Stringency in Occupational Licensing:

Explanations and Effects

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1. Introduction

Occupational licensing is the practice of government establishing minimum qualifications and requiring registration for practitioners of a given occupation (Kleiner and Vorotnikov 2017). It is often presented as a form of human-capital quality control — a barrier to entry to exclude those who cannot meet a desired minimum skill level (Timmons and Mills 2018). A requirement's stringency is a measure of how difficult or resource-intensive it is to obtain licensure, based on factors including fees, minimum level of education, required apprenticeships, and waiting periods.

Occupational licensing is prevalent across the United States, impacting nearly 30 percent of all employees as of 2008 (Kleiner and Krueger 2013). Requirements are often directly set by, or set with the input of, a dedicated state board for each occupation. These boards contain a mixture of practitioners, other professionals, and laymen, and may exist independently within state governments or fall under the purview of a specific department.

Occupational licensing is also the subject of extensive literature and debate, dating back to Adam Smith's (1776) The Wealth of Nations, in which he is critical of its merits and its effects on the poor (Kleiner 2000). Much of the debate surrounds its stated purpose of raising the quality of services and protecting consumers. Many authors argue that it is instead industry interests that create and perpetuate these requirements to collect monopolistic rents in the form of higher wages by restricting supply (Friedman and Friedman 2002; Kleiner and Krueger 2010; Kleiner 2016; Timmons and Mills 2018).

The literature on occupational licensing almost universally finds that licensure increases wages for practitioners (Kleiner 2000; Kleiner and Krueger 2010; Timmons and Thornton 2010; Timmons and Thornton 2013; Kleiner and Vorotnikov 2017; Kleiner

2017). The breadth of evidence for supply restriction is narrower, but similarly almost universal (Adams et al. 2002; Timmons and Thornton 2010; Kleiner et al. 2016; Kleiner and Vorotnikov 2017; Kleiner 2017). There are, however, some studies which do not support these theories. Zapletal (2019) finds no significant effects of stringency on prices or, along with Thornton and Weintraub (1979), supply of practitioners.

This paper has a two-fold focus on both causes and the effects of stringency of occupational licensing requirements. First, I address the question of whether organizational and administrative characteristics of professional boards affect the stringency of requirements. In particular, does the membership composition of boards and the focus of the department under which they operate, if any, matter? Friedman and Friedman (2002) argues that professional boards create a perverse incentive by placing members of a profession in charge of the regulation of entry. This creates "direct economic interest … concerning admission requirements and the definition of standards…" (Gellhorn 1956, 106). Therefore, theory would predict that the greater the percentage of professionals on the board, the loftier the requirements the board produces. Another problem of incentives may also exist based on the department that oversees a given professional board, or lack thereof. A board with a departmental focus on public health may produce distinct and differentially-impactful standards than another with a focus on commerce, even within the same occupation. It may be easier for a health-focused board, compared to other boards, to impose more stringent requirements under the cover of its noble mission.

Second, I focus on the effects of stringency on practitioners within a licensed occupation. The most simple supply and demand model of the labor economy indicates that any additional barrier to entry excludes some producers from the market. Such would be the case for a more stringent licensure requirement, be it a higher licensing fee

or more examinations. Keeping some producers out of the market would, in turn, increase the equilibrium price. Does such a model hold in real-world conditions?

In order to answer these questions, I focus on the field of cosmetology. As with most occupations in the United States, it is regulated exclusively by states, leading to great variation in the requirements across the country. The characteristics which make cosmetology particularly ripe for study are universal licensing requirements and its variation in administration across states. This presents the opportunity to examine the effects of administration, for example, by a public health-focused agency compared to a commerce-focused agency, on a state-by-state basis. Composition of state cosmetology boards, which exist in all but one state, also varies significantly. Mississippi's board, for example, is entirely composed of cosmetologists; California's board has a majority of laypeople, and only statutorily requires a single practicing cosmetologist.[1]

As far as I am aware, no study to date has examined administrative and organizational characteristics of professional boards as determinants of regulatory hurdles. Economic and political theory, however, indicate that such an effect may exist as a result of perverse incentives. Research in other disciplines, such as Weiss and Piderit (1999) and Desmidt (2016), have found that government agency mission statements affect school and employee performance. Such findings support the hypothesis that differences in professional board administration may lead to differential outcomes. Furthermore, literature examining the effects of stringency on the labor market, particularly with a focus on practitioners themselves, is relatively sparse compared to more general studies of licensing.

[1] https://stable.nhall.co/2023_departments.xlsx

2. Background on Occupational Licensing Research and Practice

Occupational licensing, its motivations, and its effects are frequently studied by economists and other scholars alike. A common claim is that occupational licensing exists for consumer protection and quality improvement (Timmons and Mills 2018). The classical explanation is that it does so by restricting "incompetent and dishonest practitioners" from participating in the market (Gellhorn 1976). Several studies posit a more passive mechanism: that licensure acts as an important signal of quality where information is difficult to obtain, particularly with a shift towards service work in the United States (Arrow 1971; Leland 1979; Kleiner 2000; Timmons and Mills 2018). Under that framework, licensure is considered socially beneficial.

The primary effect of occupational licensing is an increase in the wages of practitioners. Studies almost universally find an increase in wages of 10 to 20% for licensed occupations compared to unlicensed occupations (Kleiner 2000; Kleiner and Krueger 2010; Timmons and Thornton 2010; Timmons and Thornton 2013; Kleiner and Vorotnikov 2017; Kleiner 2017). This wage premium is less than that caused by the presence of unions and varies with other factors. In occupations licensed in some areas but not others, the effect is smaller, approximately 5 to 8%, perhaps as a result of competition with unregulated practitioners. It also varies with time and industry (Kleiner 2017). Occupational licensing appears to also cause an increase in the price of services (Adams et al. 2002; Kleiner et al. 2016), though Zapletal (2019) fails to find evidence when using business-level data.

Many authors, including Smith (1776) and Friedman and Friedman (2002), argue that licensing exists as a structural barrier to exclude entrants from the market, and that those already in the occupation perpetuate it. This supply restriction is generally agreed to be the mechanism through which occupational licensing causes a wage and/or price

premium (Adams et al. 2002; Timmons and Thornton 2010; Kleiner et al. 2016; Kleiner and Vorotnikov 2017; Kleiner 2017), though Zapletal (2019) does not find evidence to support the supply restrictions theory. Redbird (2017), though unable to find evidence of income effects, concludes that any barrier to entry not only likely excludes some potential entrants, but has the possibility to change who entrants are even if net supply does not decrease. Kleiner (2000; 2017), Kleiner and Kreuger (2010), and Kleiner and Vorotnikov (2017) find that licensing has a tendency to accumulate premiums among already-high earners. Both of these major findings indicate disparate impacts of licensing requirements.

There is little evidence of an increase in service quality as a result of occupational licensing (Timmons and Thornton 2013; Kleiner et al. 2016) despite practitioners feeling more competent (Kleiner and Krueger 2010), implying that those excluded from the market are not necessarily the poorest quality practitioners. This undermines the previously discussed signaling theory.

The variation inherent to state-level regulation of occupations has been essential to previous studies. De-regulation studies by Pizzola and Tabarrok (2017) and Timmons and Thornton (2019) look at elimination of regulatory requirements in Colorado and Alabama, respectively. These studies find that licensing provides a wage premium of 11-12% and $1,000 annually (in 1983 dollars), respectively. Other studies look at inter-state variation in licensure requirements for a specific occupation. Blair and Chung (2019) finds that licensing leads to a 17-21% reduction in the supply of practitioners. Focusing on stringency, Kleiner (2017) finds a positive relationship between the stringency of requirements and the wage premiums of practitioners in an inter-state analysis. Zapletal (2019), in contrast, fails to find evidence of an effect of requirement

stringency on wages or per-capita number of practitioners, but does note some effects on instructors.

Findings on Cosmetology

Some studies of occupational licensing focus on the field of cosmetology specifically. Most notably, Adams et al. (2002) conducts a comprehensive analysis of the supply and demand effects of stringency in occupational licensing. The authors find that the more stringent the regulations, the higher the average price and the lower the quantity consumed of the service. This finding is in line with the general literature on occupational licensing. The authors do not, however, examine the effect on wages directly.

Adams et al. (2002) also proposes that, the more political power that cosmetologists hold in a state, the greater the rents they collect, using the required number of hours of training as a proxy for political power. While perhaps a reasonable indicator, there could be confounding factors between political power and the hours of training, like a state's attitude towards regulation in general. To eliminate the simultaneity bias this produces in the supply and demand model, the authors use instrumental variable regression (Adams et al. 2002). I propose that a more direct measure of the political power of practitioners may be the composition of the occupational board, as it is the boards who are in control of the regulations. As such, boards with a practitioner-majority may wield particular influence.

Findings on Boards, Mission Statements

Friedman and Friedman (2002) argues that the structure of professional boards inherently creates a perverse incentive. That is, the incentives of those who sit on the

board, especially practitioners, are misaligned with the mission or purpose of the board, which is ostensibly consumer protection. While the effect of board composition with respect to occupational licensing requirements is untested, studies find that board composition matters in the corporate environment. Kramer et al. (2006) finds that gender diversity in corporate boards brings different perspectives, expands topics of discussion, and improves examination of stakeholder issues. Diversity more broadly improves decision making (Rhode and Packel 2010). Thompson and Manu (2021) finds that the composition of expertise on a corporate board affects company policy like dividend payments. Board composition in the public sector may be equally important, especially when considering additional political factors. As Adams et al. (2002) notes, there exists an incentive for political actors to increase professional representation on these boards in order to secure votes from practitioners, who exist in nearly every city and town.

These misaligned incentives could be constrained or exacerbated by the organization under which professional boards sit. A study of mission statements in public agencies by Weiss and Piderit (1999) finds that mission statements of public schools varied and had significant effects on performance. Desmidt (2016) similarly finds that the perceived quality of a public agency mission statement and employee performance are positively correlated, but that adherence to that mission is subject to other institutional factors. These studies examine a single government department or type of department, but state cosmetology boards fall under several different departments based on state law. Therefore, the effects of mission statement on the regulations put forth by the professional boards may be even more exacerbated than previous research on the topic suggests.

I propose two competing hypotheses for the exacerbation: one relating to breadth, the other relating to cover. Take, for example, the cases of a board under a department of health and another under a general licensing department. The former, by nature of the department it is under, may be constrained in which regulations it can pass; that is, a board under a department with a clear mission--like protecting public health--may also be limited in its scope of action. A board under a broadly-focused department may not be restricted in the same manner. Therefore, a reasonable hypothesis could be that boards under broadly-focused departments will produce more stringent requirements. Conversely, a department with a clear mission statement may provide more political cover for its board. A board under a department of health may be able to pass more stringent licensing requirements under the mission of protecting public health. A board with a less clear mission, such as that under a general licensing department, may have more difficulty justifying regulations that seem onerous.

The Case of Massachusetts

Massachusetts has a peculiar variation in occupational licensing burdens for cosmetologists during the observed period. In the first "License to Work" report by the Institute for Justice, published in 2012, Massachusetts has the highest barrier for entry of any state for the field of cosmetology; at the time, it required an average of 963 calendar days worth of education and experience (Carpenter et al. 2012). In the second edition of the report, published five years later, Massachusetts' requirements remained the same (Carpenter et al. 2017). What makes Massachusetts unique is that, in the third and latest edition of the report, published in 2022, there was a significant decrease in the requirements. It now takes an average of just 233 calendar to fulfill the state cosmetology licensing requirements, tying Massachusetts with four other states for the

lowest barrier to entry (Knepper et al. 2022). This represents an extreme swing in the requirements not seen in any other state during the same time period,[2] and creates the opportunity to observe periods before and after significant change in regulations.

Through public records requests, I have identified the cause of this recent change. Prior to June 1, 2019, the state of Massachusetts employed a two-tier track of cosmetology licensing. "Operator - Type 2" was the entry level for practitioners. To obtain this title, an individual was required to complete "a course of at least six months, which course must have included 1000 hours of professional training in a cosmetology school approved by the Board," pass written and practice examinations, and pay several fees (BOARD 1994). Practitioners with this license were only permitted to practice cosmetology under the supervision of a "Hairdresser/Cosmetologist - Type 1." After two years of supervised practice, with an additional application and related fees, an operator could apply to be a licensed as a full cosmetologist (BOARD 1994). Effective June 1, 2019, the Massachusetts Board of Cosmetology revised its regulations, eliminating the different tiers (BOARD 2019). There is no longer a requirement of two years of supervised practice, meaning that one can become a fully licensed cosmetologist upon completion of the required coursework and examinations. This change may result in an increased number of licensed cosmetologists for two reasons: (1) practitioners who were previously in the two-year waiting period immediately becoming eligible for licensure, and (2) reduced barriers may incentivize new entrants. These effects form the basis for an event study, using a difference-in-differences analysis to compare Massachusetts to other, stable states.

[2] https://ij.org/report/license-to-work-3/ltw3-data/

3. Data and Methodology

For my analysis of professional board characteristics, I compile a data set consisting of total board size and the required minimum number of all professionals, non-cosmetologist professionals, cosmetologists, and members of the executive branch on the board for each state. I acquire these data either from the website of the state board of cosmetology, if available, or from online state statutes. Within this data set, I also record the department under which each board falls. I begin by explicitly writing the name of each department as I find on the website of the state board. Where such information is unavailable, I call or email each department to verify. I then create several categories of departments and group states together within them. Figure 1 visualizes the frequency of these classifications. For boards which are independent, I search the board's website for a clear mission statement or, if none is present, directly contact the board to inquire. I am able to obtain a mission for each independent board except Alabama. I then add a column coding those boards into specific groups based on their mission statement. For example, I categorize Kansas under health based on its mission statement of, "The mission of the Kansas Board of Cosmetology is to protect the health and safety of the consuming public by licensing qualified individuals and enforcing standards of practice."[3] Louisiana, however, has a broad mission statement which does not cleanly fit into a single category:

> To increase productivity and improve services; assure and increase the standards, as well as consistency and communications. To insure that all operating cosmetologists and facilities have the proper licenses and are operating under sanitary conditions. To insure that all students graduating from schools are qualified for licensure and have attained a basic level of education.[4]

[3] https://www.kansas.gov/kboc/
[4] http://www.lsbc.louisiana.gov/default.aspx

I categorize this under general licensing. Figure 2 visualizes these new classifications. All sources are present in the data set file.[5] Many mission statements are ambiguous or lend themselves to multiple categories. In these instances, I find it necessary to make judgment calls on which category best fits the statement. I discuss the implications of this uncertainty later.

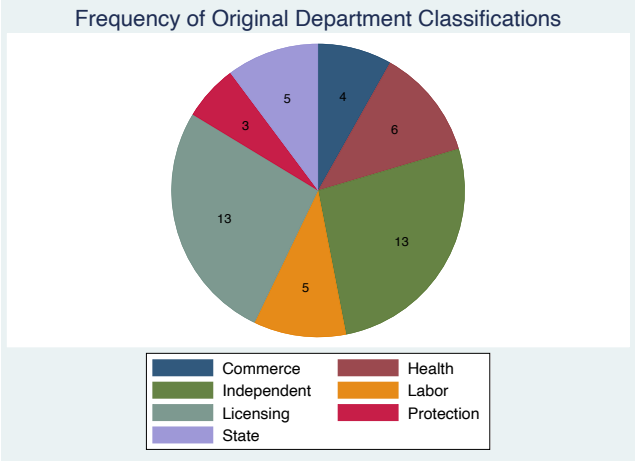

Figure 1. Original Classifications

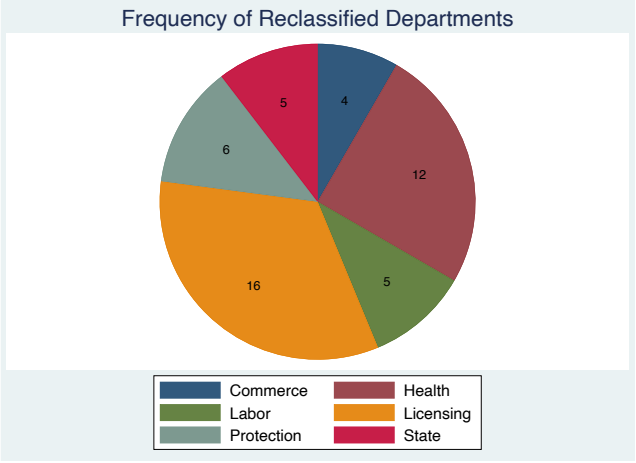

Figure 2. New Classifications

Control data for the regulatory board regressions comes from two federal sources. State regions are derived from the Bureau of Labor Statistics using the four primary regions of the country.[6] State-level cost of living data for 2021 is from the Federal Reserve Economic Data system.[7]

Data on the stringency of requirements is provided by the Institute for Justice, a libertarian, non-profit, public interest law firm.[8] In 2012, the Institute published a report titled "License to Work," with a focus on the burden of obtaining licensure in various occupations. It released updated versions of the report in 2017 and 2022. In order to

[5] https://stable.nhall.co/thesis/departments_2023.xlsx
[6] https://www.bls.gov/eag/home.htm
[7] https://fred.stlouisfed.org/release/tables?rid=249&eid=259515#snid=259560
[8] https://ij.org/about-us/

match control data, which is only available for 2021, the 2022 regulatory information is coded as 2021 in the effects of regulation regressions. The data set accompanies the 2022 report and contains data from each of the previous reports. Specifically, it includes information on the licensing fees, number of examinations, and a combined measure of burden represented by the number of calendar days, on average, to obtain licensure (Carpenter et al. 2012; Carpenter et al. 2017; Knepper et al. 2022).

Due to the Institute's self-identified political tilt, there is considerable political and monetary motivation behind its reports. Despite that, I find the data to be reliable. The Institute includes in each report a detailed methodology section. Of note, when there were multiple paths to licensure or multiple interpretations of the impact of a requirement, the report chose the least-burdensome interpretation, converse to its incentives (Carpenter et al. 2012; Carpenter et al. 2017; Knepper et al. 2022). Furthermore, Timmons and Mills (2018) uses "License to Work" data in its analysis of the effects of optician licensing requirements.

From these data, I generate several variables. In the regressions pertaining to the characteristics of the professional boards, fracCosmetologists represents the fraction of cosmetologists required by statute to be on the board. Similarly, fracProfessionals indicates the fraction of other professionals, excluding cosmetologists, required to be on the board. Such professionals may include practitioners of other occupations, like barbering, or operators of training schools. ratioCosPro represents the fraction of all professionals (including cosmetologists, unlike fracProfessionals) who are cosmetologists. strictlyCosmetology indicates whether or not a professional board is dedicated to only regulating cosmetology, or if it is inclusive of similar occupations, such as barbering, manicuring, and beauty services. Finally, occupationsRegulated

indicates the number of occupations for which a given state has some licensure requirement. I use this as a proxy for the regulatory propensity of a state.

The following figures visualize the primary variables of interest. Figure 3 shows the frequency distribution of licensing fees in 2022 across all 50 states and Washington, D.C. Licensing fees, ranging from 60 (Oklahoma) to 450 (Alaska), appear clustered at the lower end of the spectrum, with a long right tail. Figure 4 shows that the number of days to obtain licensure in 2022 is heavily concentrated around the mean and median (342.4 and 350.0 days, respectively), with relatively few states falling below or above that bin.

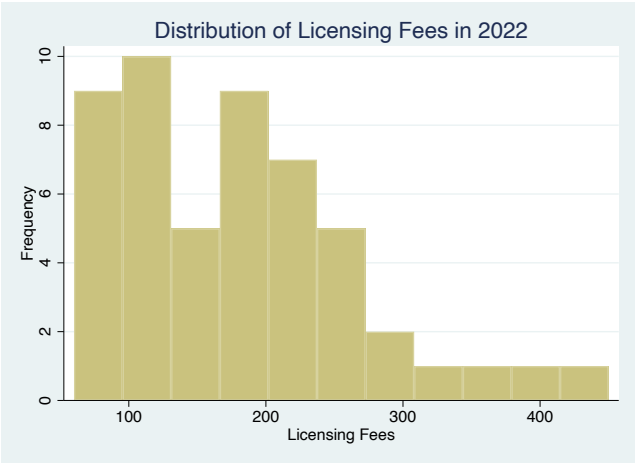

Figure 3. Licensing Fees

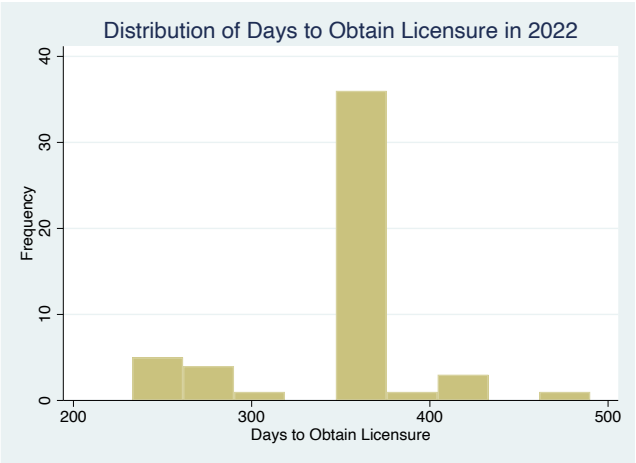

Figure 4. Days to Obtain Licensure

Figures 5 and 6 visualize the frequency distribution of the fraction of cosmetologists and professionals (excluding cosmetologists) on professional boards, respectively. As Figure 5 shows, there are several boards in which licensed cosmetologists constitute a majority; relatively more often, non-cosmetologist professionals constitute a majority. The significant variety across states allows

investigation of the effect of different board compositions on regulatory and occupational outcomes.

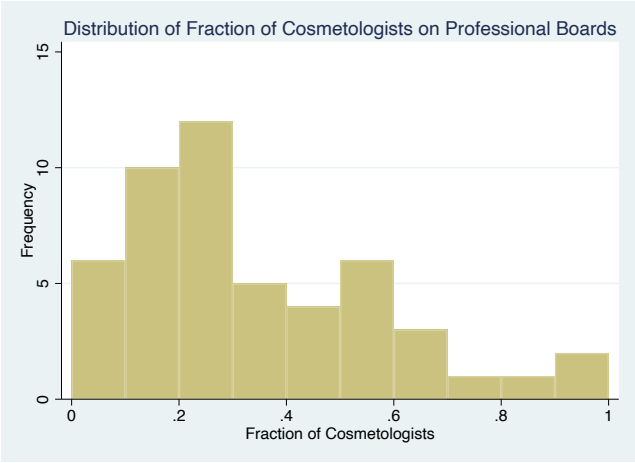

Figure 5. Fraction of Cosmetologists

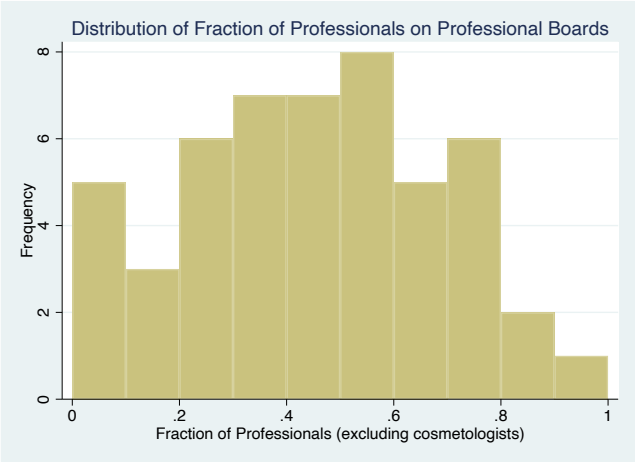

Figure 6. Fraction of Professionals

For my analysis of the effects of stringency on practitioners, I rely on data from several federal agencies. The Bureau of Labor Statistics provides annual occupation-specific data, including wages, per mille number of practitioners, and relative number of practitioners in a given area. This data is at the Metropolitan Statistical Area (MSA) level, as defined by the Census Bureau. It is available for the years 2012,[9] 2017,[10] and 2021.[11] 2022 data is unavailable as of the writing of this paper. As such, I rely on data from the previous year. Data on the cost of living for each MSA is provided by the Federal Financial Institutions Examination Counsel, based on census data. It covers the same years as the occupational data: 2012,[12] 2017,[13] and 2021.[14] Demographic data is

[9] https://www.bls.gov/oes/special-requests/oesm12ma.zip
[10] https://www.bls.gov/oes/special-requests/oesm17ma.zip
[11] https://www.bls.gov/oes/special-requests/oesm21ma.zip
[12] https://www.ffiec.gov/Census/Census_Flat_Files/Census2012.zip
[13] https://www.ffiec.gov/Census/Census_Flat_Files/CENSUS2017.zip
[14] https://www.ffiec.gov/Census/Census_Flat_Files/Census2021.zip

derived from the University of Minnesota's Integrated Public Use Microdata Series.[15] I aggregate individual level data on race, sex, and age to the MSA level, using the provided survey weights, for the aforementioned years.[16]

Panel data for the effects of stringency analysis is at the MSA level. In this case, however, treatment or policy change is at the state level. Therefore, standard errors are clustered at the state level, rather than the MSA level. Furthermore, some MSAs span multiple states, which have different stringency in requirements. In order to test the robustness of results, I run each regression twice: first with all available MSAs and then with only MSAs located wholly within a single state.

4. Results and Discussion

Professional Board Composition and Stringency of Occupational Licensing Requirements

First, I examine the effect of the composition of professional boards on the stringency of occupational licensing requirements. The results of each model in Table 1 show no effect of the composition of a board's membership on the number of days required to obtain cosmetology licensure. Of particular note, the fraction of practicing cosmetologists on a board has no impact on the number of days to obtain licensure. This finding is surprising because, as previously discussed, those already in the industry have a direct economic incentive to exclude new entrants. Despite this incentive, however, it does not appear that professionals on the board act in this manner, at least successfully. Since these data only track the actual regulations in effect, it is possible that the practitioners are simply unable to act upon their incentive. On the average

[15] Steven Ruggles, Sarah Flood, Matthew Sobek, Danika Brockman, Grace Cooper, Stephanie Richards, and Megan Schouweiler. IPUMS USA: Version 13.0 [dataset]. *Minneapolis, MN: IPUMS*, 2023. https://doi.org/10.18128/D010.V13.0

[16] https://stable.nhall.co/thesis/demographic_data.xlsx

board, only one-third of its members are required to be cosmetologists, with the median value of 29% of the board. In models 2 and 3, boards which exclusively regulate cosmetology, as opposed to other occupations like barbering and nail care, require fewer days to obtain licensure than their multi-occupation counterparts. These results are statistically significant ($p < 0.05$ and $p < 0.10$, respectively). This, too, runs counter to economic theory. When regulating only their own profession, cosmetologists would be expected to have the greatest influence on the regulations produced.

Days to Obtain Licensure	Model 1 b/se	Model 2 b/se	Model 3 b/se
fracCosmetologists	-22.566	-91.272	-80.022
	(73.558)	(76.202)	(84.602)
fracProfessionals	-63.774	-37.711	-19.015
	(99.329)	(95.727)	(90.714)
ratioCosPro	-2.048	122.452	90.461
	(122.71)	(128.199)	(125.13)
strictlyCosmetology		-52.062**	-36.366*
		(24.272)	(19.13)
occupationsRegulated		.525	.733
		(.448)	(.483)
boardsize		-1.771	-2.042
		(2.706)	(2.822)
NORTHEAST			-85.843***
			(21.351)
SOUTH			-31.96*
			(18.761)
WEST			-28.459
			(22.726)
_cons	379.59***	335.032***	356.137***
	(79.423)	(75.232)	(65.123)
Observations	50	50	50
R-squared	.05	.154	.408

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 1. Effect of Professional Board Composition on Days to Obtain Licensure

Next, I focus on the effect of board composition on licensing fees. Table 2 summarizes the results. As with the number of days to obtain licensure, I find no effect of the composition of the board on licensing fees. This finding is surprising for the same reason as above; licensing fees are a method of excluding new entrants, which those on the board have incentive to do. There are several potential explanations. First, levying extraordinary licensing fees may be infeasible. If the licensing fees for one occupation are significantly higher than another, it may draw attention to the perverse incentives of the board. Alternatively, the lack of relationship between the fraction of cosmetologists on a board and licensing fees could be due to benevolence or inability to act upon the economic incentive.

To test the question of benevolence or inability to act, I re-run the regressions for the number of days to obtain licensure and the licensing fees only for states where cosmetologists were a majority of the board. This decreases the sample size from 50 states to 13. In theory, on these boards, the cosmetologists are able to implement regulations as they see fit. However, these new regressions yield results largely the same as with the full sample of states. In no model was the fraction of cosmetologists, nor any of the other variables of interest, statistically significant. Given the small sample size, this finding is not conclusive, but does lend credence to board members not acting upon their incentive to exclude new entrants.

Licensing Fees	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
fracCosmetologists	127.125	173.4	201.778	212.707
	(155.845)	(175.53)	(199.667)	(207.615)
fracProfessionals	2.085	-34.61	-15.861	-21.932
	(115.957)	(142.044)	(160.583)	(166.834)
ratioCosPro	-155.655	-294.874	-289.237	-298.996
	(162.845)	(217.912)	(258.738)	(270.974)
strictlyCosmetology		53.535	57.577	56.53
		(54.691)	(60.296)	(61.524)
occupationsRegulated		-.18	-.343	-.362
		(.945)	(.951)	(.959)
boardsize		-6.495	-4.799	-5.081
		(5.028)	(5.294)	(5.456)
NORTHEAST			-17.214	-19.991
			(45.934)	(47.005)
SOUTH			-8.394	-5.487
			(37.157)	(39.016)
WEST			22.298	20.96
			(47.942)	(48.293)
cost_of_living				0
				(.001)
_cons	201.454**	315.663**	288.709*	265.323
	(81.766)	(139.248)	(162.999)	(177.938)
Observations	50	50	50	50
R-squared	.042	.1	.119	.121

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 2. Effect of Professional Board Composition on Licensing Fees

Professional Board Department and Stringency of Occupational Licensing Requirements

Next, I focus on the effect of department under which a given board falls on the stringency of occupational licensing requirements. First, I examine the effect of department on the days to obtain licensure using two alternative specifications of department. In the first specification, all state boards were considered relevant except

for Maine, which abolished its cosmetology board, and New Jersey, which was the only state in which the cosmetology board fell under the Office of the Attorney General. These states represented observations that did not fit into the relevant classifications, and therefore were excluded from all subsequent regressions. In the second specification, I also exclude any board which is independent of other government departments. As a classification, independent boards may not be homogenous. That is, they may vary significantly in terms of mission and other unobserved factors which unify boards under specific departments. For robustness, I exclude these boards in specification two.[17]

Table 3 shows these results, with health-focused departments as the base of comparison. There is no evidence in any of the models, across both specifications, that

[17] As discussed in the data and methodology section, I also reclassify independent boards into commerce, labor, licensing, protection, health, or state in accordance with their mission statement as an alternative specification to excluding them. In these regressions, Maine and New Jersey are still excluded, as is Alabama due to a lack of data on its mission. These regressions demonstrate no effect of professional board department on the days to obtain licensure. When examining the effect of department on licensing fees, commerce and licensing-based boards appear to have higher fees than health-based boards. However, these effects are only weakly significant ($p < 0.10$) relative to the other specifications. I believe that these findings are the result of the procedure for reclassification. As previously discussed, the mission statement of a given board did not always cleanly align with a department classification; more often than not, it included key words that related to multiple classifications. Therefore, these estimates may be subject to errors-in-variables bias. Alternatively, it may be the case that coding by mission statement does not accurately replicate the purpose ascribed to a board by its statutory organization within a state government. This theory conflicts with Weiss and Piderit (1999), which finds mission statements to have significant effects on outcomes in public schools. See appendix for regression output.

the department of a professional board impacts how long it takes to obtain licensure. Joint tests of significance on the included department codes yielded p-values in excess of 0.10 in each of the models.

These results contrast with my hypothesis that different departments may be more or less inclined to stringent regulation, or differentially able to implement such restrictions. In particular, I hypothesized that a board in a health-based department may produce more stringent requirements than a board in a general licensing department because of the public-relations cover provided by a public health mission; alternatively, the licensing department may produce more stringent requirements because it has greater flexibility in what requirements it may set -- breadth -- compared to a board that is limited to a public health focus. These results do not support either hypothesis, or the general effect of department on the days to obtain licensure.

Next, using the same two specifications, I examine the effect of professional board department on licensing fees. As before, I use health-based departments as a base of comparison for other departments. Table 4 shows the results. In the first specification, independent, licensing, and commerce-based departments have higher licensing fees compared to health-based departments by approximately $150, $87, and $107, respectively. The estimated effects of these departments are relatively stable across different models and included control variables, remaining statistically significant ($p < 0.05$) in each case. Joint tests of significance on these significant department classifications yielded p-values below 0.05 in each model. Tests of equivalence between commerce, independent, and licensing failed to demonstrate that any of these classifications are significantly different ($p < 0.05$). These findings are in line with the aforementioned hypothesis; health-focused departments produce differentially lower fees in comparison to other, more generally focused departments.

	Specification 1		Specification 2	
Days to Obtain Licensure	Model 1	Model 2	Model 3	Model 4
	b/se	b/se	b/se	b/se
commerce	-8.658	-8.713	-1.161	-3.178
	(38.358)	(39.623)	(40.531)	(43.385)
independent	-11.413	-11.361		
	(37.433)	(37.32)		
labor	-24.555	-24.704	-12.212	-16.712
	(40.35)	(42.796)	(48.179)	(53.145)
licensing	-23.474	-23.572	-14.96	-18.17
	(37.995)	(39.804)	(40.493)	(44.443)
protection	-32.766	-32.841	-19.911	-22.021
	(72.969)	(74.186)	(83.38)	(86.093)
state	-27.852	-27.857	-12.838	-13.899
	(38.372)	(38.945)	(48.585)	(50.448)
occupationsRegulated	.496	.495	.837	.757
	(.625)	(.639)	(1.009)	(1.067)
NORTHEAST	-85.795**	-85.89**	-99.937**	-103.05***
	(32.025)	(32.546)	(36.942)	(36.625)
SOUTH	-28.697	-28.576	-50.343	-48.357
	(22.315)	(22.604)	(33.249)	(34.102)
WEST	-20.524	-20.541	-40.316	-41.064
	(24.072)	(24.211)	(36.431)	(37.389)
strictlyCosmetology	-2.973	-2.907	-5.273	-4.204
	(14.811)	(15.453)	(22.121)	(22.195)
cost_of_living		0		0
		(.001)		(.001)
_cons	362.063***	361.044***	350.253***	329.676***
	(47.381)	(50.392)	(63.908)	(64.696)
Observations	49	49	36	36
R-squared	.369	.369	.395	.399

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 3. Effect of Professional Board Department on Days to Obtain Licensure

The second specification in Table 4 shows similar results when independent boards are excluded. Commerce and licensing boards demonstrate significantly ($p < 0.05$) higher licensing fees compared to boards under health-based departments by approximately $143 and $100, respectively. The effects are of the same direction and similar in magnitude to the results in the first specification. The effects of professional board department on licensing fees are therefore robust to different specifications. Consistently, health-based boards feature lower fees relative to commerce- and licensing-based boards to a statistically significant degree. This supports my breadth hypothesis of stringency in occupational licensing. More broadly-focused departments appear to implement more stringent licensing fees compared to relatively more narrowly-tailored health-based departments.

	Specification 1		Specification 2	
Licensing Fees	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
commerce	151.518**	150.767**	143.236**	143.203**
	(61.779)	(62.118)	(64.82)	(65.464)
independent	86.847***	87.571**		
	(31.811)	(33.626)		
labor	62.655	60.605	52.948	52.875
	(41.399)	(43.074)	(49.911)	(50.969)
licensing	108.215***	106.867***	99.921**	99.869**
	(35.832)	(36.937)	(44.292)	(45.701)
protection	29.325	28.299	20.197	20.163
	(50.039)	(51.759)	(56.279)	(57.591)
state	87.26	87.198	76.246	76.228
	(60.031)	(60.86)	(67.067)	(68.006)
occupationsRegulated	.164	.149	-.272	-.274
	(.956)	(.959)	(1.388)	(1.397)
NORTHEAST	18.723	17.421	22.088	22.037
	(37.706)	(38.723)	(43.134)	(45.032)
SOUTH	-8.966	-7.297	-3.754	-3.722
	(36.088)	(37.306)	(47.43)	(48.189)
WEST	32.901	32.664	45.2	45.188
	(37.905)	(38.565)	(54.166)	(55.259)
strictlyCosmetology	2.131	3.036	-.82	-.803
	(41.006)	(41.153)	(54.983)	(55.637)
cost_of_living		0		0
		(.001)		(.001)
_cons	80.351	66.325	106.254	105.917
	(66.618)	(109.727)	(95.627)	(121.599)
Observations	49	49	36	36
R-squared	.229	.229	.275	.275

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 4. Effect of Professional Board Department on Licensing Fees

Effect of Stringency of Licensing Requirements on Wages

Within the occupational data from the Bureau of Labor Statistics, there are two key measures of wages: mean annual wage and median annual wage. I use panel

regressions across three years of regulatory and occupational data (2012, 2017, and 2021) to examine the effects of stringency of licensing requirements on wages. The results in Table 5 demonstrate the effect of three measures of stringency of licensing requirements, days to obtain licensure, fees, and the number of exams, on the mean and median annual wage. In model 1, I examine the effect of the measures of stringency of licensing requirements on mean annual wage using only time- and MSA-fixed effects. In model 2, I then add in various MSA-level demographics which may be relevant to wages (fraction of residents who are male and white, and the average age). In both models, the effect of the days to obtain licensure are statistically significant ($p < 0.05$) and positive, indicating that, as the days to obtain a license increases, so too does the mean annual wage. This effect is consistent with my hypothesis. With greater barriers to entry, such as days to obtain licensure, theory implies that some potential practitioners will be excluded and therefore practitioners in the occupation can extract greater rents.

I estimated the coefficient of days to obtain licensure in model 2 to be 18.705, meaning that the average mean annual wage increases by $18.71 for every additional day required to obtain licensure. In this data set, the number of days required to obtain licensure ranges from 233 to 602, a span of 369 days, with first and third quartiles of 350 and 362, respectively. Therefore, this effect translates to a nearly $7,000 difference in mean annual wages at the extremes, and a more modest difference of approximately $225 for the interquartile range. Given the number of practitioners in the industry, and the average mean annual wage of $28,832 across all MSAs in the dataset, this effect has large economic and personal implications.

	Mean Annual Wage		Median Annual Wage	
	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
daysToLicensure	19.529**	18.705**	8.329	8.729
	(9.196)	(8.985)	(6.607)	(6.875)
licensingFees	.743	.985	1.916	2.218
	(7.386)	(7.262)	(7.226)	(7.147)
exams2	-1818.939	-2018.457	104.317	101.087
	(1698.45)	(1811.429)	(1294.955)	(1384.15)
exams3	-2311.228	-2449.559	-32.958	-41.964
	(1932)	(2069.322)	(1531.266)	(1640.651)
cost_of_living	.111**	.111*	.081*	.073
	(.055)	(.057)	(.048)	(.046)
2017	2370.92***	2500.721***	1744.596***	1977.561***
	(620.356)	(705.243)	(518.038)	(524.439)
2021	7368.585***	7615.04***	5687.215***	6019.228***
	(954.131)	(928.48)	(945.536)	(791.078)
fracWhite		6691.697		-34.251
		(6636.182)		(6135.599)
fracMale		20177.052		55009.867
		(43107.582)		(33363.282)
avgAge		-112.645 (421.885)		-245.408 (360.756)
_cons	12780.133**	2121.304	13497.988***	-3971.894
	(5922.826)	(27296.105)	(4433.898)	(22612.657)
Observations	601	601	601	601
R-squared	.636	.637	.581	.584

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 5. Effects of Stringency in Occupational Licensing on Wages

In contrast to the findings for mean annual wage, Table 5 shows that the days to obtain licensure do not have a significant effect on the median annual wage. This implies that the days to obtain licensure differentially effects the mean and median annual wages. Figure 7 visualizes the distribution of mean and median annual wages across MSAs. Mean annual wages appear more dispersed and skew rightwards, while

median wages are concentrated largely at the lower end of the range. The average mean and median annual wages in this data set are $28,832.00 and $24,730.70, respectively. Therefore, mean annual wage is both greater than the median annual wage on average, and has greater variance (primarily in the positive direction). The implication of the effect of time to licensure only being positive and statistically significant for mean annual wage is that it raises wages at the upper end of the spectrum, which would have little effect on the median annual wage. Previous studies have found that occupational licensing requirements tend to accumulate wage rents among already-high earners (Kleiner 2000; Kleiner 2017; Kleiner and Kreuger 2010; Kleiner and Vorotnikov 2017). These results appear to support that finding.

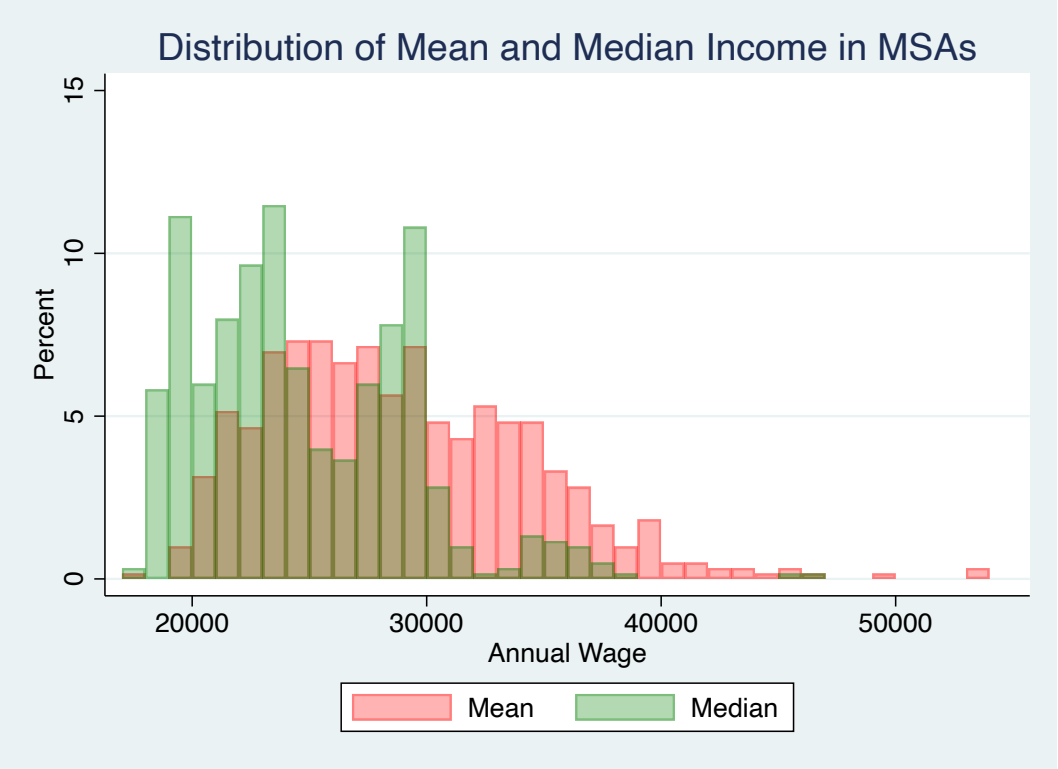

Figure 7. Distribution of Mean and Median Annual Wages

For both mean annual wage and median annual wage, the licensing fees and number of exams do not have statistically significant effects, as Table 5 shows.

Using all available MSAs, however, poses an issue for attribution: some MSAs span multiple states, which will have different requirements to obtain licensure. The previous regressions use the primary state of the MSA, as defined by the Census Bureau. However, I find it necessary to test the robustness of results by re-running all regressions for only MSAs which are wholly within a single state. Table 6 demonstrates that, when examining single-state MSAs, the effect of time to licensure on mean annual wage disappears; there remains no effect of time to licensure on median annual wage. As such, it appears that the significant results in Table 5 may be the result of unaccounted-for, differential requirements within a single MSA.

To further test the robustness of the effects found in Table 5, I conduct falsification tests using occupational data for two other occupations: preschool teachers and pharmacy technicians. Both occupations are broadly regulated, as with cosmetology, but vary in the degree of burden. Preschool teachers have the greatest burden rating of all occupations examined by the Institute for Justice, while pharmacy technicians have a relatively low burden (Knepper et al. 2022). I perform the falsification test by regressing the mean annual wage of these alternative occupations on the regulatory stringency data for cosmetology. If the relationship in Table 5 is true, I expect these falsification tests to yield insignificant results. As Table 7 shows, both falsification tests suggest significant ($p < 0.10$) but negative effects of the days to obtain licensure on mean annual wage. In Table 5, these effects are positive and significant ($p < 0.05$). This implies that some alternative causality issue or other unexplained heterogeneity across MSAs. It is particularly strange that the direction of the effect changes across occupations, implying that the omitted variable has differential effects across occupations. These interactions should be kept in mind when interpreting Table 5.

	Mean Annual Wage		Median Annual Wage	
	Model 1	Model 2	Model 3	Model 4
	b/se	b/se	b/se	b/se
daysToLicensure	17.295	15.891	7.306	7.483
	(11.227)	(10.921)	(7.536)	(7.802)
licensingFees	.253	.352	2.451	2.68
	(7.985)	(7.849)	(7.618)	(7.539)
exams2	-1502.706	-1730.272	220.256	167.172
	(1775.492)	(1839.699)	(1325.827)	(1410.465)
exams3	-3187.789	-3366.093	-515.598	-543.683
	(2003.829)	(2101.239)	(1612.65)	(1722.286)
cost_of_living	.098*	.101*	.073	.067
	(.055)	(.059)	(.048)	(.047)
2017	2332.095***	2430.846***	1669.488***	1977.653***
	(672.327)	(765.294)	(565.911)	(543.477)
2021	7677.313***	7914.717***	5828.92***	6320.553***
	(1006.582)	(950.153)	(1014.62)	(848.814)
fracWhite		8387.859		1002.908
		(7009.277)		(6343.658)
fracMale		-3146.095		36421.096
		(41327.715)		(32397.156)
avgAge		-67.228		-322.04
		(455.912)		(414.286)
_cons	14198.373**	11936.978	14198.139***	7936.524
	(6301.424)	(26088.631)	(4517.887)	(23450.755)
Observations	541	541	541	541
R-squared	.639	.641	.587	.589

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 6. Effects of Stringency in Occupational Licensing on Wages: Single-State MSAs

	Preschool Teachers		Pharmacy Technicians	
Mean Annual Wage	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
daysToLicensure	-10.201*	-10.56*	-11.336*	-11.082*
	(5.684)	(5.804)	(6.272)	(6.135)
licensingFees	-4.861	-4.726	3.368*	3.314*
	(3.726)	(3.641)	(1.739)	(1.722)
exams2	-632.598	-653.783	-421.729	-333.131
	(960.898)	(966.59)	(1389.98)	(1479.286)
exams3	1067.036	1125.97	1559.233	1632.142
	(1181.7)	(1182.696)	(1510.915)	(1579.179)
cost_of_living	.029	.028	.063***	.063***
	(.057)	(.057)	(.018)	(.019)
2017	1576.035***	2190.521***	2032.969***	2051.247***
	(389.903)	(611.838)	(258.98)	(469.32)
2021	4329.012***	5381.698***	5461.263***	5488.005***
	(847.453)	(1058.283)	(372.716)	(755.059)
fracWhite		998.731		-2083.848
		(5581.989)		(3338.787)
fracMale		-14684.032		-9000.93
		(48573.352)		(23386.465)
avgAge		-641.077		-30.18
		(410.302)		(284.153)
_cons	31666.055***	62460.961**	30293.73***	37367.47**
	(4370.938)	(30849.915)	(1703.444)	(17917.721)
Observations	621	621	674	674
R-squared	.369	.372	.859	.859

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Table 7. Falsification Test of Stringency on Mean Annual Wage

Effect of Stringency of Licensing Requirements on Number of Practitioners

Next, I focus on the effect of stringency of occupational licensing requirements on the number of practitioners in an area. The Bureau of Labor Statistics data contains measures for the number of jobs per mille of the occupation in an area and the share of

employment of that occupation in the area relative to the national average. For more readable output, I convert jobs per mille to jobs per million by multiplying by 1000.

The results in Table 8 show no effect of any of the measures of stringency on either measure of employment when examining all MSAs. Regressions examining only single-state MSAs yield similar results.[18] Tests of joint significance fail to find statistical significance of the variables of interest. These findings are contrary to the findings of many studies (Adams et al. 2002; Timmons and Thornton 2010; Kleiner et al. 2016; Kleiner and Vorotnikov 2017; Kleiner 2017) but are in line with the findings of Zapletal (2019), which also examines the cosmetology industry. Therefore, it is possible that this is an occupation-specific finding or that the phenomenon broadly disappears in recent years, given the newer data used in this study and Zapletal (2019). Further research is necessary to determine the answer with certainty. However, given how broadly cosmetology is regulated, and the significant variation in the stringency of those regulations, I believe the results are generalizable.

[18] See Table A2 in appendix for regression output.

	Jobs Per Million		Employment Ratio	
	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
daysToLicensure	-.313	-.365	0	0
	(.797)	(.882)	(0)	(0)
licensingFees	-1.057	-1.123	0	-.001
	(1.186)	(1.173)	(0)	(0)
exams2	-12.775	-17.858	-.024	-.031
	(100.38)	(105.494)	(.06)	(.058)
exams3	-25.065	-32.577	-.028	-.036
	(140.019)	(146.44)	(.066)	(.067)
cost_of_living	-.007	-.007	0	0
	(.007)	(.008)	(0)	(0)
2017	-106.504	-220.576*	.067*	.02
	(98.706)	(121.721)	(.036)	(.042)
2021	-534.438***	-729.653***	.07*	-.012
	(125.367)	(181.856)	(.041)	(.076)
fracWhite		375.042		.373
		(754.429)		(.253)
fracMale		3229.843		3.945
		(7487.067)		(3.023)
avgAge		124.326		.053
		(78.174)		(.038)
_cons	3492.397***	-3098.271	.954***	-3.259*
	(543.417)	(4446.154)	(.194)	(1.836)
Observations	580	580	580	580
R-squared	.346	.351	.029	.044

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table 8. Effects of Stringency in Occupational Licensing on Number of Practitioners

Loosening Stringency: The Case of Massachusetts

As previously discussed, in 2019, Massachusetts significantly decreased the stringency of its regulatory requirements. Throughout the period of study, from 2012 to 2022, there are 32 states that did not change their regulations in a manner that impacts the number of days to obtain licensure (Knepper et al. 2022). This provides the

opportunity to explore the difference-in-differences between Massachusetts and these stable states. Figures 8-11 plot the differences in mean annual wage, median annual wage, jobs per million, and employment ratio, respectively, over time between the two groups. 2017 is treated as the baseline year, and 2018 through 2020 are excluded to avoid anticipation effects and allow the treatment effect to occur. Visually, there appears to be a large increase in wages in Massachusetts, relative to the stable states, after the policy implementation; the trends for the measures of the number of practitioners, jobs per million and the employment ratio, are less clear.[19]

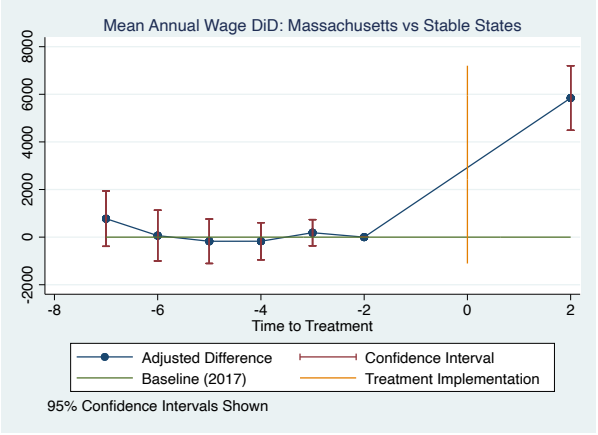

Figure 8. DiD Mean Annual Wage

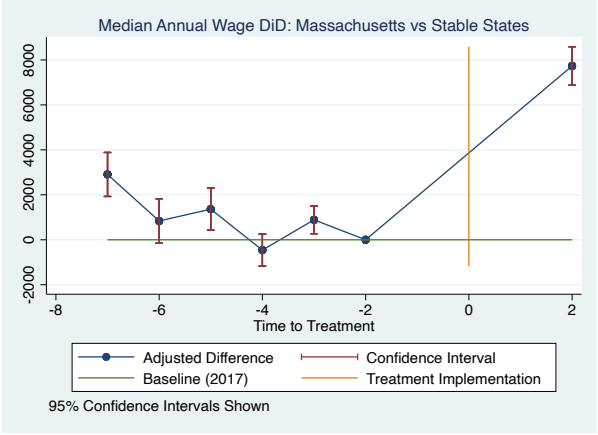

Figure 9. DiD Median Annual Wage

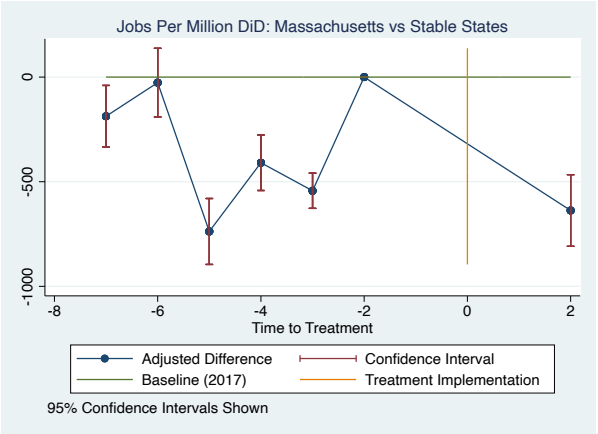

Figure 10. DiD Jobs Per Million

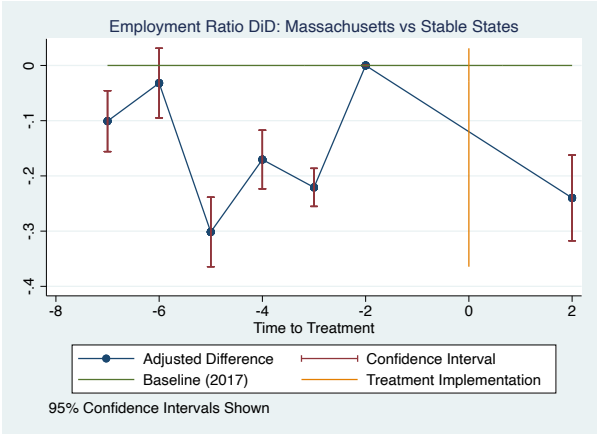

Figure 11. DiD Employment Ratio

[19] For comparisons of Massachusetts to stable New England states, see Figures A1 – A4 in appendix.

Table 9 shows the results of a simple difference-in-differences regression using treatment, post, and post-treatment interaction variables, excluding the years 2018 - 2020. The interaction term is statistically significant ($p < 0.01$) across all four metrics of interest. This can be interpreted to mean that the state of Massachusetts differs significantly from the stable states post-treatment compared to trends pre-treatment. The estimated coefficients of the interaction term for mean and median annual wages indicate $5,711.27 and $6,794.00 higher wages in Massachusetts post-treatment relative to the stable states. Similarly, the measures of employment indicate a decline in the number of practitioners in Massachusetts. These results are contrary to theoretical expectations. By decreasing the regulatory hurdles for entrants, I would expect the wages to decrease as new practitioners enter the market; the opposite seems to occur.[20][21]

	Mean Annual Wage b/se	Median Annual Wage b/se	Jobs Per Million b/se	Employment Ratio b/se
treatment	5179.777***	4860.937***	497.914***	.192***
	(455.809)	(356.497)	(176.424)	(.069)
post	2936.106***	2484.925***	-210.077	.008
	(996.02)	(685.63)	(130.505)	(.057)
post_treatment	5711.267***	6793.998***	-307.456***	-.097***
	(582.968)	(476.032)	(71.911)	(.033)
year	638.763***	437.807***	-65.277***	-.003
	(123.549)	(103.047)	(15.369)	(.006)
_cons	17378.826***	16750.199***	3843.635***	1.171***
	(1443.043)	(1297.551)	(322.003)	(.111)
Observations	1269	1269	1269	1269
R-squared	.331	.282	.052	.005

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table 9. Difference-in-Differences of Massachusetts and Stable States

[20] When comparing Massachusetts only to stable New England states, the effects on wages remain similar but the effects on the number of practitioners disappears. See Table A3 in appendix for regression output.
[21] I use a simple pre-post test comparing Massachusetts to all stable states and only stable New England states and find similar results. See Tables A4 and A5 in appendix for regression output.

Direct Effects of Board Composition on Wages and Number of Practitioners

There may exist other relationships professional board composition occupational outcomes that are not fully captured by regulations. In order to test this theory, I directly regress the key occupational statistics directly on the variables for board membership, using the most comprehensive models from Tables 1 and 2. Table 10 shows these results. None of the variables relating to professional board composition have a statistically significant effect on wages or number of practitioners.

	Mean Annual Wage b/se	Median Annual Wage b/se	Jobs Per Million b/se	Employment Ratio b/se
fracCosmetologists	-8584.64	-11671.236	-1338.943	-.648
	(11342.616)	(8536.405)	(978.26)	(.48)
fracProfessionals	-2133.221	5260.922	-1406.626	-.695
	(8251.52)	(7995.208)	(1017.309)	(.499)
ratioCosPro	10947.575	17680.519	-680.805	-.348
	(14230.053)	(11801.059)	(1268.98)	(.623)
strictlyCosmetology	-2780.216	-2862.086	317.61	.158
	(3949.914)	(3186.016)	(238.9)	(.117)
occupationsRegulated	23.982	42.997	-1.71	-.001
	(49.375)	(48.367)	(5.556)	(.003)
boardsize	955.182*	756.304*	28.418	.014
	(514.866)	(397.681)	(44.704)	(.022)
NORTHEAST	-2091.965	-2313.593	290.73	.142
	(2256.084)	(1656.182)	(213.651)	(.105)
SOUTH	1862.133	1566.658	-458.916*	-.229*
	(3459.365)	(2601.671)	(255.755)	(.126)
WEST	-2674.039	-2022.144	-704.354***	-.349***
	(2407.844)	(2103.569)	(233.719)	(.115)
cost_of_living	.373**	.298**	.009	0
	(.145)	(.123)	(.008)	(0)
_cons	-1067.983	-5806.309	2840.08**	1.402**
	(18906.18)	(16267.403)	(1215.197)	(.597)
Observations	50	50	50	50
R-squared	.474	.474	.533	.535

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table 10. Effect of Professional Board Composition on Wages, Number of Practitioners

Direct Effect of Professional Board Department on Wages and Number of Practitioners

Next, I focus on the direct effect of professional board department on wages and the number of practitioners. Table 11 shows the effect of board department on these key variables, using the specification of department which excludes all independent boards, New Jersey, and Maine. With a base of comparison of health-based boards, boards under consumer protection and state departments had greater mean annual wages of $7,526.24 and $7,196.45, respectively. These results were statistically significant ($p < 0.05$). Boards under general licensing departments also have higher wages by $6,518.27, though the effect is only weakly significant ($p < 0.10$). These results are surprising because in the previous regressions involving departments, only commerce and general licensing departments had statistically significant effects. Yet, in this direct effects regression, it is two different categories which demonstrate significant effects. The exact mechanism for these departments leading to greater average mean annual wages is unclear and requires further research. Nevertheless, the results have real-world significance given the average mean annual wage in the data set is $34,825.69.

Looking at the median annual wage, I find similar results. With health-based boards again as the base of comparison, boards under general licensing departments have significantly ($p < 0.05$) higher median wages. This effect amounts to an increase in average median annual wage of $6,581.60 for practitioners under a licensing-based department. Relative to the average median annual salary in the data set, $29,261.57, this is a increase in wages compared to other departments with real-world significance. Once again, commerce-based departments do not have a statistically significant effect on wages, despite having an effect on regulatory fees. Consumer protection and state departments have weakly significant effects ($p < 0.10$), with median wages that are $6,552.77 and $5,171.26 higher than health-based departments, respectively.

	Mean Annual Wage b/se	Median Annual Wage b/se	Jobs Per Million b/se	Employment Ratio b/se
commerce	925.012	663.263	106.34	.049
	(3334.609)	(2793.579)	(280.246)	(.138)
labor	4252.944	5001.162	18.117	.008
	(4035.532)	(3362.776)	(346.229)	(.17)
licensing	6518.265*	6581.6**	192.711	.093
	(3636.946)	(3072.312)	(266.057)	(.131)
protection	7526.239**	6552.765*	-237.377	-.119
	(3546.248)	(3784.775)	(421.677)	(.206)
state	7196.452**	5171.262*	578.614	.281
	(3485.936)	(2857.697)	(594.605)	(.292)
occupationsRegulated	129.726	131.478	2.164	.001
	(95.328)	(83.072)	(7.723)	(.004)
NORTHEAST	-5776.587*	-4050.708	202.222	.1
	(3161.82)	(2373.477)	(371.275)	(.182)
SOUTH	-1100.309	-815.312	-305.474	-.153
	(4508.983)	(3259.686)	(270.15)	(.133)
WEST	-9201.796**	-7171.867**	-366.56	-.181
	(3730.414)	(2844.67)	(240.67)	(.118)
cost_of_living	.405**	.304*	.013	0
	(.186)	(.15)	(.011)	(0)
strictlyCosmetology	-3507.421	-4198.433	318.163	.156
	(3208.254)	(2465.851)	(234.232)	(.115)
_cons	-1152.092	131.462	943.377	.468
	(15154.133)	(12701.949)	(783.367)	(.385)
Observations	36	36	36	36
R-squared	.431	.463	.375	.376

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table 11. Direct Effect of Professional Board Department on Wages, Number of Practitioners

Finally, there appears to be no direct effects of professional board department on either measure of employment. Tests of equivalence fail to reject the null hypothesis that these departments have the same effect on the employment statistics. This is in line with the findings regarding the effect of regulations on employment in Table 8. This may imply that boards under different departments do not, or are unable to, differentially exclude new entrants or otherwise limit competition.

5. Conclusion

This paper tests several theories pertaining to stringency in occupational licensing using data on cosmetology. First, I examine the relationship between the membership composition of a state's professional licensing board and the regulations that board implements. I find no evidence that the composition of a board, as it relates to cosmetologists and other professionals who may have perverse incentives, has an effect on regulatory stringency. I then examine the effect of board department on regulations. Here, I find statistically significant evidence that the department under which a board operates leads to differential licensing fees. Specifically, health-based boards require lower fees than those under commerce and general licensing departments. This may imply that boards under commerce and general licensing departments are relatively more likely to try to exclude new entrants compared to health-based boards, though I find no evidence that such attempts are successful. This finding is robust to two different specifications of professional board departments.

I then shift focus to the outcomes of stringency in occupational licensing. I find that the days to obtain licensure has a statistically significant effect on mean annual income, but not on median annual income. Due to the distributions of mean and median income, this finding implies that regulatory hurdles most directly benefit already-high earners within the occupation, which is supported by previous studies. Falsification tests using preschool teacher and pharmacy technician occupational data produce strange results; the effect of the number of days to obtain licensure is statistically significant ($p < 0.10$), but negative. The mechanism of this interaction is unclear. Furthermore, the effect is not robust to a new specification which excludes multi-state MSAs. Licensing fees and the number of exams do not have a statistically significant effect on wages. Furthermore, I find no evidence of effects of the stringency

of occupational licensing requirements on two measures of employment: jobs per million and the ratio of employment in the MSA compared to the national average.

Within the topic of outcomes, the state of Massachusetts provides an interesting test-case based on regulatory changes which significantly decreased the number of days to obtain licensure. I conduct a difference-in-differences analysis of Massachusetts, using its overhaul of cosmetology licensing requirements as a treatment, against states which saw no change in days to obtain licensure through the period of study. Contrary to expectations, Massachusetts appears to have relative wage growth and relative decrease in practitioners after the policy implementation compared to the stable states. This implies that a reduction in stringency of occupational licensing does not necessarily lead to a decrease in wages or influx of new entrants into the profession. The wage finding is robust to specifications including only stable New England states and using a simple pre-post test compared to the more robust difference-in-differences test; the finding regarding the number of practitioners is robust to the pre-post test specification but disappears when comparing Massachusetts only to stable New England states.

Finally, I examine the direct effect of professional board characteristics on occupational outcomes. Similar to my findings on the effect of board composition on regulations, there appears to be no effect of board composition on any of the key occupational outcome measures. The department under which a board falls, however, does appear to effect mean and median annual income. The expected pathway of this effect, regulatory stringency, does not appear to hold; while professional board departments have a significant effect on fees, fees do not have a significant effect on wages. This indicates that there are other, unknown factors which relate professional

board departments to wages and require further research. In line with other findings in this paper, there was no significant effect of department on employment.

Importantly, each of the wage effects was significant in real-world terms. Given the relatively low mean and median annual wages for the cosmetology occupation, differences of several thousand dollars as a result of professional board department are significant. Similarly, the effect of the number of days to obtain licensure on mean annual wages leads to significant differences in real-world income at the extreme ends, and more moderate differences between the first and third quartiles. Given the number of cosmetologists, these findings have large economic implications in addition to the personal implications for practitioners.

There are important considerations for the interpretation of these results. The failed falsification tests regarding the effect of the number of days to obtain licensure indicate potential confounding factors. Those factors may exist throughout the paper, not just in that specific finding. This is further supported by the apparent relationship between professional board department and wages that is not explained by differences in licensing fees. Instrumental variable regression may be a viable approach for future research to overcome this limitation.

At the end of this paper, there remain several unanswered questions. Is the lack of significance surrounding employment limited to cosmetology? Why do different departments have effects on fees compared to direct effects on mean and median annual income? Why do boards with a majority of practicing cosmetologists not implement more stringent requirements? All these questions warrant further research in order to better understand why the results of this paper look as they do, and to better understand stringency in occupational licensing on the whole.

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Appendix. Additional Regressions and Visualizations

	Days to Obtain Licensure b/se	Licensing Fees b/se
commerce	-6.975	117.498*
	(21.301)	(63.554)
labor	-24.23	27.416
	(24.447)	(41.352)
licensing	-22.635	63.191*
	(20.524)	(32.961)
protection	-25.375	58.682
	(35.013)	(45.487)
state	-26.603	53.912
	(26.682)	(52.972)
occupationsRegulated	.558	-.371
	(.585)	(.765)
NORTHEAST	-86.253***	6.013
	(31.152)	(38.988)
SOUTH	-29.45	-10.434
	(21.619)	(35.359)
WEST	-22.686	32.256
	(21.341)	(37.016)
cost_of_living	0	0
	(.001)	(.001)
strictlyCosmetology	.822	-3.675
	(15.088)	(42.342)
_cons	356.391***	142.045
	(40.434)	(98.741)
Observations	48	48
R-squared	.375	.192

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table A1. Effect of Professional Board Department on Stringency: Departments Reclassified

	Jobs Per Million		Employment Ratio	
	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se
daysToLicensure	.021	-.029	.001	.001
	(1.005)	(1.109)	(0)	(.001)
licensingFees	-.935	-1.022	0	0
	(1.276)	(1.256)	(0)	(0)
exams2	-54.668	-53.871	-.038	-.043
	(123.874)	(126.767)	(.064)	(.063)
exams3	52.144	47.775	.008	.001
	(158.625)	(166.822)	(.069)	(.069)
cost_of_living	-.007	-.007	0	0
	(.008)	(.008)	(0)	(0)
2017	-110.745	-225.322	.065	.014
	(109.493)	(141.731)	(.041)	(.05)
2021	-537.843***	-736.233***	.068	-.021
	(139.942)	(212.891)	(.047)	(.088)
fracWhite		317.097		.352
		(818.521)		(.276)
fracMale		3389.665		4.573
		(7891.81)		(3.11)
avgAge		127.524		.058
		(88.435)		(.043)
_cons	3360.454***	-3385.656	.888***	-3.821*
	(581.388)	(4614.871)	(.219)	(1.928)
Observations	521	521	521	521
R-squared	.343	.349	.032	.051

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

Table A2. Effects of Stringency in Occupational Licensing on Number of Practitioners: Single-State MSAs

	Mean Annual Wage b/se	Median Annual Wage b/se	Jobs Per Million b/se	Employment Ratio b/se
treatment	4218.63**	3705.901**	-524.47	-.205
	(1129.478)	(1004.218)	(269.195)	(.104)
post	808.516	33.485	-141.739	.082
	(2505.156)	(2226.576)	(473.828)	(.224)
post_treatment	5556.058***	7654.662***	-187.955	-.145
	(798.089)	(875.345)	(332.846)	(.17)
year	989.963**	682.542	-94.175**	-.007
	(325.452)	(352.132)	(27.13)	(.009)
_cons	13247.574**	14356.579**	5285.044***	1.626***
	(3814.96)	(4460.42)	(614.369)	(.216)
Observations	256	256	256	256
R-squared	.516	.375	.089	.029

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table A3. Difference-in-Differences of Massachusetts and Stable New England States

	Mean Annual Wage b/se	Median Annual Wage b/se	Jobs Per Million b/se	Employment Ratio b/se
treatment	5039.942***	3916.243***	800.781***	.324***
	(742.67)	(558.296)	(178.94)	(.072)
post	5448.898***	4255.309***	-540.877***	-.021
	(690.07)	(435.09)	(87.198)	(.039)
post_treatment	5851.102***	7738.691***	-610.323***	-.229***
	(690.07)	(435.09)	(87.198)	(.039)
_cons	28280.058***	24173.757***	2803.618***	1.136***
	(742.67)	(558.296)	(178.94)	(.072)
Observations	365	365	365	365
R-squared	.29	.271	.08	.009

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Table A4. 2017 and 2021 Pre-Post Test of Massachusetts and Stable States

	Mean Annual Wage b/se	Median Annual Wage b/se	Jobs Per Million b/se	Employment Ratio b/se
treatment	3297.419	2242.581	-173.374	-.071
	(2230.504)	(2082.343)	(228.628)	(.093)
post	4822.732**	2876.018*	-612.149	.029
	(1713.521)	(1215.889)	(351.905)	(.179)
post_treatment	6477.268**	9117.982***	-539.051	-.279
	(1713.521)	(1215.889)	(351.905)	(.179)
_cons	30022.581***	25847.419***	3777.774***	1.531***
	(2230.504)	(2082.343)	(228.628)	(.093)
Observations	73	73	73	73
R-squared	.489	.387	.108	.03

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1

Table A5. 2017 and 2021 Pre-Post Test of Massachusetts and Stable New England States

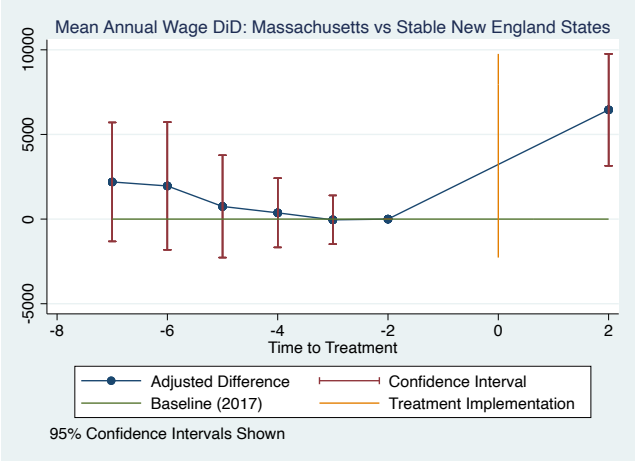

Figure A1. DiD Mean Annual Wage for Stable New England States

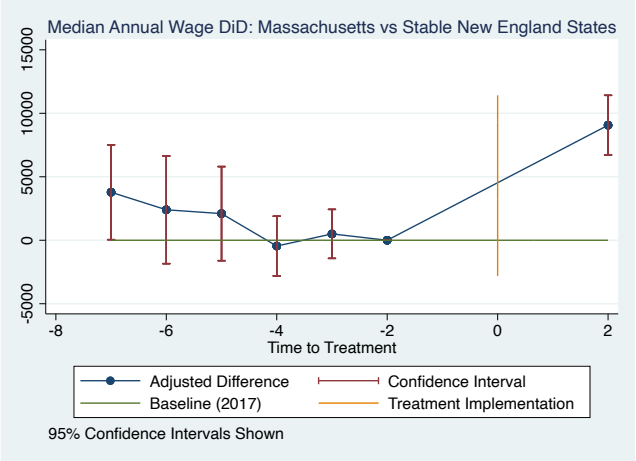

Figure A2. DiD Median Annual Wage for Stable New England States

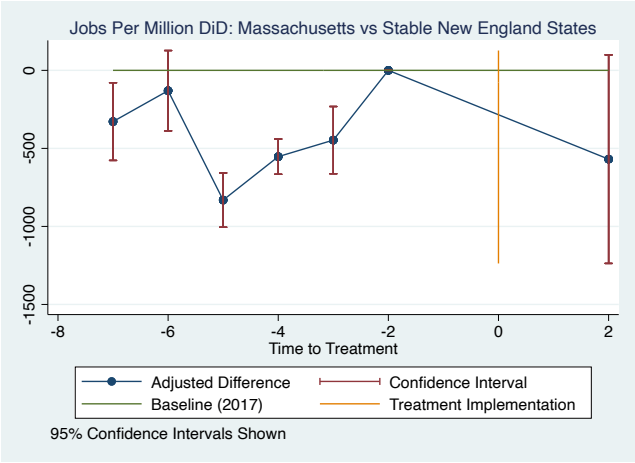

Figure A3. DiD Jobs Per Million for Stable New England States

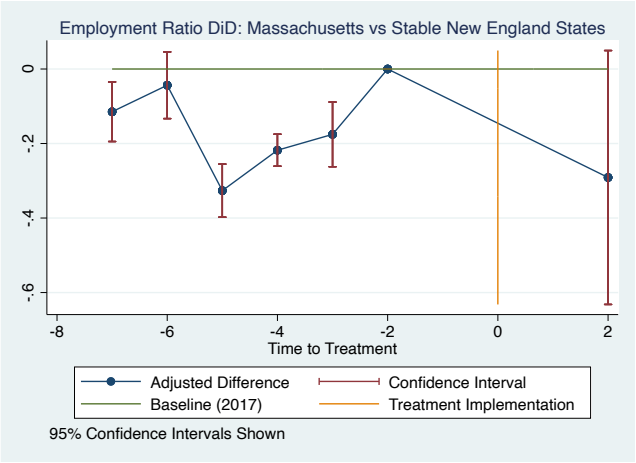

Figure A4. DiD Employment Ratio for Stable New England States