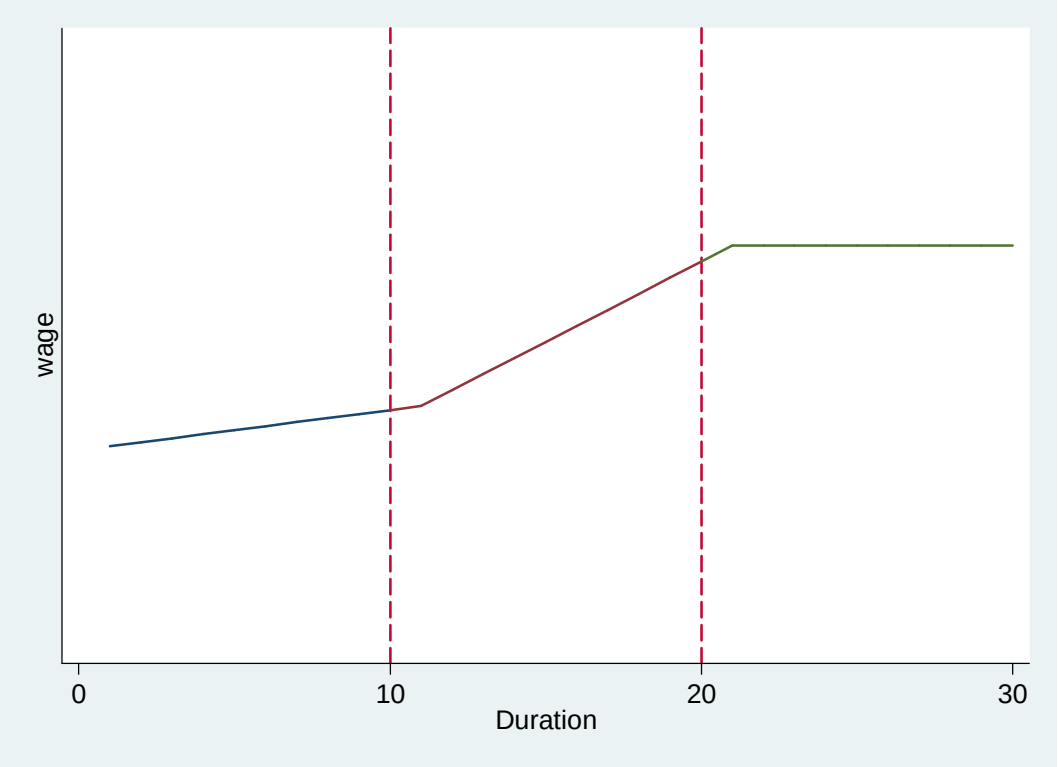
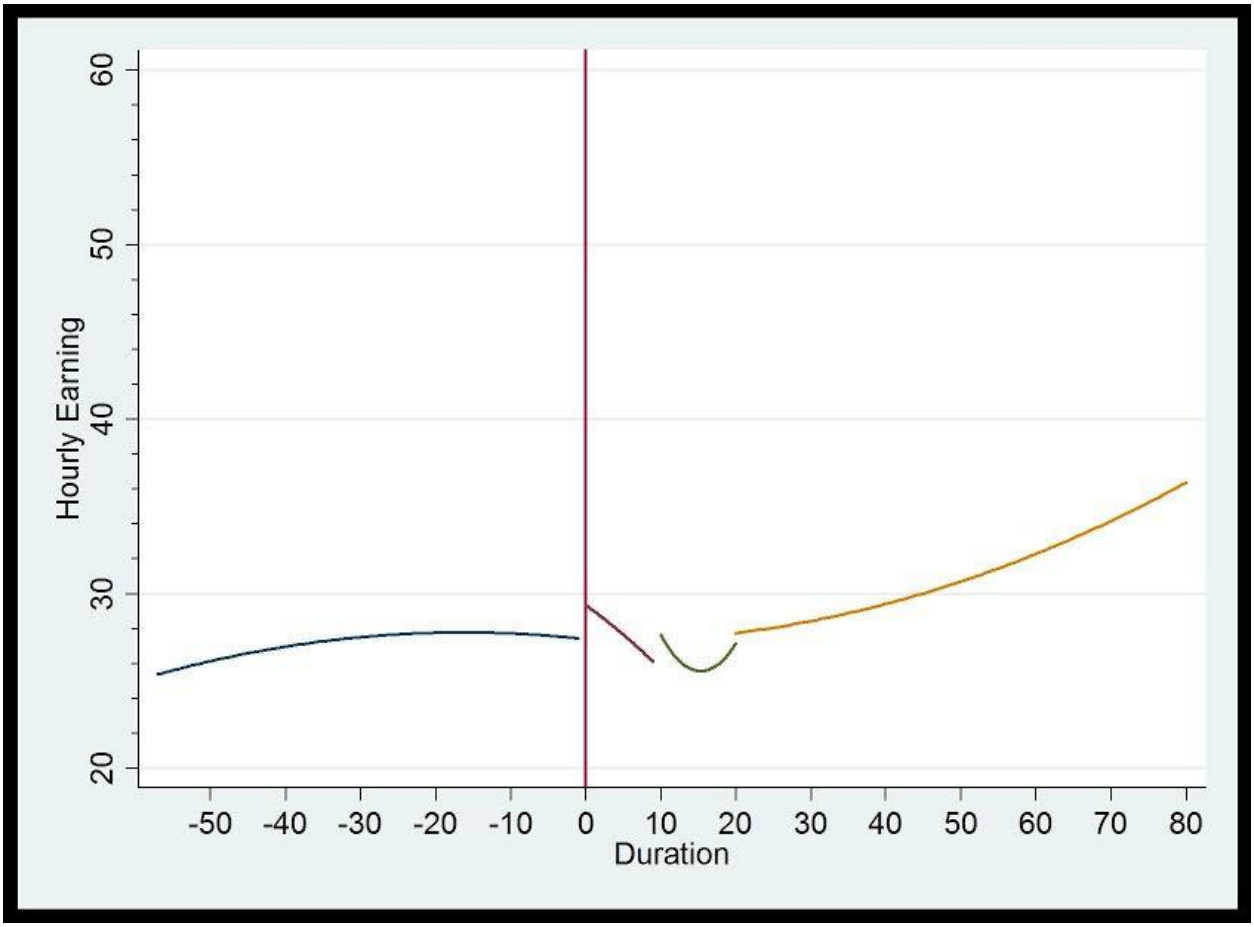


Figure 5. Estimated Slopes of Hourly Wages before and After the Implementation of Licensing Statues*



*Slopes of the lines are statistically different after the implementation of a licensing statute.

Table 1 Means and Standard deviation of Licensed and Nonlicensed occupations

VARIABLES	11 Universally Licensed Occupations	Never Licensed Occupations
Age	42.04 (11.34)	39.12 (12.57)
Male	0.30 (0.46)	0.49 (0.50)
White	0.83 (0.38)	0.79 (0.41)
Experience	19.92 (11.39)	19.97 (12.69)
Total Worked Weeks per year	46.65 (9. 78)	46.23 (11.80)
Average Worked Hours per week	40.77 (7.96)	39.84 (8.21)
Total Worked Hours per year	1,916.67 (569.08)	1,867.99 (636.66)
Log Hourly Earnings (2014 CPI)	3.37 (0.57)	2.96 (0.62)
licensure	0.94 (0.24)	0.00 (0.00)
Years of Duration	51.75 (36.90)	0.00 (0.00)
Industry Size (% of GDP)	4.04 (3.29)	6.20 (4.26)
N	151,742392	842,399,749

Table 2 Effects of Licensing Duration on Log Hourly Earnings

Panel A. All Occupations

VARIABLES	(1) Log Hourly Earnings	(2) Log Hourly Earnings	(3) Log Hourly Earnings	(4) Log Hourly Earnings	(5) Log Hourly Earnings	(6) Log Hourly Earnings
Duration	0.0030***	0.0035***		0.0021***	0.0016**	
	(0.000)	(0.000)		(0.000)	(0.001)	
Duration Squared		-0.0000**			0.0000	
		(0.000)			(0.000)	
licensure			0.1784***			0.0480*
			(0.000)			(0.0254)
Constant	0.8545***	0.8555***	0.8272***	0.8655***	0.8643***	0.8495***
	(0.0287)	(0.0290)	(0.0302)	(0.0286)	(0.0286)	(0.0288)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,453,630	14,453,630	14,453,630	14,453,630	14,453,630	14,453,630
R-squared	0.325	0.325	0.322	0.330	0.330	0.330

Panel B. Occupations that changed their regulation status

VARIABLES	(1) Log Hourly Earnings	(2) Log Hourly Earnings	(3) Log Hourly Earnings	(4) Log Hourly Earnings	(5) Log Hourly Earnings	(6) Log Hourly Earnings
Duration	0.0039***	0.0053***		0.0014***	0.0005	
	(0.000)	(0.001)		(0.000)	(0.001)	
Duration Squared		-0.0000			0.0000	
		(0.000)			(0.000)	
licensure			0.1463***			0.0363
			(0.010)			(0.025)
Constant	0.8938***	0.9061***	0.9131***	0.9108***	0.9064***	0.9168***
	(0.029)	(0.036)	(0.030)	(0.030)	(0.032)	(0.030)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,801,113	13,801,113	13,801,113	13,801,113	13,801,113	13,801,113
R-squared	0.303	0.303	0.302	0.306	0.306	0.306

Panel C. Occupations that did not change regulation status

VARIABLES	(1) Log Hourly Earnings	(2) Log Hourly Earnings	(3) Log Hourly Earnings	(4) Log Hourly Earnings	(5) Log Hourly Earnings	(6) Log Hourly Earnings
Duration	0.0027***	0.0013*		0.0014***	0.0039***	
	(0.000)	(0.001)		(0.000)	(0.001)	
Duration Squared		0.0000**			-0.0000**	
		(0.000)			(0.000)	
licensure			0.2565***			-0.1330***
			(0.005)			(0.036)
Constant	0.8224***	0.8243***	0.8079***	0.8336***	0.8346***	0.8308***
	(0.029)	(0.029)	(0.029)	(0.029)	(0.029)	(0.030)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,685,219	12,685,219	12,685,219	12,685,219	12,685,219	12,685,219
R-squared	0.323	0.323	0.322	0.325	0.325	0.325

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Effects of Licensing Duration on Total Worked Hours per year

Panel A. All Occupations

VARIABLES	(1) Total Worked Hours per year	(2) Total Worked Hours per year	(3) Total Worked Hours per year	(4) Total Worked Hours per year	(5) Total Worked Hours per year	(6) Total Worked Hours per year
Duration	0.3125***	-1.6734**		0.0897	0.9248**	
	(0.053)	(0.307)		(0.200)	(0.444)	
Duration Squared		0.0199***			-0.0069***	
		(0.003)			(0.002)	
licensure			-25.4616***			73.4839***
			(5.671)			(18.181)
Constant	755.7721***	752.0063***	730.0350***	747.0595***	748.8821***	752.7786***
	(23.451)	(23.797)	(23.639)	(25.037)	(25.049)	(24.626)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,453,630	14,453,630	14,453,630	14,453,630	14,453,630	14,453,630
R-squared	0.147	0.148	0.147	0.150	0.150	0.150

Panel B. Occupations that Changed their Regulation Status

VARIABLES	(1) Total Worked Hours per year	(2) Total Worked Hours per year	(3) Total Worked Hours per year	(4) Total Worked Hours per year	(5) Total Worked Hours per year	(6) Total Worked Hours per year
Duration	-1.4147***	-3.2553***		0.5858*	1.7950**	
	(0.110)	(0.608)		(0.347)	(0.678)	
Duration Squared		0.0345***			-0.0177**	
		(0.010)			(0.008)	
licensure			-72.3954***			76.2312***
			(8.935)			(17.756)
Constant	705.2900***	689.6890***	692.1555***	690.6337***	696.7370***	696.8075***
	(23.753)	(23.558)	(24.102)	(25.333)	(24.887)	(24.595)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,801,113	13,801,113	13,801,113	13,801,113	13,801,113	13,801,113
R-squared	0.147	0.148	0.148	0.148	0.148	0.148

Panel C. Occupations that did Not Change their Regulation Status

VARIABLES	(1) Total Worked Hours per year	(2) Total Worked Hours per year	(3) Total Worked Hours per year	(4) Total Worked Hours per year	(5) Total Worked Hours per year	(6) Total Worked Hours per year
Duration	0.6760***	0.8492***		-0.0491	0.1505	
	(0.049)	(0.207)		(0.141)	(0.497)	
Duration Squared		-0.0016			-0.0009	
		(0.002)			(0.002)	
licensure			69.7666***			-160.5182***
			(5.273)			(48.984)
Constant	730.0293***	729.8010***	728.0400***	730.2953***	730.3774***	730.3561***
	(25.379)	(25.402)	(25.121)	(25.605)	(25.595)	(25.695)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,685,219	12,685,219	12,685,219	12,685,219	12,685,219	12,685,219
R-squared	0.165	0.165	0.165	0.166	0.166	0.166

Table 4. Effects of Licensing Duration on Labor Market Participation

Panel A. All Occupations

VARIABLES	(1) Participation	(2) Participation	(3) Participation	(4) Participation	(5) Participation	(6) Participation
Duration	0.0001***	-0.0000		-0.0001***	-0.0001***	
	(0.000)	(0.000)		(0.000)	(0.000)	
Duration Squared		0.0000**			0.0000*	
		(0.000)			(0.000)	
licensure			-0.0004			-0.0082***
			(0.001)			(0.002)
Constant	0.8574***	0.8573***	0.8550***	0.8557***	0.8556***	0.8558***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,453,630	14,453,630	14,453,630	14,453,630	14,453,630	14,453,630
R-squared	0.029	0.029	0.029	0.029	0.029	0.029

Panel B. Occupations that Changed their Regulation Status

VARIABLES	(1) Participation	(2) Participation	(3) Participation	(4) Participation	(5) Participation	(6) Participation
Duration	-0.0000*	-0.0001		-0.0001***	-0.0002**	
	(0.000)	(0.000)		(0.000)	(0.000)	
Duration Squared		0.0000			0.0000	
		(0.000)			(0.000)	
licensure			-0.0042***			-0.0078***
			(0.001)			(0.002)
Constant	0.8361***	0.8351***	0.8350***	0.8364***	0.8359***	0.8356***
	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,801,113	13,801,113	13,801,113	13,801,113	13,801,113	13,801,113
R-squared	0.029	0.029	0.029	0.029	0.029	0.029

Panel C. Occupations that Did Not Change Their Regulation Status

VARIABLES	(1) Participation	(2) Participation	(3) Participation	(4) Participation	(5) Participation	(6) Participation
Duration	0.0001***	0.0002***		-0.0000	0.0001	
	(0.000)	(0.000)		(0.000)	(0.000)	
Duration Squared		-0.0000***			-0.0000	
		(0.000)			(0.000)	
licensure			0.0074***			-0.0081
			(0.000)			(0.005)
Constant	0.8497***	0.8495***	0.8497***	0.8493***	0.8493***	0.8493***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Industry Size	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SOC	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,685,219	12,685,219	12,685,219	12,685,219	12,685,219	12,685,219
R-squared	0.032	0.032	0.032	0.032	0.032	0.032