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EFFECTS OF OCCUPATIONAL LICENSING LAWS ON MINORITIES: EVIDENCE FROM THE PROGRESSIVE ERA

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Abstract

This paper investigates the effect of occupational licensing regulation on the representation of minority workers in a range of skilled and semi-skilled occupations representing 6 percent of the civilian, non-farm labor force. We take advantage of a quasi-experiment afforded by the introduction of state-level licensing regulation during the late nineteenth and to mid twentieth centuries to identify the effects of licensing on minority representation. We find that licensing laws seldom harmed minority workers. In fact, licensing sometimes helped minorities, particularly in occupations where information about worker quality was difficult to ascertain.

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For classic economic reasons, we conjecture that the craft unions are more likely to have monopolistic powers than industrywide unions. Therefore we would expect to observe more such discrimination in the first type of union than in the second. And included in the category of craft unions are such organizations at the American Medical Association, and any profession in which admission involves the approval of a governing board.

(Alchian and Kessel 1962).

Occupational licensing coupled with white-dominated craft unions has been a particularly effective tool for reducing employment for Negroes.

(Williams 1982, p. 90-91)

Professionalization, with its carefully delineated medical prerequisites, spelled out in detail the requirements for being a doctor… If one must gain entrance into a medical society or obtain a license, women could rise to meet the requirements… In short, it is possible to argue that it is easier to overcome a series of known obstacles than tilt at a series of shadowy specters. *(Walsh 1977, p. 14-15)*

I. INTRODUCTION

Many scholars have claimed that occupational licensing regulations disadvantage minorities such as women, blacks, and Jews (Kessel 1958, 1970; Alchian and Kessel 1962; Frech 1975; Sorkin 1977; Williams 1982). Licensing regulations may disadvantage minorities, either because minorities find it more costly to obtain a license, or because licensing represents a deliberate effort to exclude minorities. While in the first instance a decline in minority representation is an unintended consequence of licensing, in the second instance, licensing allows regulatory authorities and incumbent practitioners to indulge in their taste for discrimination.[1] In either case, however, the observable

[1] Incumbent practitioners, in an effort to reduce the extent of competition, may wish to discriminate against minorities because they are an easy target. Alternatively, incumbents may wish to discriminate through the licensing process simply because they prefer not to have minorities in their profession. The desire to use licensing as a mechanism for deliberate discrimination against minorities will, of course, depend on the degree to which the services provided by these workers are segregated by race or sex. For instance, if medical services are segregated along racial lines (which has been true historically), the benefits to white physicians from medical licensing regulation aimed at reducing the prevalence of black doctors will be marginal since black doctors are not a competitive threat . In this case, it is unlikely that white doctors will seek licensing in a deliberate effort to reduce the representation of black doctors. Notice, however, that the introduction of a medical licensing law may still have the unintended effect of reducing the representation of blacks in the medical profession if the licensing regulations apply to *all* new physicians (which they invariably do) and if blacks find it disproportionately costly to meet the new requirements. Hence, licensing can reduce minority representation even if markets for professional services are segregated by race or sex.

implications of licensing are the same: licensing will have a negative effect on the prevalence of minority groups within regulated occupations.[2]

Generally, it is argued that occupational licensing reflects capture by the regulated group (Stigler 1971). To the extent that it introduces entry barriers that increase producer rents at the expense of efficiency, licensing may reduce the representation of disadvantaged groups within an occupation. However, this is not the only role that licensing may play. Since Arrow (1963), economists have recognized that licensing can also help solve informational asymmetries about professional quality (Akerlof 1970; Leland 1979). In fact, recent scholarship suggests that the desire to reduce informational asymmetries was an important motivation for the rise of licensing in early twentieth century America (Law and Kim 2005). If uncertainty about worker quality gives rise to statistical discrimination over observable characteristics like sex or race, then licensing regulation that serves as an improved signal of quality may help minority workers and increase their presence in regulated occupations (Lundberg and Startz 1983; Coate and Loury 1993).[3]

Curiously, relatively little empirical work has systematically examined the relationship between occupational licensing and the representation of minorities or disadvantaged workers. This is a significant omission given that 20 percent of today's

[2] The claim is not that there was no discrimination against minorities prior to licensing but rather that licensing may have the effect of reducing the representation of minority workers even further. Indeed, the historical literature suggests that there was discrimination against minority workers in many occupations (Walsh 1977; Williams 1982). However, because we employ a differences-in-differences approach, our empirical methodology controls for state-specific discriminatory tastes as well as discriminatory tastes that are changing over time across all states.

[3] The potential for licensing to reduce the extent of statistical discrimination against women doctors has been noted by Walsh (1977, p. 15) who writes: "Female physicians already suspect because of their sex, required corroboration of their expertise to meet a disbelieving public." Because it is possible for minorities to statistically discriminate against themselves (i.e. female patients may statistically discriminate against female doctors), occupational licensing may reduce the degree of statistical discrimination even in markets where service provision is segregated by race or sex.

labor force continues to be licensed by state governments (Kleiner 2006). In this paper we attempt to remedy this deficiency. Specifically, we take advantage of the quasi-experiment afforded by cross-state and temporal variation in the adoption of licensing regulation across a broad sample of occupations representing approximately 6 percent of the non-agricultural civilian labor force during the late nineteenth and early twentieth centuries (the Progressive Era) to identify how licensing affected women and blacks. Because licensing laws were adopted at different times in different states, and because licensing may affect minorities differently than white men, we can estimate the effect of licensing on minority participation using a "difference-in-differences" estimator. We compare the differential effect of the adoption of licensing regulation on the majority group (white men) and minorities in various occupations, using states that did not adopt licensing to control for nationwide trends in minority participation in these occupations. By including a range of occupations that represent a spectrum of high and low skill jobs, we are able to speak generally about the effects of licensing on minority groups. Additionally, for two occupations (teachers and physicians) we have data on specific licensing requirements that allow us to measure licensing more precisely.

The remainder of this paper is structured as follows. In section II we review the relevant empirical literature. Section III presents information on the evolution of licensing regulations for various occupations over time and discusses the validity of our identification strategy. Section IV discusses the data. Section V outlines the empirical methodology and presents the regression results. Section VI examines the effect of specific teacher and physician licensing requirements on the gender and racial composition of these two occupations. Section VII concludes.

II. LITERATURE REVIEW

To date much of the evidence on the effects of licensing on the presence of women and minorities in particular occupations has focused on aggregate time series trends on the female or minority share of the occupation during periods when licensing laws were introduced or strengthened. Frech (1975) and Sorkin (1977), for instance, argue that stricter licensing requirements introduced in the early decades of the twentieth century halted a steady increase in the percentage of female and black physicians. This negative correlation between periods of licensing and the minority share of the occupation at the national level is taken as evidence that licensing harms minorities. While these figures are suggestive of a possible relationship between licensing and minority representation, one must however be cautious about attributing changes in the composition of an occupation at a national level to changes in legislation that are enacted at the state level.

An alternative approach to analyzing the effect of licensing on minority representation involves comparing licensing exam pass rates. In his examination of cosmetology licensing in Illinois and Missouri in the early 1970s, Dorsey (1980, 1983) finds that black license applicants were 30 percent less likely to pass the licensing exam than white applicants, holding constant education and training. Along similar lines, it has also been found that black insurance license applicants in Illinois were far more likely to fail the licensing exam than white applicants (Revised Agent-Broker Exams 1978). The differential between white and black licensing exam pass rates is attributed to discrimination on the part of licensing authorities. A recent paper by Federman,

Harrington and Krynski (2006) also finds evidence that English-only licensing exams negatively affect the representation of Vietnamese manicurists.

While this body of evidence is more compelling than the time series approach, it is still problematic. First, factors apart from education and training are likely to affect examination pass rates. Individual ability and the quality of training are also likely to matter. Second, the evidence from these studies is limited to a small number of occupations in a small number of states.

Methodologically, our approach takes its cue from the literature that examines how exogenous changes in market competition affect the representation and performance of minorities in certain industries. The specific hypothesis tested in these studies is whether competition in product markets influences the degree of employment discrimination. Since Becker (1957), it has often been argued that non-competitive product markets allow employers to indulge in their taste for discrimination. When product markets are less than competitive, employers earn above normal rents; employers may spend these rents by hiring workers in a discriminatory fashion (Alchian and Kessel 1962). Variation in the degree of competition in product markets can therefore be used to test this hypothesis.

Within this literature, many approaches have been adopted. The most recent approach uses changes in regulatory regime to identify the degree of product market competition. State or federal deregulatory legislation offers a potentially exogenous source of variation in competitive market structure. Two studies in particular stand out in this regard. Using individual-level data from the Current Population Survey (CPS), Heywood and Peoples (1994) find that federal trucking deregulation during the 1970s

significantly increased the presence of blacks in the for-hire trucking sector. Black and Strahan (2001) analyze how changes in state-level banking regulation affected the earnings of female versus male banking employees. Using bank-level data as well as individual level CPS data to measure employee earnings, Black and Strahan find that while deregulation lowered the earnings of all bank employees during the sample period, deregulation reduced the real wages of male workers faster than those of female workers. They also find that the share of managerial positions held by women increased following deregulation.

The approach we employ in this paper most closely resembles that of Black and Strahan. First, we use individual-level data for our analysis. Second, identification comes from cross-state and temporal variation in state regulation (in our case, occupational licensing regulation). Licensing laws, like some banking regulations, fall within the jurisdiction of state governments. Additionally, during the Progressive Era, licensing laws were adopted by various states at different times. Depending on the specific occupation studied, variation comes from as many as 48 states over 7 different census years.

However, our approach differs from these studies in several important respects. First, because the Census of Population did not report data on earnings prior to 1950, we restrict ourselves to occupational status. Second, whenever possible, we examine two types of minorities: females and blacks. Third, because our focus is on occupational licensing regulation, there is an important difference in interpretation. In these other studies, the hypothesis under investigation is whether changes in product market competition change the extent of discrimination by employees. For us, the hypothesis is

whether the introduction of licensing laws reduces the prevalence of minorities in that occupation, either as an unintended consequence of the fact that licensing laws disproportionately disadvantage minorities, or because licensing laws allow regulatory authorities to indulge in their own discriminatory tastes. Finally, we have a clearly articulated alternative hypothesis. Theoretically, it is possible that licensing regulation will increase the presence of minorities, particularly in occupations where information about worker quality is an issue, because licensing may function as an impartial signal of quality that reduces the extent of statistical discrimination over observable worker characteristics.

III. OCCUPATIONAL LICENSING AS A QUASI-EXPERIMENT

During the Progressive Era government at all levels—state, local, and federal—began to play an increasingly active role in the economy. In the labor market, occupational licensing regulations governing the standards of practice and the minimum qualifications needed to practice occupations ranging from medicine and pharmacy to barbering and plumbing were enacted in earnest by state legislatures. We are interested in determining whether licensing disproportionately affected minority worker participation in these newly regulated occupations. In order to make valid causal inferences we need to establish that licensing is exogenous with respect to other factors that might influence minority participation in these fields. Our goal in this section is to argue that the introduction of state level occupational licensing regulations during this period constitutes a quasi-experiment.

As a starting point we examine national trends in the adoption of licensing regulation for different occupations during the late nineteenth and early twentieth centuries. Our measure of the extent to which an occupation is licensed is the percentage of workers in a given occupation who operate in a state that regulates that occupation. Information on the introduction of state licensing laws is from the Council of State Governments (1952), which, in the early 1950s, surveyed state government agencies about the characteristics of their licensing laws. This survey reports the year in which a state enacted a licensing law. For our purposes, we code a state as having introduced licensing in a given census year, say 1920, if the state enacted a licensing law between 1909 and 1919.[4]

Figure 1 presents information on the growth of occupational licensing between 1860 and 1950 for 9 occupations: accountants, barbers, beauticians, engineers, midwives, pharmacists, plumbers, practical nurses and registered nurses.[5] For an occupation to be included in our sample, it had to meet four criteria. First, it had to be included in the Council of State Government survey. Second, for the purpose of econometric identification, the adoption of licensing regulation had to span at least two census periods. Third, the occupation had to have a sufficiently large sample within the Integrated Public Use Microdata Samples (IPUMS) of the Census of Population. Finally, at least one percent of the occupation had to be either black or female. This implies that for some occupations, we will analyze the effect on females but not blacks.

Several interesting facts emerge from an analysis of this figure. First, while it is clear that the extent of licensing overall increased during these decades, there are no

[4] We also allowed a five year lag for licensing to take effect. Our empirical results were unaffected by this change.

[5] Data on teachers and physicians will be presented later.

obvious temporal patterns regarding the growth of licensing across these occupations. Some occupations, like dentistry and accounting, began licensing earlier (in the 1870s and 1880s) than other occupations, like engineers and beauticians (which did not begin to become licensed until the early 1900s). Second, the rate at which licensing diffused within an occupation also differs dramatically across these occupations. For instance, while regulation of accountants, engineers, and registered nurses spread very quickly, licensing of barbers, plumbers, midwives and practical nurses spread more gradually. Third, the extent to which each occupation was licensed by the end of the sample period varies dramatically across occupations. Accordingly, while the Progressive Era did witness the rise of state level occupational licensing of various professions, these facts suggest that licensing was not clearly correlated with time, at least at a national level.

If licensing is to serve as a quasi-experiment, then licensing laws for a given occupation should ideally appear to be more or less randomly adopted across states. This ensures that licensing states (the treatment group) are similar to non-licensing states (the control group), which is a key precondition for a quasi-experiment where state level variation is the source of identification.

Figures 2 through 4 display maps that show, by census decade interval, when states adopted regulation licensing accountants, engineers, and registered nurses, respectively.[6] States that are shaded in darker colors adopted licensing later than those shaded in lighter colors. A glance at these maps suggests that there are no easily discernable geographical patterns with respect to the adoption of licensing regulation for these occupations. Early or late adopting states do not appear to be concentrated in

[6] Maps for the other occupations are similar in most important respects; hence, we restrict our attention to these three.

particular geographic regions. The timing of adoption of licensing legislation for each of these occupations does not appear to be related to region, urbanization, or demography in any obvious way. For instance, New England and Mid-Atlantic states (states that were more urbanized, wealthy, faster growing, and politically progressive) did not always adopt regulation sooner than southern or western states. Indeed, states that adopt licensing regulation at any given point in time do not appear to share much in common. Consider, for instance, Figure 3, which shows the timing of engineering licensing. Among states that adopted engineering licensing regulation, Louisiana was the earliest adopter, followed in the subsequent decade by Florida, Idaho, and Wisconsin. Additionally, the pattern of adopters varies across occupations. Compare, for instance, Figure 3 with Figure 4, which shows the timing of registered nursing regulation. States that were the earliest adopters of nursing regulation (California, the Midwest, and parts of the Northeast) were among the later adopters of engineering licensing. Hence, the evidence presented in these maps suggests that the timing of adoption of licensing regulation is not well correlated with geographic region.

While the adoption of licensing regulation is not well correlated with geography, it may be correlated with other factors that would hinder causal inference. For instance, if states that tend to adopt licensing were also states where minorities were increasing their representation in skilled jobs, then we might misattribute the growth of minority workers in these occupations to the adoption of licensing laws. Alternatively, if urbanization leads to greater tolerance of female labor force participation and is also correlated with political activity that generates licensing regulation, then any positive correlation between licensing and female participation in licensed professions may be spurious. In order for

states that do not license to function as a valid control, they must experience similar trends in minority participation in these occupations. The failure to find a correlation between changes in minority labor force participation and licensing would suggest that unlicensed states are indeed a valid control.

To investigate these possible sources of endogeneity, we estimated a series of probit regressions of the factors that influence whether a state has adopted licensing of a given occupation in a given year. The independent variables in these regressions are a series of state-census-year controls that proxy for state-level characteristics that may be correlated with changes in minority representation in a given occupation. If these control variables are not systematically correlated with licensing regulation across occupations, then we are more confident that we have valid control state-years. The control variables that interest us most are those that directly measure state-level changes in minority representation. Because it is often argued that licensing is introduced in order to reduce competition from potential entrants, we present results using changes in the minority's share of the labor force. Qualitatively similar results were obtained, however, when we used changes in the minority's share of the occupation.

Table 1 presents the probit regression results. The second and third rows of the table show the relationship between changes in female and black labor force shares and licensing. None of these coefficients are statistically significant. As additional state year controls we included the average age of the population, literacy rates, urbanization rates, the share of the population that is domestic born, census region dummies and year dummies. No systematic patterns emerge from an analysis of these coefficients. It would therefore appear that the passage of occupational licensing laws was not correlated with

trends in the race and gender composition in a state. This suggests that the adoption of occupational licensing regulation may indeed furnish a quasi-experiment that will allow us to make causal inferences about how licensing laws affected women and blacks.

IV. THE DATA

The data for our empirical analysis are from IPUMS which represent a sample of individual returns from the United States Census of Population. Our full sample includes individual-level observations from the 48 contiguous states from 1870 through 1960 censuses (with the exception of 1890, for which the individual census returns were destroyed). The population censuses include information on occupation (self reported), race, sex, state of residence, and other individual and household level characteristics. For consistency, we use the IPUMS 1950 Census of Population occupational definitions. We restricted our attention to individuals aged 14 years and older. Additionally, we dropped housewives, inmates, retired persons, military personnel, and individuals living on reservations from our sample.

Our key variables, of course, pertain to the race and sex of the individual. We restricted our attention to blacks since they are the only racial group reasonably well represented across the regulated occupations.[7] As other controls, we included indicators for marital status (excluded category is never married), residence in a metropolitan area, foreign born, school attendance, the number of families living in the household, age, and the number of children. Because the 1870 Census of Population did not include information on marital status, the first two indicator variables were excluded for our

[7] We experimented with including foreign born workers as a minority group and found little evidence that they were harmed by licensing.

analysis of those occupations where licensing began very early in the sample period. Since questions about current school attendance were not asked in the 1950 Census of Population, we exclude this variable in those regressions that include 1950 in the sample. Whenever possible, we also include a binary variable that equals 1 if the individual is literate.

Table 2 presents information on the size of the sample available for each of the occupations under investigation. The size of the sample (in person years) depends on which census years are included and the presence of workers in that occupation by sex or race. While the number of person years in our sample is very large, it is important to bear in mind that identification is coming from cross-state and temporal variation in licensing regulation. Hence, in the fourth column, we also report the number of state-years of data available for each occupation.

Table 2 also shows the total number of workers in each occupation, the share of the sample that worked in each occupation, as well as the number and share of female and black workers in each of the regulated occupations. For occupations like barbers and beauticians, black workers are well represented. Identification of the effect of licensing on black workers should be relatively easy for these occupations. For other occupations, however, the number of female or black workers is small. These small numbers may make it difficult to isolate the effect of licensing laws on these groups.

More descriptive information about our data can be furnished through regression analysis (see Table 3). Our dependent variable is a binary variable that equals 1 if an individual located in a given state is a member of a given occupation in a given year (and 0 otherwise). State and year fixed effects are included to control for unobserved

heterogeneity at the state level and within census years. The probit coefficients on the individual and household controls are generally significant and have the expected signs. Women are under-represented as plumbers, engineers, pharmacists, but are over-represented as either practical or registered nurses. Blacks are more likely to be barbers but less likely to be plumbers or registered nurses. Literacy is positively and significantly correlated with more technical occupations like accounting and pharmacy. Finally, individuals living in cities are more likely to be involved in most of these occupations.

To control for licensing we use an indicator that equals 1 if an individual resides in a state that regulates that occupation in a given year and 0 otherwise. The coefficient on this variable is seldom significant; when it is significant, it is positive, which suggests that licensing increases the probability that an individual works in a given occupation. These results are roughly consistent with other work on the effects of Progressive Era licensing laws that use state level data (Law and Kim 2005). For barbers, accountants, pharmacists, practical nurses, and registered nurses, the licensing indicator variable is negative but not significant. Licensing may have reduced the growth of these occupations but its effects are not precisely estimated. If licensing is to facilitate discrimination against females or blacks, it is most likely to do so within these occupations since licensing can only be used to disadvantage particular groups if in fact it functions as an effective entry barrier. For the remaining occupations the coefficient on the licensing variable is positive and sometimes significant. Hence, we do not expect licensing to facilitate discrimination in these occupations.

V. DIFFERENCE-IN-DIFFERENCES ANALYSIS

Our primary goal in this paper is to determine whether licensing disadvantaged female or black workers. To estimate the effect of occupational licensing regulation on the prevalence of female or black workers in each occupation, we use a "difference-in-differences" (DID) estimator. In terms of the regression framework, we can obtain the DID estimator by interacting the licensing indicator variable with the black or female indicator variable. The coefficient on this interaction term is the DID estimate. The interaction term tells us if female or black workers are disproportionately affected by licensing, controlling for the effect that licensing has on the likelihood of any individual belonging to this occupation.

For each occupation, we estimate the following probit regression equation separately for female and black workers:

$$P(y_{ijt} = 1) = F\{\beta_1 L_{jt} + \beta_2 M_{ijt} + \beta_3 L_{jt} M_{ijt} + \beta_4 X_{ijt} + \beta_5 S_j + \beta_6 T_t + \varepsilon_{ijt}\}$$

$P(y_{ijt} = 1)$ is the probability that individual i in state j in census year t works in the occupation; L_{jt} is the licensing indicator variable; M_{ijt} is the minority status (black or female) indicator variable; $L_{jt}M_{ijt}$ is the interaction term; X_{ijt} is a vector of other individual and household level controls; S_j and T_t are state and year fixed effects; and ε_{ijt} is the error term. The variable of interest is β_3, the coefficient on the interaction term.

Table 4 displays the DID estimates of the effects of occupational licensing regulation on black workers. Each column shows the coefficient estimates for a given occupation. The coefficient on the interaction term is negative and significant for only barbers, suggesting that black representation in barbering was reduced by licensing. Interestingly, it is positive and significant for practical nurses. In this occupation, black

representation increased following the introduction of licensing regulation. For the remaining occupations, the coefficient is statistically insignificant and of varying sign. The coefficients for the other control variables continue to have plausible signs and significance levels. Thus, while blacks were indeed underrepresented in many professions, licensing does not appear to have reduced black representation in most occupations.

Table 5 shows the DID estimates of the impact of licensing regulation on female workers. Again, each column displays probit coefficient estimates for a given occupation. For none of the occupations in our sample is the coefficient that corresponds with the DID estimator negative and significant. In fact, practical nursing is the only occupation where the coefficient is negative. This suggests that female representation was not impaired by the introduction of licensing regulation. For engineers, pharmacists, plumbers and registered nurses, the interaction term is positive and significant, implying that the representation of women increased more in states that licensed these occupations than control states that did not. For the remaining occupation, the coefficient on the interaction term is positive but not significantly different from zero.

The DID results suggest the following tentative conclusions. In general, the introduction of occupational licensing regulation during the Progressive Era did not tend to harm female or black workers. Only for barbers did licensing have a negative impact on minority representation. By functioning as an entry barrier, barber licensing may have reduced opportunities for blacks, which is consistent with the conventional view of how licensing affects minorities. However, for many occupations, licensing had no effect.

This is, perhaps, not surprising since we find little evidence that licensing functioned as an effective entry barrier overall.

For five of the nine occupations—specifically, plumbing, engineering, pharmacy, practical nursing and registered nursing—licensing regulation appears to have had a positive effect on the presence of female or black workers.[8] It is revealing that the occupations where licensing seems to have helped female or black workers are also relatively technical occupations. For technical occupations, it is difficult for consumers to accurately determine the quality of service. Markets for these services are therefore likely to be characterized by poor information about worker quality. In such markets, consumers might rationally engage in statistical discrimination over observable worker characteristics like race or sex. If licensing serves as an independent signal of quality, the introduction of licensing regulation may allow minority workers to credibly signal their abilities and overcome statistical discrimination. The fact that licensing appears to have helped female and black workers in technical, high skilled occupations where it is difficult to discern worker quality but not in low skilled occupations where worker quality is more easily discovered is consistent with the hypothesis that licensing reduces statistical discrimination against minority workers.

Robustness check: grandfathering and licensing

So far our analysis has focused on the effects of licensing on all workers within a given occupation. Perhaps one reason why we do not find significant negative effects of licensing on minority representation is because licensing laws invariably grandfather existing workers. In general, licensing requirements are only binding for new entrants in

[8] For nursing, a profession that is disproportionately female, it is unclear which sex is the potential target of discrimination. Hence, the registered nursing results are somewhat difficult for us to interpret.

an occupation. As a result, a significant portion of our sample may be unaffected by the introduction of a licensing law in a given year, biasing our coefficient estimates toward zero. As a robustness check, we re-estimated our DID regressions focusing on young workers (less than 35 years old), the sub-sample of workers for whom licensing requirements are most likely to be binding.[9] Because there were only 19 young midwives, we were unable to estimate this regression for midwives.

Table 6 displays the DID regressions for the sub-sample of young black workers. While our earlier results suggested that black representation in barbering was harmed by licensing, when we restrict attention to the group most likely to be disadvantaged by licensure, we find no such effect. For the remaining occupations, the interaction term is insignificantly different from zero. Accordingly, these regressions show that the introduction of licensing laws did not disproportionately harm young black workers. Table 7 shows the corresponding regressions for young female workers. For pharmacy, plumbing, and registered nursing, the interaction term is positive and significant while for the other occupations it is insignificantly different from zero. The evidence therefore suggests that the adoption of licensing legislation did not reduce the representation of young female workers and often increased it. In our view, it is revealing that the three

[9] Because licensing laws grandfather existing workers, one might be tempted to estimate a differences-in-differences-differences (triple diff) regression that interacts licensing, minority status and an indicator for young workers. An advantage of this approach is that it controls for within-state omitted factors that are potentially correlated with minority representation. The validity of a triple diff approach, however, rests in part on the assumption that old minority workers function as a good control for young minority workers with regards to occupational choices. This assumption is unlikely to be valid in our context. For instance, the old sub-sample of our data set likely includes old black workers who were former slaves. These workers are unlikely to be a good control for young black workers. Additionally, marriage and family obligations and the influence they have on female labor force participation and occupational choices make older women a poor control for younger women. Hence, we choose to present our analysis that focuses exclusively on young minority workers. The triple diff approach does, however, generate qualitatively similar results. Our results are also robust to the choice of age cutoff. Qualitatively similar results were found using 30 years of age as the cutoff for young workers.

occupations where licensing increased the representation of young female workers are also occupations where we found that licensing improved female representation overall. These occupations, as discussed earlier, are ones where uncertainty about worker quality was likely an issue. If licensing requirements only apply to new entrants, and licensing laws reduce uncertainty about worker quality, then new entrants should disproportionately benefit from licensing. Our regression results provide some support for this perspective.

VI. PHYSICIAN AND TEACHER LICENSING CASE STUDIES

We now turn our attention to a detailed analysis of two occupations: medicine and teaching. An examination of how medical and teaching licensing regulations affected black and female workers is of interest for several reasons. First, for these two occupations, we have detailed information on the characteristics of state licensing regulation. Instead of measuring the effect of licensing by the presence of an initial licensing law, we now measure licensing using specific licensing requirements that are consistently measured across all states. A potential problem with the licensing variable used in the previous sections is that it treats all states that license a given occupation as having identical licensing regimes. An advantage of using a specific licensing requirement is that it furnishes a more accurate indicator of licensing and should reduce measurement error that biases coefficient estimates towards zero. Second, teaching and medicine are two occupations where uncertainty about worker quality was likely to be a serious issue, particularly during the period under investigation. During the Progressive Era, advances in basic science dramatically altered the nature of the medical profession,

making the issue of physician quality increasingly salient to consumers of medical services. (Law and Kim 2005; Ludmerer 1985; Starr 1982). Similarly, in teaching, the growing importance of high school education and training in more technical scientific subjects also increased the knowledge base required to be an effective teacher (Goldin 1998). An examination of physician and teacher licensing regulation may therefore provide additional support for the statistical discrimination hypothesis. Finally, critics of medical licensing requirements have often claimed that medical licensing laws were used by organized medicine to shut down medical schools that trained female and black doctors (Kessel 1958; Starr 1982). It is often asserted that these medical licensing laws harmed minority and female workers (Kessel 1970). An examination of the effects of medical licensing laws will therefore furnish a test of this claim.

For each occupation, we measure licensing in two ways. For physicians, we use (i) the year in which a four-year medical degree was required for a medical license and (ii) the year in which some pre-medical college education was required for a medical license. Data on these requirements are from Baker (1984) and from the American Medical Association's Council on Medical Education (1930). For teachers, we use (i) the year in which graduation from high school was required for the lowest level of teacher certification; and (ii) the year in which some college education was required for the lowest level of teacher certification. Our data on teacher licensing requirements is taken from the US Bureau of Education's semi-annual survey of state-level teacher licensing requirements (US Bureau of Education).

Figures 5 and 6 displays information on the timing of adoption of the four-year medical school requirement for physicians and the high school graduation requirement

for teachers.[10] For physicians we focus our attention on the years from 1880 to 1930. For teachers, the data are from 1910 to 1940. Prior to 1910, no state required teachers to have a high school diploma. While there is no obvious pattern regarding the adoption of the four year medical school requirement, for teachers, it would seem that later adopters of the high school requirement for teachers are heavily concentrated in the southern states while northern states are well represented among the early adopters. This suggests to us that it may be more difficult for us to make definitive causal inferences regarding the effects of teacher licensing requirements on blacks.

As before, we need to check if there are systematic correlations between occupational licensing and trends minority representation. If no systematic correlations are found, then we have more confidence that our control state-years are valid. In probit regressions of the correlates of teacher and physician licensing requirements at the state-year level, we find no systematic relationship between changes in female or black labor force shares and the presence of teacher and physician licensing requirements. Accordingly, it appears that licensing of teachers and doctors was not systematically related to minority labor force representation at the state-year level.

Table 8 shows the regression results from our analysis of the impact of physician licensing requirements on females and blacks. Columns (1) through (3) display the results when the four-year medical degree requirement is used to measure physician licensing. In columns (4) through (6) the pre-medical college requirement is used to measure physician licensing. We present our results with and without interaction effects. While licensing did not reduce the growth of the medical profession overall, there is some evidence that it

[10] The maps for the pre-medical college requirement for physicians and the high school requirement for teachers are similar.

increased the representation of blacks; the coefficient on the black-licensing interaction term is positive and significant when the pre-medical college requirement is used to measure doctor licensing (column 6). For women, the coefficient on the interaction term is not significant regardless of how we measure physician licensing. Thus, it would seem that medical licensing laws enacted in the early decades of the twentieth century had a positive impact on black representation in the medical profession (which is consistent with the statistical discrimination hypothesis) and no effect on women. These results contrast sharply with the conventional view, which argues that minority representation in medicine was adversely affected by Progressive era physician licensing laws.

Table 9 displays the regression results for teachers. In the first three columns the high school graduation requirement measures teacher licensing. In the last three columns the requirement that license holders have attended some college is our measure of teacher licensing. The coefficients on the sex and race interaction terms are qualitatively similar regardless of how licensing is measured. Teacher licensing requirements increased black representation and reduced female representation. The results for blacks are consistent with the statistical discrimination hypothesis where licensing helps ensure a level of quality among black teachers. Licensing regulation, as a signal of quality, may have helped blacks enter the teaching profession. The results for women, however, are more difficult to interpret. Taken at face value, they are consistent with the standard hypothesis that argues that entry barriers facilitate discrimination. However, we are uncertain as to whether this is the correct interpretation, since, as noted earlier, in occupations that are disproportionately female it is unclear which sex is the target of discrimination.

In the case of teachers, southern states are heavily represented among the late adopters of teacher licensing regulation. It is possible that opportunities for blacks in the south changed at a different rate than in other regions. For instance, if educational opportunities for blacks evolved differently in the south, then, since the timing of licensing is correlated with region, our DID estimates may incorrectly attribute improvements in the representation of blacks to teacher licensing regulation. As a robustness check, we re-estimated the teaching regressions excluding states from the South Atlantic (OK, AR, TX, LA) and West South Central (MS, AL, TN, KY) census regions. Eliminating these southern states from our sample does not alter our findings, either qualitatively or quantitatively. Teacher licensing reduces female representation but increases black representation, regardless of which measure of teacher licensing we use.

The time period during which teacher licensing requirements were introduced was also a period when marriage bars—laws that prevented married women from working—were also adopted by local school districts (Goldin 1990). If licensing requirements are positively correlated with marriage bars, then our regression results will overestimate the negative effect of teacher licensing laws on female representation in the teaching profession. Because women who never married were not subject to these laws, as a robustness check we re-estimated the teacher regressions on the sub-sample of workers who were never married.[11] The significantly negative impact of licensing on female representation in the teaching profession persists in these regressions.

The early twentieth century was also a period of rising public school enrollments, particularly at the high school level (Goldin 1998). As high school enrollments rose, the

[11] An additional check would be to include state-level information on the prevalence of marriage bars directly in our regressions. However, we were unable to locate state-level data on marriage bars in the teaching profession.

demand for teachers with advanced skills also increased, which may have favored male representation in the teaching profession. If teacher licensing is positively related to rising high school enrollments, then our regressions will overestimate the negative effect of licensing on female representation in teaching. To determine if this was the case, we included the share of a state's school age population enrolled in public schools in our regressions on the relationship between state-year characteristics and our two measures of teacher licensing. We find no systematic relationship between school enrollment and the presence of teacher licensing requirements. The negative impact of licensing on female representation in teaching is therefore unlikely to be the product of rising school enrollments.

As a final robustness check, we also re-estimated the teacher and physician regressions focusing exclusively on the young sub-sample of our data set. For physicians, the representation of young female and black workers was unaffected by either measure of physician licensing. For teachers, we find that licensing increased the representation of young blacks and decreased the representation of young women, regardless of how teacher licensing is measured. These results mirror those found using the full data set.

VII. CONCLUSION

It is widely believed that licensing laws, by functioning as an entry barrier, reduce opportunities for traditionally disadvantaged workers. In this paper we take advantage of cross-state and temporal variation in the introduction of occupational licensing regulation during the Progressive Era to determine if in fact this is the case. By merging information on the timing of state licensing laws with detailed, individual-level data, we are able to

investigate the effects of these laws on a broad sample of occupations, ranging from barbers and beauticians to plumbers and pharmacists. Additionally, for two occupations (teachers and physicians), we gathered detailed information on the nature of state licensing requirements and we examine the effects of these requirements on minority representation. Taken together, these occupations represent approximately 6 percent of the civilian labor force from the late nineteenth to mid twentieth centuries.

Contrary to the received wisdom, our empirical analysis suggests that the introduction of licensing legislation did not generally harm black or female workers. In only two occupations was licensing harmful for minority representation. Barber licensing reduced the representation of black barbers and teacher licensing harmed the representation of women in the teaching profession. However, for the remaining occupations in our sample licensing either had no effect on female or black participation or it had a positive effect. For instance, we find that licensing increased the representation of blacks in the medical profession, and women in engineering and pharmacy. In our view, it is revealing that those occupations where licensing appears to have helped minorities are generally those where information about worker quality was likely to be an important concern. This suggests the role that licensing may play in reducing statistical discrimination. Hence, the conventional wisdom about how licensing affects minorities is not well supported, at least during the Progressive Era.

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Figure 1: The growth of licensing, 1870-1950

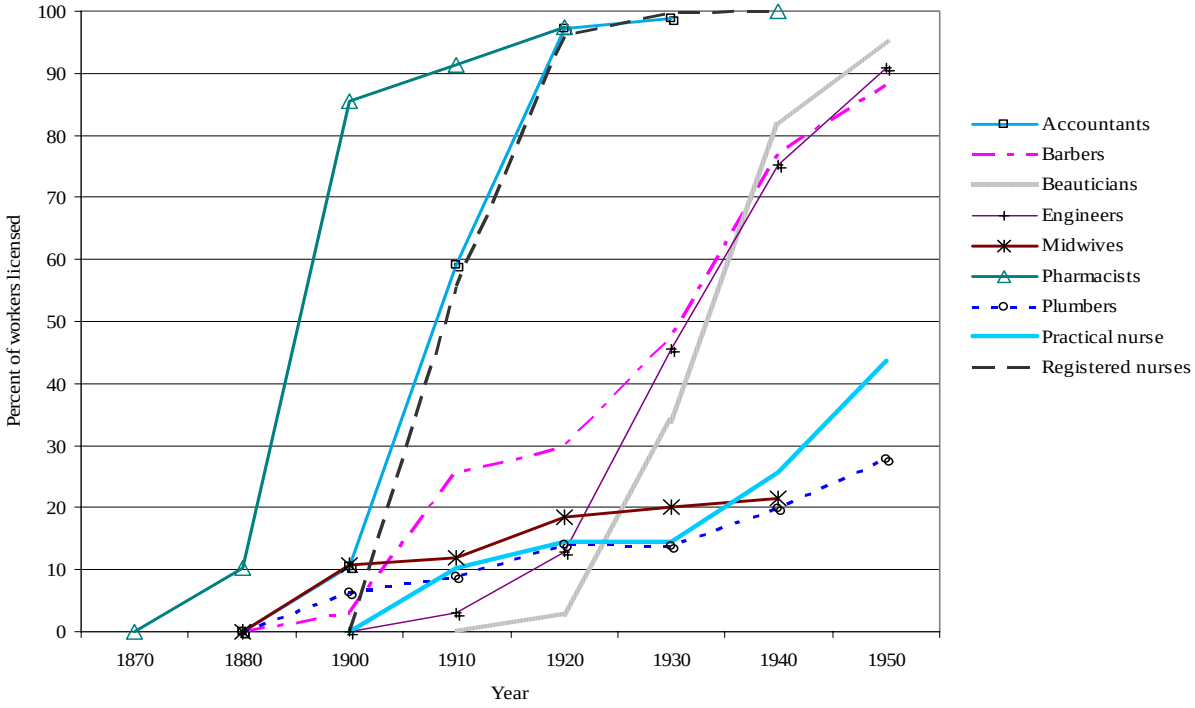

Figure 2: Accounting licensing regulation by decade of adoption

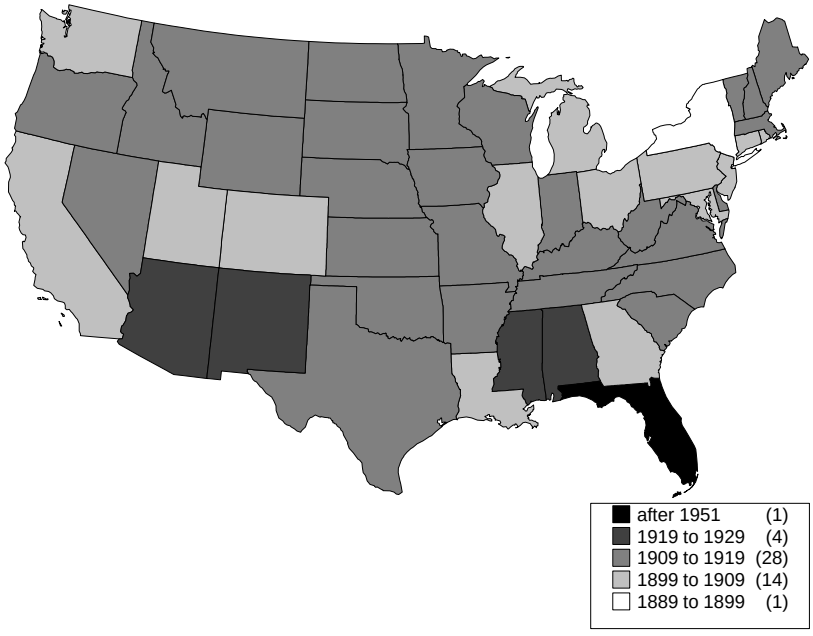

Figure 3: Engineering licensing regulation by decade of adoption

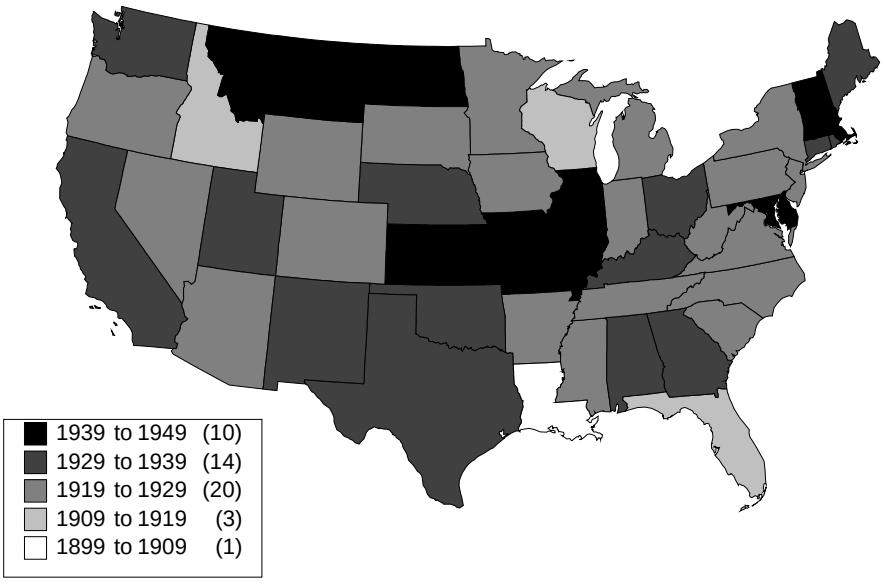

Figure 4: Registered nurse licensing regulation by decade of adoption

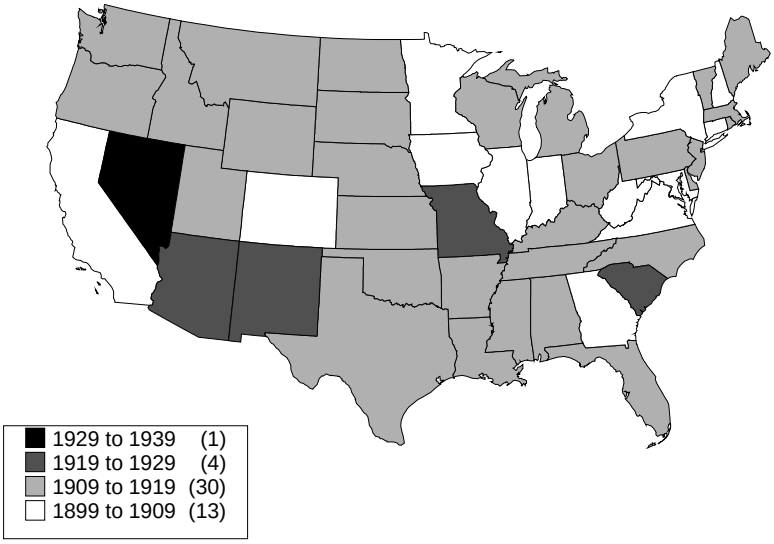

Figure 5: Four-year medical degree requirement by decade of adoption

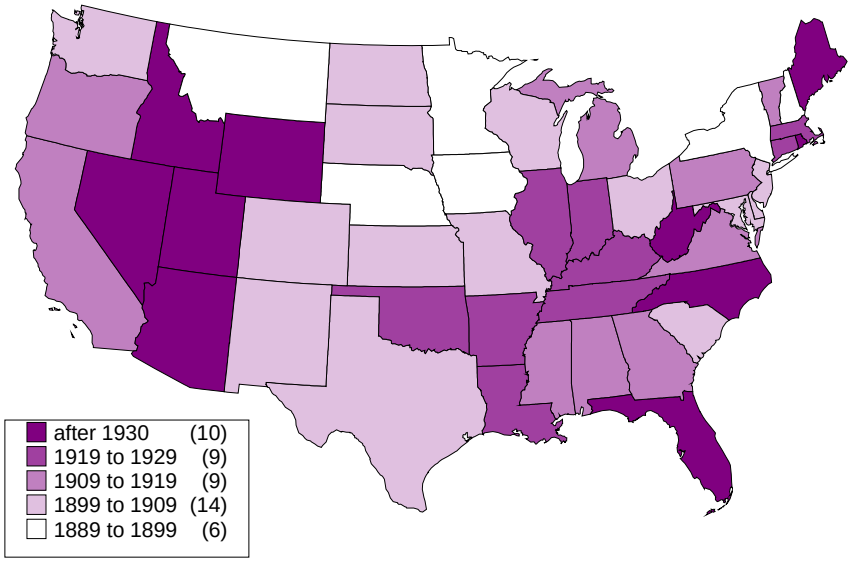

Figure 6: High school graduation requirement for lowest level of teacher certification by decade of adoption

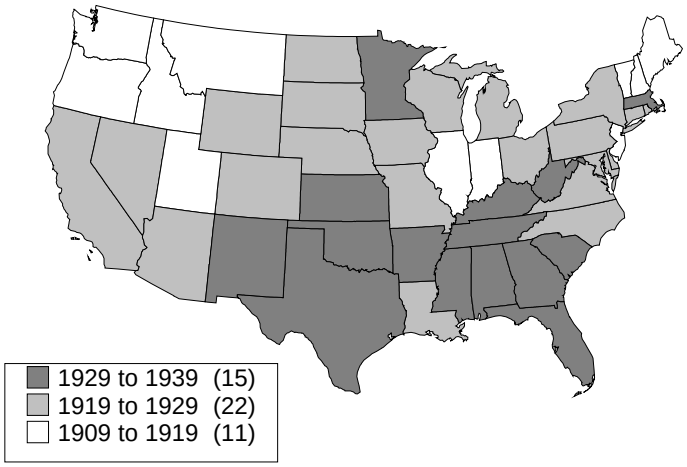

Table 1: Correlates of licensing adoption

	Accountant	Barber	Beautician	Engineer	Midwives	Pharmacist	Plumber	Practical Nurse	Registered Nurse
Δ(Occ. share)	-0.16	-0.08	-0.07	0.24	0.63*	-0.27	-0.05	-0.14	-0.11
	(0.16)	(0.21)	(0.08)	(0.94)	(0.29)	(0.19)	(0.15)	(0.14)	(0.07)
Δ(Female LF)	-3.03			-0.29		-0.90	-0.32	-0.28	-4.89
	(8.81)			(0.77)		(0.71)	(0.78)	(0.96)	(3.60)
Δ(Black LF)		-0.33	0.44		0.08		0.14	0.05	-0.11
		(0.20)	(0.36)		(0.22)		(0.15)	(0.18)	(0.23)
Age	-0.05	-0.14	-0.35**	0.35**	-0.62*	0.35*	-0.13	0.56**	0.0005
	(0.25)	(0.14)	(0.15)	(0.15)	(0.25)	(0.14)	(0.18)	(0.13)	(0.25)
Literacy	-7.25					-2.07			5.96**
	(4.46)					(2.42)			(2.75)
Domestic	-4.70	0.49	8.00**	-9.12	1.38	1.38	-9.07	3.15	-6.65
	(3.89)	(2.31)	(3.23)	(3.28)**	(1.35)	(1.35)	(2.65)**	(3.20)	(3.85)
Urbanization	-9.16	0.40	1.96*	-3.44**	3.93	0.57	1.50	-0.92	-0.89
	(3.54)**	(0.68)	(0.90)	(0.89)	(3.43)	(0.96)	(1.01)	(0.96)	(1.30)
Statistically significant year dummies	None		+1930**, +1940**, +1950**	+1910*, +1920** +1930**, +1940**, +1950**	None	+1910**, +1920**, +1930**	None	+1910**, +1920**, +1930**, +1940**, +1950**	+1920**, +1930**
Statistically significant census regions	None	+WNC*,	+MA**, +ESC*, +WSC*	None	+ENC*	None	+ENC**, +WNC**, +SA**, +ESC**, +WSC**, +MT*, +PC*	-ENC*, -WNC*, -SA*, -ESC**, -WSC**, -MT**, -PC**	+SA*, +ESC*, +WSC*
Observations	192	321	240	240	229	288	300	280	240

Notes: Robust standard errors are reported in parentheses. ** and * denote statistical significance at the 1 percent and 5 percent levels, respectively. Regressions were weighted by state labor force. Each column represents a separate regression

Table 2: Descriptive data on sample

Occupation	Years included in sample	States excluded (missing licensing data)	State years of data	Sample size (person years)	Number of workers in occupation	Number of female workers in occupation	Number of black workers in occupation
Accountants	1880-1930[a]		192	957,787	1,745	188	0
(percent)					(0.18)	(10.8)	
Barbers	1880-1950	MI, NV	321	1,811,048	8,953	n/a[b]	1,000
(percent)					(0.49)		(11.2)
Beauticians	1910-1950		240	441,193	4,700	n/a[b]	584
(percent)					(1.07)		(12.43)
Engineers	1900-1950		288	1,901,607	10,865	127	0[d]
(percent)					(0.57)	(1.17)	(0)
Midwives	1880-1930	IL, PA	229	188,039[c]	158	158[c]	115
(percent)					(0.07)	(100)	(72.8)
Pharmacist	1870-1940[a]		288	1,421,937[d]	2,708	98	0[e]
(percent)					(0.19)	(3.62)	(0)
Plumbers	1880-1950	ME, MI	321	2,331,786	9,965	118	243
(percent)					(0.44)	(1.2)	(2.4)
Practical Nurses	1900-1960	MA, MI, MO, OK,	280	2,374,246	5,836	5,582	922
(percent)		PA, SC, SD, TN			(0.25)	(95.6)	(15.8)
Physicians	1900-1930		192	1,117,373	4,332	185	61
(percent)					(0.39)	(4.3)	(1.4)
Registered nurses	1900-1940		240	1,470,335	5,736	5,580	138
(percent)					(0.39)	(97.3)	(2.4)
Teachers	1910-1940		192	1,187,781	22,388	17,614	1,321
(percent)					(1.9)	(78.7)	(5.9)

Notes:
[a] 1910 not included because accounting and pharmacy not reported as an occupation in that year.
[b] By the census definitions, barbers are always men and beauticians are always women.
[c] We exclude men from this sample because there were only two male midwives.
[d] We exclude blacks from this sample because the share of engineers who were black was less than one percent.
[e] We exclude blacks from this sample because the share of pharmacists who were black was less than one percent.

Table 3: Determinants of occupational participation

	Accountant	Barber	Beautician	Engineer	Midwife	Pharmacist	Plumber	Prac Nurse	Reg Nurse
Licensing	-0.068	-0.012	0.037	0.039	0.325	-0.044	0.117	-0.036	-0.038
	(0.080)	(0.022)	(0.027)	(0.020)	(0.106)**	(0.033)	(0.037)**	(0.033)	(0.052)
Female	-0.268			-1.021		-0.580	-1.005	1.295	1.424
	(0.029)**			(0.027)**		(0.041)**	(0.022)**	(0.032)**	(0.040)**
Black		0.136	-0.053		-0.000		-0.461	0.001	-0.616
		(0.043)**	(0.033)		(0.096)		(0.030)**	(0.025)	(0.054)**
Age	-0.002	0.001	-0.007	0.000	0.025	0.004	-0.002	0.012	0.005
	(0.001)**	(0.001)	(0.001)**	(0.000)	(0.002)**	(0.000)**	(0.000)	(0.001)**	(0.001)**
At school	-0.114				0.513	-0.335			0.382
	(0.041)**				(0.203)*	(0.080)**			(0.054)**
Literate	0.776				0.020	0.706			0.527
	(0.130)**				(0.101)	(0.075)**			(0.092)**
Domestic	0.327	-0.226	0.034	0.278	-0.567	0.153	0.211	-0.003	0.029
	(0.028)**	(0.059)**	(0.023)	(0.017)**	(0.115)**	(0.033)**	(0.020)**	(0.015)	(0.035)
Widowed	0.199	0.106	0.236	0.002	0.325		0.065	0.116	-0.301
	(0.021)**	(0.025)**	(0.024)**	(0.024)	(0.124)**		(0.024)**	(0.019)**	(0.028)**
Married	0.049	0.196	0.291	0.310	0.666		0.101	-0.087	-0.263
	(0.054)	(0.023)**	(0.019)**	(0.019)**	(0.127)**		(0.018)**	(0.017)**	(0.018)**
Children	-0.051	-0.039	-0.066	-0.042	-0.012	-0.046	0.003	-0.031	-0.098
	(0.006)**	(0.005)**	(0.005)**	(0.003)**	(0.026)	(0.004)**	(0.004)	(0.006)**	(0.008)**
Two families	0.004	0.012	-0.002	0.049	0.034	0.080	-0.043	0.179	-0.096
	(0.022)	(0.014)	(0.021)	(0.012)**	(0.103)	(0.016)**	(0.020)*	(0.018)**	(0.024)**
Three families	0.050	0.047	0.035	0.153	-0.343	0.037	-0.017	0.248	0.174
	(0.029)	(0.042)	(0.027)	(0.021)**	(0.120)**	(0.029)	(0.026)	(0.021)**	(0.028)**
City	0.508	0.093	0.067	0.367	0.315	0.129	0.298	-0.020	0.111
	(0.041)**	(0.017)**	(0.018)**	(0.017)**	(0.120)**	(0.015)**	(0.018)**	(0.017)	(0.028)**
Observations	834,382	1,737,679	441,193	1,901,607	164,243	1,631,502	2,225,502	2,374,246	1,470,335
State years	192	321	240	288	229	288	321	280	240

Notes: State and year fixed effects are included. Robust standard errors, clustered at the state level, are reported in parentheses. ** and * denote statistical significance at the 1 percent and 5 percent levels, respectively. Each column represents a separate regression.

Table 4: Effect of occupational licensing on black workers

	Barber	Beautician	Midwives	Plumber	Practical Nurse	Registered Nurse
Licensing indicator	0.007 (0.023)	0.043 (0.030)	0.276 (0.113)*	0.115 (0.035)**	-0.054 (0.035)	-0.031 (0.057)
(Black)*(licensing)	**-0.173** **(0.049)****	-0.055 (0.075)	0.137 (0.175)	0.039 (0.063)	**0.137** **(0.067)***	-0.086 (0.135)
Female				-1.005 (0.022)**	1.298 (0.032)**	1.424 (0.040)**
Black	0.215 (0.052)**	-0.015 (0.073)	-0.014 (0.101)	-0.471 (0.027)**	-0.060 (0.046)	-0.539 (0.138)**
Observations	1,737,679	441,193	164,243	2,225,502	2,374,246	1,470,335
State years	321	240	229	321	280	240

Notes: State and year fixed effects as well as individual and household level controls (age, literacy, domestic, married, widowed, children, two families, three families, at school) are also included when available. Robust standard errors, clustered at state level, are in parenthesis. ** and * denote statistical significance at the 1 and 5 percent levels, respectively. Each column represents a separate regression.

Table 5: Effect of occupational licensing on women workers

	Accountant	Engineer	Pharmacist	Plumber	Practical Nurse	Registered Nurse
Licensing indicator	-0.077 (0.082)	0.037 (0.020)	-0.053 (0.033)	0.114 (0.037)**	0.056 (0.041)	-0.252 (0.061)**
(Female)*(licensing)	0.110 (0.106)	**0.105** **(0.049)****	**0.398** **(0.133)****	**0.114** **(0.035)****	-0.099 (0.053)	**0.239** **(0.080)****
Female	-0.371 (0.106)**	-1.10 (0.044)**	-0.950 (0.132)**	-1.036 (0.014)**	1.333 (0.027)**	1.202 (0.081)**
Black				-0.461 (0.030)**	0.001 (0.025)	-0.616 (0.054)**
Observations	834,382	1,901,607	1,421,937	2,225,502	2,374,246	1,470,335
State years	192	288	288	321	280	240

Notes: State and year fixed effects as well as individual and household level controls (age, literacy, domestic, married, widowed, children, two families, three families, at school) are also included when available. Robust standard errors, clustered at state level, are in parenthesis. ** and * denote statistical significance at the 1 and 5 percent levels, respectively. Each column represents a separate regression.

Table 6: Effect of occupational licensing on young black workers

	Barber	Beautician	Plumber	Practical Nurse	Registered Nurse
Licensing indicator	-0.038	0.042	0.141	-0.025	-0.013
	(0.035)	(0.037)	(0.048)**	(0.061)	(0.060)
(Black)*(licensing)	-0.065	-0.097	0.036	0.085	0.141
	(0.066)	(0.089)	(0.085)	(0.075)	(0.146)
Female			-1.000	1.170	1.493
			(0.034)**	(0.032)**	(0.043)**
Black	0.135	-0.032	-0.523	0.177	-0.765
	(0.056)*	(0.073)	(0.030)**	(0.039)**	(0.135)**
Observations	849,076	257,966	1,112,244	1,104,664	748,407
State years	321	240	321	280	240

Notes: State and year fixed effects as well as individual and household level controls (age, literacy, domestic, married, widowed, children, two families, three families, at school) are also included when available. Robust standard errors, clustered at state level, are in parenthesis. ** and * denote statistical significance at the 1 and 5 percent levels, respectively. Young is defined as below 35 years of age. Each column represents a separate regression.

Table 7: Effects of occupational licensing on young women workers

	Accountant	Engineer	Pharmacist	Plumber	Practical Nurse	Registered Nurse
Licensing indicator	-0.126 (0.137)	0.060 (0.025)*	-0.127 (0.052)*	0.138 (0.050)**	0.077 (0.076)	-0.340 (0.084)**
(Female)*(licensing)	0.015 (0.135)	0.136 (0.088)	**0.571** **(0.231)***	**0.182** **(0.058)****	-0.092 (0.067)	**0.375** **(0.097)****
Female	-0.253 (0.0128)*	-1.097 (0.072)**	-1.122 (0.216)**	-1.036 (0.038)**	1.19 (0.040)**	1.154 (0.089)**
Black		-0.970 (0.068)**		-0.515 (0.032)**	0.210 (0.021)**	-0.635 (0.060)**
Observations	436,889	1,061,878	721,956	1,112,244	1,104,664	748,407
State years	192	288	288	321	280	240

Notes: State and year fixed effects as well as individual and household level controls (age, literacy, domestic, married, widowed, children, two families, three families, at school) are also included when available. Robust standard errors, clustered at state level, are in parenthesis. ** and * denote statistical significance at the 1 and 5 percent levels, respectively. Young is defined as below 35 years of age. Each column represents a separate regression.

Table 8: Effects of physician licensing requirements on women and black workers

	(1)	(2)	(3)	(4)	(5)	(6)
Four-year med school req't	0.009	0.008	0.007			
	(0.024)	(0.024)	(0.024)			
Pre-medical college req't				0.061	0.063	0.057
				(0.035)	(0.035)	(0.035)
(Female)*(Four year med school req't)		0.003				
		(0.036)				
(Black)*(Four year med school req't)			0.087			
			(0.083)			
(Female)*(Pre-medical college req't)					-0.034	
					(0.034)	
(Black)*(Pre-medical college req't)						**0.180**
						(0.077)*
Female	-0.412	-0.413	-0.412	-0.412	-0.399	-0.412
	(0.035)**	(0.039)**	(0.035)**	(0.035)**	(0.032)**	(0.034)**
Black	-0.673	-0.673	-0.706	-0.673	-0.673	-0.754
	(0.037)**	(0.037)**	(0.050)**	(0.037)**	(0.037)**	(0.050)**
Observations	1,117,373	1,117,373	1,117,373	1,117,373	1,117,373	1,117,373
State years	192	192	192	192	192	192

Notes: State and year fixed effects as well as individual and household level controls (age, literacy, domestic, married, widowed, children, two families, three families, at school) are also when available. Robust standard errors, clustered at state level, are in parenthesis. ** and * denote statistical significance at the 1 and 5 percent levels, respectively. Each column represents a separate regression.

Table 9: Effects of teacher licensing requirements on women and black workers

	(1)	(2)	(3)	(4)	(5)	(6)
High school graduation req't	0.017	-0.074	0.006			
	(0.022)	(0.026)**	(0.023)			
Some college req't				0.029	-0.058	0.021
				(0.022)	(0.021)**	(0.024)
(Female)*(High school req't)		**-0.240**				
		(0.021)**				
(Black)*(High school req't)			**0.151**			
			(0.035)**			
(Female)*(Some college req't)					**-0.248**	
					(0.026)**	
(Black)*(Some college req't)						**0.137**
						(0.048)**
Female	1.101	1.249	1.102	1.101	1.208	1.102
	(0.026)**	(0.034)**	(0.026)**	(0.026)**	(0.028)**	(0.026)**
Black	-0.388	-0.395	-0.468	-0.388	-0.393	-0.439
	(0.035)**	(0.035)**	(0.040)**	(0.035)**	(0.036)**	(0.036)**
Observations	1,187,781	1,187,781	1,187,781	1,187,781	1,187,781	1,187,781
State years	192	192	192	192	192	192

Notes: State and year fixed effects as well as individual and household level controls (age, literacy, domestic, married, widowed, children, two families, three families, at school) are also included when available. Robust standard errors, clustered at state level, are in parenthesis. ** and * denote statistical significance at the 1 and 5 percent levels, respectively. Each column represents a separate regression.