Is Occupational Licensing a Barrier to Interstate Migration?

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December 2017

Occupational licensure, one of the most significant labor market regulations in the United States, may restrict the interstate movement of workers. We analyze the interstate migration of 22 licensed occupations. Using an empirical strategy that controls for unobservable characteristics that drive long-distance moves, we find that the between-state migration rate for individuals in occupations with state-specific licensing exam requirements is 36 percent lower relative to members of other occupations. Members of licensed occupations with national licensing exams show no evidence of limited interstate migration. The size of this effect varies across occupations and appears to be tied to the state specificity of licensing requirements. We also provide evidence that the adoption of reciprocity agreements, which lower re-licensure costs, increases the interstate migration rate of lawyers. Based on our results, we estimate that the rise in occupational licensing can explain part of the documented decline in interstate migration and job transitions in the United States.

We have benefited from comments by Ian Fillmore, Hwikwon Ham, Mindy Marks, Alexandre Mas, Jesse Rothstein, Sam Schulhofer-Wohl, David Slutsky, Betsey Stevenson, and Aaron Sojourner. We thank Jing Cai, Rebecca Furdek, Robin Lehninger, and Seth Zawila for excellent research assistance, and Dave Van Riper for help in preparing our data. We appreciate comments from the participants at the American Economic Association annual meetings, Association for Policy Analysis and Management annual meetings, Baylor University, Labor and Employment Relations Association annual meetings, Population Association of America annual meetings, University of Kansas, University of Minnesota, and the W.E. Upjohn Institute for Employment Research. We thank the Smith Richardson Foundation and the Kauffman Foundation for their financial support of our research. The views expressed here are those of the authors and do not necessarily reflect the views or policies of the Smith Richardson Foundation, the Kauffman Foundation, the Federal Reserve Bank of Minneapolis, or the Federal Reserve System.

1. Introduction

Occupational licensing has become one of the most significant forms of labor market regulation in the United States. About 25 percent of the workforce requires a license to work; in 1950, that figure was only 5 percent (U.S. Department of Labor, Bureau of Labor Statistics 2016; Kleiner and Krueger 2010, 2013). Proponents of occupational licensing contend that it protects consumers, ensuring high service quality and protecting the public from harm by making sure that all service providers have attained a minimum qualification level. By requiring such qualifications, however, occupational licensing may also restrict entry and limit the mobility of individuals in these occupations. The jurisdiction-specific nature of licensing also may limit the ability of workers to move to take advantage of job opportunities, and may limit the wage growth and employment of members of licensed occupations by restricting their geographic mobility. We provide new and more comprehensive detailed evidence of the influence of occupational licensing on reducing the interstate migration of licensed workers. These results suggest that reducing some of these restrictions has the potential to enhance labor market fluidity, increase the efficiency of the labor market, and raise the earnings of regulated workers.

Economists have long recognized the ability of workers to move to different labor markets without restriction as fundamental to the efficient functioning of those markets (Smith 1776; Friedman 1962). Most occupational licenses are granted at the state level,[1] and often the cost of attaining licensure in another state can be significant, even for those already licensed in another state. If the rise in occupational licensing restricts interstate mobility, it potentially subjects a growing share of the labor force to barriers to mobility

[1] A White House report estimated that over 1,100 occupations are licensed in at least one state and 60 are licensed in every state (U.S. Executive Office of the President, 2015).

and subsequent wage growth. In this study, we show that individuals in a variety of licensed occupations, ranging from high income and education professions to blue-collar trades, move across states at a significantly lower rate than others, although the size of this reduction varies substantially across occupations. Our empirical strategy exploits the detailed migration information available in the American Community Survey (ACS) to control for unobservable characteristics of licensed occupation members that influence the probability of moving a long distance. We show that occupations with state-specific licensing requirements, such as exams, experience the largest reductions in interstate migration, whereas the interstate mobility of occupations requiring passage of a national exam for licensure is generally no lower than that of others. We provide additional evidence of a causal link between state licensing requirements to the interstate migration of lawyers. We provide approximations of the earnings growth of licensed individuals arising from their reduced incentives to move across states.

Despite the growing importance of occupational licensing, the existing literature investigating the link between occupational licensing and geographic mobility is sparse. Using data from the 1950 census, Holen (1965) showed that dentists and lawyers have limited between-state mobility relative to physicians. Pashigian (1979) considered the interstate migration of multiple universally licensed occupations, and occupations with little reciprocity between states had lower interstate mobility between 1965 and 1970. In a study of 14 universally licensed occupations also using the 1970 census, Kleiner et al. (1982) found a negative relationship between licensing "restrictiveness" (based on state exam and experience requirements) and interstate mobility, as well as a positive correlation between expanded reciprocity and interstate migration rates. More recent

work includes Tenn (2001) and DePasquale and Stange (2016). Tenn's dissertation examines the links between the interstate migration of lawyers and their wages, finding that wages are higher in states with lower migration rates. In contrast, DePasquale and Stange show that the adoption of the Nurse Licensure Compact, which enables registered nurses to practice across state lines without obtaining additional licensure, does not affect the labor supply or the geographic mobility of nurses.

The growth of occupational licensing from the 1950s through 2008 is shown in Figure 1 (Kleiner and Krueger 2013). The figure also shows the decline in gross interstate migration rates from World War II using estimates from the Current Population Survey (CPS) for various years. The limiting effect of occupational licensing on interstate migration can provide insights into two yet-unexplained trends: the decrease in interstate migration and labor market churn over the last three decades. Annual interstate migration fell from 3 to 1.5 percent between 1980 and 2010 (Molloy et al. 2011), and annual job-to-job flows fell from 16 to 11 percent over the same time period (Molloy et al. 2016).[2] If occupational licensing decreases interstate migration by 20 percent, as our results suggest, the increase in licensing can account for 4 percent of the decline in interstate migration and 1.2 percent of the decrease in job-to-job flows between 1980 and 2010. The aging of the U.S. population, in contrast, accounts for only 10 percent of the decline in interstate migration between 1980 and 2015 and 9 percent of the decline in job-to-job flows between 1998 and 2010 (Molloy et al. 2016; Hyatt and Spletzer 2013).

[2] Many others have also documented and investigated these trends. For more on the decline in geographic mobility, see Molloy et al. (2013), Kaplan and Schulhofer-Wohl (2017), and Johnson and Schulhofer-Wohl (2017). Work on the decline in labor market churn includes Abowd and Vilhuber (2011), Bjelland et al. (2011), Davis et al. (2012), Hyatt and McEntarfer (2012), and Lazear and Spletzer (2012).

Our study proceeds as follows. Section 2 presents a simple theoretical framework relating occupational licensing and geographic mobility. Section 3 describes our data. Section 4 outlines our empirical strategy, and Section 5 presents our results, including tests of the robustness of our results and the causal model for lawyers. In Section 6 we summarize, conclude, and present directions for future research.

2. Modeling Occupational Licensing and Geographic Mobility

The potential restrictive effect of occupational licensing on interstate migration can be modeled using classic models of migration decision making developed by Sjaastad (1962). In these models, an individual decides whether to migrate based on expected utility differences (usually modeled as a function of wages or trade-offs of wages for other nonpecuniary items) between the origin and destination. They migrate if, given their beliefs, they have a higher expected utility from migrating than from not migrating:

$$E[u(w_D)] - C \geq E[u(w_O)]. \qquad (1)$$

While expected utility u is a function of wages in the origin and destination (w_O and w_D, respectively), migrating also incurs a cost C. Often this cost is thought of as including onetime moving costs, such as transportation, finding a home and job and other setup costs incurred at the destination, as well as so-called psychic costs, such as being farther from family, finding new friends, and so on. For moves where the origin and destination are both within a state, members of licensed occupations incur no additional cost to migration relative to unlicensed workers. Licensed individuals considering a move to a destination in another state face the additional cost of re-licensure, an issue that unlicensed individuals considering the same move do not face. If re-licensure cost is

high enough, the interstate migration rates of licensed individuals will be lower than that of others, but their within-state migration rates should be unaffected.

Although the exact requirements for licensure vary by occupation, most include training, experience, and exam obligations, as well as the payment of licensing fees and participation in continuing professional development activities (Sass 2015). An individual seeking re-licensure in another state may range from completing more training and exams or merely filling out forms and paying a fee. The specific requirements vary not only by occupation but also by destination and origin state. For particular occupations, some states have reciprocity agreements with other states, which recognize licenses granted in another state as valid for practice. Institutional costs are associated with these regulations. In some cases, re-licensure costs can be high. For example, a licensed public schoolteacher with a decade of teaching experience in New Hampshire is not legally allowed to teach in an Illinois public school without completing significant new coursework and apprenticeships (Sass 2015). The existence of such requirements could constitute a significant cost to migration across state lines for those in licensed occupations, and these costs could prevent individuals from moving if the costs of re-licensure had been lower.

3. Data

For our empirical analysis, we rely on the ACS as available through IPUMS-USA (Ruggles 2017). As the largest nationally representative survey that contains detailed migration and occupation measures, as well as other information, the ACS is the existing dataset most suited to studying the relationship between licensing coverage and

migration.[3] We use the ACS from 2005 to 2015 for our main analyses because these years contain more detailed migration information than is available in earlier years. Since we are interested in the migration of currently employed and employable individuals, we limit our sample to those aged 18 to 65. The data available through the ACS only have information on occupational licensing coverage, but not if the individual attained a license (Gittleman and Kleiner 2016).[4]

The 22 licensed occupations we examine are shown in Table 1. We chose these occupations based on the following criteria: (1) they were uniquely identifiable using ACS occupation codes, (2) they were universally licensed in all states, and (3) entry into the occupation requires licensure, so all members of an occupation must be licensed. All of these occupations require passage of at least one exam to attain licensure. We use the structure of this exam to divide the occupations into two categories: occupations for which the content and passing standards of the licensing exam vary across states, and those for which the main licensing exam is a national exam with a single passing standard. We refer to the former group as "state-specific" licensed occupations and the latter as "quasi-national" licensed occupations.[5] Some occupations with similar tasks, such as occupational and physical therapists, were merged by combining two or more ACS occupation categories to increase the sample size. These 22 licensed occupations cover a wide variety of employment types, from low to high income and education, and

[3] The address-based sampling design of the Current Population Survey (CPS) unfortunately limits its usefulness in studying the relationship between migration and licensing because movers are not followed over time.

[4] The ACS has a weakness of only identifying current occupation; consequently, we only observe occupation of migrants after their move. We discuss in detail the implications of our results in Section 4.

[5] More details on the rationale for classification of occupations as quasi-national and state-specific are shown in Appendix Table A1.

across a range of industries. The occupations we analyze make up 11 percent of the U.S. labor force, with the state-specific licensed occupations accounting for 7 percent and the quasi-national licensed occupations for 4 percent.

We focus on occupations that are universally licensed in all states and all the individuals in the occupation have attained a license and use it in their work to ensure that all members of the occupation face re-licensure costs to move across states (Gittelman and Kleiner 2016). Although many occupations, such as engineers and accountants, are universally licensed in all states, licensure is not required to enter the occupation, and half or less have attained a state license (Gittleman, Klee, and Kleiner, forthcoming). Therefore, re-licensure costs do not factor in the interstate migration decision for a large percentage of the members of these occupations. Similarly, we do not examine other occupations such as securities brokers since they are largely licensed at the national level and state provisions are not relevant. In addition, we do not analyze truck drivers, since a large part of the relevance of licensing is either national or local, and state provisions are less applicable.

4. Empirical Strategy

We estimate the relationship between being a member of a licensed occupation and interstate migration using the following model:

$$B_{ist} = \delta_B licensed_{ist} + X_{ist}\beta + \alpha_s \times \eta_t + \varepsilon_{ist}, \qquad (2)$$

where B_{ist} is an indicator for moving between states in the last year for individual i residing in state s in year t, $licensed_{ist}$ is an indicator for being a member of a licensed

occupation, X_{ist} is a vector of control variables,[6] and $\alpha_s \times \eta_t$ are state-year fixed effects. The comparison group in our model contains members of all other occupations regardless of licensure status.[7] The estimate of our coefficient of interest, $\hat{\delta}_B$, likely does not identify our parameter of interest, the effect of the cost of re-licensure on interstate migration, due to the presence of correlations between $licensed_{ist}$ and the error term ε_{ist}. Fortunately, we can address this selection bias problem by using the detailed migration information available in the ACS.

Starting in 2005, the ACS contains detailed information for migrants on current and previous locations at geographies below the state level, known as Public Use Microdata Areas of migration (MIGPUMAs). These geographic units correspond to areas with roughly 100,000 or more residents and are defined separately within each state.[8] We use this current and former MIGPUMA of residence information to define two types of migrants for those who move within a state: those who move within the same MIGPUMA or between adjacent MIGPUMAs (defined as MIGPUMAs who share a border) and those who move between non-adjacent MIGPUMAs. We refer to the former group of within-state migrants as "close" migrants and the latter as "far" migrants.

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[6] These variables include measures of education (less than high school, high school graduate, some college, bachelor's degree, more than a bachelor's degree), race (non-Hispanic white, non-Hispanic black, Hispanic white, and other race), sex, marital status (married, divorced, widowed, never married), age (5-year categories with a separate category for ages 18 and 19), citizenship status, employment status (employed, unemployed, not in labor force), and number of children. We also control for income quartile (measured in 2015 dollars), with the quartiles calculated for each occupation separately, and those with incomes greater than the maximum reported from each occupation excluded from estimations for that occupation (or occupation type).

[7] The presence of licensed occupations in our comparison group biases our estimate of δ_B towards zero, as some of the members of the comparison group are also licensed. These are members of licensed occupations not identifiable in the ACS.

[8] Some MIGPUMAs combine two or more Public Use Microdata Areas (PUMAs) of residence, so the two do not perfectly correspond. For more information, see https://usa.ipums.org/usa-action/variables/MIGPUMA1#description_section.

Annual close, far, and interstate migration rates for our sample, as well as selected descriptive statistics, are shown in Table 2. Note that the majority of moves are close, since approximately 11.5 percent of the population moves within states in a given year, compared to 2.5 percent moving between states and 1 percent moving a far distance within a state.

Far moves made within a state are likely to be more similar to interstate moves than close moves. Individuals moving within the same MIGPUMA or between adjacent MIGPUMAs are likely to keep the same employer and job after the move, since they are moving within the same local area; these moves are more likely motivated by reasons other than employment. Moving a farther distance, whether it is within the same state or between states, is more likely to be accompanied by a change in employer. To illustrate how the similarity between far within-state and interstate moves allows us to address the selection problem in equation (2), consider the corresponding equation for far moves:

$$F_{ist} = \delta_F licensed_{ist} + X_{ist}\beta + \alpha_s \times \eta_t + \upsilon_{ist}, \qquad (3)$$

where F_{ist} is now an indicator for moving far within a state, and all other variables are defined as in equation .2. Similarly, we expect $Cov(licensed_{ist}, \upsilon_{ist}) \neq 0$, and therefore our estimate $\hat{\delta}_F$, to also suffer from selection bias. However, as members of licensed occupations do not need to become re-licensed when they move within a state, $\delta_F = 0$. Therefore, $\hat{\delta}_F$ identifies the bias resulting from correlation between the probability of making a far move and being a member of a licensed occupation. Consider the following expression for the error term υ_{ist}:

$$\upsilon_{ist} = \gamma_{ist} + \omega_{ist} + u_{ist}, \qquad (4)$$

where γ_{ist} captures unobserved characteristics correlated with licensure status that affect the probability of moving at all, regardless of distance. The ω_{ist} term represents characteristics affecting the likelihood of moving a far distance, whether within or between states, that are correlated with being in a licensed occupation. Licensed occupations, such as lawyers, realtors, barbers and cosmetologists, and many health care related occupations, are likely to have a "practice" or "network" component, and consequently success in these occupations involves development of reputation capital or clientele in one's local area. Moving away from these customers results in loss of this local capital and development of similar capital in the destination area, which requires a significant investment of time and money. The additional reputation- or network-related cost likely deters members of licensed occupations from moving far distances and is unrelated to the cost of licensure itself. If we assume $Cov(licensed_{ist}, u_{ist}) = 0$, the expectation of $\hat{\delta}_F$ is

$$E(\hat{\delta}_F) = \delta_F + bias_F(\gamma_{ist}) + bias_F(\omega_{ist}) = 0 + bias_F(\gamma_{ist}) + bias_F(\omega_{ist}), \quad (5)$$

where $bias_F(\cdot)$ is the bias resulting from that component. Note that both γ_{ist} and ω_{ist} are also components of the error term in the interstate migration equation,

$$\varepsilon_{ist} = \gamma_{ist} + \omega_{ist} + e_{ist}, \quad (6)$$

as they also influence the probability of moving between states. Therefore, we have this expression for $E(\hat{\delta}_B)$ if we also assume $Cov(licensed_{ist}, e_{ist}) = 0$:

$$E(\hat{\delta}_B) = \delta_B + bias_B(\gamma_{ist}) + bias_B(\omega_{ist}), \quad (7)$$

and $E(\hat{\delta}_B) - E(\hat{\delta}_F)$ identifies δ_B if $bias_B(\gamma_{ist}) = bias_F(\gamma_{ist})$ and $bias_B(\omega_{ist}) = bias_F(\omega_{ist})$. Each of these bias terms contains three elements: (1) the correlation between the component and the dependent variable, (2) the correlation between the

component and $licensed_{ist}$, and (3) the correlation between the component and the other variables in the equation. As the right-hand side of each equation is specified identically, (2) and (3) are plausibly true. Recall that we defined γ_{ist} to be unobserved characteristics correlated with licensing status affecting the probability of moving at all, and so its relationship with the dependent variable in both equations (moving far or moving between states) should be similar. The other component ω_{ist} represents characteristics of licensed occupations that affect the probability of moving a long distance, and so its relationship with moving far or moving between states should be identical. Therefore, it is plausible that the bias from each term should be approximately equal in both the far and interstate equations.

In addition to the assumptions discussed above, the ability of the "difference" estimator $E(\hat{\delta}_B) - E(\hat{\delta}_F)$ to identify δ_B also relies on the additional assumptions of no correlation between $licensed_{ist}$ and the remaining parts of each error term (u_{ist} and e_{ist}). These assumptions are likely to not hold, as there are potentially other unobserved factors correlated with licensing status that affect the likelihood of migration, whether between states or within a state, that are not captured by γ_{ist} and ω_{ist}. We therefore do not claim that $E(\hat{\delta}_B) - E(\hat{\delta}_F)$ identifies a causal effect of licensure on interstate migration, but this difference estimator is likely "closer" to this effect than the estimate of $\hat{\delta}_B$ in equation (2).

We face an additional issue in estimating the effect of re-licensure costs on interstate migration from the content of the ACS dataset. Our key independent variable $licensed_{ist}$ is defined based on current reported occupation, and our dependent variables are measures of migration in the past year. The ACS does not contain information on an

individual's occupation last year (i.e., prior to their move). Therefore, individuals currently in licensed occupations in the ACS consist of two groups: individuals who were also employed in that occupation last year ("continuing" members of the occupation) and individuals who were not ("new entrants" into the occupation). Therefore, δ_B and δ_F do not solely identify the effect of re-licensure cost on migration (as they would if we could condition on last year's occupation), but instead are a combination of this effect (the difference in migration rates between continuing members of licensed occupations and other occupations) and the difference in migration rates between new entrants into licensed occupations and new entrants into other occupations.

We have previously described the predicted relationship between re-licensure costs and migration rates of continuing members of occupations: continuing members only face re-licensure costs if they move between states. We then ask, what is the relationship between licensure costs and migration rates for new entrants into occupations? All new entrants into licensed occupations face initial licensure costs, whether they stay where they are currently living or move. If initial licensure costs vary across states, new entrants into licensed occupations have an incentive to move to states with lower licensure costs. Relative licensure costs between states are not a factor in the migration decisions of unlicensed occupations.

Assuming that other incentives to migrate for new entrants operate similarly across licensed and unlicensed occupations (and/or differences in these incentives are effectively "differenced out" using the between–far difference estimator), we expect new entrants in licensed occupations to have higher interstate migration rates relative to new entrants in unlicensed occupations, as they have a stronger incentive to move across states because

of varying initial licensure costs, but this difference in incentives does not exist for within-state moves. This means our estimate of the effect of licensure on interstate migration is a combination of a negative effect for continuing members of licensed occupations and a positive effect for new entrants. Therefore, our estimator $E(\hat{\delta}_B) - E(\hat{\delta}_F)$ is biased upward by the presence of new entrants in our sample.

We can provide some suggestive evidence on the size and presence of this bias by using data from the Annual Social and Economic Supplement of the Current Population Survey (CPS ASEC). While not a panel dataset, the ASEC records both the current occupation of individuals as well as their occupation one year ago. As the data contains the occupation before and after a move for those who moved in the last year, we can identify new entrants into occupations as well as continuing members, and therefore calculate the fraction of new entrants into occupations by their migration status. The CPS migration question allows us to distinguish three types of migration for those who moved: moves within a county, moves between counties within the same state, and moves between states.

Table 3 shows the fraction new entrants into our three main license categories: all licensed occupations, state-specific licensed occupations, and quasi-nationally licensed occupations,[9] by their migration status in the last year. For all three occupation categories, individuals who moved between states have the highest fraction of new entrants, followed by individuals who moved between counties within a state.[10] The fact

[9] All 22 occupations we use in the ACS are also identifiable in the CPS ASEC.
[10] It is not surprising that a large fraction of interstate migrants are new entrants into occupations, given that the most commonly cited reason for far-distance moves is a job change, and migration is highest among young people who are likely to be at the beginning of their careers (Molloy et al. 2011, 2013).

that interstate migrants currently employed in a licensed occupation are 3.6 percentage points (about 25 percent) more likely to be new entrants than those who move between counties within a state suggests that the upward bias in our estimates is potentially quite significant.[11] However, the difference in the relative fraction of new entrants among interstate migrants is similar between quasi-nationally and state-specific licensed occupations, making it quite likely that results for the two categories are equally affected by this bias.[12]

5. Results

We estimate our difference estimator $\mathrm{E}(\hat{\delta}_{\mathrm{B}}) - \mathrm{E}(\hat{\delta}_{\mathrm{F}})$ by simultaneously estimating models (2) and (3), clustering our standard errors on last year's state of residence. As we use linear probability models, the coefficients are percentage point changes, which are not directly comparable across the two models because of differences in the mean of the dependent variable (only about 1 percent of the population moves far within a state, whereas approximately 3 percent of the population moves between states within a year). We therefore convert our estimates to percentage effects by dividing them by the estimated value of the constant in their respective model and multiplying by 100, and we use the simultaneous estimation to calculate standard errors. We first estimate our model for all licensed occupations and the two licensed occupation groups (state-specific and quasi-national) and provide evidence that our results are robust to changes in the definition of far moves. We then explore the heterogeneity in effects across occupations

[11] We performed a similar analysis using the 2001, 2004, and 2008 panels of the Survey of Income and Program Participation, and results were consistent with our CPS findings, and are available in Appendix Table A2.

[12] The sample size in the CPS ASEC is much smaller than the ACS, which is why we do not employ more sophisticated statistical techniques to examine this difference, or repeat our analysis by occupation.

and show more direct links between licensing policies and the interstate migration of lawyers.

5.1 Results by licensing group

Our main results are shown in Table 4. We provide the estimate of the difference estimator $\mathrm{E}(\hat{\delta}_{\mathrm{B}}) - \mathrm{E}(\hat{\delta}_{\mathrm{F}})$ as well as the estimates of its two components. Results are shown for four different specifications. Column (1) compares the migration rates of members of all 22 licensed occupations to that of others, finding that individuals in these occupations have between-state migration rates that are 22.5 percent lower than their far within-state migration rate relative to members of other occupations. This difference is driven by their lower between-state migration rate, as their far within-state rate is similar to that of other occupations. Columns (2) and (3) repeat the analysis for the state-specific licensed occupations and the quasi-national licensed occupations, respectively. The results are very different for the two different groups: the relative interstate migration rate of state-specific licensed occupations is 36 percent lower than that of others, whereas that of quasi-national licensed occupations is 5 percent higher. A more direct comparison of the two groups is shown in Column (4), which compares state-licensed occupations to quasi-national licensed occupations (i.e., the "treatment" group is state-licensed occupations, and the comparison group is quasi-national occupations, with others excluded from the sample). In this case, all members of the sample are subject to occupational licensing, but individuals in licensed occupations with state-specific exam requirements move at a 31 percent lower rate between states than those with national exams. However, they also move far within a state at a 15 percent lower rate, which is evidence that clientele and network-based aspects of these occupations may play a

significant role in limiting migration of these occupations out of their local area. After accounting for these estimates, the relative migration rates of state-specific licensed occupations between states are still 16 percent lower than those of quasi-national licensed occupations.

5.2 Robustness to MIGPUMA definitions

The ability of our estimation strategy to identify the effect of licensing on interstate migration relies on our measure of far within-state migration (moving between non-adjacent MIGPUMAs within a state) being a good proxy for a move that corresponds with both a job change and a move out of one's local area. To implement a robustness check for how sensitive our results are to the definition of a MIGPUMA, we exploit the fact that these definitions changed as a result of the 2010 census.

The definition of MIGPUMAs in the ACS changed in 2012. The extent of these changes varied substantially across states: some states saw no change from the pre-2012 definition, whereas others saw the number of MIGPUMAs within their state decrease substantially. To ensure that our results are not driven by these changes, we repeat our analysis for the time periods with consistent MIGPUMA definitions: 2005–2011 and 2012–2015. Results are shown in Panels A and B of Table 5. Results are similar across the two periods, although in the later period there is no significant difference in relative between-state migration rates for quasi-national occupations. It is, therefore, unlikely that our results are affected by the change in MIGPUMA definition, and our measure of far migration within a state (moving between non-adjacent MIGPUMAs) performs equally well in being a proxy for a "far" move under both definitions.

Another threat to our empirical strategy is if some movements between states do not result in changing the state of licensure of an individual. For example, individuals who are licensed and working in New York may move to Connecticut while keeping their job and license in New York. These types of moves are most likely to occur in the Northeast census region, where states are small and metropolitan areas often cross many state borders.[13] We therefore repeat our analysis excluding individuals currently residing in this region or who did a year ago. Results are shown in Panel C of Table 5 and are very similar to our main results in Table 4. Our results appear unaffected by the unique geography of states in the Northeast region.[14]

5.3 Occupation-specific analysis

As state requirements for licensure are unique to each occupation, we expect substantial variation in the effects of licensure on interstate migration across occupations, even within the state-specific and quasi-national categories, especially as these classifications are based on only the exam requirement. We investigate the heterogeneity across occupations in the effect of licensing on interstate migration by repeating our analysis separately for the 22 occupations listed in Table 1. In these specifications, the $licensed_{ist}$ indicator is replaced by an indicator for belonging to one of the listed occupations (i.e., $teacher_{ist}$, $lawyer_{ist}$, etc.). In some of the specifications, we also set a minimum education, as many occupations require a minimum education level to enter.

[13] The Northeast census region contains the New England division (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) and the Mid-Atlantic division (New Jersey, New York, and Pennsylvania).

[14] States in the Northeast region were also the most affected by the MIGPUMA definition change in 2012. For example, Massachusetts had many small MIGPUMAs in the pre-2011 definition, and after the change in 2012, the entire eastern half of the state was combined into one MIGPUMA. As results excluding the Northeast are nearly identical to results using the entire country, this is further evidence that our results are not sensitive to MIGPUMA definitions.

For example, we limit the sample for the physician education level to those with at least a bachelor's degree, since including those with lower education levels in the comparison group for such a highly educated profession are likely errors in the data.[15] All other control variables are the same as in our main analysis.

Results for the state-specific licensed occupations are shown in Table 6. There are large differences across occupations in the relative between-state migration rate. Pharmacists and teachers have the lowest relative rates, at -47 and -39 percent, respectively.[16] Other occupations with reduced relative interstate migration include lawyers (-25 percent), real estate appraisers and brokers (-21 and -13 percent, respectively), electricians (-13 percent), and barbers/cosmetologists (-7.5 percent). The other occupations—insurance agents, EMTs/paramedics, pest control workers, and chiropractors—display no statistically significant difference in their relative between-state migration rates compared to members of other occupations, although their point estimates are all less than zero. Our results also show that occupations for which network and clientele effects are expected to be important also have lower far within-state migration rates, such as teachers, barbers/cosmetologists, and real estate brokers and appraisers.[17]

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[15] Minimum education levels for each occupation's specification, if applicable, are listed in the notes to Tables 6 and 7.

[16] In many states, only teachers employed by public schools have to be licensed. Unfortunately, the industry and occupation codes in the ACS do not allow distinction of public school teachers from other teachers. Our estimate of the effect of licensing on migration of teachers is therefore likely to be upwardly biased, as the migration decisions of private school teachers should not be affected by licensing.

[17] The lower far migration rate for teachers is likely not a result of a network or clientele effect, but instead likely a result of the loss of benefits specific to school districts, such as tenure, pensions, and seniority within union contracts. Perhaps surprising is the fact that lawyers appear to not suffer from this clientele effect, as they move at a higher rate and far distance within the state. However, many lawyers work for corporations, as public defendants, or district attorneys, or they work for large law firms, where development of a local clientele and network is less important.

Table 7 shows the results for the quasi-national licensed occupations for the period 2005–2015. Here again, we see large differences across occupations. Nurses and physicians move at a relatively higher rate between states than those in other occupations, and there are no significant differences in migration rates for most other occupations, consistent with state licensing requirements not affecting the migration of these occupations with national licensing exams. However, three occupations stand out as showing substantially limited interstate migration, at a level comparable to lawyers: social workers, dental hygienists, and dentists. Why would their interstate migration rates be lower if their licensing is based on a national exam? Social workers do have a national exam but no system of reciprocity between states, and many states require additional state-specific courses for licensure.[18] Although their main written licensing exam is national, dentists and dental hygienists must also pass a clinical exam. Several clinical exams are offered by regional organizations, and not all are accepted by all the other states for licensure. A few states, such as California and Delaware, have a state-specific clinical exam. For these three occupations, these state-specific training requirements and differences in accepted clinical exams likely explain their reduced interstate migration.

Our results strongly suggest that state-specific requirements for occupational licensing limit the ability of individuals in affected occupations to move between states, but the interstate migration of licensed occupations with more nationally standardized requirements is not influenced by state licensure. However, despite the use of our

[18] See Social Work License Map, "Frequently Asked Questions," https://socialworklicensemap.com.

differences estimator to remove the influence of unobservable characteristics correlated with migration and licensure, they do not prove that this relationship is causal. Fortunately, we do have information on potential exogenous variation for one occupation in our sample that we can use to implement a causal model.

5.4 Additional evidence from lawyers

Ideally, we would have information on historical changes in state requirements for re-licensure for all of our licensed occupations—information that would enable a causal analysis. Unfortunately, this information is not available for most occupations. States have broad discretion to set their own licensing requirements for each occupation, and often the specifics are delegated to a licensing board.

One exception is lawyers. Unlike many other occupations, lawyers have a large national association, the American Bar Association (ABA), and a national organization, the National Conference of Bar Examiners (NCBE), both of which oversee a major component of lawyer licensure: the bar exam. The websites for these two entities provide current information on state licensing requirements and a listing of ABA-accredited law schools, as well as historic information for the last 5–15 years.

One aspect of lawyer licensure for which we have information is reciprocity agreements. Entering into reciprocity agreements, which accept individuals holding licenses in specific other states as qualified to practice with few or no additional requirements, is one way that states can lower the barriers to re-licensure. The licensing guides published by the NCBE provide the year in which states entered into reciprocity agreements for the first time for lawyers, but we only have information about the member states of each agreement starting in 2015. We use this information, as well as information

on the difficulty of each state's bar exam, to draw a more concrete link between the limited between-state migration of lawyers and licensing requirements.

5.4.1 Lawyer reciprocity and between-state migration

Ten states adopted reciprocity agreements for lawyers between 2001 and 2015. As of 2015, 7 states had no such agreement, and the remaining 34 states already had reciprocity agreements in place in 2001. The introduction of reciprocity potentially increases the ability of lawyers to migrate to a state, as the barriers to re-licensure are much lower. We test whether this is the case using the following specification:

$$Y_{ist} = \gamma_1 lawyer_{ist} + \gamma_2 reciprocity_{st} + \delta lawyer_{ist} \times reciprocity_{st} + X_{ist}\beta + \alpha_s \times \eta_t + \varepsilon_{ist} \quad (8)$$

where Y_{ist} is an indicator for moving between states in the last year for individual i residing in state s in year t, $lawyer_{ist}$ is an indicator for being a lawyer, $reciprocity_{st}$ is an indicator for having a reciprocity agreement in place, and X_{ist}, $\alpha_s \times \eta_t$, and ε_{ist} are as in equation (2). The adoption of a reciprocity agreement for lawyers should only affect the migration of lawyers, so δ is the key coefficient of interest. We use this difference-in-difference (DID) strategy to examine both in-migration and out-migration of lawyers to and from states that adopt reciprocity agreements. In-migration specifications define the reciprocity variable using the current state of residence, and out-migration uses last year's state of residence. We repeat the analysis for three different control samples: all individuals with at least a bachelor's degree (the sample used in the main analysis), as well as all licensed individuals (defined using members of the 22 occupations in Table 1) and state-specific licensed individuals with this minimum level of education. As these individuals also face a potential barrier to migration from licensing, they are likely a more appropriate comparison group for lawyers.

Results are shown in Table 8. The in-migration of lawyers increases by 0.004 percentage points after the introduction of a reciprocity agreement, approximately 15 percent relative to all licensed individuals and 20 percent relative to state-specific licensed individuals. In the out-migration specifications, none of the coefficients are significant, although the point estimates on the migration of lawyers after the introduction of reciprocity are positive using the licensed and state-specific licensed samples. The lower half of Table 8 shows the results of tests of differences in pre-trends between the migration rates of lawyers and the comparison group in the three years prior to the adoption of a reciprocity agreement. The *p*-value for the test of joint significance for these three coefficients is not above conventional thresholds for statistical significance, indicating no difference in pre-trends for the two groups in all three specifications.

The in-migration of lawyers increases into states that adopt reciprocity agreements relative to that of other licensed occupations, but there is little evidence of an effect on out-migration of members of that occupation.

5.4.2 Difficulty of re-licensure: the bar exam

One of the major components of lawyer licensure is the bar exam. All lawyers must pass this state-specific exam, and the content and difficulty vary significantly across states. To investigate whether the difficulty of a state's bar exam is related to the movement of lawyers, we use information from the American Bar Association on ABA-approved law schools' median LSAT scores (the law school entrance exam) and state bar passage rates to form a state "bar difficulty index." We form this index by regressing bar passage rates on school median LSAT scores and year and state fixed effects using data from 2011 to 2015, the only years available, weighted by the number of bar takers from

each school. The index is expressed in standard deviation units, ranging from -3.13 (Alaska) to 2.18 (California).

Bar exam difficulty should only affect the migration of lawyers who must take it to become licensed in that state. As mentioned in the previous section, by 2015 all but seven states have some form of reciprocity agreement in place for lawyers. The existence of these agreements means that not all lawyers licensed elsewhere have to take a state's bar exam to become licensed. To qualify for licensure under these agreements, lawyers have to be licensed in a particular state and have been practicing lawyers for a minimum number of years (usually three out of the last five, five of the last seven, or similar requirements). Using the member states of current reciprocity agreements and practice requirements from a guide published by the ABA and NCBE, we identify individuals who likely must take a state's bar exam for licensure using the current and last year's state of residence and age.[19] We therefore limit our sample to include only lawyers and explore the relationship between our index and the migration of lawyers using the following specification:

$$Y_{ist} = \gamma_1 musttakebar_{ist} + \gamma_2 barindex_s + \delta musttakebar_{ist} \times barindex_s + X_{ist}\beta + \eta_t + \varepsilon_{ist}, \quad (9)$$

where $musttakebar_{ist}$ is an indicator for likely having to take the bar for licensure in that state, $barindex_s$ is our bar difficulty index, and other variables are the same as in equation (2). As we have no time variation in the bar index,[20] we cannot include state

[19] We use the median age of law school graduation reported by the ABA (26) and make the assumption that a law school graduate has practiced every year since graduation. So to satisfy a three of the last five years requirement, we assume an individual must be at least 29 years old. We also use information on the Uniform Bar Exam (UBE), which has been adopted by 18 states since its introduction in 2011.

[20] Indices computed using individual years of data varied greatly from year to year (while relative bar difficulty likely does not) because of the small number of observations for many states—hence our creation of only one index from five years of data.

fixed effects in our specification. Our coefficient of interest is δ, which measures the effect of bar exam difficulty on the migration of lawyers who likely have to take the bar exam for licensure relative to lawyers who likely do not.

Results are shown in Table 9. Using all states, we see that increasing bar exam difficulty by one standard deviation is associated with 1.2 percentage point lower in-migration and 2.5 percentage points lower out-migration rates of lawyers who likely must take the bar relative to lawyers who likely do not. This is a very large relative effect: approximately a 40 percent reduction in in-migration rates and 90 percent in out-migration rates. However, it is common knowledge among lawyers that the California bar exam is notoriously difficult, with about a 50 percent pass rate over time. To see whether our results are driven by California's statistics, we exclude the state from the sample and re-estimate our model. Indeed, the coefficient on the interaction between the bar index and likely having to take the bar is no longer significant once we exclude California, although the point estimate remains negative. This pattern remains the same when we change our measure of bar exam difficulty to an indicator for having a bar exam in the top five most difficult according to our index.[21] California's difficult bar exam appears to deter both migration into and out of the state, but we cannot conclude that bar exam difficulty is related to interstate migration in other states (Tenn 2001).

Results using reciprocity and bar exam measures show that adopting reciprocity increases the migration of lawyers into a state, and state bar exam difficulty negatively predicts in- and out-migration of lawyers relative to those in other occupations, at least in California. However, these results are not conclusive. The reciprocity results have

[21] These states are, in decreasing order of bar difficulty, California, Louisiana, Michigan, Nevada, and Hawaii.

modest statistical significance, and the lack of a time dimension in our bar exam index limits its causal interpretation. In any case, the results only provide evidence linking state licensure and migration for a single occupation. Despite these limitations, they do provide evidence that the reduced interstate migration rates experienced by state-specific licensed occupations are likely tied to the high cost of re-licensure.

5.5 Potential Economic Consequences

Occupational licensing's limiting effect on interstate migration has potential implications for the earnings growth of individuals in licensed occupations, and the rise of this form of labor market regulation may explain part of the decrease in interstate migration and job transitions since 1980. To gauge the size of these effects, we perform some simulations using our estimates, and the results are shown in Tables 10 and 11. Table 10 shows that if licensing reduces the interstate migration of licensed relative to unlicensed individuals by 20 percent (approximately the median reduction for the state-specific licensed occupations we study), the number of annual interstate migrants is reduced by 93,600. Moreover, as these individuals do not experience the additional 10 percent earnings growth from changing jobs (Topel and Ward 1992),[22] their total annual earnings is reduced by $356 million. Table 10 also shows this value for 10 percent and 40 percent reductions in migration for licensed individuals, which lead to annual earnings losses of $178 million and $711 million, respectively.

Table 11 reports simulations of the fraction of the decline in interstate migration and job-to-job flows arising from the increase in occupational licensing using our estimates. Panel A shows the annual interstate migration rate and rate of job-to-job transitions in

[22] We assume all interstate migrants experience a job-to-job transition.

1980 and 2015, as well as the fraction of the workforce licensed in each year. We make two simplifying assumptions in our calculations. First, we assume there was no change in the relative interstate migration rate between licensed and unlicensed individuals over this time period. Second, we assume every interstate move results in a change of job. As shown in Panel B of Table 11, if licensing reduces the interstate migration of licensed relative to unlicensed individuals by 20 percent, the increase in occupational licensing from 15 percent of the labor force in 1980 to 30 percent in 2015 explains 6 percent of the decline in interstate migration and 2 percent of the decline in job-to-job flows over this time period. These numbers are 3 and 1 percent and 13 and 4 percent if we assume migration rates of licensed workers are 10 and 40 percent lower than those of unlicensed workers, respectively. To put these values in context, others have shown that the aging of the U.S. population over the same time period explains only 10 percent of the decline in interstate migration over the same time period and 9 percent of the decline in job-to-job flows between 1998 and 2010 (Molloy et al. 2016; Hyatt and Spletzer 2013).

6. Conclusion

We examined to what extent occupational licensing may be a contributing factor to the general decline in interstate migration. We compared the relative within- and between-state migration rates of members of 22 licensed occupations to those of others using data from the American Community Survey. Our empirical strategy compared the relationship between licensure and migration between states and a far distance within state, which controls for unobservable characteristics that influence the propensity of licensed occupations to move out of their local area. First, we found that migration across states for licensed individuals is reduced, but the size of the reduction varies across

occupations. Quasi-nationally licensed occupations do not show any limitations on their interstate geographic mobility. Second, using a causal model with reciprocity agreements for lawyers, we find evidence that the adoption of these agreements increases the migration of lawyers into a state.

Economists have long held that restrictions on geographic mobility limit the ability of the labor market to operate efficiently. Within this context, occupational licensing provisions that restrict job entry through interstate migration could also be a barrier to economic opportunity and labor market efficiency. Specifically, the paper has empirically examined whether occupational licensing statutes limiting occupational entry from other states influence interstate migration.

The results of our estimates have implications for public policy and law. For example, in 1941, the U.S. Supreme Court held against a California statute, making it illegal to restrict indigent individuals from migrating to the state during the Great Depression.[23] The Court ruled that the California statute "prevent[ed] a citizen because he was poor from seeking new horizons in other States (Roback 1943). In this way, limits on occupational entry might essentially withhold the ability to migrate from large segments of the population.

Our analysis examines the migration of individuals. For many, migration is not an individual decision; instead, it is a choice made on the basis of overall household or family well-being. As our analysis is limited to the individuals we observe in an occupation after their move, we miss a potentially important effect of licensure on those making interstate moves: individuals who are forced out of an occupation or out of the

[23] Edwards v. People of State of California, 1941.314 U.S. 160.

labor force entirely as a result of moving between states. An example is so-called trailing spouses—those who move because their partner obtains a better job in another state. And if these spouses were in a licensed occupation prior to the move, they may have to switch careers as a result. The effect of licensure on career changes or labor force exits made as a result of household migration is potentially important, and because we cannot identify individuals affected by these phenomena in the ACS, we leave their analysis for future research.

While our main empirical strategy helps control for unobservable differences driving migration patterns, we can only provide causal evidence using differences in state licensing policy for one occupation. As additional statutory data on licensing become available, researchers should develop additional causal models between the changes in occupational licensing statutes and its influence on interstate migration for additional occupations.

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Tables and Figures

Table 1: Universally licensed occupations identifiable in the ACS

State-specific licensed occupations		Quasi-national licensed occupations	
Occupation name	ACS code(s)	Occupation name	ACS code(s)
Elementary/secondary teacher	2300, 2310, 2320, 2330, 2340	Nurse (RN/LPN)	3130, 3255, 3256, 3258, 3500
Lawyer	2100, 2105	Physician	3060
Barber/cosmetologist	4500, 4510	Social worker	2010
Real estate broker/sales agent	4920	Occupational and physical therapist	3150, 3160
Electrician	6350, 6355	Psychologist	1820
Insurance agent	4810	Dental Hygienist	3310
Pharmacist	3050	Dentist	3010
EMT/paramedic	3400	Physician assistant	3110
Real estate appraiser/assessor	810	Veterinarian	3250
Pest control worker	4240	Optometrist	3040
Chiropractor	3000	Podiatrist	3120

Note: Codes listed are 2003-2015 ACS codes. Teacher sample also conditional on industry code 7860 (Elementary and secondary schools). State-specific licensed occupations have state licensing exams of varying content and difficulty; quasi-national licensed occupations are licensed at the state level, all requiring passage of a national exam for licensure. For more details see text.

Table 2: Descriptive statistics, 2005-2015

A. Main analysis samples

	Full Sample	Licensed Individuals	State-specific licensed individuals	Quasi-national licensed individuals
Moved between states	0.025	0.023	0.020	0.028
Moved far within state	0.010	0.010	0.010	0.010
Moved close within state	0.115	0.095	0.096	0.093
Race				
Non-Hispanic white	67.79	77.95	80.15	74.49
Non-Hispanic black	10.63	8.07	6.93	9.87
Hispanic white	8.98	5.04	5.62	4.13
Other	12.61	8.94	7.30	11.51
Sex				
Male	48.31	30.96	37.22	21.10
Female	51.69	69.04	62.73	78.90
Education				
Mean years of education	13.42	16.14	16.07	16.25
Fraction with…				
Less than high school	10.15	0.75	1.13	0.16
High school graduate	34.82	10.16	13.51	4.89
Some college	25.56	20.61	14.38	30.43
Bachelor's degree	19.12	31.30	31.84	30.46
More than bachelor's degree	10.36	37.17	39.14	34.06
Employment status				
Employed	71.09	88.81	86.95	91.73
Unemployed	5.68	2.13	2.50	1.54
Not in labor force	23.23	9.06	10.55	6.72
Labor income (2015$)	37,513	64,963	57,035	77,459
Age	41.13	43.05	42.78	43.49
N	15,283,179	1,551,012	950,545	600,467

Table 2, continued: Descriptive statistics, 2005-2015 ACS

B. State-specific licensed occupations

	All state-specific licensed individuals	Elementary/ secondary teachers	Lawyers	Barbers/ cosmetologists	Real Estate Brokers/Agents	Electricians	Insurance Agents	Pharmacists	EMTs/ Paramedics	Real estate appraisers	Pest control workers	Chiropractors
Moved between states	0.020	0.020	0.028	0.017	0.018	0.018	0.021	0.026	0.026	0.013	0.018	0.033
Moved far within state	0.010	0.010	0.013	0.007	0.008	0.009	0.009	0.018	0.013	0.006	0.009	0.012
Moved close within state	0.096	0.086	0.087	0.130	0.105	0.112	0.103	0.085	0.160	0.089	0.136	0.093
Race												
Non-Hispanic white	80.15	81.84	85.43	68.32	79.96	77.20	79.58	73.43	82.56	87.68	72.68	89.66
Non-Hispanic black	6.93	7.27	4.38	11.95	5.12	5.71	6.90	5.24	4.92	3.48	8.49	1.32
Hispanic white	5.62	5.10	3.56	7.99	6.32	8.66	6.36	2.53	5.97	3.37	9.76	1.82
Other	7.30	5.78	6.62	11.74	8.60	8.43	7.16	18.80	6.55	5.47	9.07	7.20
Sex												
Male	37.22	22.33	62.28	13.08	41.86	97.76	51.22	43.38	67.98	63.38	94.93	73.29
Female	62.73	77.67	37.72	86.92	58.14	2.24	48.78	56.62	32.02	36.62	5.07	26.71
Education												
Mean years of education	16.07	16.91	19.94	12.47	14.46	12.60	14.42	18.31	13.46	14.59	12.56	20.23
Fraction with…												
Less than high school	1.13			5.15	0.86	6.27			0.53	0.46	7.49	
High school graduate	13.51			57.72	21.52	49.87	23.06		24.29	19.33	53.54	
Some college	14.38	5.31		32.19	31.79	37.43	30.78	3.55	59.40	30.53	29.58	
Bachelor's degree	31.84	46.01	2.02	3.93	36.12	5.57	39.29	39.45	13.71	40.67	8.36	1.85
More than bachelor's degree	39.14	48.69	97.98	1.01	9.71	0.87	6.87	57.00	2.08	9.00	1.03	98.15
Employment status												
Employed	86.95	85.46	93.78	86.80	85.16	85.16	89.66	93.76	90.20	91.59	87.58	95.37
Unemployed	2.50	1.72	1.61	2.88	3.19	7.47	3.23	0.92	2.52	2.13	5.30	1.18
Not in labor force	10.55	12.82	4.60	10.31	11.65	7.37	7.12	5.33	7.29	6.28	7.12	3.45
Labor income (2015$)	57,035	43,091	148,922	21,986	63,339	45,802	70,960	98,526	39,468	58,425	34,007	89,991
Age	42.78	42.97	44.43	39.78	45.85	40.98	43.57	41.34	35.2	46.2	40.69	43.65
N	950,545	520,391	99,048	71,412	70,233	69,172	48,653	25,531	16,581	9,882	5,753	5,005

Table 2, continued: Descriptive Statistics, 2005-2015 ACS

C. Quasi-National Licensed Occupations

	All quasi-national licensed individuals	Nurses (RN/LPN)	Physicians	Social Workers	Occupational and physical therapists	Psychologists	Dental hygienists	Dentists	Physician Assistants	Veterinarians	Optometrists	Podiatrists
Moved between states	0.028	0.023	0.057	0.021	0.035	0.031	0.017	0.029	0.043	0.052	0.025	0.027
Moved far within state	0.010	0.009	0.012	0.011	0.012	0.010	0.010	0.013	0.021	0.017	0.005	0.016
Moved close within state	0.093	0.093	0.074	0.116	0.091	0.082	0.082	0.062	0.112	0.076	0.067	0.063
Race												
Non-Hispanic white	74.49	76.27	68.80	64.84	83.09	85.51	87.47	73.34	78.11	92.20	80.17	83.23
Non-Hispanic black	9.87	9.90	4.61	19.46	3.34	4.49	2.33	2.91	6.00	1.20	1.82	4.84
Hispanic white	4.13	3.49	4.48	6.56	2.70	4.19	3.73	4.78	5.66	2.33	2.22	2.08
Other	11.51	10.33	22.10	9.14	10.86	5.81	6.47	16.97	10.23	4.27	15.79	9.85
Sex												
Male	21.10	9.13	63.95	18.83	22.56	29.34	2.45	72.42	32.23	43.72	58.74	74.49
Female	78.90	90.87	36.05	81.17	77.44	70.66	97.55	27.58	67.77	56.28	41.26	25.51
Education												
Mean years of education	16.25	15.18	20.08	16.07	17.30	19.36	14.74	20.12	16.95	20.16	20.19	20.15
Fraction with…												
Less than high school	0.16						0.18					
High school graduate	4.89			7.81			2.74				0.33	
Some college	30.43	48.77		13.69	7.74		61.59		18.48		0.12	0.10
Bachelor's degree	30.46	39.76	0.13	43.37	41.04	3.81	31.36	0.17	26.69	0.20	0.27	0.30
More than bachelor's degree	34.06	11.47	99.87	35.12	51.22	96.19	4.13	99.83	54.83	99.80	99.28	99.61
Employment status												
Employed	91.73	91.30	96.78	88.68	93.83	92.81	91.14	95.82	92.60	96.24	97.34	95.83
Unemployed	1.54	1.48	0.57	2.91	0.62	1.07	1.61	0.48	1.50	0.41	0.28	0.75
Not in labor force	6.72	7.22	2.65	8.41	5.55	6.12	7.24	3.70	5.89	3.35	2.37	3.42
Labor income (2015$)	77,459	54,742	216,363	39,952	61,383	67,275	43,821	186,718	73,406	99,589	113,171	145,655
Age	43.49	43.69	44.45	42.08	40.24	46.55	41.53	46.51	39.24	43.42	44.17	45.87
N	600,467	326,053	76,636	75,107	29,309	17,819	15,877	14,960	8,673	7,835	3,535	900

Note: Sample includes all individuals aged 18-65 not residing in group quarters with nonimputed values for migration status, education, income, occupation, age, sex, race, citizenship status, marital status, and employment status. Samples for the following occupations limited by education: insurance agents, social workers, optometrists (high school degree or more) teachers, nurses, occupational and physical therapists, pharmacists, physician assistants, podiatrists (some college or more), lawyers, physicians, dentists, psychologists, chiropractors, veterinarians (bachelor's degree or more).

Table 3: Fraction new entrants into occupation by migration status, CPS ASEC 2005-2015

Migration status	All licensed (1)	State-specific licensed (2)	Quasi-national licensed (3)
Moved between states	0.184	0.203	0.164
Moved between counties, within state	0.148	0.165	0.121
Moved within county	0.113	0.118	0.104
No move	0.078	0.083	0.069
Moved between states - Moved between counties	0.036	0.038	0.043
P-value	0.016	0.074	0.042
N	107,200	63,963	43,237
N moved between states	1,773	916	857

Note: Sample includes all individuals aged 18-64 not living abroad last year currently employed in a licensed occupation. New entrants defined as those not employed in that occupation in the previous year. Licensed, state-specific licensed, and quasi-national licensed categories include occupations listed in Table 1.

Table 4: Occupational licensing and migration, 2005-2015 ACS

	All licensed (1)	State-specific licensed (2)	Quasi-national licensed (3)	State vs. national licensed (4)
Percent difference moved between - moved far	-22.52	-36.37	5.52	-16.33
	(3.72)	(5.25)	(2.18)	(4.06)
Percent difference moved between states	-23.99	-42.11	10.81	-31.12
	(2.42)	(3.71)	(1.74)	(3.40)
Percent difference moved far within state	-1.46	-5.74	5.29	-14.78
	(1.85)	(2.13)	(1.67)	(2.53)
N	15,283,179	15,283,179	15,283,179	1,551,012

Note: Standard errors clustered on last year's state of residence in parentheses. Sample in columns (1)-(3) described in notes to Table 2; sample in column (4) includes only licensed occupations listed in Table 1. All specifications include state x year fixed effects, and controls for income, race, sex, education, marital status, age, and citizenship status. Percent differences calculated as (coefficient/constant)*100. Estimation uses sample weights and is performed using OLS and simultaneous estimation of moved between and moved far specifications.

Table 5: Occupational licensing and migration, robustness checks, 2005-2015 ACS

	All licensed (1)	State-specific licensed (2)	Quasi-national licensed (3)	State vs. national licensed (4)
A. 2005-2011				
Percent difference moved between - moved far	-17.89	-35.09	7.10	-15.47
	(3.01)	(4.88)	(2.23)	(4.47)
Percent difference between states	-20.50	-41.48	11.90	-31.38
	(1.60)	(3.34)	(1.96)	(4.42)
Percent difference far within state	-2.61	-6.39	4.80	-15.92
	(1.89)	(2.43)	(1.51)	(3.26)
N	9,960,611	9,960,611	9,960,611	1,003,685
B. 2012-2015				
Percent difference moved between - moved far	-20.26	-36.60	1.65	-25.47
	(3.52)	(6.90)	(3.75)	(7.50)
Percent difference between states	-20.79	-41.41	8.57	-39.63
	(2.21)	(4.89)	(2.14)	(6.40)
Percent difference far within state	-0.53	-4.81	6.92	-14.16
	(1.96)	(2.66)	(3.14)	(4.49)
N	5,322,568	5,322,568	5,322,568	547,327
C. Excluding northeast census division				
Percent difference moved between - moved far	-18.51	-29.12	3.55	-14.96
	(4.08)	(5.40)	(2.20)	(4.11)
Percent difference between states	-19.35	-33.78	8.72	-27.14
	(2.42)	(3.38)	(1.47)	(3.31)
Percent difference far within state	-0.84	-4.67	5.16	-12.18
	(2.03)	(2.33)	(1.87)	(1.89)
N	12,512,459	12,512,459	12,512,459	1,235,734

Note: Standard errors clustered on last year's state of residence in parentheses. Sample in columns (1)-(3) described in notes to Table 2; sample in column (4) includes only licensed occupations listed in Table 1. Panel A uses data from years 2005-2011; Panel B uses data from years 2012-2015; Panel C excludes all individuals reporting residence in the northeast census division (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont) in the current or last year. All specifications include state x year fixed effects, and controls for income, race, sex, education, marital status, age, and citizenship status. Percent differences calculated as (coefficient/constant)*100. Estimation uses sample weights and is performed using OLS and simultaneous estimation of moved between and moved far specifications.

Table 6: Occupational licensing and migration, state-specific licensed occupations, 2005-2015 ACS

	Teachers	Lawyers	Barbers/ Cosmetologis	Real estate brokers	Electricians	Insurance agents	Pharmacists	EMTs/ Paramedics	Real estate appraisers	Pest control workers	Chiropractors
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Percent difference moved between - moved far	-39.43	-24.93	-7.50	-13.35	-13.08	-7.18	-46.71	-12.09	-21.15	-13.38	-6.84
	(3.63)	(5.51)	(4.24)	(5.02)	(6.68)	(4.36)	(6.75)	(10.07)	(9.20)	(13.08)	(9.58)
Percent difference between states	-44.43	-14.57	-18.41	-20.41	-10.59	-7.22	-29.97	-10.59	-37.35	-16.06	-2.13
	(2.96)	(4.74)	(2.97)	(3.10)	(2.93)	(3.78)	(5.81)	(7.13)	(6.64)	(10.66)	(7.37)
Percent difference far within state	-5.00	10.36	-10.91	-7.06	2.49	-0.04	16.75	1.50	-16.20	-2.68	4.71
	(1.50)	(3.96)	(2.94)	(2.87)	(5.43)	(2.79)	(2.95)	(6.04)	(5.81)	(8.70)	(6.21)
N	8,600,039	4,791,570	15,279,936	15,283,171	15,281,982	13,959,632	8,602,658	15,242,542	15,282,247	15,256,659	4,791,433

Note: Standard errors clustered on last year's state of residence in parentheses. Samples for the following occupations limited by education: insurance agents (high school degree or more) teachers, pharmacists (some college or more), lawyers, chiropractors (bachelor's degree or more). All specifications include state x year fixed effects, and controls for income, race, sex, education, marital status, age, and citizenship status. Percent differences calculated as (coefficient/constant)*100. Estimation uses sample weights and is performed using OLS and simultaneous estimation of moved between and moved far specifications.

Table 7: Occupational licensing and Migration, quasi-national licensed occupations, 2005-2015 ACS

	Nurses	Physicians	Social Workers	Occupational and Physical Therapists	Psychologists	Dental Hygienists	Dentists	Physician Assistants	Veterinarian	Optometrist	Podiatrist
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Percent difference moved between - moved far	5.49	33.32	-34.66	1.08	2.13	-26.31	-20.24	-2.80	0.63	-5.11	-31.25
	(1.96)	(19.13)	(7.53)	(7.42)	(4.13)	(9.70)	(8.99)	(12.70)	(25.32)	(18.24)	(25.40)
Percent difference between states	9.31	49.40	-36.11	4.45	2.76	-20.86	-0.66	20.81	30.30	-27.45	-10.64
	(1.75)	(16.11)	(6.08)	(6.04)	(2.87)	(5.31)	(3.86)	(10.79)	(12.70)	(14.15)	(19.15)
Percent difference far within state	3.82	16.08	-1.45	3.37	0.64	5.44	19.58	23.61	29.67	-22.34	20.61
	(0.90)	(6.46)	(3.87)	(2.74)	(2.94)	(7.38)	(8.18)	(4.52)	(15.74)	(7.43)	(18.21)
N	8,602,304	4,791,569	15,276,894	8,596,007	4,790,539	15,250,087	4,762,297	8,595,813	4,971,400	13,958,734	8,599,692

Note: Standard errors clustered on last year's state of residence in parentheses. Samples for the following occupations limited by education: optometrists (high school degree or more) nurses, occupational and physical therapists, physician assistants, podiatrists (some college or more), physicians, dentists, psychologists, veterinarians (bachelor's degree or more). All specifications include state x year fixed effects, and controls for income, race, sex, education, marital status, age, and citizenship status. Percent differences calculated as (coefficient/constant)*100. Estimation uses sample weights and is performed using OLS and simultaneous estimation of moved between and moved far specifications.

Table 8: Difference-in-difference estimates of the effect of adopting reciprocity on between-state migration of lawyers, 2001-2015 ACS

	In-migration			Out-migration		
	Full sample	Licensed individuals	State licensed individuals	Full sample	Licensed individuals	State licensed individuals
	(1)	(2)	(3)	(4)	(5)	(6)
Lawyer*Reciprocity	0.004	0.004	0.004	-0.0001	0.001	0.002
	(0.002)	(0.001)	(0.002)	(0.003)	(0.003)	(0.003)
Lawyer	-0.011	-0.004	0.010	-0.009	-0.003	0.011
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Reciprocity	0.002	0.0004	0.00003	0.0005	-0.001	-0.003
	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.004)
Testing pre-trends						
Lawyer*one year prior	0.004	0.009	0.007	-0.003	-0.001	-0.001
	(0.006)	(0.005)	(0.005)	(0.011)	(0.011)	(0.012)
Lawyer*two years prior	0.008	0.011	0.011	0.010	0.012	0.011
	(0.010)	(0.010)	(0.010)	(0.015)	(0.015)	(0.015)
Lawyer*three years prior	0.017	0.019	0.019	0.020	0.022	0.021
	(0.015)	(0.014)	(0.014)	(0.024)	(0.025)	(0.025)
P-value test of joint significance	0.467	0.108	0.179	0.652	0.669	0.689
Dependent variable mean	0.035	0.026	0.019	0.035	0.026	0.019
N	5,454,288	1,236,490	799,813	5,454,288	1,236,490	799,813

Note: Standard errors clustered on state in parentheses. Dependent variable is indicator for moving between states in past year. All specifications include state and year fixed effects, linear state-specific trends, and controls for income, race, sex, education, marital status, age, citizenship status, employment status, and number of children. In-migration specifications use reciprocity status of current state of residence; out-migration specifications use that of last year's state. Sample limited to individuals with at least a bachelor's degree in all specifications; Licensed individual and state licensed specifications limit sample further to members of the 22 licensed and 11 state-specific occupations used in the main analysis, respectively.

Table 9: Difficulty of state bar exam and migration of lawyers, 2001-2015 ACS

	In-migration		Out-migration	
	Full sample	Excluding California	Full sample	Excluding California
	(1)	(2)	(3)	(4)
Specification 1: linear bar index				
Must take bar * bar index	-0.012	-0.001	-0.025	-0.016
	(0.004)	(0.008)	(0.008)	(0.012)
Must take bar	0.023	0.021	0.029	0.028
	(0.008)	(0.008)	(0.014)	(0.014)
Bar index	0.001	0.0004	0.007	0.004
	(0.002)	(0.002)	(0.004)	(0.002)
Specification 2: indicator for top 5 "hardest" bars				
Must take bar * top 5 bar	-0.023	-0.011	-0.061	-0.019
	(0.008)	(0.013)	(0.041)	(0.020)
Must take bar	0.023	0.023	0.027	0.026
	(0.008)	(0.008)	(0.013)	(0.013)
Top 5 bar	-0.005	-0.005	0.027	0.005
	(0.002)	(0.002)	(0.035)	(0.007)
Dependent variable mean	0.027	0.029	0.027	0.029
N	113,601	98,795	113,601	98,831

Note: Standard errors clustered on state in parentheses. Dependent variable is indicator for moving between states in past year. All specifications include year fixed effects and controls for income, race, sex, education, marital status, age, citizenship status, employment status, and number of children. In-migration specifications use bar exam difficulty of current state of residence; out-migration specifications use that of last year's state. Sample limited to individuals with at least a bachelor's degree in all specifications. "Must take bar" is indicator for likely not being covered by a reciprocity agreement. Bar difficulty measure formed from regression of school-level 2011-2015 bar passage rates on median LSAT score and state and year fixed effects, weighted by total number of bar takers.

Table 10: Estimates of the annual earnings loss due to licensing's limit on interstate migration

	Percent reduction in interstate migration for licensed workers		
	10%	20%	40%
"Lost" licensed interstate migrants	46,800	93,600	187,200
"Lost" earnings	$178 million	$356 million	$711 million

Note: "Lost" licensed interstate migrants are the number of individuals who would have migrated if licensed individuals migrated at the same rate as unlicensed individuals. "Lost" earnings are the total additional annual earnings growth they would have experienced as a result of this move. We assume all interstate migrants change jobs. Calculations use U.S. workforce size of 104 million (calculated using 2015 ACS data), median individual annual earnings of $38,000 (also from the ACS), occupational licensing rate of 30% (Kleiner and Krueger 2010), annual interstate migration rate of 1.5% (Molloy et al. 2016), and an additional earnings gain of 10% for job changers (Topel and Ward 1992).

Table 11: Estimated effect of the increase in occupational licensing on interstate migration and job-to-job flows, 1980-2015

A. Observed Trends

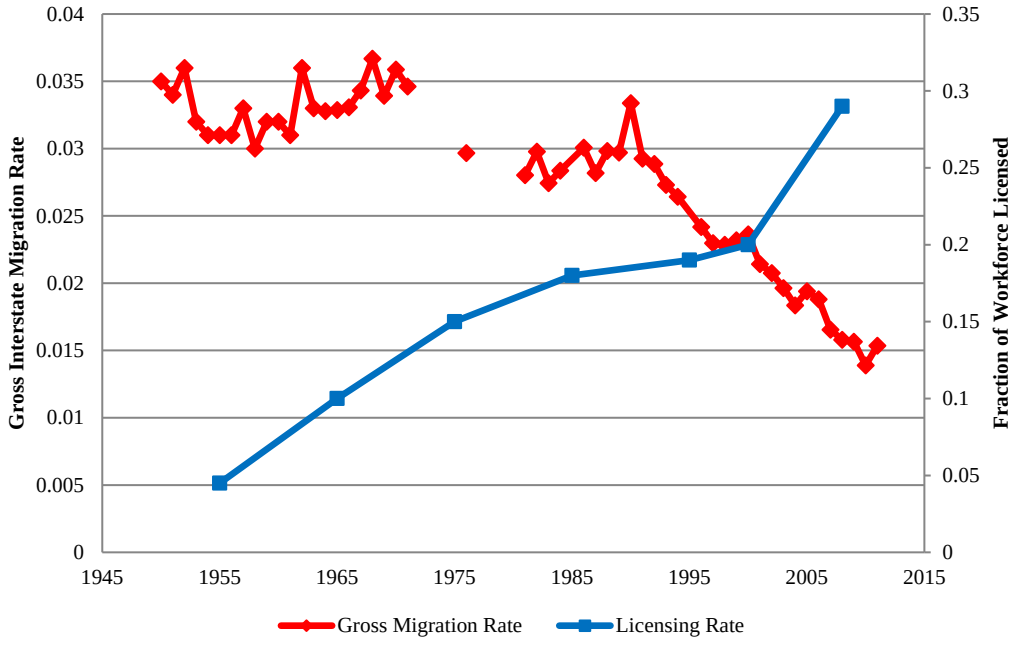
Outcome	1980	2015	Source
Annual interstate migration rate	0.03	0.015	Molloy et al 2016 figure 2
Annual rate of job-to-job flows	0.16	0.11	Molloy et al 2016 figure 2
Fraction of labor force subject to licensing	0.15	0.25	Kleiner and Krueger 2010, BLS 2016

B. Calculations

Percent reduction in interstate migration for licensed workers (1)	Migration rate of unlicensed, 1980 (2)	"Predicted" 2015 interstate migration rate (3)	Fraction of observed decline in interstate migration due to increase in licensing (4)	Fraction of observed decline in job-to-job flows due to increase in licensing (5)
10%	0.0305	0.0297	0.0203	0.0061
20%	0.0309	0.0294	0.0412	0.0124
40%	0.0319	0.0287	0.0851	0.0255

Note: We assume no change in the effect of licensing on interstate migration between 1980 and 2015, and every move between states results in a job-to-job transition. Calculations as follows: Column (2) is 0.03/(0.85+0.15(1-column (1)/100), as population total migration rate must be (weighted) average of licensed and unlicensed migration rates. Column (3) is 0.7*column 2 + 0.3*((1-column 1/100)*column 2), assuming no other change in migration rates between 1980 and 2015. Column 4 is (0.03-column 3)/0.015, as actual decline in interstate migraiton was 0.015 between 1980 and 2015. Column 5 is (0.03-column 3)/0.05, as actual decline in job to job flows was 0.05 between 1980 and 2015.

Figure 1: Interstate Migration Rates and Occupational Licensure, 1950-2008



Notes: Gross interstate migration rates from Kaplan and Schulhofer-Wohl (2017). Occupational licensure rates from Kleiner and Krueger (2013)

Appendix Tables

Table A1: Classification of occupations

Occupation	Reason	Source
"State-specific" licensed occupations		
Elementary/secondary teachers	Education and training requirements, including exams, vary widely across states	https://www.teach.org
Lawyers	Licensure based on passage of state-specific exam	http://www.ncbex.org
Barbers/cosmetologists	Licensure based on passage of state-specific exam	https://www.cosmetology-license.com
Real estate brokers/agents	Training hours and exams vary by state	https://www.kapre.com
Electricians	Licensure based on passage of state-specific exam in most states	http://www.necanet.org
Insurance agents	Training requirements and exams vary by state	https://www.insurancelicenseexpress.com
Pharmacists	Passage of state-specific MJPE required	https://nabp.pharmacy
EMTs/paramedics	Licensure based on passage of state-specific exam	https://www.nremt.org
Real estate appraisor	Licensure based on passage of state-specific exam	http://www.appraisalinstitute.org
Pest control woker	Licensure based on passage of state-specific exam	https://www.epa.gov/pesticide-worker-safety/how-get-certified-pesticide-applicator#certified
Chiropractors	Many states only require passage of part of national exam, 40 states require state-specific exam	https://www.chirobase.org
"Quasi-national" licensed occupations		
Nurses	Licensure based on passage of national exam with a single passing standard	https://www.ncsbn.org/licensure.htm
Physicians	Licensure based on passage of national exam with a single passing standard	https://www.fsmb.org/
Social workers	Licensure based on passage of national exam(s) with a single passing standard	http://www.socialworklicensure.org/
Occupational and physical therapists	Licensure based on passage of national exam with a single passing standard	http://www.fsbpt.org/, https://www.nbcot.org/
Psychologists	Licensure based on passage of national exam, passing scores vary slightly by state	http://www.apa.org/gradpsych/2004/01/get-licensed.aspx
Dental Hygienist	Licensure based on passage of one of five national/regional exams	http://www.adha.org/licensure
Dentists	Licensure based on passage of national exam with a single passing standard	http://www.ada.org/en/education-careers/licensure/state-dental-licensure-for-us-dentists
PA	Licensure based on passage of national exam with a single passing standard	https://www.aapa.org/wp-content/uploads/2016/11/Licensure_Requirements_summary-chart_7-17.pdf
Veterinarian	Licensure based on passage of national exam with a single passing standard	https://www.aavsb.org/dlr
Optometrist	Licensure based on passage of national exam with a single passing standard	https://www.optometry.org/state_requirements.cfm
Podiatrist	Licensure based on passage of national exam with a single passing standard	http://www.apmle.com

Table A2: Fraction new entrants into occupation by migration status, SIPP panels 2001, 2004, 2008

Migration status	All licensed	State-specific licensed	Quasi-national licensed
Moved between states	0.460	0.554	0.385
Moved between counties, within state	0.323	0.321	0.360
Moved within county	0.231	0.251	0.218
Moved between states - Moved between counties	0.137	0.233	0.025
P-value	0.001	0.000	0.688
N	2,217	1,417	809
N moved between states	265	142	127

Note: Sample contains individuals aged 18-64 who were observed for at least one year prior to and after making one of the three categories of move, made no other move of any category during the SIPP panel, and were employed in a licensed occupation within one year of their move. New entrants are not employed in the same occupation in the year prior to a move. P-value shown is that for the test that the difference in the fraction of new entrants among those who move between states and those who move between counties is zero.