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Regulating Occupations: Does Occupational Licensing Increase Earnings and Reduce Employment Growth?

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Introduction

Occupational licensing has been one of the fastest growing labor market institutions in the U. S. during the past 60 years. To illustrate in the early 1950s only about 4.5 percent of the labor force was licensed at the state level (Council of State Governments, 1952, U.S. Census, PUMS, 1950). However, by the late 1980s persons working in licensed occupations had grown to almost 18 percent of the U.S workforce, with an even larger number if city and county licenses for occupations are included (Kleiner, 1990). The number and percent of the workforce in licensed occupations has continued to grow but at much smaller rate, and data from the Department of Labor's Labor Market Survey and the 2000 Census showed that the percent of the workforce that work in occupations licensed by states in 2000 is at least 20.5 percent, a growth rate of 11.1 percent during the past 15 years.[1] Yet little is known about licensing's impact on earnings and employment growth.

Unlike most EU nations, who regulate occupations at the national level, licensing in the U.S. has been the purview of states. In the U.S. the licensing of occupations has been the most restrictive form of regulation where fines or jail are imposed for individuals who receive payment for regulated services. The granting of licenses is generally placed with state licensing boards that usually consist of individuals in the occupation and they have an understandable incentive to restrict entry. Moreover, choosing only the most able to practice also may serve to increase the average level of

[1] The methods used to calculate the percent licensed was gathering the listing of licensed occupations in Bureau of Labor Statistics Occupation and Employment Survey from the Department of Labor's funded Labor Market Information Survey as stated at their Web site : http://www.acinet.org/acinet/default.asp. This was matched with occupations in the 2000 Census. If no match was obtained the occupation was dropped. From the Census the number working in the licensed occupation in each state was estimated and used to calculate a weighted average of the percent of the workforce in U.S. that works in a licensed occupation.

human capital within the occupation. In this paper we discuss the why and how of occupational regulations' ability to restrict supply and the implications for the earnings of practitioners in these regulated occupations. Although our method of analysis can not tell conclusively that any earnings effects are due to supply or demand driven factors, the analysis will hopefully establish certain facts regarding licensing and earnings for certain occupations. One of our methods of analysis develops the counterfactual case of how much individuals in these occupations would earn if they did not have a license. Moreover, another section of the study examines how tougher regulatory statutes and administrative procedures impact earnings.

One perspective on occupational licensing suggests that it is "diagnostic and inexpensive to administer, they impose minimal costs on those who are actually competent, but present a serious obstacle to those who are not." (Camerer, Issacharoff, Loewenstein, O'Donoghue, and Rabin, 2003). Although this may be the case with driver's licenses, it is generally not the case for licensed occupations. Entering an occupation such as dentistry or law requires at least seven years beyond high school, of which at least three are spent in occupation- specific training. Pass rates can vary by more than 25 percent by state, and usually are given only twice a year. Being successful on a licensing exam requires much effort and expense in most occupations. Failure to pass an exam results in considerable shame and guilt costs for individuals discouraging them from either entering the occupation or choosing another state in which to practice (Kandel and Lazear, 1992). There is little to no published research on the relationship

between performance on the licensing exam and their ability to perform on the job. [2] Even for occupations with lower general education requirements like cosmetology, job-specific training usually is longer than one year with an apprenticeship followed by a state-licensing exam. Unlike drivers' license where individuals do not have the choice with whom they will interact on the road, consumers generally can choose from whom they obtain a regulated service.

From a public policy perspective all states have enacted licensing of some occupations. Tabulations by the Council of State Governments show that more than 800 occupations are licensed in at least one state, but more than 50 occupations are licensed in all states (Berry, Council of State Governments, 1986, Council on the Licensure Enforcement and Regulation, 2000). In Appendix one we give the number of workers in licensed occupations by state and the ratio of licensed workers to total employment by state. An analysis of income inequality in the U.S. has shown that being in an occupation rather than just educational skill biased educational attainment is an important determinant of growing relative wage differences among U.S. workers (Eckstein and Nagypál, 2004). Consequently, establishing barriers to entry into these regulated and often high-income occupations may provide a partial explanation of growing income inequality.

This study examines the impact of being in a licensed occupation and variations in state statutes on earnings for regulated occupations. We initially examine the impact

[2] Since licensure tests are not trying to measure performance but rather competence there has been virtually no work on this attempting to link test results and performance (Sackett, 2004). The Standards for Educational and Psychological Testing (1999) American Educational Research Association notes that for licensure testing one relies on "content validity" (does the test sample a specified "content domain") as opposed to "criterion-related validity" (does the test correlate with subsequent performance).

of being in a licensed occupation on the hourly earnings of universally regulated occupations relative to similar unlicensed counterparts. Next we find that switching to a licensed occupation has far greater earnings effects than going from a licensed occupation to a unregulated one. To provide greater depth to our analysis we examine five universally licensed occupations doctors, dentists, teachers, lawyers, and cosmetologists and compare them to similar occupations that are unlicensed. We find that except for teachers all have some positive earnings effects relative to their selected "opportunity cost" occupations.

To further examine the licensing impact we estimated whether being in a state that licenses the occupation relative to one that does not. This is the estimate of the hourly earnings premium for being in a regulated state. To provide more precision for our results we examine semi-parametric estimates of the impact of being in a licensed versus unlicensed occupation and the effect of licensing along all points of the earnings distribution using the specifications of these estimates and simulation methods. Finally, we examine the impact of variations in state licensing laws and pass rates on earnings within universally regulated occupations.

How Licensing Affects Quality of Service

Licensing creates greater incentives for individuals to invest in greater occupation-specific human capital because they will be able to recoup the full returns on their investment if they do not need to face low-quality substitutes or "lemons in the market" for their services (Akerlof, 1970). Moreover, if there are incentives for occupations to restrict supply and create barriers to entry, then what are the consequences for consumers of the regulated service? Figure 1 shows the anticipated process of how

occupational regulation affects service quality. Along its upper branch, the figure shows how regulation operates through state-level pass rates, more restrictive licensing statues, and reciprocity agreements with other states to restrict the entry of new practitioners. Furthermore, licensing boards react to changes in consumer demand by changing administrative outcomes through changes in the pass rate for new entrants or changing requirements for persons coming from other states (Maurizi, 1974 and Kleiner, 1990). The figure shows the consequences of restricting entry for an occupation in any period are to reduce supply and increase the prices of the regulated service. Whether there is a net consumer benefit from licensing is determined by whether the upper portion of the curve restricts entry and reduces consumer demand by more than the bottom part increases quality and raises the services rendered through the benefits of regulation. To the extent that licensing raises wages and reduces employment and output there could be a deadweight loss from this form of regulation. The evidence from the empirical literature suggests that the quality impacts are unclear when the outcome measures are either complaint rates or malpractice insurance premiums. However, there is considerable evidence that licensing raises prices and increases earnings (Kleiner, forthcoming).

Evidence on the Earnings Impact of Licensing

The area of occupational regulation that has received the most attention by researchers has been attempting to examine the extent to which licensing restricts entry as well as the impact of these restrictions on earnings and the supply of individuals in these occupations. For the higher education and income occupations working mainly in the private sector like physicians, dentists, and lawyers, licensing appears to have large

effects through either limiting entry or restricting movement to the state (Anderson, Halcoussis, Johnston and Lowenberg, 2000, Tenn, 2000, Kleiner and Kudrle, 2000, Boulier, 1980). However, for other occupations which include teachers, nurses, and cosmetologists the impact of licensing on earnings is murky, with some studies finding small effects and others finding none (Angrist and Guryan, 2003, Kleiner and Petree, 1988, White, 1980, Carroll and Gaston, 1981, and Thornton and Weintraub, 1979). The employment and state migration effects of licensing vary by occupation as well (Tenn, 2000, and Kleiner, Gay, and Greene, 1982) . For barbers and nurses the impact of regulation on labor supply is small. However, for many of the other occupations, licensing's impact on employment in a state is through limiting the movement of practitioners to the state from areas where opportunities are more limited. This migration effect appears to be of sufficient magnitude to result in a geographic misallocation of interstate occupational resources and perhaps this has a structural effect on the geographic allocation of human capital.

Similar to the variation of the impact of unionism on relative wages across occupations and industries, there are also differences in the impact of licensing on earnings largely based on the characteristics of the occupation examined (Lewis, 1986). To the extent that a pattern exists, it appears that occupations that deal directly with customers or patients are most likely to receive the largest benefits from occupational licensing. For example, dentists, in part through a reduction in the supply of new entrants into the occupation from 1990 to 2000, received larger pay increases than any other major regulated occupation. They even overtook physicians in their hourly pay for virtually all age groups by 2000 (Friedman and Kuznets, 1945, Kleiner, forthcoming).

Lawyers, through restrictions on interstate mobility also have been able to obtain economic benefits (Tenn, 2001). In addition, physicians, by limiting the supply of alternative medicine providers have been able to enhance the earnings of the members of their occupation (Anderson, Halcoussis, Johnston, and Lowenberg , 2000). On the other hand occupations, like teachers and nurses, have not been able to significantly enhance the earnings of their profession through licensing, perhaps as a consequence of the market structure of their employer. Unlike doctors, dentists, and lawyers, nurses and teachers work primarily for large institutions like hospitals or school boards. Hospital and school administrators have incentives to reduce costs within their organization and likely will put pressure on legislatures to ease licensing restrictions to ensure an ample supply of practitioners. Moreover, for nurses and teachers the primary mode of determining wages, hours and other terms of conditions is through collective bargaining.

Earnings of Licensed versus Unlicensed Occupations

Our strategy is to give results for the impact of being licensed relative to similar unregulated occupations. We begin with a large grouping of licensed occupations, and examine the impact of licensing on earnings for this group. Next we examine the earnings effect of individuals who switch into and out of licensed and unlicensed occupations. In order to examine this issue in greater detail we compare the earnings of persons who are dentists, lawyers, physicians, teachers and cosmetologists to individuals who work in unlicensed occupations and are listed in the Census within the same one-digit job family. This implies that they have similar education, job requirements, and skills. The focus of the analysis is to examine the counterfactual of what would be the impact on the earnings of individuals in an occupation if that occupation ceased to be regulated but maintained

other general education and experience-related factors. We do not analyze the accounting profession in detail since only one-third of all persons who classify themselves as accountants are Certified Public Accountants (CPAs), which is the licensing credential for this occupation[3].

One potential errors-in-variables issue in self-reporting is Census questionnaires responses that some individuals overstate their occupation for status reasons, especially in unlicensed occupations. For example, chemical technicians may answer that they are chemists on the Census form. Therefore, the empirical analysis presented is both for individuals who claimed to be in the occupation and for individuals who identified themselves as being in the occupation and had the minimum level of education generally required for this line of work. These alternative specifications give the results of a truncated sample with only those individuals who meet the minimum expected level education for that occupation. Furthermore, one would expect that there are characteristics of individuals who chose an occupation that would cause them to select one occupation relative to another. Consequently, the table gives results of estimates of the impact of licensing with the general human capital variables and another set of equations with inclusion of a self-selection correction variable using the Mills inverse ratio method (Heckman, 1979).

Table 1 gives the regression estimates of the impact of licensing on earnings using different statistical specifications of the earnings equation for these listed regulated and unregulated occupations. The expectation is that there are characteristics of

[3] There were 1,733,220 persons who stated that they were accountants in the 2000 Census and there were 577,000 persons who are licensed CPAs in the U.S. according to the National Association of State Boards of Accountancy.

individuals who chose an occupation that would cause them to select one occupation over another. Consequently, the table gives results of estimates of the impact of licensing with the general human capital variables and another set of equations with inclusion of a self-selection correction variable which adjusts the estimates by potential omitted variables which may result in persons choosing a regulated versus an unregulated occupation (Heckman, 1979). In all these specifications licensing is estimated as a dummy variable with one denoting a licensed occupation and zero for a unlicensed one. Accountants are included in this analysis since Certified Public Accountants (CPA) are licensed in all states, but most accountants do not have a CPA. Column one shows the impact of licensing when basic human capital variables are controlled for, as well as self-selection issues for entering a licensed occupation in this regression model.[4] These estimates include all who claimed to be in the occupation in the Census in 1990 and 2000, a sample size of more than one million persons. The results in column one shows that being in a licensed occupation enhances the hourly earnings of the regulated occupations by 10.5 percent. The coefficient value on licensing is precisely estimated and is statistically significant at the 99 percent confidence level using grouped corrections for the standard errors. In the second column estimates are developed from a truncated sample of only those individuals who have completed general education at the minimum level associated with the occupation. For example, the minimal level of education for teachers is a four-year college degree, whereas graduate education is required for attorneys and physicians. The sample size using minimum education cutoff criteria by occupation is still large with more than 740,000 individuals in the sample. Again this coefficient value is large

[4] The instrumental variable used to identify the equation for the inverse Mills ratio used to implement the selection variable was the nonlabor income in household minus the individual's income with dummies for the relationship to the head of the household (Neuman and Oaxaca, 2003).

showing an 11.6 percent impact, yet measured with somewhat less precision, but is statistically significant at the 5 percent confidence level[5]. The results from Table one show that being in a licensed occupation has a moderately large impact on the hourly earnings of the individuals in the occupation, with magnitudes similar to those obtained by being represented by a union (Lewis, 1986). With these reduced form estimates it is difficult to know if the impacts on earnings are a result of supply restrictions generally promoted by professional associations that represent these licensed occupations, or the additional general, specific, or continuing education requirements that enhance the productivity of the individuals in these regulated occupations.

Partial State Regulation of Occupations

For most of the occupations that are regulated in the U.S. there is licensing in some states but not in others. One issue is whether being in a state that regulates an occupation through licensing has any impact on the earnings of the individuals relative to states that do not regulate the occupation. Table 2 shows the impact of being in a state that licenses the occupation relative to ones that do not, using the same human capital and state level statistical control variables as presented in Table 1. These estimates are for more than 2.7 million partially regulated workers from the 2000 Census, and shows that licensing has a statistically significant impact on hourly earnings of more than 4 percent.

These estimates are not able to determine whether this increase in earnings is a consequence of the restriction of the supply of regulated practitioners, is a consequence of the enhanced human capital gathered as a result of higher educational standards, or enhanced reputation capital which is perceived by consumers as existing in a regulated

[5] Estimates using separate male and female equation models showed similar impacts of licensing on earnings.

occupation. Nevertheless, these results support the view that licensing enhances the earnings of the individuals in regulated occupations, but does not answer whether it is a consequence of restriction of supply, or perceptions of enhanced quality resulting from an occupation becoming licensed in a state. Nevertheless, these results provide additional evidence that states that chose to regulate an occupation also drive up the hourly earnings of the practitioners in that state.

Switching Occupations

Another methodological approach that uses the occupations analyzed in Tables one and two is to find the impact of licensing on earnings for those individuals who switched from being in a unlicensed occupation to a regulated one and vice versa (Mincer, 1986). In order to do this we examine individuals in the National Longitudinal Survey of Youth (NLSY) for various years from 1984 to 2000, who switched from being in a unlicensed occupation to a licensed one. In addition, we examined individuals who went from a regulated occupation to a unregulated occupation. The expectation is that individuals who change their jobs or occupations do so as a consequence of an economic gain. This research approach attempts to control for individual human capital characteristics as well as other unobservables that cannot be captured within a regression framework. The results of these estimates are presented in Table 3. They show that full time workers, who are not in school and change their occupation, have large percentage increases in their wages in their first year of employment[6]. For example, switching to a unregulated occupation from a regulated one results in a 26 percent increase in earnings, but the switch from a unregulated occupation is associated with a 43 percent increase in

[6] Estimates for three years after the switch showed similar relative impacts of switching to a licensed occupation from a non licensed one.

hourly earnings. The gain is 65 percent greater for those who switch to a licensed occupation relative to those who move the other way in the first period following the switch. Using this quasi- "fixed effect approach" the gains to entering a licensed occupation is larger relative to changers who move in the other direction and is similar to estimates of licensing's impact on the earnings of physicians in Israel (Kugler and Sauer, 2004)

Although the estimates provided in Tables 1 through 3 give overall results of the impact of licensing on earnings for a group of occupations they do not provide results for individual occupations relative to a more closely related comparison group. The selection of similar comparison occupations have closely-related education and work skill sets as the regulated ones. Based solely on general human capital factors such as education and type of work these occupations are well-matched. In order to provide more detailed results of the impact of licensing Table 4 gives more detailed estimates of regulation showing the licensed occupations along with its related unlicensed one. The estimates use Census data and information on the regulatory status of the occupation. The table provides analysis on the following licensed occupations: dentists, physicians, lawyers, teachers and cosmetologists along with the listing of occupations that have similar educational and skill requirements, but are not licensed. The specifications presented are for the truncated sample of individuals who met the minimum education requirements and include estimates with and without the inclusion of the selection correction coefficient using the inverse Mills ratio. These estimates are consistent with those in Tables 1 and 2, and show that licensing usually has positive and statistically significant impacts on hourly earnings. Nevertheless, there are substantial variations in the

magnitudes of the results with dentists showing the largest licensing impact on earnings relative to its comparison occupation, while teachers have the smallest coefficient values. Perhaps public sector administrators and school boards are able to lobby legislatures to obtain exemptions from strict regulations and thereby increase the supply and this modifies the ability of public sector unions to obtain significant pay increases for their members through licensing. Clearly the choice of the comparison occupations may also influence the results. Moreover, we are not able to find whether supply shifts in the regulated occupation or the unregulated occupation are contributing to the wage impacts of regulation.

These results suggest that occupations that have a market structure that serves individual clients like physicians and dentists seem to gain more from licensing than individuals who work in occupations whose primary employer is for example, a school board, corporate, or nonprofit entity (Wheelan, 1998). Further, there is some evidence that large employers who are organized can lobby state legislatures to obtain more relaxed licensing provisions or exemptions from licensing laws that allow them to do the work of licensed practitioners. In the case of teachers and school board administrators this means allowing provisional teaching certificates for teachers. Although the exemptions in states, like Texas, where almost 20 percent of the teachers in the public schools have temporary provisional certificates rather than licenses allow school boards to hire teachers with the understanding that they must eventually be licensed.

Semi-parametric Estimates

Although Tables 2 through 6 present statistical evidence of the effect of being regulated on earnings, they do not answer the question of what would have been the

earnings of the regulated occupation if they had the characteristics of the unregulated occupation. This is a counterfactual of the earnings effect of being in a regulated versus unregulated occupation. To further show the earnings effect we present an earnings gap analysis which estimates what licensed persons would have earned if they had been in a unregulated occupation**.** This approach builds on the analysis of what would have been the earnings outcome if all the measured characteristics of one group were given to the other group, except for licensing. For example, using this approach assumes that the market rewards individuals differently for each year of schooling, age or experience based on whether the individual was licensed. In order to do the statistical analysis of developing a counterfactual for this issue, a decomposition analysis is specified.[7] Since there is relatively little mobility between the two groups, the assumption of noncompeting groups for these two occupations is plausible[8]. For each person in the regulated occupation the model predicts what would have been the earnings of the individual if they were not regulated along each position of the earnings distribution.[9] Therefore, the expectation is that the earnings in the unregulated occupation would be to the left of the actual distribution of the regulated occupation. Further, this approach

[7] A basic mathematical presentation of the form of the decomposition analysis can be stated as follows: $W_l = \alpha_{l} + \Sigma\beta_{jlw}X_{jlw}$ and $W_{nl} = \alpha_{nl} + \Sigma\beta_{jnlw}X_{jnlw}$,where W is earnings and X is a vector including all observable factors such as education and experience and the subscripts NL signify unregulated occupations and L signifies a regulated occupation. Using the standard algebra of the decomposition analysis the simplified equation becomes:
$\overline{W}_l - \overline{W}_{nl} = \sum[\beta_{jlw}(\overline{X}_{jlw} - \overline{X}_{jnlw})] + [(\alpha_l - \alpha_{nl}) + \sum(\beta_{jlw} - \beta_{jnlw})\overline{X}_{jnlw}]$ (Filer, Hammermesh and Rees, 1996).

[8] Data gathered from the NLSY show very few changers over time between these occupations.

[9] The probabilities that different characteristics appear in regulated and unregulated occupations are calculated from logit models. They are incorporated into kernel density estimation so that counterfactual distributions can be constructed. With these counterfactual, one can analyze, for example, what the wage distribution would have looked like in 2000 if the individual were unlicensed, and thereby assess the relative importance of that factor in explaining the observed changes in wage outcomes due to that factor (DiNardo, Fortin, and Lemieux, 1996).

depicts what would have been the earnings distribution of earnings if the individual in the licensed occupation became unlicensed, which also lies to left of the actual earnings distribution.

A caveat to the decomposition analysis is that individuals who have greater unobservable ability characteristics such as better social skills, communications or aptitudes may choose to enter a licensed occupation where the economic returns are higher than ones that require similar aptitudes, but are unregulated. Given the large queue of persons wishing to enter these regulated occupations, part of the returns to individuals in licensed occupations may be the higher quality labor market attributes of persons in regulated occupations that consumers perceive as higher quality. Although regulated occupations generally would be expected to be able to restrict supply and thereby increase the earnings of its members, there may be labor market mistakes by representatives of the occupations, such as the American Medical Association.

This segment of the analysis examines occupations where most of the persons in the occupation must have a license. Public school teacher licensing with testing is a relatively new phenomenon in comparison with the other occupations in our analysis with most of the states beginning to engage in tougher licensing standards with written exams during the 1980s. Moreover, licensing with standardized state administered exams only became the norm during the 1990s. Although some recent analysis has suggested that the recent regulation of teachers has had little quality effects as measured by human capital, and there has been little analysis of the impact of regulation relative to similar occupations (Angrist and Guryan, 2003).

The statistical approach for the decomposition analysis uses a semi-parametric estimate of the impact of earnings for each group along each stage of the earnings distribution. The analysis allows for a graphical representation of the total distribution of individuals in both the regulated and unregulated occupations. In this case the graph shows all hourly income earners in the licensed occupation superimposed on a figure that shows how many the individuals would have made a particular income if they were unregulated. This approach shows the impact of licensing at each point along the hourly earnings distribution. The coefficients are derived from the estimates in Tables 1 and 2 where the basic method estimates two standard log wage regressions using the variables in these tables, one for licensed and the other for unlicensed individuals. Predicted wages for licensed individuals are generated from each regression and the difference is the value of earnings for each occupation if that occupation were not regulated for each point along the earnings distribution.[10] The main advantage of this methodology is that the entire wage distribution is analyzed, allowing the licensing factor to have different effects at different points along the distribution. Thus, unlike traditional decomposition analysis that usually presents differences at the mean of a distribution or quartile regressions, the decomposition technique is unique by using semi-parametric estimates that allows one to decompose the changes in the entire log wage distribution. The semi-parametric decomposition method also allows an assessment of how much of the total discrepancy between two wage distributions can be explained by this type of regulation.

[10] The procedure for generating the semi-parametric estimates is a nonparametric kernel density estimation. The kernel function is simply a weighting function so that observations closer to the point of interest are weighted more heavily than observations farther away from this point. For graphical display the density function estimate is calculated for a number of equally spaced evaluation points. In the analysis that is presented the observations of interest are individuals' log real wages, using a Gaussian kernel function with 200 evaluation points and a bandwidth of .05. A major advantage of this methodology is that we can examine the entire wage distribution in contrast to standard summary measures such as a discrimination coefficient or a Gini coefficient.

The drawbacks of this approach are the assumptions of no spillovers between the licensed and unlicensed occupations. Another drawback of the approach is that the estimation and interpretation of the results can be difficult. In addition, the method provides point estimates of the wage distributions, but there are no standard errors, and rigorous hypothesis testing has not been developed, outside of using bootstrapping techniques with simulations (Budd and McCall, 2001).

Figure 2 panel a and b show graphical representations of the decomposition analysis for five of the regulated occupations and their most similar occupation based on education and aptitude. The figures show the earnings distribution of the licensed occupation, the unlicensed occupation and the earnings distribution of the licensed occupation if they became unlicensed. The figures for the semi-parametric estimates are consistent with the estimates shown in Table 1 through 4. They show that regulation raises earnings along most segments of the earnings curve for most of the occupations although the impacts are small. Using all these approaches shows that licensing has a positive effect on earnings relative to similar unregulated occupations, and that for most portions of the curve the unlicensed occupations lie to the left of the regulated ones. It does not answer the questions of whether already licensed occupations can get higher earnings by making those regulations tougher through statutory provisions or through changing administrative procedures which are often decided by the state licensing boards, and involve changing the pass rate. For already licensed occupations the ability to impose more rigorous entry requirements through statutory provisions, and increasing the pass rate for entering the occupation may provide individuals in the occupation with

higher earnings. Consequently, we now turn the analysis to the impact of changes in state statutes and administrative procedures on the earnings of regulated practitioners.

Small Differences in Licensing Regulations that May Matter

Among universally licensed occupations there are institutional and legal factors that influence entry into an occupation or a state. In the case of licensing there are generally perceived to be statutory as well as administrative constraints such as examination requirements that impact labor supply and subsequently earnings (Kleiner, 2000). At the state level statutory factors generally include education for both general training, which is defined as years of high school and college education, and specific levels that include years of professional or trade school. Further measures include specific requirements for good moral character, citizenship, and residency in the state for specific periods of time, recommendations from current practitioners, and tests for competency. States can vary in the stringency with which they each set the requirements for practicing.

A further set of requirements is established for individuals who attempt to move to the state from elsewhere. These requirements generally include similar general and specific statutory requirements as those entering the occupation, but with several notable exceptions. This means retaking substantial parts of the original licensing test that the individual had to take to initially enter the occupation. States, however, can establish virtual "treaties" with other states to allow them to accept each others licensed practitioners without additional education or tests. The statutes and agreements with other political entities vary from accepting any applicant from another state who has a valid license at one end of a continuum to endorsement or acceptance of applicants if they meet

the entry requirements in force at the time of initial licensure or currently in force within the state to reciprocity only with states that have signed agreements at the other end of the continuum (Kleiner, Gay and Greene, 1982 and Tenn, 2000). States vary a great deal by occupation in how they allow licensed practitioners from other states or countries to enter and work within their political jurisdiction.

Beyond the statutory factors each state can establish its own pass rate for entering the occupation even when they use a national standardized test. The pass rate on the same exam can be higher in California than North Dakota. Individuals considering entering an occupation in a state may decide not to move to the state when the pass rate is low. Moreover, for most licensed individuals choosing a state in which to locate, initial failure on an exam would result in more study time, lower incomes, and retaking the test. To illustrate, for dentists the present-value cost of failing the exam was approximately $54,000 in 1997 dollars. This estimate was derived by initially assuming that the individual becomes a licensed practitioner by passing the exam the next time it is given, which is about twice a year, and the individual is employed as a dental assistant rather than a dentist in the interim (Kleiner and Kudrle, 2000).

To quantify the statutory factors that impact licensing an index is used to obtain a quantitative value of the relative restrictiveness of each state's licensing provisions. The indices chosen were the summated rating scale and Rasch index. The Rasch index uses a Guttman type ordering of each of the statutory values. The seeming ordering of the statues of licensing practices suggests that a ranking of states by their licensing activity: those with high levels of statutory intensity for the toughest statute would have the highest ranks, those with lower levels of statutory intensity for that feature would be next:

followed by those with high levels statutory intensity for the second most restrictive law and so on. One latent variable model that fits these data well are Rasch-type models (Wang, 1997).[11] This index is developed so that it estimates the effect of regulation on both earnings and the supply of Rasch models using a logit form to estimate the latent ability (statutory progressiveness) of respondents (states). An even simpler way to summarize the data for the statutes is to form a summated rating by adding together the levels attached to different responses (Barthalomew, 1996). With a 0/1 coding for the presence of absence of a practice, a state with five statues gets a 5, while one with 3 statues gets a 3 scale, and so on. The model uses both Rasch and summated ratings for the statutory provisions of our legal measures. The estimates show a similar distribution of states by the Rasch and the summated rating measure of licensing. The two summary statistics give similar scalings. The estimates are given for the Rasch scalings but the summated rating scales had similar results as did estimates for factor analytic methods of forming a single factor model as well.

This approach adds up the values of each of the statutory requirements for licensure to form one measure of the restrictiveness of entry into the occupation. Based on the relative restrictiveness of the state statutes, the states were then divided into high, medium, and low regulation states. Another measure of restrictiveness was the pass rate in the state. The assumption is that the lower the pass rate the more restrictive the state is regarding its licensing procedures. Both the statutory regulations and the pass rate on the state administered exam serve to restrict entry and create potential barriers to working in an occupation.

[11] Rasch type models have the following properties. They are unidimensional, require discrete observations, require statistical independence, and can be estimated using maximum likelihood techniques (Andrich, 1988). If the latent variables are continuous then the standard technique is factor analysis.

Table 5 shows results of estimates of the impact of statutory index values and pass rates on the hourly earnings for cosmetologists, dentists, lawyers, physicians, and teachers.[12] There are two sets of control variables. One group holds constant for human capital factors such as race, gender, education, age, age-squared, and citizenship. The second set of control variables account for demand factors in the state that may impact earnings including population and per capita gross state product in the state.[13] Column one presents the impact of tougher licensing using a Rasch index measure of regulation, and it includes a dummy variable control for the year of the observation for those occupations for which there is data for 1990 and 2000. The second column presents the impact of the statutes on earnings for the upper one-third of the states in terms of their relative restrictiveness using the summated rating scale, and they also include a dummy variable control for the year of the observation. The last column shows the impact of the pass rate on earnings of the practitioners. The results show that tougher licensing statutes and positive impacts on the level of earnings of practitioners for two of the five occupations, namely for cosmetologists and physicians. However, for the pass rates there was no statistical impact on the earnings of the practitioners for either lawyers or cosmetologists. Similarly, estimates using changes in the statutory provisions over the decade do not appear to have an impact on the change in earnings of these licensed practitioners. This may be because the changes in the provisions were small and occurred late in the decade and therefore likely to have only modest effects or these legal provisions were paled in comparison to administrative factors such as the pass rate.

Employment Change Impacts of Licensing

[12] These estimates are in a reduced form that includes both supply and demand variables that impact earnings of practitioners in these occupations.
[13] Each of the state level controls has standard errors adjusted for group bias in the regression estimates.

Table 6 gives estimates of the employment growth for librarians, respiratory therapists, and dietitians and nutritionists from 1990 to 2000 in those states that regulate these occupations relative those who do not by regulatory status in 2000. The results in the Table show that for occupations that experienced declines in employment during the decade like librarians and dietitians, those states that license the occupations had their employment for practitioners decline at an even faster rate than those that did not regulate them. For example, librarians saw overall employment decline by approximately 7 percent over the decade of the 1990s, but this decline was composed of a 5.3 percent decline in the unlicensed sector and a 9.2 percent decline in the regulated sector. Similarly for dietitians and nutritionists the overall decline in employment in the occupation over the decade was 9.5 percent which was comprised of a 5.2 percent decline in the unlicensed states and there was a 13.7 percent decline in the licensed states. However, for an occupation that experienced rapid growth in employment such as respiratory therapists the differences in the growth rates between regulated and unregulated states is only 2.3 percentage points. Nevertheless, even among occupations that are experiencing rapid growth in employment, states that are regulated grew at a 6.2 percent lower rate than ones in which there was no regulation using only simple differences in the mean values between the regulated and nonregulated states.

In order to provide additional statistical rigor to the analysis, we estimated a difference-in-difference regression analysis of the impact of employment change within occupations that are approximately evenly divided between being licensed and unlicensed practitioners based on the tabulations in Table 6. The approach used combines all three partially regulated occupations: librarians, respiratory therapists, and dietitians and

nutritionists from 1990 to 2000 and compares their percent employment change with both fully licensed occupations lawyers, dentists, and cosmetologists, and unlicensed occupations which include economists, computer programmers and glaziers. These occupations were selected based on availability of data in the 1990 and 2000 Census and the inclusion of high and relatively lower levels of educational requirements. The results are presented in Table 7. The difference-in-difference approach gives regression estimates and compares the percent employment growth which is due to licensing in the partially licensed occupations with the comparison of growth rates of both fully licensed occupations and unlicensed ones for each state. The overall impact across all the occupations in the sample of regulated, unregulated and partially regulated occupations shows that licensing reduces the percentage growth rate by a statistically significant 20 percent over the 1990 to 2000 period. One interpretation of this result is that an occupation that grew at a 10 percent rate during the 1990 to 2000 period with licensing would have grown at 12 percent rate without regulation. These estimates provide evidence that this form of regulation can serve as a barrier to employment growth within an occupation that may in turn lead to gains in wages.

Impacts on the Economy

The estimates in Table one show that individuals in licensed occupations earn about 10 to 12 percent more than their unlicensed counterparts. Furthermore, if licensed occupations comprise about 20 percent of the total workforce, licensing drives up economy-wide costs to consumers by about 2 to 2.4 percent relative to a labor market where no one was licensed. Compared to total wage income in the U.S. of 5.8 trillion dollars in 2000 the estimated reallocation of earnings from consumers to licensed

practitioners is between 116 billion and 139 billion in 2000 dollars using this approach. Using economy-wide medium estimates of the elasticity of labor demand of .3 the "deadweight loss" to society of licensing is between 34.8 and 41.7 billion dollars per year (Hammermesh, 1993)[14]. This value can also serve as a background for what might be an alternative to licensing such as the certification of occupations, which allows individuals to practice without government sanctions. This example of the magnitudes of the effects of licensing under these assumptions suggests that this form of labor market regulation has moderate quantitative impacts on the costs and quantity of services. However, the benefits of licensing such as signaling quality and providing some protection to potentially large downside consumer losses by eliminating the least qualified potential practitioners may be worth the added cost of licensing to society by giving consumers protection against the worst case outcome scenario (Kahneman and Thaler, 1991).

Conclusions

This study examines the impact of being licensed and variations in state statutes on earnings for several regulated occupations. We initially examine the impact of being in a licensed occupation on the hourly earnings of universally regulated occupations relative to similar unlicensed counterparts. For the occupations examined we find the impact of being licensed to be about 10 to 12 percent, which is at the lower bound of the wage impact of institutions like unions. Moreover, we estimated the impact of being in a state that licenses an occupation relative to ones that do not, and find there is about a four percent hourly earnings premium. Next, we find that switching to a licensed occupation

[14] Other simulated estimates using values of personal consumption expenditures the as basis of the reallocation estimates produced similar outcomes for the reallocation effects and "dead weight loss" results.

has far greater economic value than going from a licensed occupation to a unregulated one. Finally, we examine five universally licensed occupations doctors, dentists, teachers, lawyers, and cosmetologists and compare them to similar occupations that are unlicensed. We find that except for teachers all have some positive earnings effects relative to their selected "opportunity cost" occupations.

To provide more precision to our results we examine semi-parametric estimates of the impact of being in a licensed versus unlicensed occupation and the effect of licensing along all points of the earnings distribution using the specifications of these estimates and simulation methods. Finally, we examine the impact of variations in state licensing laws and pass rates on earnings for universally regulated occupations. We find that these impacts are small on the order of 2 to 7 percent in relatively highly regulated states for doctors and cosmetologists, and they are zero for dentists, teachers and lawyers. However, other estimates for dentists during the 1980s when state by state laws had greater variation found that the earnings premium was about 11 percent.

Furthermore, we find that occupational licensing reduces employment growth in states that are licensed relative to those that are not regulated. Comparing three occupations that are approximately evenly divided between licensed and unregulated we find that employment growth is higher in the unregulated states by approximately 20 percent over the decade from 1990 to 2000. This could be a source of the wage premium enjoyed by individuals in licensed occupations.

Licensing increases the economic status of most practitioners. Policy makers need to examine whether these increases are a result of increased quality caused by greater training and higher quality services or as a consequence of restricting competition

and its consequent dead weight loss through the restriction of entry into the occupations. Moreover, are there other policy options such as certification of occupations that are sufficient to realize the benefits of quality without the potential negative effects of monopoly wage gains?

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Table 1. Estimates of the Aggregate Impact of Licensing for Selected Occupations [1]

Variables	Total Census Sample	Limited by Minimum Education
License	0.10	0.12
	(.02)	(.06)
Age	0.05	0.07
	(.02)	(.03)
AgeSQ	0.00	0.00
	(.00)	(.00)
Female	-0.37	-0.39
	(.12)	(.13)
White	-0.15	-0.19
	(.11)	(.18)
UScitizen	0.03	0.25
	(.04)	(.14)
LN(pGsp)	0.64	0.79
	(.18)	(.25)
LN(Pop)	-0.07	-0.10
	(.08)	(.09)
Year2000	-0.15	-0.14
	(.10)	(.13)
Education	0.12	
	(.02)	
Mills ratio	-0.03	-0.04
	(.06)	(.15)
Constant	3.63	5.88
	(1.98)	(2.34)
Number of obs	1,044,141	740,227
R^2	0.37	0.15

[1]Occupations included

Personnel and labor relations managers
Accountants and auditors
Purchasing agents and buyers, farm products
Computer systems analysts and scientists
Actuaries
Statisticians
Mathematical scientists, n.e.c.
Chemists, except biochemists
Biological and life scientists
Physicians
Dentists
Veterinarians
Optometrists
Podiatrists
Registered nurses
Pharmacists
Postsecondary teachers, subject n.s.
Teachers, prekindergarten and kindergarten
Teachers, elementary school
Teachers, secondary school
Teachers, special education
Librarians
Economists
Sociologists
Social workers
Clergy
Lawyers
Judges
Public relations specialists
Dental hygienists
Licensed practical nurses
Bartenders
Waiters and waitresses
Maids and housemen
Barbers
Hairdressers and cosmetologists

Table 2: Impacts of Partial State Licensing on Hourly Earnings for Regulated Occupations[1]

Variables	Cross section regression
Licensed in State	0.04
	(.01)
Age	0.08
	(.00)
AgeSQ	0.00
	(.00)
Female	-0.30
	(.01)
White	0.08
	(.01)
UScitizen	0.08
	(.02)
LN(pGsp)	0.51
	(.05)
LN(Pop)	0.03
	(.01)
Education	0.08
	(.00)
Constant	1.15
	(.24)
Number of obs	2,756,892
R^2	0.25

[1] Standard errors in parenthesis with group corrected standard errors: Estimates are for 2000.

Table 3: Percentage change in hourly wages after switching occupations using NLSY 1984-2000*

	Median Percentage wage change		Ratio of (1) divided by (2)
	From licensed to non-licensed (1)	From non-licensed to licensed (2)	
Persons who change occupations at least once	26% (obs.=99)	43% (obs.=119)	1.65

*Estimates include only full time workers who are not in school, and are adjusted by the wage deflator by year.

Table 4. Coefficient Estimates of the Impact of Licensing Relative to Similar Nonlicensed occupations [1]

Occupation	Without Self-selection	With Self-Selection
Physicians		
Biological and life scientists	0.407	0.378
Dentists		
Biological and life scientists	0.643	0.638
Teachers2		
Public relations specialists	0.000	0.003
Lawyers		
Economists	0.048	0.006
Sociologists	0.454	0.440
Cosmetologists		
Bartenders	0.042	0.042
Waiters and waitresses	0.063	0.063
Maids and housemen	0.112	0.112

1Estimates include individuals with minimum level of education and the controls listed in Table 4-2

[2] The sample for teachers is limited by State average starting salary in the year before the census year.

Table 5: Estimates of the Impact of Tougher State Regulations on Earnings[1]

Occupation	Regulations(Rasch)	Regulations(High)	Pass Rate
Cosmetologists	0.00	0.08	0.00
	(.01)	(.04)	(.00)
Sample Size	6374	6374	3,078 [3]
Dentists[2]	0.01	0.02	
	(.02)	(.04)	
Sample Size	6567	6567	
Lawyers	0.00	-0.02	0.00
	(.01)	(.02)	(.00)
Sample Size	65599	65599	65599
Physicians	0.00	0.03	
	(.00)	(.01)	
Sample Size	53033	53033	
Teachers	-0.01	-0.03	
	(.02)	(.03)	
Sample Size	196313	196313	

[1]With following controls : Age, Age Squared, Gender,Education, Race, U.S. citizen, LN(percapita(Gsp), LN(Population), and Year 2000

[2] Using only the Census Year 2000 sample

[3] Using only the Census Year 1990 sample

Table 6: Comparing Employment Growth of Occupations in Regulated and NonRegulated States From 1990 and 2000 Census

Partially Licensed Occupation and Year	Number in the Occupation	Percent licensed in Occupation	Percent Change in Employment In NonLicensed Sector	Percent Change in Employment In the Licensed Sector
Librarians				
1990	215,680	50.2		
2000	200,060	49.2	-5.3 %	-9.2%
Respiratory Therapists				
1990	63,560	49.8		
2000	86,956	49.5	37.6	35.9
Dieticians and Nutritionists				
1990	94,360	49.5		
2000	85,480	47.2	-5.2	-13.7

Table 7 : Difference-in-Difference Estimates of the Impact of Licensing on Percent Employment Change for Partially Licensed Occupations 1990-2000 (Librarians, Respiratory Therapists, and Dieticians and Nutritionists)[1]

Licensed state	-.20 (.07)*
State controls	Yes
Nine Occupation controls	Yes
R^2	.34
Number of state level observations	450

[1] Licensed occupation controls included universally licensed occupations per cent employment change for: lawyers, dentists and cosmetologists, and nonlicensed occupations economists, sociologists, and glaziers.

* Indicates statistical significance at the 95 percent confidence level

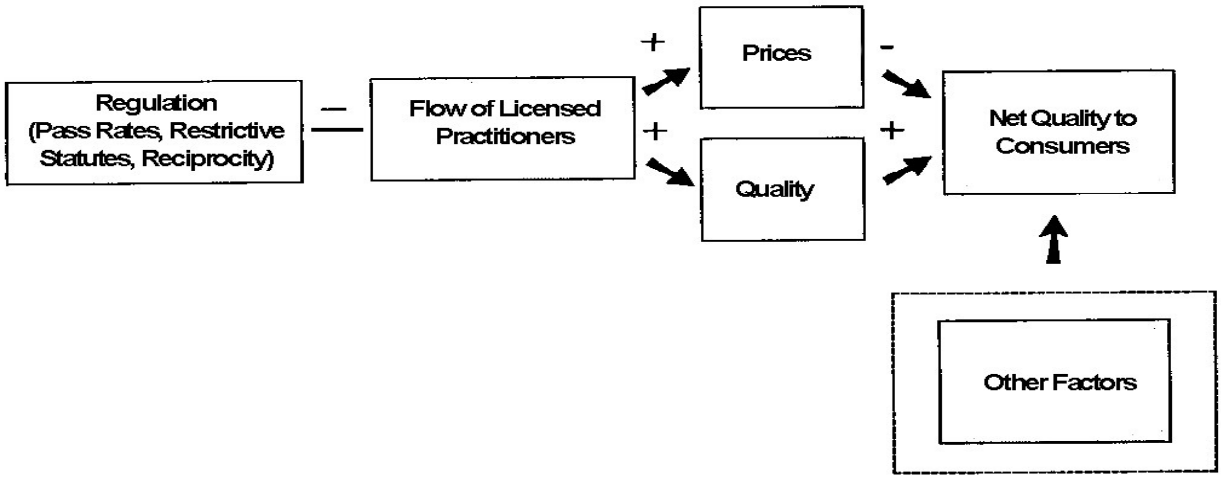
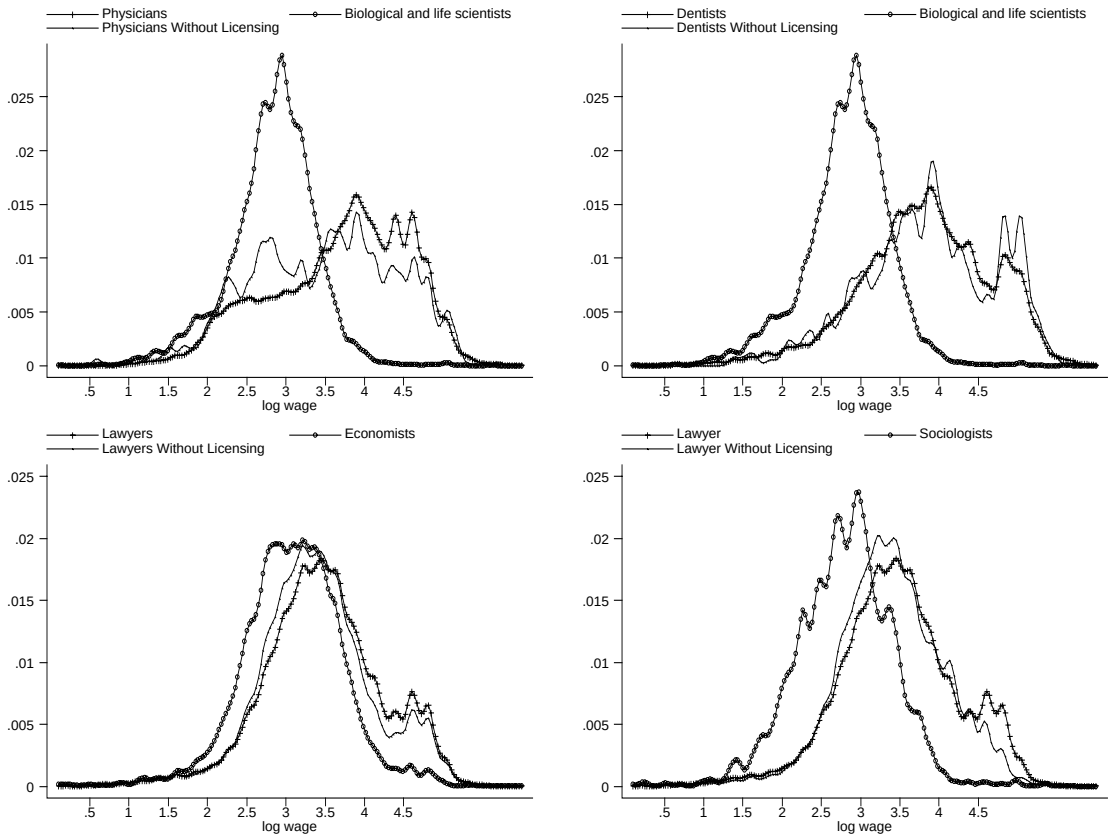


Figure-1 Regulation's Impact on Net Quality

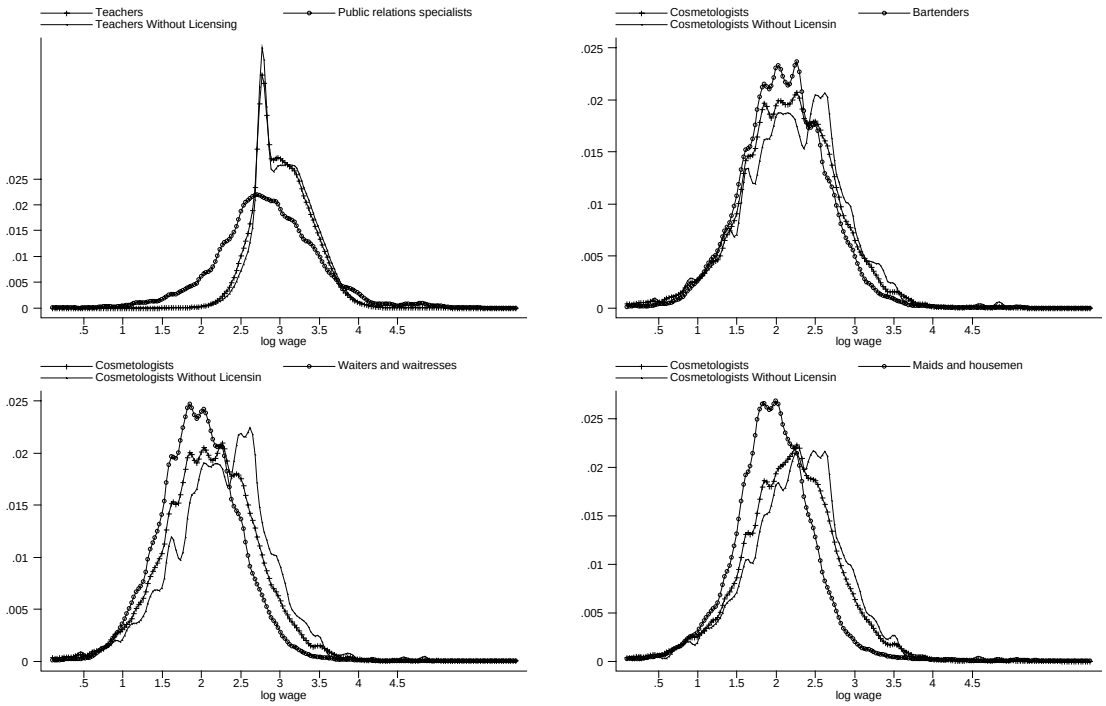
Figure 2: Semi-parametric estimates of the Impact of Licensing on Earnings Relative to Occupations with Similar Education and Aptitudes and No Licensing

Panel A



Semi-parametric Estimates of the Impact of Licensing

Panel B



Semi-parametric Estimates of the Impact of Licensing

Appendix 1: Ratio of Licensed Workers to Total Employment*

State	Licensed	Total	**Percent**
ALABAMA	263800	2015620	13.09%
ALASKA	75320	330420	22.80%
ARIZONA	296140	2399600	12.34%
ARKANSAS	345360	1209260	28.56%
CALIFORNIA	4802460	15820040	30.36%
COLORADO	523000	2338540	22.36%
CONNECTICUT	528560	1757260	30.08%
DELAWARE	78780	399120	19.74%
FLORIDA	1666140	7501560	22.21%
GEORGIA	555580	4023880	13.81%
HAWAII	113700	598920	18.98%
IDAHO	120200	621800	19.33%
ILLINOIS	1697540	6165300	27.53%
INDIANA	367120	3066380	11.97%
IOWA	234480	1525080	15.37%
KANSAS	161860	1360260	11.90%
KENTUCKY	223920	1868560	11.98%
LOUISIANA	274080	1969200	13.92%
MAINE	137520	657000	20.93%
MARYLAND	567260	2780060	20.40%
MASSACHUSETTS	737360	3339880	22.08%
MICHIGAN	1368620	4841900	28.27%
MINNESOTA	352860	2667700	13.23%
MISSISSIPPI	74980	1228500	6.10%
MONTANA	92300	457900	20.16%
NEBRASKA	203040	885400	22.93%
NEVADA	198460	1022100	19.42%
NEW HAMPSHIRE	165820	676720	24.50%
NEW JERSEY	777260	4219380	18.42%
NEW MEXICO	193340	824940	23.44%
NEW YORK	1430980	9061380	15.79%
NORTH CAROLINA	943340	4017160	23.48%
NORTH DAKOTA	40500	328860	12.32%
OHIO	1153480	5647700	20.42%
OKLAHOMA	306700	1630940	18.81%
OREGON	327200	1716180	19.07%
PENNSYLVANIA	956120	5967660	16.02%
RHODE ISLAND	129920	535920	24.24%
SOUTH CAROLINA	325960	1910720	17.06%
SOUTH DAKOTA	72320	380420	19.01%
TENNESSEE	590260	2754020	21.43%
TEXAS	1350160	9883880	13.66%
UTAH	186480	1093480	17.05%
VERMONT	79480	332280	23.92%
VIRGINIA	625500	3684300	16.98%
WASHINGTON	360700	2988680	12.07%
WEST VIRGINIA	142220	767060	18.54%
WISCONSIN	694920	2847320	24.41%
WYOMING	28620	254620	11.24%
Total	26,941,720	134,374,860	**20.05%**