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The Economic Effects of Licensure of Dietitians and Nutritionists and Social Workers

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Abstract

This dissertation examines the economic effects of occupational regulation of dietitians and nutritionists (DNs) and social workers (SWs). Both occupations require a bachelor's degree, employ high percentages of female, part time, and institutional workers, have strong occupational associations, and are subject to different types of regulation in different states. Models for the effect of regulation on numbers and wages of practitioners use individual-level data from the 1980, 1990, and 2000 5% Census surveys and control for regulation via a dummy variable (for linear effects) or a function of years of regulation (for non-linear effects). Models for the effect of regulation on quality of service use individual-level data from the 1984 through 2013 Behavioral Risk Factor Surveillance System (BRFSS) surveys and measure quality of service in terms of health indicator variables derived from survey questions. Empirical models include OLS, FE, and 2SLS models with IVs for regulation variables. Results are found for the effect of any regulation, regulation that is named licensure (with or without practice restriction), or licensure on the number of practitioners, wages, and quality of service. I find no evidence that regulation reduces the number of DN or SW practitioners, but licensure of DNs is associated with an increase in the number of DNs in job positions that are exempt from regulation. Any regulation of DNs and regulation named licensure of SWs have small, positive, although not significant, impacts on wages. I find positive elasticities of wages with respect to years of regulation for both DNs and SWs. I also find small improvements in the quality of service due to any regulation of DNs and licensure of SWs. Results for different regulation levels are similar to those for licensure.

Keywords: licensure, occupational regulation, wage impact, health outcomes, dietitian, nutritionist, social worker, health economics, labor economics

JEL Classification: I, J

Chapter 1: Introduction

1.1 Types of State Occupational Regulation

In the U.S., occupational regulation can occur at the federal,[1] state,[2] or local level,[3] but most occupational regulation occurs at the state level. Thus, it is up to the state legislature to decide if and when to regulate an occupation and what kind of regulation to adopt. State regulation of occupations generally falls into one of four types:[4] registration, title protection, certification, and licensure. These types of regulation differ by how restrictive they are for the regulated individual and by how much information they provide to the consumer.

Registration is the least restrictive form of state occupational regulation. Typically, registration requires an individual to file his qualifications with a state agency before practicing his occupation. Although the state is aware that the individual is practicing, it has no responsibility for assessing or verifying the individual's qualifications and it does not define or restrict the scope of the individual's practice. The value of registration to the consumer is that it can help the consumer find individuals that practice a particular occupation.

Title protection is more restrictive than registration. Typically, title protection restricts the use of an occupational title to those individuals who meet certain qualifications. The state

[1] An example of federal occupational regulation is the licensure of air traffic controllers and pilots by the Federal Aviation Administration.
[2] Examples of state occupational regulation include licensure of doctors, teachers, and manicurists.
[3] Local occupational regulation includes licensure of tree trimmers in Minneapolis, MN; tour guides in New Orleans, LA; and auctioneers in Newark, NJ.
[4] CLEAR (the Council on Licensure, Enforcement, and Regulation) defines three categories of occupational regulation: licensure (right-to-practice), certification (occupational right-to-title), and registration. These CLEAR categories are based on occupational titles, not on scope of practice. As a result, the certification category can mean either (1) title protection with no scope of practice defined or (2) title protection with scope of practice defined. To avoid ambiguity, I separate the CLEAR certification category into (1) title protection and (2) certification, where both title protection and certification include title protection, but certification also defines the scope of practice associated with the title. Kleiner (2006b), who has published several books on occupational licensing and whom I frequently reference in this dissertation, uses the CLEAR definition of certification and sees three types of occupational regulation: registration, certification, and licensure. However, various individual states and occupational associations recognize four types of occupational regulation: registration, title protection, certification, and licensure.

verifies the individual's qualifications, but the state does not define or restrict the scope of the individual's practice. For example, an individual cannot use the title "Clinical Social Worker" in the state of Alabama unless he or she has earned a master's degree, passed an exam, completed field work, and been approved by the state board of social workers. However, Alabama does not define what a "Clinical Social Worker" does, so individuals who have not been approved by the state board can perform the same services as "Clinical Social Workers" as long as they do not use the title. The value of title protection to the consumer is that it can help the consumer identify individuals who have certain qualifications, but title protection does not tell the consumer if the titled individual is qualified to perform a specific service.

Like title protection, certification restricts the use of an occupational title to those individuals who meet certain qualifications. However, certification is more restrictive than title protection, because certification also defines the practice associated with the title. The state verifies the individual's qualifications and defines the scope of the individual's practice, but the state does not restrict that practice to those who are certified. A financial planner in the state of New Jersey, for example, can become a "Certified Financial Planner" upon meeting a list of requirements (including minimum education and experience and passing an examination) and being approved by the board. As a "Certified Financial Planner," the individual is certified to perform a list of services that are enumerated in the state regulation. Another individual who is not certified can perform those same services, but cannot claim the title of "Certified Financial Planner." For this reason, certification is also sometimes called voluntary licensure. The value of certification to the consumer is that it can help the consumer identify individuals who are deemed to be qualified by the state to perform specific services.

Licensure is the most restrictive form of state occupational regulation. Like certification, licensure includes both title protection and practice definition, but licensure also includes practice restriction, making practice in a licensed profession illegal without a license. A state licensing board specifies and enforces the requirements for obtaining and renewing a license to practice a specific occupation in the state, and thereby exercises a degree of control over employment in that occupation. Thus, a physician cannot practice medicine or claim to be a medical doctor in the state of Florida without a Florida state medical license. The value of licensure to the consumer is that it informs the consumer that a licensed professional has met state licensure requirements, but, since all practitioners must be licensed, licensure does not assist consumers in distinguishing between practitioners of a licensed occupation.

State legislators do not always adhere to these definitions of the types of state occupational regulations. In particular, the name of a state regulation may not match the detailed provisions of the regulation. I have found examples where the name is more restrictive than the regulation and examples where the regulation is more restrictive than the name. For example, the state of Oklahoma has a law that licenses Dietitians and Nutritionists, but the provisions of the law do not restrict practice to licensees, so the law is actually certification instead of licensure. Similarly, the state of Nebraska has a law that certifies Social Workers, but the provisions of the law include practice restriction, so the law is actually licensure instead of certification. There are also cases where a state regulates an occupation, but does not name the regulation as any of the types defined here. South Dakota, which licenses Social Workers, is an example of this. Therefore, to be sure about what type of occupational regulation is imposed by a state, it is necessary to read the text of the actual regulation for a particular occupation. Confusion about the meaning of the terms registration, title protection, certification, and

licensure and inconsistencies between regulation names and regulation provisions can obscure the signaling value of occupational regulation for the consumer.

1.2 The Economics of Occupational Licensure

Of the four types of state regulation of occupations, only licensure (with its practice restriction) controls entry into an occupation. The state licensing board exercises this control by setting the minimum requirements for obtaining or renewing a license and by specifying a code of conduct for licensees with consequences for violations. Licensure statutes typically specify minimum levels of education or training, numbers of practice hours, required examinations, continuing education requirements, and licensure fees. The board can control available openings for education, training, and practice; the frequency and pass rate of examinations; and the size of licensure fees to limit the number of practitioners entering a licensed occupation. The board can also control the strictness and level of enforcement of the code of conduct, the availability and difficulty of continuing education courses, and the size of licensure renewal fees to manage the number of practitioners who maintain licensure.

When licensure reduces the number of practitioners in an occupation, the result is generally an increase in wages for practitioners and an increase in the price of services for consumers. Individuals who seek to enter a licensed occupation invest time, effort, and money to comply with the licensure requirements and expect to realize a return on their investment in human capital in the form of higher wages and job security.[5] Consumers expect higher quality service from licensees due to the minimum competency demonstrated by compliance with licensure requirements. The result is higher prices for consumers who are able and willing to pay, but no services for consumers who either cannot or will not pay the premium due to

[5] Since licensure includes practice restriction, licensees do not have to compete with low-quality substitutes for their services (Akerlof 1970; Shapiro 1986).

licensure. Access to services may also be reduced due to the reduction in the number of practitioners.

From a public policy perspective, occupational licensure improves the quality of service provided to consumers, reduces the availability of lower-quality substitutes, and minimizes consumer uncertainty about the quality of service. This uncertainty is due to asymmetric information, where the consumer knows less about the factors that may affect the purchase of a service than the practitioner does. This is particularly true of occupations that make use of advanced technology or medical science (Kleiner 2006b). Licensure addresses market failures due to asymmetric information and minimizes consumer uncertainty about the quality of service, which helps to alleviate the level of risk perceived by the consumer and increases the consumer's demand for the service (Arrow 1971).

When licensure is first introduced, it raises entry costs for the occupation, since applicants for licensure have to meet the licensure requirements and pay licensure fees. This increase in entry costs causes the short-run supply of labor to decrease as the market waits for new practitioners to become licensed. Practitioners in the occupation before licensure is passed can enjoy higher wages during the early years following licensure. In the long-run, the higher wages associated with licensure attract additional entrants into the occupation, new entrants become licensed, and the market moves long-run wages back down, in the absence of any action by the licensing board (Maurizi 1974). However, the price paid by consumers for the services of a licensed practitioner is likely to be higher than the price paid prior to licensure in both the short-run and the long-run.

Licensure is a barrier to entry that can control the quality of practitioners entering an occupation. Barriers to entry are artificial limits to an occupation's labor supply that can force

wages in that occupation to increase, resulting in a potential increase in the price of service provided. For many occupations, licensure requirements include an examination that individuals must pass before applying for a license. State licensing boards can set the pass rate for the exam based on the current excess demand or supply in the labor market. If the board wants to match the supply of practitioners to the demand for services in the short term, the board may respond to excess supply by lowering pass rates and to excess demand by raising pass rates (Maurizi 1974). However, most members of state licensing boards are practitioners of the occupation it licenses, so the board may respond to excess demand by lowering the pass rate on the licensure examination to slow the flow of new licensees into the occupation and help to maintain higher wages for licensees.

Since licensure can restrict entry into a licensed occupation, it can cause an oversupply of labor in other related, unlicensed occupations that may have comparable education and aptitude requirements (Filer, Hamermesh, and Rees 1996). Consider the case of doctors who are licensed in every state and research biologists who are not licensed. If the state licensing board chooses to restrict entry into the medical profession, the supply of doctors decreases. If an individual can only be a doctor or a research biologist, medical school graduates who cannot enter the market for doctors instead choose to enter the market for research biologists, creating an oversupply of research biologists in that market. The increase in the number of research biologists equals the decrease in the number of doctors, and the increase in doctors' real wages equals the decrease in research biologists' real wages. However, the labor and wage effects for research biologists of a decrease in the labor supply for doctors are likely to be smaller than suggested in this simple example, since individuals who are excluded from being doctors can actually choose to be something other than research biologists.

Practitioners of a licensed occupation may experience gains due to the higher wages and improved job security resulting from licensure restricting entry into the occupation. However, society can experience losses due to the reduction in the number of practitioners of an occupation and higher prices paid for services provided by licensees. Overall, there is a reallocation of income from consumers to practitioners. This welfare loss is due to lost employment in the occupation and loss of service output to society (Kleiner 2006b). Using economic data from 2000,[6] Kleiner estimates that the reallocation of earnings from consumers to licensed practitioners is between $116 billion and $139 billion per year, while the dead-weight loss to society due to licensure is between $34.8 and $41.7 billion per year.

State occupational licensure regulations typically include grandfather clauses that exempt current practicing members of an occupation from new licensure regulations. These grandfather clauses play an important role in securing support for licensure from current workers in an occupation. When an occupation is licensed for the first time, a grandfather clause automatically qualifies current practicing members of the occupation for a license. When existing licensure requirements are made stricter, a grandfather clause allows current licensees to retain their licenses without having to meet the stricter requirements.

Initially, the increases in wages of practitioners due to licensure may be limited by a grandfather clause. Current workers are not forced out of the occupation by licensure, so the licensing board cannot easily restrict the number of practitioners. However, as current workers leave the occupation due to normal attrition, licensure can limit the number of new licensees

[6] Assumptions of this analysis include: Individuals in licensed occupations earn about 10-12% more than their unlicensed counterparts and licensed occupations make up 20% of the total workforce (in 2000), so licensing increases overall consumer costs by 2-2.4% relative to a labor market without licensure. Total wage income in the U.S. is $5.8 trillion in 2000 and elasticity of labor demand is -0.3 (Hamermesh 1993).

entering the occupation to replace them. When the replacement rate is less than the rate of attrition, the number of workers in the occupation shrinks (Dorsey 1980).

Since occupational licensure is generally a state regulation, an individual who is licensed to practice an occupation in one state cannot practice that same occupation in another state without first obtaining a license. Some licensure regulations also include state residency requirements that stipulate either how long an individual has to reside in a state before applying for a license in that state or that an individual has to reside in a state to practice in that state. When licensure restricts "occupational migration" between states, it acts as a barrier to mobility that causes a misallocation of labor resources across states.

Often, licensure statutes include reciprocity agreements that allow an individual that is licensed in one state to either practice in another state using his current license or easily obtain a license in another state without having to meet new licensure requirements. Reciprocity agreements remove the barriers to mobility. However, willingness to incorporate reciprocity agreements in licensure regulations varies across occupations. Typically, licensed dentists can move easily from state to state, but public school teachers have limited mobility due to the efforts of strong unions (Kleiner 2006b).

In nonprofessional occupations (i.e., those that do not require a college education), licensing examinations generally include both a written test and a practical test. An applicant for licensure who fails either part of the exam is excluded from working in the licensed occupation. This is true even though performance on a written licensure examination has not been shown to predict an individual's ability to perform the tasks associated with the licensed occupation (Kleiner 2006b). Dorsey (1980) found that less educated applicants, blacks, and those choosing apprenticeship, rather than formal classroom training in a trade school, are more likely to fail the

written examination than are better educated applicants, whites, and those choosing to attend trade school. This may occur because some applicants for licensure are at a disadvantage in taking written examinations, even if they perform well on the practical examination and can adequately perform the tasks related to the occupation. Thus, occupational licensure can restrict the labor market opportunities of groups of workers whose alternatives are already limited, resulting in distributional effects due to licensure, in addition to price and output effects. In addition, when an occupation is newly licensed by the state, if the provisions of the regulation do not include a grandfather clause that automatically qualifies current workers for licenses, some current workers will fail to obtain a license. This creates a second group of excluded workers.

1.3 Literature Review – Number, Wage, and Quality Impacts of Licensure

1.3.1 Impact of Licensure on the Number of Practitioners in an Occupation

Economic theory predicts a reduction in the number of practitioners due to licensure. However, there are mixed results in the literature as to whether licensing actually does reduce the number of practitioners. Carroll and Gaston (1981) studied electricians, dentists, plumbers, real estate agents, optometrists, sanitarians, and veterinarians and found that licensing lowers the total stock of practitioners. However, Thornton and Weintraub (1979) found little evidence that stricter licensing requirements had an impact on the state's number of barbers, and White (1980) found that licensing had no impact on employment levels for nurses.

There is empirical evidence that state licensing boards can affect the number of practitioners in a licensed occupation by manipulating the pass rate on licensing exams. Kleiner and Kudrle (2000), for example, estimated that a ten percent decrease in a state dentistry licensing exam's pass rate reduced the number of dentists per capita in the state by two percent. Jackson (2006) and Carpenter and Stephenson (2006) found similar results for CPAs. Maurizi

(1974) modeled the short term behavior of licensing boards in setting examination pass rates as a function of excess demand and mean income of practitioners in a licensed occupation. Using data for a limited number of licensed occupations in 1940 and 1950, he found that a ten percent increase in excess demand for workers resulted in a one to ten percent decrease in the pass rate, depending on the licensed occupation. He also found that a ten percent increase in average practitioner income was associated with up to a ten percent decrease in pass rate.

1.3.2 Impact of Licensure on the Wages of Practitioners in an Occupation

Empirical evidence of a wage premium due to occupational licensure is mixed. Using data from a specially designed 2006 Gallup survey resulting in approximately 2,000 observations of individuals working in various occupations, Kleiner and Krueger (2010) found that, if a licensure dummy is added to a standard wage equation, having a license is associated with an average wage premium on hourly earnings of 15 percent. Kleiner (2006b) analyzed the impact of licensure on wages in regulated occupations relative to similar unregulated occupations. He looked at a sample of 36 occupations using Census data from 1990 and 2000 and found an average wage premium due to licensure of 12 percent for fully licensed occupations[7] and four percent for partially licensed occupations,[8] possibly due to spillover of higher wages from regulated states to unregulated ones. For regulated occupations, the highest-wage occupations and those with the highest education requirements tend to show the largest wage growth (percent growth) during the 1990s, while lower-wage occupations and those with lower education requirements tend to show smaller wage growth than national averages across all occupations (Kleiner 2006b). Increases in wages due to licensure may also depend on whether licensees in the occupation work in the quasi-private sector where wages are determined on an individual

[7] Fully licensed occupations are occupations that are licensed in all states in the U.S.
[8] Partially licensed occupations are occupations that are licensed in some, but not all states in the U.S.

basis (e.g., physicians, dentists, lawyers) or primarily for large institutions like hospitals and school boards where wages may be determined by collective bargaining under institutional pressure to control costs (e.g., nurses and teachers).

A number of empirical studies focus on the effect of occupational licensure on specific occupations. For selected occupations requiring post-graduate education and with employment in the quasi-private sector, several studies find empirical evidence that licensure may have a positive wage premium. Licensure was found to increase wages from 1 to 340 percent, depending on the occupation. These studies include Shephard (1978), Kleiner (2000), and Kleiner and Kudrle (2000), who studied dentists; Kleiner (2000) and Tenn (2001), who studied lawyers; Kugler and Sauer (2005), who studied physicians in Israel; and Benham and Benman (1975) and Feldman and Begun (1985), who studied optometrists.[9] However, empirical evidence of the impact of licensure on wages is mixed for occupations with lower education requirements or with institutional employment. Some studies did not find a wage premium due to licensure for those occupations. White (1978) found that licensure did not increase wages of clinical lab personnel except in states that made a college degree a licensure requirement. White (1980) also found that licensure was not associated with a wage premium for registered nurses in 1960 and 1970, despite earlier estimates of a wage premium due to licensure in 1950.[10] Kleiner and Petree (1988) found that licensure has no impact on wages of public school teachers. Kleiner (2000) found that licensure of barbers and cosmetologists did not increase their wages relative to unlicensed occupations with similar training requirements. Other studies did find a wage premium due to licensure. Timmons and Thornton (2007) found that, after controlling for place of work and job specialization, licensure of radiologic technologists increased average wages by

[9] To the extent that dentists, lawyers, physicians and optometrists are in private practice, they have some latitude in setting their fees, subject to the demand for their services. Fee setting may impact wages for these professionals.
[10] White (1980) used state-level wage data for registered nurses from the 1950, 1960, and 1970 U.S. Census.

about three percent; and Timmons and Thornton (2010) found that some licensure provisions increased barber earnings by as much as 26 percent.

1.3.3 Impact of Licensure on the Quality of Service by Practitioners

To the extent that licensure results in a reallocation of income from consumers to licensed practitioners, consumers should expect that licensure increases the quality of service provided. However, empirical studies of the quality effects of occupational licensure yield mixed results. Shapiro (1986) found that licensing is a means of solving the principal-agent problem. In general, practitioners do not have a strong incentive to acquire the level of human capital necessary to provide good service to their clients. By setting competency requirements that practitioners have to meet to acquire a license, licensing provides a means of aligning the interests of the practitioners with those of the principals (consumers). Shapiro found that licensing improves the quality of service delivered to consumers, but his model suggests that licensing generally decreases consumer welfare. Overall, the costs associated with licensure (higher prices) appear to exceed the benefits of licensure (higher quality of service).

Leland (1979) modeled the demand for used automobiles (the lemons problem) and determined that the quality of service delivered to the consumer in a market with asymmetrical information does not maximize social welfare. Instead, quality standards are generally set above the social welfare maximizing level. Although minimum quality standards may initially increase quality of service, Ryoo (1996) found that, in the long run, minimum quality standards provide a ceiling on the quality of services delivered to consumers.

Most empirical studies have generally failed to find evidence of improvements in quality of service provided to the consumer due to licensure. Maurizi (1980) found evidence that licensing of contractors in California between 1954 and 1975 increased the frequency of

complaints of poor service. Maurizi suggests that licensing resulted in the introduction of licensing exam schools and as a result, contractors with little experience could learn how to pass the exam without necessarily learning the skills of the trade. Carroll and Gaston (1981) studied seven different licensed occupations and found either a negative impact or no impact on the quality of services received by consumers. A number of studies of public school teaching quality ((Kleiner and Petree 1988), (Angrist and Guryan 2003), (Kane, Rockoff, and Staiger 2005), and (Kane and Staiger 2005)) found no improvement in teaching quality due to licensure. Cordes (2005) used insurance malpractice premiums as a measure of the quality of counselor[11] services and found no evidence that licensure reduces the risk of a high insurance payout. In the case of dentists, Holen (1978) found that licensing reduces the likelihood of unsatisfactory outcomes and increases the quality of care, while Kleiner and Kudrle (2000) found that tougher licensing statutes have no effect on overall quality, but higher-income groups benefit from tougher standards. Taken together, the lack of significant empirical evidence of quality improvement due to licensure weakens any public policy argument for occupational licensure that argues that the most important justification for occupational licensure is that it improves the quality of service rendered to consumers.

1.4 Occupations Selected for Empirical Analysis

The empirical analysis chapters of my dissertation focus on estimating the economic effects of occupational licensure on two occupations: (1) dietitians and nutritionists and (2) social workers. I selected these occupations because they have not been extensively studied in the literature, they are recognized by the U.S. Bureau of Labor Statistics[12] and the U.S. Census,[13] and they share a

[11] Counselors include pastoral counselors, marriage and family therapists, and professional counselors.

[12] The U.S. Bureau of Labor Statistics identifies Dietitians and Nutritionists as Occupation 29-1031 (http://www.bls.gov/oes/current/oes291031.htm); while Social Workers include Child, Family, and School Social Workers - Occupation 21-1021 (http://www.bls.gov/oes/current/oes211021.htm), Healthcare Social Workers –

number of similarities. First, both occupations have a strong national association that advocates for the profession and sets the standards for licensure examinations at the national level,[14] even though actual regulation is controlled by the individual states. Second, both occupations fall under the broad category of health and social services occupations, which is an area where much of occupational regulation activity is focused. Third, both occupations experienced new regulation by a number of states during the period from 1980 to 2000. Fourth, both occupations set a minimum education level of a bachelor's degree for licensure. Fifth, both occupations have a high percentage of female practitioners (approximately 93 percent of dietitians and nutritionists and 70 percent of social workers are female). And, finally, members of both occupations work in a wide range of industries and perform a number of different kinds of work that may affect wages, independent of state regulation effects.

1.4.1 Dietitians and Nutritionists

1.4.1.1 Overview of the Profession

Dietitians and nutritionists (DNs) are experts in food and nutrition who promote healthy eating habits and treat illnesses by recommending dietary modifications (*Dietitians and Nutritionists* 2014/15). Within the field of dietetics and nutrition, there are a number of specialties. Clinical dietitians provide nutritional services to patients in hospitals, nursing care facilities, and other institutions and may specialize in weight management or the care of renal (kidney), diabetic, or critically ill patients. Community dietitians work in places such as public health clinics, home health agencies, and health maintenance organizations, where they counsel individuals and

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Occupation 21-1022 (http://www.bls.gov/oes/current/oes211022.htm), Mental Health and Substance Abuse Social Workers – Occupation 21-1023 (http://www.bls.gov/soc/2000/soc_f1c3.htm), and All Other Social Workers – Occupation 21-1029 (http://www.bls.gov/soc/2000/soc_f1c9.htm).

[13] The U.S. Census identifies Dietitians and Nutritionists as Occupation Code 097 and Social Workers as Occupation Code 174 (http://usa.ipums.org/usa-action/variables/OCC1990/#codes_section).

[14] The Commission on Dietetic Registration (formerly the American Dietetic Association) is the national association for Dietitians and the Association of Social Work Boards is the national association for Social Workers.

groups on nutritional practices designed to prevent disease and promote health. Management dietitians oversee large-scale meal planning and preparation in health care facilities, company cafeterias, prisons, and schools. Consultant dietitians work under contract with health care facilities or in their own private practice. They perform nutrition screenings for their clients and offer advice on diet-related concerns such as weight loss and cholesterol reduction.

All but a few states regulate DNs.[15] Regulation requirements vary somewhat across states, but all statutes require earning a minimum of a bachelor's degree, completion of supervised practice, passing an examination, and payment of a fee. Most DNs have a bachelor's degree in dietetics, clinical nutrition, foods and nutrition, or food service systems management. These degree programs typically include courses in nutrition, psychology, chemistry, and biology.

DNs frequently choose to earn the Registered Dietitian Nutritionist (RDN) credential, which is administered by the Commission on Dietetic Registration (CDR), the credentialing agency for the Academy of Nutrition and Dietetics. The RDN is a national credential, distinct from any state regulation of DNs. However, many employers of DNs require the RDN and the qualifications for the RDN are typically copied by the states when crafting the statutes for state regulation of DNs. To earn the RDN, the CDR requires DNs to complete a minimum of a bachelor's degree and a dietetic internship program,[16] pass an examination that is administered at the national level, and pay an application fee. In order to maintain the RDN credential, RDNs must complete continuing professional education requirements and pay yearly fees. DNs may

[15] The source is the Commission on Dietetic Registration (http://www.cdrnet.org).
[16] Students may complete both criteria at once through a Coordinated Program, or they may finish coursework requirements before applying for an internship. These programs are accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND).

also seek additional certifications in a variety of specialties such as pediatric nutrition, renal nutrition, gerontology nutrition, oncology nutrition, and sports dietetics.

There is sometimes confusion about the meaning of the two titles: dietitian and nutritionist. Experts in the fields of dietetics and nutrition do recognize a distinction (Lehman 2015). A dietitian is generally recognized as one who has met the RDN requirements and maintains registration by complying with registration renewal requirements. A nutritionist, on the other hand, is someone who has studied nutrition, but is typically not required to obtain a specific degree or meet other requirements. Instead, a nutritionist's expertise may come from personal experience in the area of health and nutrition and may incorporate alternative approaches as components of nutritional counseling. Thus, dietitians are nutritionists, but nutritionists may or may not be dietitians. However, it is not true that nutritionists are necessarily less credentialed than dietitians, since nutritionists with graduate degrees in nutrition or related fields can be granted protected titles (such as Certified Nutrition Specialist (C.N.S) or Certified Clinical Nutritionist (C.C.N.)) by certification boards (Lehman 2015).

While the Bureau of Labor Statistics defines dietitians and nutritionists as a single occupation, until recently nutritionists have not been widely recognized by government agencies or professional organizations. In 1980 and 1990, the U.S. Census included dietitians as an occupational choice, but not nutritionists. The latter were not included as a recognized occupation by the Census until 2000, when the two titles were combined into a single occupation. The American Dietetic Association (ADA), the nation's largest organization of food and nutrition professionals, officially changed its name to the Academy of Nutrition and Dietetics in 2012, after nearly 100 years as the ADA.[17] Prior to the name change, the ADA dealt

[17] The source is the Commission on Dietetic Registration (http://www.cdrnet.org).

with the education of dietitians, the requirements for becoming a registered dietitian, and the promotion of licensure of dietitians, but did not define the title nutritionist.

State statutes for regulation of dietitians and nutritionists typically either mention just dietitians or use the terms dietitian and nutritionist interchangeably. There are a few cases where the titles of state statutes mention only nutritionists, but the actual statutes map the term nutritionist back to the term dietitian. For example, Montana and Nebraska issue licenses for nutritionists and not dietitians, but the wording of the statutes equates nutritionists with dietitians, since an individual must first become a registered dietitian before applying for a nutritionist license. There are also cases where statutes recognize advanced degrees in nutrition with special regulations. Kentucky and Mississippi license dietitians at the bachelor's degree level and then provide certification or title protection for nutritionists who are licensed dietitians and also earn advanced degrees in nutrition. However, at the bachelor's level, state regulations apply either just to dietitians or to both dietitians and nutritionists. Thus, it is not possible to distinguish between state statutes for dietitians and nutritionists.

In this dissertation, I follow the precedent set by the BLS and the U.S. Census and I treat dietitians and nutritionists (DNs) as a single occupation. To address any resulting ambiguity, I limit any datasets for empirical analysis to the population of DNs who have obtained at least a bachelor's degree. This is the minimum education level for RDNs and the minimum education level for all types of state regulation of DNs. In this manner, I can eliminate any individuals who did not complete a college degree (such as self-taught nutritionists) and I can control for any advanced graduate degrees earned by DNs that might equate to special certifications. I can also use state statute data for regulation of dietitians and apply it equally to both dietitians and nutritionists.

1.4.1.2 State Regulation of Dietitians and Nutritionists at the Bachelor's Level

Licensure of DNs began in Puerto Rico in 1974 (Skipper 2008). Nearly a decade later, regulation of DNs followed in the United States with title protection for DNs in California and Montana in 1983. The first states to license DNs were Iowa and North Dakota in 1986. As of 2000, 41 states and the District of Columbia regulated DNs. An additional six states passed occupational regulation for DNs between 2001 and 2012. Only Arizona, Colorado, and New Jersey still have no statutory regulation of DNs.[18] In New Jersey, bills to license DNs failed to pass in 1997 and 2008.[19]

An examination of state regulation of DNs must recognize the influence of the Commission on Dietetic Registration (CDR) (formerly the American Dietetic Association (ADA)).[20] As a national organization, the CDR/ADA has no authority to impose statutory regulation of DNs at the state level. However, the CDR/ADA has influenced state regulation of DNs in at least three important ways. First, the CDR/ADA actively promotes state licensure of DNs[21] and maintains a government relations team with a contact for states that want to pursue licensure. Second, the CDR/ADA defines uniform, national RDN credentials that, almost without exception, have been adopted as the basis for regulation requirements by states that have chosen to regulate DNs. Third, the CDR/ADA promotes and monitors quality in the dietetics profession and provides quality resources for RDNs, including: medical nutrition therapy guides for practice, an evidence analysis library, standards of practice in nutrition care, standards of professional performance, and a code of ethics (Hager 2005).

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[18] Commission on Dietetic Registration, About CDR, State Licensure, *Laws that Regulate Dietitians/Nutritionists*, http://www.cdrnet.org/vault/2459/web/files/Licensurelawsregulations.pdf, accessed 02 January 2015.
[19] Act A2933 was introduced on June 9, 2008. http://www.njleg.state.nj.us/2008/Bills/S2000/1941_I1.HTM
[20] The Commission on Dietetic Registration (CDR) is the credentialing agency for the Academy of Nutrition and Dietetics, formerly the American Dietetic Association. The website for the CDR is: http://www.cdrnet.org.
[21] CDR Mission Statement: "The Commission on Dietetic Registration administers rigorous valid and reliable credentialing processes to protect the public and meet the needs of nutrition and dietetics practitioners, employers, and consumers." http://www.cdrnet.org/about/, accessed 12 February 2015.

Data on state regulation of DNs is available through the CDR, which provides a list of laws that regulate DNs and links to the state licensure agencies and applicable statutes.[22] These statutes include information about the dates that regulations were enacted and became effective, the types of regulation, and the detailed regulation requirements. For each state, Table 1.1 summarizes the type of regulation of DNs, the year the regulation became effective, and any exemptions to the regulation.

For occupational regulation of DNs in the United States, there are examples of title protection, certification, and licensure, but no examples of registration. Thus, in practice, DNs have only three types of regulation. However, the name of the state statute frequently does not match the actual type of regulation spelled out in the statute. So, by name, DNs have all four types of occupational regulation. Examples of how the statute name differs from the type of statute include: California and Maine, where statutes that are named registration are actually title protection and certification, respectively; ten states that have statutes that are named licensure, but are actually certification because the statutes do not include practice restriction;[23] and Alabama and Montana, which do not use a statute name that implies any specific type of regulation. The regulation type in Table 1.1 is the actual type of regulation of DNs, even if it differs from the name of the statute.

State regulation of DNs has been dynamic, with some states initially enacting less-strict forms of regulation and later enacting a stricter form. This is the case for ten states,[24] where the regulation of DNs was initially either title protection or certification and was later changed to

[22] Commission on Dietetic Registration, About CDR, State Licensure, *State Licensure Agency List*, http://www.cdrnet.org/state-licensure-agency-list, accessed 02 January 2015.
[23] The ten states are Alaska, Georgia, Idaho, Maryland, Massachusetts, Michigan, Mississippi, Nevada, Oklahoma, and Texas.
[24] The ten states are Alabama, Delaware, Georgia, Kentucky, Louisiana, Maine, Maryland, Mississippi, Montana, and Rhode Island.

licensure. States for which the type of regulation changed over time have multiple rows in Table 1.1. In all cases, changes in state regulation of DNs over time have made the regulations stricter. At one point, Georgia had certification in place when the state legislature voted to remove regulation of DNs, but a licensure statute was later enacted before the certification statute expired.

Most states exempt DNs who work in certain industries or job positions from having to meet state regulations.[25] These exemptions are listed in Table 1.1. An exemption applies to a DN who practices the occupation in a work setting or economic sector that is explicitly listed as exempt from regulation. For example, Minnesota has licensed DNs since 1995, but a DN can work in a nursing home without first obtaining and then maintaining a license to practice. The most frequent exemptions from regulation for DNs are for federal employees; members of the armed forces; persons marketing, distributing, or preparing food or dietary supplements; and employees of a religious organization. Thus, even in the case of licensure, where practice in an occupation is restricted to those who are licensed, the exemptions built into the licensing statute can weaken its effects.

1.4.2 Social Workers

1.4.2.1 Overview of the Profession

Social workers (SWs) are professionals who help people cope with and solve problems in their everyday lives (*Social Workers* 2014/15). There are different types of SWs who specialize by working with a particular population or in a specific setting. Child, family, and school SWs assess the needs of children and their families and offer assistance to improve their situation. Medical and public health SWs help vulnerable populations cope with chronic, acute, or terminal illnesses. Mental health and substance abuse SWs assess and treat individuals with mental

[25] Thirty-four of forty-seven states that regulate DNs include exemptions in the state statutes.

illness or substance abuse problems. Other types of SWs include administrators, researchers, planners, and policymakers. Of the 642,000 positions held by SWs in the U.S. in 2008, 46% were child, family, and school SWs; 22% were medical and public health SWs; 21% were mental health and substance abuse SWs; and 11% were other types of SWs.

SWs must earn a college degree from a social work program that is accredited by the Council on Social Work Education. A bachelor's degree in social work (BSW) or a related field, such as psychology or sociology, is the most common minimum requirement for entry into the profession.[26] Accredited programs require a minimum of 400 hours of supervised field experience. Entry-level social workers are trained as generalists. They typically deal with a broad range of clients, maintain a wide scope of knowledge, and practice a great diversity of skills. A master's degree in social work (MSW) is usually required for positions in health and school settings, for clinical work, and for supervisory, administrative, and staff training positions. Master's programs prepare graduates for work in a field of concentration and include a minimum of 900 hours of supervised field experience or internship. College and university teaching positions and most research appointments normally require a doctorate in social work (DSW or Ph.D.) (*Social Workers* 2014/15).

All states and the District of Columbia have enacted some regulation for the practice of social work and the use of related professional titles. Because of the different education and experience levels required for different types of SW positions, there are three levels of state regulation of SWs: bachelor's, master's, and clinical. Each regulation level has degree and examination requirements. Regulation at the bachelor's level generally requires the individual to earn a BSW degree and take the bachelor's level exam and qualifies the individual to work as a

[26] A BSW program includes courses in social work value and ethics, dealing with a culturally diverse clientele and at-risk populations, promotion of social and economic justice, human behavior and the social environment, social welfare policy and services, social work practice, social research methods, and field education.

generalist. Regulation at the master's level requires the individual to earn a MSW degree and take the master's or advanced generalist exam. Regulation at the clinical level requires the individual to earn a MSW or DSW degree and take the clinical or advanced generalist exam. Every state that regulates SWs regulates at the clinical level and may also regulate at the bachelor's and/or master's level.

The degree requirement is the same (MSW) for the master's and clinical levels in all states that regulate either or both levels of SW practice. Thus, it is not possible to distinguish between the master's and clinical levels of regulation based on educational attainment. Furthermore, since every state that regulates SWs at the bachelor's level also regulates SWs at the clinical level, controlling for regulation of SWs at the clinical level in my empirical models is not useful. Instead, I control for regulation of SWs at the bachelor's level and rely on control for graduate degrees and age (as a proxy for experience) to capture any impacts due to regulation of SWs at the master's or clinical levels. Also, since a bachelor's degree is the minimum education level for entry into the SW profession and the minimum education level for all types of state regulation of SWs, I limit any datasets for empirical analysis to the population of SWs who have obtained at least a bachelor's degree. This allows me to focus on the economic impacts of licensure of SWs at the bachelor's level and makes comparison between my empirical results for DNs and SWs possible.

1.4.2.2 State Regulation of Social Workers at the Bachelor's Level

U.S. licensure of SWs began in Maryland in 1957.[27] Fifteen years later, Mississippi licensed SWs in 1972, followed by licensure in Kansas and title protection in Kentucky in 1974. As of 2000, all but 18 states regulated SWs at the bachelor's level and all states regulated SWs at the

[27] The source is the Association of Social Work Boards (http://www.aswb.org).

clinical level. An additional three states passed occupational regulation for SWs between 2001 and 2005. Of the 39 states that currently do regulate SWs at the bachelor's level, four states employ title protection and 35 states employ licensure.

The Association of Social Work Boards (ASWB) is a nonprofit association that is dedicated to regulation of SWs. Its mission is "To strengthen protection of the public by providing support and services to the social work community to advance safe, competent and ethical practices."[28] While each state decides which levels of SW practice to regulate and writes its own statutes, the ASWB owns and maintains the SW licensing examinations that are used by its members. ASWB's members include 49 states, the District of Columbia, the U.S. Virgin Islands, and all ten Canadian provinces. California is the only state that is not a member, because it chooses to administer its own SW licensing examinations. The ASWB also developed and maintains a model practice act that offers regulatory bodies a resource for developing their own laws and regulations. These model regulations define standards of minimum social work competence associated with the levels of practice.[29]

Data on state regulation of SWs is available through the ASWB, which provides a list of laws that regulate SWs and links to the state licensure agencies and applicable statutes. These statutes include information about the dates that regulations were enacted and became effective, the types of regulation, and the detailed regulation requirements. For each state, Table 1.2 summarizes the type of regulation of SWs at the bachelor's level, the year the regulation became effective, and any exemptions to regulation.

For SWs in the United States, there are examples of title protection and licensure at the bachelor's level, but no cases of registration or certification. Thus, in practice, SWs have only

[28] The source is the Association of Social Work Boards (http://www.aswb.org).

[29] The Association of Social Work Boards, "Social Work Licensing Basics," http://www.aswb.org/SWL/licensingbasics.asp, accessed 09 January 2010.

two types of regulation. Like regulation for DNs, the name of the state statute for SWs sometimes does not match the type of regulation spelled out in the statute. So, by name, SWs have all four types of occupational regulation. Examples of how the statute name differs from the type of statute include: Louisiana and Oregon, where statutes that are named registration are actually licensure and title protection, respectively; five states that have statutes that are named certification, but are actually licensure;[30] three states that have statutes that are named licensure, but are actually title protection;[31] and Pennsylvania, South Dakota, and Utah, which do not use a statute name that implies any specific level of regulation. The regulation type in Table 1.2 is the actual type of regulation of SWs, even if it differs from the name of the statute.

Most states exempt SWs who work in certain industries or job positions from having to meet state regulations. These exemptions are listed in Table 1.2. An exemption applies to a SW who practices the occupation in a work setting or economic sector that is explicitly listed as exempt from regulation. For example, North Dakota has licensed SWs since 1987, but a SW does not need a license to work for a nonprofit agency in North Dakota. The most frequent exemptions from regulation for SWs are for federal employees, state employees, employees of elementary and secondary schools, and non-state residents.

1.5 Outline of Dissertation

This dissertation includes 6 chapters. Chapter 1 defines the types of state regulation of occupations, discusses the economics of occupational licensure, surveys the literature dealing with the number, wage, and quality impacts of occupational licensure, and identifies the two occupations that are the focus of the empirical analysis in Chapters 3, 4, and 5. Chapter 2 examines why states license occupations. Chapter 3 examines the impact of licensure of

[30] The five states are Nebraska, New Jersey, North Carolina, Wisconsin, and Wyoming.
[31] The three states are Alabama, Kentucky, and West Virginia.

dietitians and nutritionists (DNs) and of social workers (SWs) on the number of practitioners in those occupations. Chapter 4 examines the impact of licensure of DNs and SWs on wages of practitioners. Chapter 5 examines the impact of licensure of DNs and SWs on the quality of service provided by practitioners. Chapter 6 summarizes the empirical results and discusses them in the context of the existing literature on the impact of occupational licensure.

1.6 Tables

Table 1.1: State Regulation of Dietitians and Nutritionists at the Bachelor's Level

Table 1.1 (State Regulation of Dietitians and Nutritionists at the Bachelor's Level) – Page 1 of 2			
State	Regulation Type	Year Effective	Exemptions
Alabama	Title Protection	1984	Person employed by licensed health care facility before May 1984.
	Licensure	1989	Hospital employee until May 1994; member of armed forces; federal employee; certified teacher employed by a federal, state, county, or municipal agency or by an elementary /secondary school or accredited institution of higher education.
Alaska	Certification	2000	Animal nutritionist; federal employee; member of armed forces.
Arizona	None	-	-
Arkansas	Licensure	1989	Member of armed forces; hospital or long term care facility employee; employee of a religious organization; animal nutritionist; person selling vitamins, health products, or food.
California	Title Protection	1983	None
Colorado	None	-	-
Connecticut	Certification	1994	Federal employee.
Delaware	Certification	1994	None
	Licensure	2009	Federal or state employee.
District of Columbia	Licensure	1987	None
Florida	Licensure	1988	Federal employee; person marketing, distributing, or preparing food or dietary supplements; educator; person employed by a hospital, nursing home, assisted living or continuing care facility; employee of a religious organization.
Georgia	Certification	1984	None
	Licensure	1994	Member of armed forces; federal, state, or local government employee.
Hawaii	Licensure	2009	None
Idaho	Certification	1995	None
Illinois	Licensure	1992	Federal or state employee; person selling health products; educator; employee of a religious organization.
Indiana	Certification	1994	None
Iowa	Licensure	1986	Member of armed forces; educator; person selling food or dietary supplements.
Kansas	Licensure	1989	Employee of a religious organization.
Kentucky	Certification	1988	None
	Licensure	1994	Member of armed forces; educator; federal, state, county or municipal employee.
Louisiana	Certification	1987	Member of armed forces; federal employee; educator.
	Licensure	1988	Member of armed forces; federal employee; educator.
Maine	Certification	1985	Educator.
	Licensure	1988	Educator; federal or state employee; person marketing or distributing food.
Maryland	Certification	1986	None
	Licensure	1989	Federal employee; person selling health products; food service employee.
Massachusetts	Certification	1999	Person marketing, distributing, or preparing food or dietary supplements; employee of a religious organization.
Michigan	Certification	2007	Person marketing, distributing, or preparing food or dietary supplements.
Minnesota	Licensure	1995	Animal nutritionist; state employee involved in research studies; nursing home or home care employee.

Table 1.1 (State Regulation of Dietitians and Nutritionists at the Bachelor's Level) – Page 2 of 2			
State	Regulation Type	Year Effective	Exemptions
Mississippi	Certification	1986	None
	Licensure	1994	Member of armed forces; nutrition educator.
Missouri	Licensure	1995	State employee.
Montana	Title Protection	1983	None
	Licensure	1987	Educator.
Nebraska	Licensure	1988	Member of armed forces; person marketing, distributing, or preparing food or dietary supplements; educator; person with a doctoral degree; employee of a religious organization.
Nevada	Certification	1995	None
New Hampshire	Licensure	2001	Member of armed forces; federal or state employee working in public health facility.
New Jersey	None	-	-
New Mexico	Licensure	1990	Federal or state employee.
New York	Certification	1991	Federal, state, or local government employee.
North Carolina	Licensure	1992	Member of armed forces; state or local government employee; hospital or health care facility employee.
North Dakota	Licensure	1986	Member of armed forces; educator.
Ohio	Licensure	1987	Member of armed forces.
Oklahoma	Certification	1985	Federal employee.
Oregon	Licensure	1990	None
Pennsylvania	Certification	2002	None
Rhode Island	Certification	1991	Federal, state, or local government employee; employee of non-profit health agency.
	Licensure	1992	Federal, state, or local government employee; person with doctoral degree.
South Carolina	Licensure	2006	Member of armed forces; federal employee; educator; employee of a religious organization.
South Dakota	Licensure	1996	Member of armed forces.
Tennessee	Licensure	1987	Member of armed forces; educator; federal, state, or local government employee; employee of hospital or nursing home.
Texas	Certification	1984	None
Utah	Certification	1986	None
Vermont	Certification	1995	None
Virginia	Title Protection	1995	None
Washington	Certification	1988	None
West Virginia	Licensure	1996	Cook in an educational institution.
Wisconsin	Certification	1994	None
Wyoming	Licensure	2012	None

Data for Dietitians and Nutritionists are from the Commission of Dietetic Registration, "Laws that Regulate Dietitians and Nutritionists" (http://cdrnet.org/certifications/licensure/index.cfm) accessed 05 August 2009 and (http://www.cdrnet.org/vault/2459/web/files/Licensurelawsregulations.pdf) accessed 02 January 2015, with data verified/edited based on the actual state statutes and with exemptions derived from the actual state statutes. Note that exemptions that do not apply to an individual who is a DN with a minimum of a bachelor's degree are not included. Also, the language describing exemptions has been simplified in some cases to allow the information to be included in the table.

Table 1.2: State Regulation of Social Workers at the Bachelor's Level

Table 1.2 (State Regulation of Social Workers at the Bachelor's Level) – Page 1 of 2			
State	Regulation Type	Year Effective	Exemptions
Alabama	Title Protection	1978	None
Alaska	Licensure	2001	Federal, state, or local government employee; employees of nonprofit agency.
Arizona	Licensure	2004	Non-state resident.
Arkansas	Licensure	1981	Hospital employee; state employee working in family service, social service, or adult protective service.
California	None	-	-
Colorado	None	-	-
Connecticut	None	-	-
Delaware	None	-	-
District of Columbia	Licensure	1981	Federal employee.
Florida	None	-	-
Georgia	None	-	-
Hawaii	Licensure	1994	Federal, state, or local government employee; college employee; employee of a religious organization.
Idaho	Licensure	1993	None
Illinois	None	-	-
Indiana	None	-	-
Iowa	Licensure	1985	None
Kansas	Licensure	1974	None
Kentucky	Title Protection	1974	State employee; school employee.
Louisiana	Licensure	2000	None
Maine	Licensure	1977	None
Maryland	Licensure	1957	Federal employee; non-state resident.
Massachusetts	Licensure	1980	State or local government employee.
Michigan	Licensure	1978	None
Minnesota	Licensure	2005	State or local government employee; employee of a federally recognized tribe; employee of a private nonprofit agency.
Mississippi	Licensure	1972	Federal employee.
Missouri	Licensure	1989	State employee.
Montana	None	-	-
Nebraska	Licensure	1993	Federal employee; educator; employee of a religious organization; addiction counselor; state employee providing rehabilitation or support services.
Nevada	Licensure	1999	Federal, state, or local government employee.

Table1.2 (State Regulation of Social Workers at the Bachelor's Level) – Page 2 of 2			
State	Regulation Type	Year Effective	Exemptions
New Hampshire	None	-	-
New Jersey	Licensure	1991	State or local government employee; school employee; employee of non-profit agency.
New Mexico	Licensure	1990	None
New York	None	-	-
North Carolina	Licensure	1992	None
North Dakota	Licensure	1987	Employee of nonprofit agency.
Ohio	Licensure	1984	Elementary or secondary school employee; state government employee; substance abuse counselor; member of labor organization.
Oklahoma	Licensure	1981	State government employee; employee of a health care facility.
Oregon	Title Protection	1990	None
Pennsylvania	Title Protection	1990	None
Rhode Island	None	-	-
South Carolina	Licensure	1976	Hospital employee.
South Dakota	Licensure	1975	None
Tennessee	Licensure	1986	Non-state resident.
Texas	Licensure	1999	None
Utah	Licensure	1994	Federal employee; non-state resident.
Vermont	None	-	-
Virginia	Licensure	1979	Federal, state, or local government employee; employee of nonprofit agency; private personnel manager.
Washington	None	-	-
West Virginia	Title Protection	1997	Elementary or secondary school employee.
Wisconsin	Licensure	1991	Elementary or secondary school employee; employee of a religious organization.
Wyoming	Licensure	2000	Non-state resident; employee of a religious organization; elementary or secondary school employee.

Data for Social Workers are from the Association of Social Work Boards, "Social Work Licensing Basics" (http://www.aswb.org/SWL/licensingbasics.asp) accessed 09 January 2010 and "Member Statutes and Regulations" (https://www.aswb.org/licensees/member-statutes-and-regulations/) accessed 02 January 2015, with data verified/edited based on the actual state statutes and with exemptions derived from the actual state statutes. Note that exemptions that do not apply to an individual who is a SW with a minimum of a bachelor's degree are not included. Also, the language describing exemptions has been simplified in some cases to allow the information to be included in the table.

Chapter 2: Why States License Occupations

2.1 Introduction

Occupational licensure is a long-standing form of regulation in the United States. It began with physician licensing in the Virginia colony in 1639 and continued through the mid-nineteenth century with state medical authorities licensing physicians in most states. However, early occupational licensure did not include practice restriction or uniform education and training standards, so it was not successful in providing a minimum quality of service for consumers. As a result, there was no effective state occupational licensure in place at the time of the U.S. Civil War. Modern professional associations were formed in the second half of the nineteenth century and this led to the passage of the first modern medical practice legislation in Texas in 1873. The Supreme Court case *Dent v. West Virginia* in 1888 took away the federal authority to override states in the area of occupational licensing and gave the states the right to license occupations to protect the health, welfare, or safety of citizens. Following that decision, state occupational licensure grew steadily, with licensure of 12 occupations by 1889, 30 occupations by 1920, and more than 800 occupations in at least one state by 2003[32] (Kleiner 2006b). Licensed occupations include both professional occupations where practitioners must earn one or more college degrees (e.g., physicians, dentists, and lawyers) and non-professional occupations (e.g., barbers, beauticians, and massage therapists).

As a result of the growth in state regulation, the percentage of the U.S. workforce that is subject to licensure has increased from 4.5% in the 1950s, to 20% in 2000, and to 29% in 2008 (Kleiner 2013). Much of the growth in the number of workers subject to licensure since 1990 has been in health care and services occupations, which made up over half of the licensed

[32] About 50 occupations were licensed in all states by 2003 (Berry 1986). About 1,100 occupations were subject to licensure, certification, or registration in at least one state by 2003 (Kleiner 2006b).

occupations in 1990. This is due both to growth in the number of individuals working in occupations that were already licensed in 1990 and to an increase in the number of new health care occupations resulting from advancements in health technologies and specializations that were licensed after 1990 (Graddy 1991a). More recently, states continue to regulate additional occupations, but the rate of growth in the number of licensed occupations has decreased due to state legislatures requiring stronger justifications for licensure (Kleiner 2006b).

2.2 Economic Theories of Occupational Licensure

If the market between the practitioners who provide a service and the consumers who purchase that service operated under the assumptions of a perfectly competitive model, occupational licensure would not be necessary. A prerequisite for the effective operation of any market is that the consumers have knowledge concerning the nature of the product or service being provided, so that the rational choice can be made in attempting to maximize satisfaction. Under competitive market conditions, when there are many buyers and sellers in the market, well-informed consumers are able to obtain the products or services they want for the price they want. Some consumers will choose goods or services of lower quality and pay a lower price, while others will opt for a combination of higher quality and higher prices. Overall, consumers will generally be able to obtain the quantity, quality, variety and price that are optimal for their income level.

In the actual market for many professional services, practitioners know more about the services and the skills needed to provide those services than consumers. This asymmetric information problem is particularly true for professions that require high levels of education or skill, use advanced technology, or deal with health care or medicine. Consumers need information about the providers' qualifications to minimize the risk of selecting a low-quality

provider (Leffler 1978). The initial growth in occupational licensing laws from 1880 to 1930 was a response to the asymmetric information problem caused by a rapid growth in the knowledge and skills held within various professions and the reduction in transportation costs that made urbanization feasible. Consumers found themselves in densely populated urban areas without critical information about the quality of key service providers (e.g., doctors and lawyers). Passage of occupational licensing laws in the early twentieth century helped to address this problem (Law and Kim 2005). Licensure requirements establish a minimum level of competency as measured by the applicant's ability to complete the education or training requirements and pass any licensure examination. Consumers can purchase services from a licensed practitioner, knowing that the state licensing board has determined that the licensee is qualified to provide those services. Licensure minimizes consumer uncertainty about the quality of service, which helps to alleviate the level of risk perceived by the consumer and increases the consumer's demand for the service (Arrow 1971).

The dominant rationale for occupational regulation is that is serves the public interest. From a public policy perspective, state legislators typically justify occupational licensure by claiming that licensing laws increase the competence of practitioners and, as a result, protect consumers.[33] This is consistent with the "public interest theory,"[34] which focuses on the consumer protection aspect of occupational licensure. It is one of two contrasting theories used by economists in discussions of occupational licensure. The second theory is the "rent capture theory,"[35] which focuses on the restricted entry aspect of occupational licensure. While the two

[33] The stated objectives of licensing laws in Minnesota, for example, are "to increase competence and reduce negligence of practitioners" (Office of the Legislative Auditor, State of Minnesota 1999) from Kleiner (2006b, p. 98).

[34] The "public interest theory" is called the "public interest view" by Timmons and Thornton (2010) and it is consistent with the view of Shapiro (1986).

[35] The "rent capture theory" is called the "private interest view" by Timmons and Thornton (2010) and it is consistent with the view of Friedman (1962).

economic theories look at occupational licensing from different viewpoints, both perspectives are important to an understanding of the topic.

According to the "public interest theory," the major theoretical justification for occupational licensure is the market failures that occur due to asymmetric information (Kleiner 2006b). Licensure reduces the asymmetric information problem between the provider and the consumer and reduces the consumer's perceived level of risk of selecting a low-quality provider by ensuring that licensees meet a set of requirements for minimum competency. However, the public may also benefit from occupational licensure in other ways. For consumers who tend to underestimate personal risk, occupational licensure provides paternalism by protecting consumers from making unsafe choices, such as purchasing a root canal from an unlicensed dentist. The practice restriction component of licensure removes (or reduces) that possibility (Wheelan 1998). Professional licensure may also correct market failures where there is a negative externality created from poor service. For example, if a doctor misdiagnoses a patient, a contagious disease may spread to others; or, if an electrician does a poor job installing an electrical service, a fire may be sparked. In these examples, the quality of service is too low from a social welfare perspective and licensure requirements that exclude low-quality practitioners (thus eliminating the negative externality) can benefit the general public.

An alternative explanation for professional licensing comes from an economic theory of regulation that has evolved over that last four decades. Stigler (1971) proposed a theory of economic regulation where regulation is sought by an industry and is designed and operated primarily for its benefit. This is referred to as the "rent capture theory," where professionals actively pursue licensure for their occupation in order to gain higher wages and improve job security (Kleiner 2006b). Stigler conjectures that any occupation with sufficient political power

will seek to control entry. His "rent capture theory" laid the groundwork for a less kind view of regulation, in general, and of occupational licensure in particular.

The economic effects of occupational regulation have been studied in the literature. Licensing boards can restrict entry into an occupation by manipulating licensure requirements and examination pass rates. This may reduce the supply of labor in the occupation, which typically raises wages and allows practitioners to capture rents. It also hedges against downside risk by reducing competition, both through the reduction in the supply of labor and the introduction of practice restrictions that succeed in carving out specific services that can be provided only by licensed practitioners (Wheelan 1998). Licensure creates greater incentives for individuals to invest in more 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 for their services (Akerlof 1970; Shapiro 1986). Through licensure of their occupation, professionals also enjoy a level of prestige associated with being a member of an exclusive club.

While consumers may benefit from occupational licensure by avoiding the risk of low-quality service, they are on the losing side when the economic effects of licensure are taken into account. Licensure typically increases the price of services and reduces consumer access to those services, due to higher prices and entry restrictions. Another casualty of occupational licensure is the reduction in innovation due to practice restriction (Graddy 1991a). There is little evidence that the quality of service is improved under licensure, although licensure does set some minimum level of provider competence through the successful completion of licensure requirements. Thus, in exchange for some assurance of a minimum quality of service which addresses the consumer's aversion to loss, consumers are subject to higher prices, reduced access, and less innovation, without overall quality improvement.

In the early years of occupational licensure, the anti-competitive aspects of licensure that benefitted practitioners over consumers were generally accepted without question by the public as being necessary to maintain the quality of professional services. More recently, attention is being paid to the social and economic costs of occupational licensure. However, despite the many costs and few benefits of occupational licensure, it has a great deal of public support and the public is reluctant to abandon regulation to adopt any alternative policy. States can be expected to continue to license occupations because "licensing has evolved as the culturally and politically acceptable method of quality assurance," even though it provides little actual quality improvement and it carries real economic costs (Kleiner 2006a).

2.3 Production of Occupational Regulation

The major theoretical justification for licensure has historically been market failures due to asymmetric information on quality between producers and consumers that regulation can correct (Kleiner 2006b). While growth of information technology and access to the Internet weakens that argument somewhat, states still have an interest in shielding the public against the untrustworthy, the incompetent, or the irresponsible (Kleiner 2002). All states have enacted licensure of some occupations and continue to pass new legislation for occupational regulation.

In most cases, the practitioners of an occupation seek regulation through their associations. The goal of most occupational associations seeking regulation is licensure instead of certification, title protection, or registration, because licensure restricts practice to members of the occupation and allows for control of standards of practice and entry into the profession. If the goal of the occupational association is licensure, state legislatures generally require justification of the potential impact of licensure on the supply of practitioners and the cost of services. Some states have sunrise provisions that require members of the occupation seeking

regulation to propose the components of the legislation, include cost and benefit estimates, and convince legislators that consumers will be unduly harmed if the proposed legislation is not adopted (CLEAR 2015). As a general rule, any proposed new legislation for occupational regulation must be formulated to serve the public interest in some way; otherwise it may be difficult to obtain the support of state legislators who have to answer to their constituents.

There is generally no opposition on the part of employers to the formation of occupational associations at work, since, unlike unions, these associations do not demand a wage premium from the employer (Freeman and Lazear 1995). As an occupational association grows, it may reach the point where it has the political clout, financial resources, and organizational skills to lobby state legislatures and present a case for regulation. Members of the occupation are informed and organized by the association and costs of seeking regulation are low for individual practitioners, while the potential benefits of regulation can be significant (Kleiner 2006b).

Frequently, attempts by associations to secure regulation for occupations are not successful. There may be opposition to new regulation on the general grounds that the costs of regulation to society are too large compared to expected benefits. These costs include higher prices for services, reduced access to services, less innovation in the occupation, and a reallocation of income from consumers to practitioners (Kleiner 2006b). There may also be organized opposition to regulation for a particular occupation from those who are professional competitors. In New Jersey, for example, recent attempts to license dietitians[36] have been blocked by petition signing campaigns led by natural healing professionals.[37] Obstetricians have opposed right-to-practice legislation for nurse-midwives (Gross 1984). Attempts to regulate

[36] New Jersey Assembly Bill A2933 and Senate Bill S1941 call for licensure of dietitians.
[37] Homeopathic forums claim that licensure of dietitians would deprive the people of New Jersey of their freedom of choice and natural practitioners of their freedom of speech (De Poto 2009).

physician assistants have been opposed by physicians and other health professionals (Daniels and Regens 1980/81).

Even though consumers may benefit from occupational licensure, consumers rarely demand it.[38] This is because the costs of taking action to seek regulation of an occupation are high. Consumers would have to learn about an occupation and the services practitioners in that occupation provide, determine what kind of regulation to pursue, and work to inform and organize a large enough group of consumers to effectively lobby the state legislature to regulate the occupation. If the cost of a professional service is low or an individual consumer purchases that service only infrequently, it is not cost-effective for that consumer to demand regulation. If a group of consumers does pursue regulation of an occupation, there is likely to be a free-rider problem where the costs of obtaining regulation are shouldered by few, while the benefits of regulation are enjoyed by many (Kleiner 2006b).

Most states have hearings during each legislative session to deal with requests for new occupational regulation. Like any new legislation, occupational regulation requires legislative support, including someone to sponsor the bill and legislators to vote for it, so political factors can affect passage. Legislators must weigh the risks of no regulation for an occupation against the social costs of regulation. Ideally, this tradeoff is aimed at maximizing consumer utility or welfare. Since voters tend to prefer to reduce the downside risk of any service, legislators may consider requests for new occupational regulation legislation that benefits the public by addressing consumer aversion to loss, even though the legislation provides greater economic

[38] Exceptions where consumers (or others outside of an occupation) might call for regulation of an occupation include cases where there is perceived corruption or incompetence among the practitioners of an occupation. Examples include stock brokers after the market crash of 1929 (Gellhorn 1976) and mortgage brokers after the subprime mortgage crisis of 2008 (Clement 2008).

benefits to the practitioners of the occupation than to the consumers of their services (Kahneman and Thaler 1991).

A supply and demand framework can be used to discuss the factors that influence passage of occupational regulation legislation (Smith 1982; Graddy 1991a; Graddy 1991b). The demand for regulation for a particular occupation is a result of the combined efforts of four groups that have both an interest in whether the occupation is regulated and potential political influence on legislators. The four groups are (1) providers of the service, (2) consumers of the service, (3) professional competitors of the providers, and (4) public interest groups. The practitioners who provide the service and request regulation for the occupation are likely to support the regulation because regulation improves the value of their human capital. Consumers of the service are likely to support regulation if they are loss averse or oppose regulation if they are concerned about the price and availability of the service. The extent of asymmetry in the distribution of information determines the value of regulation to the consumer. Professional competitors of the providers are likely to oppose the regulation out of a fear that practice restriction will exclude them from providing the service. Public interest groups are likely to support regulation if it benefits the public or oppose regulation if the social and economic costs are too high. These four interest groups will participate in the political process to actively seek a particular outcome and give political and financial support to legislators if the value of the outcome to the group exceeds the cost of obtaining that outcome (Graddy 1991a).

The costs of lobbying legislators to obtain desired regulatory outcomes include the costs of organizing the group and giving political contributions and support to legislators. Organizational costs increase with the size of the group, decrease with its cohesiveness, and tend to be less for practitioners than for consumers. Small groups are more likely to participate in the

political process and attain their desired outcomes than large groups. Costs of political contributions and support increase with more restrictive regulation and the degree of harm it might cause, since additional costs are incurred when there is opposition from other interest groups. Occupations whose practitioners work for individual consumers (e.g., barbers) have an easier time getting licensed, since individual consumers are less likely to mount opposition to proposed regulations than are organized institutions (e.g., hospitals) that consume the services of many providers (Kleiner 2006b).

The supply of occupational regulation comes from the state legislature, where legislative choice is a response to the demands of interest groups that offer political support in exchange for regulation (Stigler 1971; Peltzman 1976). Legislators' willingness and ability to respond to the demand for regulatory legislation depend both on the political environment within which they operate and on the amount and type of legislation that can be supplied in a given legislative environment. It is assumed that legislators consider both the positions of influential interest groups and the general public interest in their decisions regarding occupational regulation.

2.4 Occupational Characteristics that Affect Regulation

There are many characteristics of an occupation that make it more or less likely to be licensed than other occupations. These include the type of occupation, the mean education and wage levels of practitioners, the type of consumer of the practitioner's services (individual versus institutional), the degree of political organization of any occupational association, and the existence of substitute occupations that can provide the same services and may organize opposition to licensure. Technically advanced occupations where the asymmetric information problem is significant are more likely to be licensed than less technical occupations (Kleiner 2006b). The number of years of education and income of practitioners, which are positively

correlated with occupational licensure, are proxies for professional complexity (Moore 1961; Kleiner and Kreuger 2010). An occupation in the health sector or one that has high malpractice insurance premiums is associated with a risk of harm to consumers and so has a higher probability of being licensed than an occupation that poses less risk to consumers (Wheelan 1998). Occupations where others besides the buyers of the service can be harmed by purchasing the service from incompetent practitioners have social costs that are greater than private costs and so are more likely to be licensed. Examples include physicians, construction workers, and pharmacists (Moore 1961).

Occupations in service industries are more likely to be licensed than occupations in manufacturing (Eckstein and Nagypal 2004). Occupations whose practitioners work for individual consumers are more likely to be licensed than occupations in which most practitioners work for large institutions, since institutions can organize more easily to oppose licensure than individual consumers (Graddy 1991a). Occupations with strong professional associations are more likely to be licensed than occupations that do not have associations, since they are likely to benefit more from regulation than broad, diffuse groups (Peltzman 1989). Occupational associations generally organize campaigns and initiate requests for regulation. They can do so without incurring a significant free-rider problem, since the costs of obtaining regulation are shared by members of the association (Kleiner 2006b). And finally, occupations without available substitutes are less likely to encounter organized opposition to regulation and so are more likely to be licensed.

There may be differences across occupations that result in an individual state enacting regulation for one occupation, but not for another similar occupation. The state of Ohio, for example, licenses preschool teachers, but not child care workers, yet practitioners in both

occupations are responsible for the care and teaching of young children. This may be due to the fact that teachers have a strong occupational association, while child care workers do not. City bus drivers are licensed in Minnesota, while taxi drivers are not, perhaps due to public versus private liability issues. Delaware licenses veterinary technologists, but not pharmacy technicians, possibly because pharmacists have opposed right to practice legislation for pharmacy technicians.

Similarly, there may be differences across states that result in a specific occupation being licensed in some states, but not in others. Massage therapists, for example, are licensed in 38 states, while 36 states license security guards and only 8 states license travel agents. White (1980) found that licensure of registered nurses (RNs) came first in states where hospitals already employed relatively large numbers of RNs compared to the number of practical nurses, attendants, and orderlies. With significant numbers of RNs already employed, licensure would be unlikely to force changes in employment patterns and, as a result, hospitals and physicians would be less likely to oppose licensure. However, if relatively few RNs are employed, opposition to licensure of RNs might occur, since hospitals and physicians would see more substitutes for RNs and threaten to shift employment away from RNs. Therefore, occupational characteristics alone cannot explain why a particular occupation is licensed in a particular state. It is likely to be a combination of occupational characteristics and state characteristics, including the characteristics and political climate of the state legislature, that influences which occupations are licensed in which states (Carpenter, Knepper, Erickson, and Ross 2012).

2.5 State Characteristics that Affect Regulation

State characteristics that affect the passage of occupational regulation and the strictness of that regulation have been studied in the literature. Graddy (1991b) modeled the decision of state

legislatures to regulate occupations in terms of both public interest and interest group forces, as well as characteristics of the legislative environment within which they operate. She found that the probability of regulation increases with interest group organization, political market volatility, legislative resources, and information asymmetry. Zhou (1993) studied the contributions of occupational power (prestige of the occupation and age of the national association), state capacities (per-capita state revenue and inter-party competition), and diffusion processes to the variation among states in licensing 30 occupations between 1890 and 1950. He found that the adoption rate for licensing legislation for an occupation increases with increased occupational power, increased state capabilities, increases in the cumulative number of occupations licensed in the state, and increases in the cumulative number of states licensing that occupation. High state revenues increase licensing for occupations concerned with public health and safety, but decrease licensing for occupations in the business sector.

Moore (1961) found that the least restrictive types of regulation were imposed for the public welfare, while the most restrictive types were imposed to benefit practitioners. Begun, Crowe, and Feldman (1981) studied regulation of optometrists and found that a strong occupational interest group leads to more stringent regulation, while more inter-party competition in the state legislature decreases the occupational interest group's control over regulation. Teske (2004) studied state regulation of attorneys and found that the severity of licensure requirements (such as entry barriers, bar exam fees, and continuing education hours) was determined by the power and concentration of attorneys in the state. Average lawyer income (a power variable) and percentage of population holding law degrees (a concentration variable) in the state, for example, were positively associated with higher entry barriers for the profession. The percentage of population holding law degrees was also positively associated

with higher bar exam fees and lower continuing education requirements. Thus, the specific provisions of state licensure for an occupation may be influenced by the power and concentration of the practitioners of that occupation in that state.

These studies identify some of the state characteristics that affect regulation. Other factors also contribute to the variation in the number of occupations regulated and the percentage of the workforce in each state that is licensed. State characteristics that affect occupational licensure include demographic and economic characteristics, the degree of pre-existing occupational regulation, and the composition of the state legislature. Larger and more urbanized states are more likely to have stronger occupational associations that can effectively represent occupations and obtain regulation as rent capture. States with high population density, heavy industrialization, or high per capita incomes tend to have higher levels of occupational licensing than more rural, less industrialized, or lower income states.

Characteristics of the state legislature also affect the production of occupational regulation. Three state legislature factors are significant determinants of the change in the number of licensed occupations (Smith 1982; Graddy 1991b; Begun et al. 1981). First, party concentration is negatively related to licensure, so that occupational licensure is passed more frequently in states where party control of the legislature is less certain. This is because licensing laws are devices used by politicians to carve out interest group support from their constituencies. Thus, passage of more occupational regulation is likely in response to political competition, because occupational regulation is a durable permanent regulation[39] that reassures interest groups of the support of the legislature. Second, a change in the identity of the majority party is negatively related to volume or industrial output, so that less legislation is enacted in less

[39] Occupational regulations are rarely repealed, so an occupational association that is successful in convincing legislators to support regulation is likely to remain loyal to those legislators.

stable political environments. Third, the number of constituents per representative is positively related to licensure output, so that as the number of constituents per representative increases, a voter has less incentive to monitor (and possibly oppose) legislative output.

If the political environment in the state is consumer-oriented, the legislature should be responsive to unorganized consumer interests and thus carefully consider the public interest aspects of any proposed regulation. Decisions about occupational regulation should be based on the complexity of service and the extent of asymmetric information in the unregulated market. Occupations that pose the greatest risk to the public due to potential harm from unregulated practitioners should be the most likely to be regulated (Wheelan 1998).

If the political environment is favorable to occupational regulation because the state is one of the most regulated states,[40] the legislature should be familiar with occupational associations, the arguments for and against occupational regulation, and voter responses to passage of regulation legislation. Industries that are most impacted by occupational regulation are more likely to contribute to influential individuals in the legislature. In these states, legislators may be more inclined to support occupational regulation and the probability of passage is high. This may be especially true when the occupation seeking regulation is similar to other occupations the state already regulates. One example of this is occupational regulation of health sector occupations. Due to specialization and advancements in medical technology, new health sector occupations are being created and practitioners in those occupations are seeking regulation. In states that already regulate a large number of health sector occupations, impediments to passing occupational regulation for new health sector occupations may be reduced.

[40] The most regulated states license almost three times the number of occupations as the least regulated states (Kleiner 2006b).

The amount of legislation that can be passed in a session of the state legislature depends on available resources, which are affected by setup costs for organizing a legislative session, limits on session length, and the amount of staff support. Limited resources may constrain the ability of legislators to produce occupational regulation (Smith 1982). For example, some states limit the length of their legislative session, which raises the opportunity cost of producing a piece of legislation and may yield less legislation. States also vary in the amount of staff support available to legislators; those with fewer resources are more constrained in the amount of legislation that can be produced.

2.6 Summary and Discussion

The long history of occupational licensure in the United States has resulted in a large number of licensed occupations and a large percentage of the U.S. workforce that is subject to licensure. Two contrasting theories of occupational licensure have been studied in the literature. The "public interest theory" focuses on the consumer protection aspect of occupational licensure, while the "rent capture theory" focuses on the restricted entry aspect of occupational licensure. The two theories deal with opposing sides of the market for services, since practitioners must request licensure in order for the state legislature to consider it, while the proposed legislation must benefit consumers in order for the state legislature to pass it. Occupational licensure is popular with both practitioners and consumers, so states continue to license occupations despite the economic costs, even though licensure brings little quality improvement.

The major theoretical justification for licensure has been market failures due to asymmetric information on quality between producers and consumers of services. Practitioners of an occupation typically seek regulation through their associations. A supply and demand framework can be used to understand the factors that affect the production of occupational

regulation. The demand for regulation for a particular occupation is a result of the combined efforts of four groups that have both an interest in whether the occupation is regulated and potential political influence on legislators. The four groups are (1) providers of the service, (2) consumers of the service, (3) professional competitors of the providers, and (4) public interest groups. The supply of occupational regulation comes from the state legislature, where legislative choice is a response to the demands of interest groups that offer political support in exchange for regulation.

There are many characteristics of an occupation that make it more or less likely to be licensed than other occupations. These include the type of occupation, the mean education and wage levels of practitioners, the type of consumer of the practitioner's services (individual versus institutional), the degree of political organization of any occupational association, and the existence of substitute occupations that can provide the same services and may organize opposition to licensure. There is much variation in the number of occupations regulated and the percentage of the workforce in each state that is licensed. State characteristics that affect occupational licensure include demographic and economic characteristics, the degree of pre-existing occupational regulation, and state legislators' willingness and ability to respond to the demand for regulatory legislation.

In the case of DNs and SWs, occupational characteristics that increase the likelihood of state regulation include the type of occupations, the education requirements, and the presence of strong national associations. Both occupations deal with the broad area of health care and social services, where practitioners provide services that are intended to improve the health and welfare of consumers. Because of the education requirements, where practitioners must earn a minimum of a bachelor's degree and often earn advanced degrees, there is likely to be an asymmetric

information problem between practitioners and consumers that supports the public interest theory of regulation for DNs and SWs. In fact, both national associations (the CDR for DNs and the ASWB for SWs) justify the push to license their respective occupations based on the need to protect the public from unqualified practitioners. In addition, both associations facilitate the push to licensure by maintaining strong standards of practice with national accreditation of degree programs, control of national licensure examinations, and provision of model practice acts for state statutes based on national requirements.

Other characteristics of the DN and SW occupations decrease the likelihood of state regulation. These include the relatively low wages compared to other occupations with similar degree requirements, the high percentage of institutional workers in both occupations, and the availability of professional competitors who may oppose regulation. Based on U.S. Bureau of Labor Statistics data, both DNs and SWs earn less, on average, than other occupations that require a bachelor's degree (*Dietitians and Nutritionists* 2014/15; *Social Workers* 2014/15). Both DNs and SWs have a substantial percentage of practitioners who work in institutional settings, such as hospitals and educational institutions. Professional competitors who have opposed regulation of DNs and SWs include natural healing professionals and psychologists, respectively.

In a number of ways that affect the likelihood of occupational regulation, DNs and SWs are similar to registered nurses (RNs) and public school teachers; although RNs and public school teachers have unions, while DNs and SWs do not have unions. All four occupations deal with the health and welfare of consumers, require a minimum of a bachelor's degree,[41] have strong associations, have high percentages of institutional employment, and have low wages

[41] In some states, RNs require a minimum of an associate's degree, but some states are increasing the minimum education requirement for RNs to a bachelor's degree.

relative to other occupations that require a bachelor's degree. In addition, all four occupations have a high percentage of female practitioners and roughly comparable median wages (although RNs typically earn more than DNs and public school teachers, who typically earn more than SWs).[42] Occupational size varies significantly across the four occupations, with approximately 2.7 million RNs, 2.5 million public school teachers, 600,000 SWs, and 67,000 DNs in 2012. However, there are enough similarities to suggest that the literature on the economic effects of licensure of RNs and public school teachers might provide insight into the economic effects of licensure of DNs and SWs.

As noted in Chapter 1, White (1980) found that licensure had no impact on employment levels for RNs and did not cause a wage premium for RNs in 1960 and 1970, despite earlier estimates of a wage premium due to licensure in 1950. Kleiner and Petree (1988) found that licensure has no impact on public school teacher pay and uncertain effects on quality, as measured by student achievement test scores. Other studies by Kane, Rockoff, and Staiger (2005) and Kane and Staiger (2005) found no quality improvement due to licensure of public school teachers. Taken together, the literature suggests that, for RNs and public school teachers, licensure is not found to affect the number of practitioners or the quality of service provided by practitioners; and there is also no evidence of a lasting wage premium due to licensure. In the chapters that follow, the empirical results for DNs and SWs are compared to those for RNs and public school teachers.

[42] BLS data for 2012 median pay shows RNs earn approximately $65,000, DNs and teachers earn $55,000, and SWs earn $44,000.

Chapter 3: Effect of Occupational Licensure on the Number of Practitioners

3.1 Introduction

This chapter begins the empirical analysis of the economic effects of occupational licensure on two occupations: dietitians and nutritionists (DNs) and social workers (SWs). I estimate whether licensure affects the number of practitioners in these occupations. The effect of licensure on the number of practitioners is a topic of interest, because the practice restriction component of licensure allows licensing boards to control entry into a licensed occupation. However, there are mixed results in the literature as to whether licensing actually does reduce the number of practitioners, with empirical results depending on the occupation studied. I model the effect of licensure on the number of practitioners for DNs and SWs separately and then compare the empirical results across the two occupations.

3.2 Research Design

The goal of this chapter is to analyze the number of practitioners in the DN and SW occupations over a time interval of active state regulation to determine if licensure had an effect on the number of practitioners. I use the 1980, 1990, and 2000 5% Census Public Use Microdata Series (Ruggles et al. 2004) as the source for data about the number of practitioners in the DN and SW occupations over the time period from 1980 to 2000. The Census data includes individual observations that are each associated with a state, an observation year, and an occupation. After appropriate filtering[43] of the Census data to select the professional[44] DNs or SWs from each 5% sample, I multiply the number of DNs or SWs in each state for each observation year by 20[45] to compute an estimate of the total number of professional DNs or SWs. I then use these estimates

[43] Filtering is described in Section 3.3.
[44] Professional DNs and SWs are individuals who have earned at least a bachelor's degree and are actively working in the occupation.
[45] Since the Census data is a 5% sample, multiplying by 20 estimates the number in a 100% sample.

to construct a second dataset for each occupation that contains state-level data, including year, state, number of practitioners, state regulation dummies, and other state-specific variables. This dataset is the basis for my empirical analysis of the effect of occupational licensure on the number of practitioners.

Figures 3.1a and 3.1b plot the number of states that introduced any regulation or licensure, respectively, of DNs each year between 1980 and 2014.[46] For DNs, any regulation means licensure, certification, or title protection, because there are no cases of registration. The 20-year period from 1980 through 2000 encompasses most of the period of state regulatory activity for DNs, since no states regulated DNs in 1980, 41 states plus the District of Columbia regulated DNs by 2000, and only six states regulated DNs after 2000.

Similarly, Figures 3.2a and 3.2b plot the number of states that introduced any regulation or licensure, respectively, of SWs each year between 1955 and 2014.[47] For SWs, any regulation means licensure or title protection, because there are no cases of certification or registration. Again, the 20-year period from 1980 through 2000 encompasses much of the period of state regulatory activity for SWs, however the time interval is not as well matched to SW regulation activity as it is to DN regulation activity. Eleven states regulated SWs before 1980 and three states regulated SWs after 2000, but 23 states regulated SWs between 1980 and 2000. So, the time period from 1980 to 2000 captures more than half of the state regulation activity for SWs.

In addition to estimating the effect of occupational licensure on the total number of practitioners in the DN and SW occupations, I also model the effect of licensure on the number

[46] The source for the type of state regulation of DNs in effect for each state in the observation years is the Commission on Dietetic Registration (http://www.cdrnet.org), with data verified/edited based on the actual state statutes.

[47] The source for the type of state regulation of SWs in effect for each state in the observation years is the Association of Social Work Boards (http://www.aswb.org), with data verified/edited based on the actual state statutes.

of practitioners in each occupation who work in industries or job positions that are exempt from regulation and the effect of licensure on the number of practitioners who work in industries or job positions that are not exempt from regulation in states that regulate DNs and SWs. This allows me to examine whether occupational licensure of DNs and SWs pushes practitioners towards or away from job positions in those occupations that are subject to licensure. Logically, if practitioners in an occupation see licensure as a way to earn higher wages, then we might expect to see movement from job positions that are exempt to job positions that are not-exempt as a result of licensure. Individuals who expect to earn higher wages in return for investing time, effort, and money to comply with licensure requirements, would have an incentive to seek employment in a higher-wage position that requires a license. Conversely, if licensure does not result in higher wages for an occupation, then we might expect to see movement from job positions that are not-exempt to job positions that are exempt as a result of licensure. There is little incentive to invest in the human capital necessary to become licensed, if licensure does not bring a reward in the form of higher wages.

I define two categories of individual practitioners in the DN and SW occupations: the exempt category and the not-exempt category. Since only states that regulate an occupation have statutes that specify which industries or job positions are exempt from regulation, I include observations from only those states that regulate the occupation by the year 2000 in the exempt and not-exempt categories. The exempt category includes individuals who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation. For example, if a state first regulated DNs in 1985 and the regulation statute exempts federal workers, then DNs who are federal workers in that state in 1980, 1990, and 2000 are all in the exempt category. The not-exempt category includes individuals who

work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation. Therefore, if a state first regulated SWs in 1992 and the regulation statute does not exempt elementary and secondary school employees, then SWs who are elementary and secondary school employees in that state in 1980, 1990, and 2000 are all in the not-exempt category.

I estimate the number of practitioners in exempt and not-exempt categories using the datasets of professional DNs and SWs built from the 5% Census data samples. For states that regulate DNs or SWs by 2000, I map the individual DNs and SWs to the appropriate category (exempt or not-exempt) based on the exemptions from regulation in Tables 1.1 and 1.2. I then multiply the number of DNs or SWs in each category in each state and year by 20 to compute an estimate of the total number of DNs or SWs in each category for that state and year.

There is sufficient information in the U.S. Census data to identify individual DNs and SWs who work in industries or job positions that are exempt from regulation in states that regulate those occupations. Census variables for each observation include year, state, occupation, industry,[48] employment status, and class of worker. Occupation identifies DN, SW, or some other occupation; industry identifies the work setting and economic sector in which an individual performs an occupation;[49] employment status allows identification of individuals who are in the labor force, are employed, and are at work, as opposed to individuals who are not in the labor force or are unemployed or are not working for some reason; and class of worker identifies whether an individual works for a private company, is in the armed forces, or is employed by the federal, state, or local government.

[48] Individuals who worked in more than one industry were asked to report the industry in which he/she first earned the most money, or, second, spent the most time.
[49] The source for the definition of the Census industry variable is (https://usa.ipums.org/usa-action/variables/IND#description_section).

Summarizing the research plan, I use individual-level data from the 1980, 1990, and 2000 5% Census samples to create datasets of individual observations of professional DNs and SWs. I then incorporate data on state regulation from the CDR for DNs and the ASWB for SWs to identify states that regulate the occupations by the year 2000 and the industries or job positions that are exempt from regulation. This allows me to map observations to the exempt category (job positions that are exempt from regulation) and the not-exempt category (job positions that are not exempt from regulation) and estimate both the total number of observations and the numbers in each category for each state and year. I then build a state-level dataset for each occupation with entries for each state and observation year that includes the total number of observations, the number of observations in the exempt and not-exempt categories, state regulation dummies, and state characteristic variables. Using the state-level datasets, I estimate four models for the number of DNs and SWs as a function of regulation of those occupations. These include models for (1) the total number of DNs or SWs in all states, (2) the number of DNs or SWs in states that regulate the occupations by the year 2000, (3) the number of DNs and SWs in the exempt category, and (4) the number of DNs and SWs in the not-exempt category.

3.3 Data

In this section, I describe the details of the construction of the two datasets for each occupation: (1) the individual observations of professional DNs and SWs derived from Census 5% samples, and (2) the dataset of the number of DNs and SWs in various categories for each state and year. For the datasets of individual observations of professional DNs and SWs, I use the 1980, 1990, and 2000 5% Census samples and extract individuals in each occupation. I then keep individuals who are currently employed and working for wages and have earned at least a bachelor's degree. This results in a dataset of professional members of each occupation. Variables important for

empirical analysis of the effect of licensure on the number of practitioners include: year, state where employed, annual wage, number of weeks worked per year, and the usual number of hours worked per week, as well as job-related variables that include industry, employment status, and class of worker. I compute an hourly wage from annual wage divided by the product of number of weeks worked per year and the usual number of hours worked per week. All dollar amounts are converted to year 2000 dollars. I use the computed hourly wage to remove outliers by dropping any individual with an hourly wage less than $2.61 (the lowest state minimum wage) and any individual with an hourly wage greater than five standard deviations above the mean.[50]

3.3.1 Construction of Datasets for Dietitians and Nutritionists

For DNs, I begin with 14,266 DN[51] observations (4,089 from the 1980 Census, 5,400 from the 1990 Census, and 4,777 from the 2000 Census) and drop 2 observations for individuals who work outside the United States and so are not subject to state regulation of DNs. To focus on individuals who are currently employed and working for wages, I drop 3,218 observations for individuals who are unemployed, on leave, or not in the workforce and 530 observations for individuals who do not work for wages. The Census data does not identify which individuals are actually subject to occupational regulation. Since a bachelor's degree is the minimum education criterion for the RDN credential and for any type of state regulation of DNs, I drop 5,089 observations for individuals who have not earned at least a bachelor's degree.[52] To remove outliers, I drop 120 observations for individuals with computed hourly wages below the lowest state minimum wage and 22 observations for individuals with hourly wages that are more than

[50] For DNs, five standard deviations above the mean is $135.05 per hour. For SWs, five standard deviations above the mean is $134.60 per hour.
[51] In 1980 and 1990, the choice of occupational codes includes Dietitians, but not Nutritionists. In 2000, Dietitians and Nutritionists share the same occupational code.
[52] Kleiner (2006b) used the same technique of dropping individuals who did not report meeting the minimum expected level of education for an occupation from the Census data before empirical analysis.

five standard deviations above the mean hourly wage. This leaves 5,346 DN observations. Since the dataset is based on 5% Census samples, I calculate the number of observations for each combination of year and state and then multiply by 20 to get estimates of the total number of DNs for each state in each of the three Census years (1980, 1990, and 2000).

Using state regulation data from the CDR, I identify the 41 states that regulated DNs by the year 2000. Then, using the exemptions to state regulation of DNs in Table 1.1 and the industry, employment status, and class of worker variables in the Census data, I map each observation from those 41 states to either the exempt category or the not-exempt category. An observation is mapped to the exempt category if the individual is exempt from regulation in the state, even if regulation was enacted after the observation year; and an observation is mapped to the not-exempt category if the individual is not exempt from regulation in the state, even if regulation was enacted after the observation year. I then calculate the number of observations in the two categories for each combination of year and state and multiply by 20 to get estimates of the total number of exempt and not-exempt observations for each state in each of the three Census years.

I use the estimates of the total number of DNs, exempt DNs, and not-exempt DNs for each year and state to create a state-level dataset for DNs. Using regulation data from the CDR, I create regulation dummies for each year and state. The regulation dummies for DNs include (1) any regulation (licensure, certification, or title protection); regulation that is named licensure, but may or may not include practice restriction; and regulation that actually is licensure because it includes practice restriction. I also include year and state dummies and a large number of exogenous state variables for the observation year, to control for state-level factors that may affect the number of DNs and SWs, independent of regulation of those occupations. The

exogenous state variables include: state population,[53] natural log of state per-capita gross domestic product in year 2000 dollars,[54] natural log of per-capita income in year 2000 dollars,[55] total average state tax burden (state and local taxes),[56] percentage of females age 25 and over in the state who have earned at least a bachelor's degree,[57] percentage of males age 25 and over in the state who have earned at least a bachelor's degree,[58] ratio of per capita state debt to per capita income,[59] percentage of state population on Medicare,[60] percentage of state population below the poverty line,[61] percentage of state population living in urban areas,[62] and state unemployment rate.[63] Since some of the exogenous state variables are not available for the District of Columbia, observations from D.C. are not included. The resulting dataset for DNs has 150 observations, one for each of the 50 states in each of the three Census years. Summary statistics are included in Table 3.1.

3.3.2 Construction of Datasets for Social Workers

For SWs, I begin with 98,270 SW observations (26,866 from the 1980 Census, 35,953 from the 1990 Census, and 35,451 from the 2000 Census) and drop 12 observations for individuals who work outside the United States and so are not subject to state regulation of SWs. To focus on individuals who are currently employed and working for wages, I drop 16,560 observations for individuals who are unemployed, on leave, or not in the workforce and 1,453 observations for individuals who do not work for wages. Again, since the Census data does not identify which

[53] The source for state population data is the U.S. Census (http://www.census.gov).
[54] The source for state per-capita gross domestic product is the Bureau of Economic Analysis (http://www.bea.gov).
[55] The source for state per-capita income is the Council of State Governments' *Book of the States*.
[56] The source for average state tax burden is Tax Foundation (http://www.taxfoundation.org).
[57] The source for educational attainment data for females is the U.S. Census (http://www.census.gov).
[58] The source for educational attainment data for males is the U.S. Census (http://www.census.gov).
[59] The source for per capita state debt and state per capita income is the Council of State Governments' *Book of the States*.
[60] The source for percentage of state population on Medicare is the U.S. Census (http://www.census.gov).
[61] The source for percentage of state population below the poverty line is the U.S. Census (http://www.census.gov).
[62] The source for percentage of state population in urban areas is the U.S. Census (http://www.census.gov).
[63] The source for state unemployment rate is the Bureau of Labor Statistics (http://www.bls.gov).

individuals are actually subject to occupational regulation and a bachelor's degree is the minimum education criteria for entering the SW profession and for any type of state regulation of SWs, I drop 25,933 observations for individuals who have not earned at least a bachelor's degree. To remove outliers, I drop 952 observations for individuals with computed hourly wages below the lowest state minimum wage and 147 observations for individuals with hourly wages that are more than five standard deviations above the mean hourly wage. This leaves 53,213 SW observations. Since the dataset is based on 5% Census samples, I calculate the number of observations for each combination of year and state and then multiply by 20 to get estimates of the total number of SWs for each state in each of the three Census years (1980, 1990, and 2000).

Using state regulation data from the ASWB, I identify the 33 states that regulated SWs by the year 2000. Then, using the exemptions to state regulation of SWs in Table 1.2 and the industry, employment status, and class of worker variables in the Census data, I map each observation from those 33 states to either the exempt category or the not-exempt category. I then calculate the number of observations in the two categories for each combination of year and state and multiply by 20 to get estimates of the total number of exempt and not-exempt observations for each state in each of the three Census years.

I use the estimates of the total number of SWs, exempt SWs, and not-exempt SWs for each year and state to create a state-level dataset for SWs following the same procedure used for creating the corresponding dataset for DNs. I add regulation dummies for each year and state based on ASWB data. The regulation dummies for SWs include any regulation (licensure or title protection), regulation that is named licensure, and regulation that actually is licensure. The resulting dataset for SWs has 150 observations (one for each of the 50 states in each of the three

Census years) and also includes year and state dummies and the same exogenous state variables included for DNs. Summary statistics are included in Table 3.1.

3.4 Empirical Model

To estimate the effect of state regulation of DNs and SWs on the number of practitioners in each occupation, I use an empirical model of the form:

$$N_{st} = \beta_0 + \boldsymbol{\beta}_1 \boldsymbol{R}_{st} + \boldsymbol{\beta}_2 \boldsymbol{S}_{st} + \gamma_s + \tau_t + \varepsilon_{st}$$

where the dependent variable N is one of four measures of the number of practitioners for state s in year t, R is a dummy for the type of regulation (any regulation, regulation named licensure, or licensure) in state s in year t, S is a vector of exogenous state characteristics in state s in year t, γ includes state fixed effects, τ includes year fixed effects, and ε is a random disturbance term in state s in year t. The fixed effects (FE) model controls for unobservable state attributes that are constant over time. I estimate separate empirical models for each combination of number measure and state regulation variable for each occupation. Year dummies are for the three Census years: 1980, 1990, and 2000. The four different measures of the number of practitioners are (1) the total number of practitioners in the occupation when the model includes all 50 states, (2) the total number of practitioners in the occupation when the model includes only states that regulate the occupation by the year 2000, (3) the number of practitioners in the exempt category for the occupation when the model includes only states that regulate the occupation by the year 2000, and (4) the number of practitioners in the not-exempt category for the occupation when the model includes only states that regulate the occupation by the year 2000. The three different state regulation variables are (1) a dummy variable equal to one if the state has any type of regulation of the occupation, (2) a dummy variable equal to one if the state has regulation that is named licensure (with or without practice restriction), and (3) a dummy variable equal to one if

the state has true licensure (with practice restriction) of the occupation. For DNs, there are 41 states that regulate the occupation by the year 2000, and the dummy variable for any type of regulation is equal to one if the state has licensure, certification, or title protection for DNs. For SWs, there are 33 states that regulate the occupation by the year 2000, and the dummy variable for any type of regulation is equal to one if the state has licensure or title protection for SWs. All models include both year and state fixed effects, with clustering by state.

Economic theory predicts a possible reduction in the number of practitioners due to licensure, because state licensing boards can restrict practice in the occupation through manipulation of licensure requirements. As noted in Chapter 1, the literature includes mixed results on this topic, and there are examples of occupations where licensure does not appear to reduce the number of practitioners. For both DNs and SWs, there is a strong national organization that develops, maintains, and administers the examinations required to earn credentials in states that regulate those occupations. The Commission on Dietetic Registration (CDR) not only administers the examinations for licensure, certification, and title protection for DNs, but also sets the requirements for the national RDN credential, which is the model for nearly every state statute. Similarly, the Association of Social Work Boards (ASWB) administers the examinations for licensure and title protection of SWs and also developed and maintains a model practice act upon which most state statutes are based. Thus, there is a high degree of national influence over the state statutes for occupational regulation of DNs and SWs.

Of course states do ultimately control whether or not to regulate DNs or SWs, what type of regulation to enact, and the detailed elements of the statutes. Therefore, in the case of licensure of DNs or SWs, when practice restriction is included in the state statute, it is possible for states to limit the number of practitioners. However, where national professional

organizations for DNs and SWs set standards that are duplicated by state statutes, the impacts of state regulations may be reduced and the number of practitioners may not be strongly influenced by licensure. Therefore, it seems reasonable to expect either no impact or a very small negative impact on the number of practitioners due to licensure for these occupations.

The topic of how occupational licensure affects the number of individuals in the exempt and not-exempt categories is not found in the literature. Practitioners who expect to earn higher wages due to licensure would have incentive to move from job positions in the exempt category to those in the not-exempt category to earn higher wages in exchange for meeting licensure requirements. Practitioners who do not expect to realize a wage premium due to licensure would have incentive to move from job positions in the not-exempt category to those in the exempt category to avoid investing in the human capital necessary to become licensed.

3.5 Empirical Results

This section discusses the results of the empirical analysis for both DNs and SWs. In addition to the linear models for the effect of any regulation, regulation named licensure, and licensure on the number of DNs or SWs that are reported in this section, I also estimate non-linear models for the effect of years-of-any regulation, years-of-regulation named licensure, and years-of-licensure on the number of DNs or SWs. Empirical results for the non-linear models are included in the Appendix for Chapter 3, instead of in this section, since no significant coefficients for the years-of-regulation variables are found.

3.5.1 Empirical Results for Dietitians and Nutritionists

Estimates of the impact of state regulation on the number of DNs are included in Table 3.2 for any regulation (licensure, certification, or title protection), Table 3.3 for regulation named licensure (with or without practice restriction), and Table 3.4 for licensure (with practice

restriction). Each column in the tables includes results for a separate model for one of the measures of the number of DNs as a function of the type of regulation. The four models include (1) the number of DNs using data for all 50 states, (2) the number of DNs using data from just the 41 states that regulate DNs by 2000, (3) the number of DNs in the exempt category using data from just the 41 states that regulate DNs by 2000, and (4) the number of DNs in the not-exempt category using data from just the 41 states that regulate DNs by 2000. All models control for year and state fixed effects and exogenous state variables and employ clustering by state.

In Table 3.2, the coefficient of the any regulation variable is positive, but not statistically significant for all models. There is no evidence that any regulation of DNs reduces the number of DNs in any model or that any regulation of DNs causes movement between job positions in the exempt and not-exempt categories. Results in Table 3.3 for the effect of regulation named licensure on the number of DNs are similar to those in Table 3.2, since the coefficient of the regulation named licensure variable is positive, but not statistically significant for all models.

For the effect of licensure on the number of DNs in Table 3.4, the coefficients of the licensure variable in the first two columns are positive and not statistically significant, so there is no evidence that licensure of DNs reduces the number of DNs. The coefficient of the licensure variable in the third column is positive and significant at the 5% level. This suggests that licensure increases the number of DNs in job positions that are exempt from regulation. While the coefficient of the licensure variable in the fourth column is negative, it is not statistically significant, so I cannot conclude that licensure also decreases the number of DNs in job positions that are not exempt from regulation. However, a plausible argument to explain the signs of the coefficients is that the increase in the number of practitioners in the exempt category may be due

to a shift of practitioners away from the not-exempt category, as practitioners avoid investing in the human capital necessary to earn licensing credentials if there is an option to practice the occupation as a member of the exempt category.

3.5.2 Empirical Results for Social Workers

Estimates of the impact of state regulation on the number of SWs are included in Table 3.5 for any regulation (licensure or title protection), Table 3.6 for regulation named licensure (with or without practice restriction), and Table 3.7 for licensure (with practice restriction). Each column in the tables includes results for a separate model for one of the measures of the number of SWs as a function of the type of regulation. The four models include (1) the number of SWs using data for all 50 states, (2) the number of SWs using data from just the 33 states that regulate SWs by 2000, (3) the number of SWs in the exempt category using data from just the 33 states that regulate SWs by 2000, and (4) the number of SWs in the not-exempt category using data from just the 33 states that regulate SWs by 2000. All models control for year and state fixed effects and exogenous state variables and employ clustering by state.

In all three tables, the coefficients of the regulation type variable in the first two columns are negative and not statistically significant. Although the coefficients have the expected negative sign, the lack of statistical significance means there is no empirical evidence that any type of regulation of SWs reduces the number of practitioners. The coefficients of the regulation type variable in the last two columns of the three tables are also not statistically significant, so there is no empirical evidence of any shift in the number of practitioners between job positions in the exempt and not-exempt categories due to regulation of SWs.

3.6 Conclusions and Discussion

In this chapter, I investigate the impact of state regulation of DNs and SWs on the number of practitioners. For both occupations, the impact of different types of regulation on the number of DNs or SWs is small and not significant. There is no evidence to support the hypothesis that licensure reduces the number of practitioners. This result for DNs and SWs is consistent with the literature for RNs and public school teachers, where, as noted at the end of Chapter 2, licensure is not found to affect the number of practitioners for those occupations.

One possible explanation for not finding evidence of a decrease in the number of practitioners due to licensure is that licensure can actually increase the demand for service by reducing lemons in the market through the minimum competency requirements. Consumers who are loss averse and were not in the market for service prior to licensure may enter the market when licensure is in place. This increase in demand could balance out any reduction in the number of practitioners due to licensing (Kleiner 2006b).

In the case of DNs, there is some evidence that licensure of DNs causes movement of DNs from the not-exempt category to the exempt category. This evidence is a statistically significant increase in the number of DNs in job positions that are exempt from regulation, together with a decrease in the number of DNs in job positions that are not exempt from regulation that is not significant. This shift from the not-exempt to the exempt category due to licensure may show movement of DNs to exempt positions to avoid complying with licensure requirements, if not-exempt job positions do not have higher wages. For SWs, there are no significant results associated with changes in the numbers of SWs in the exempt and not-exempt categories due to licensure.

3.7 Tables and Figures

Figure 3.1a – Number of States that Introduced Regulation of Dietitians and Nutritionists per Year

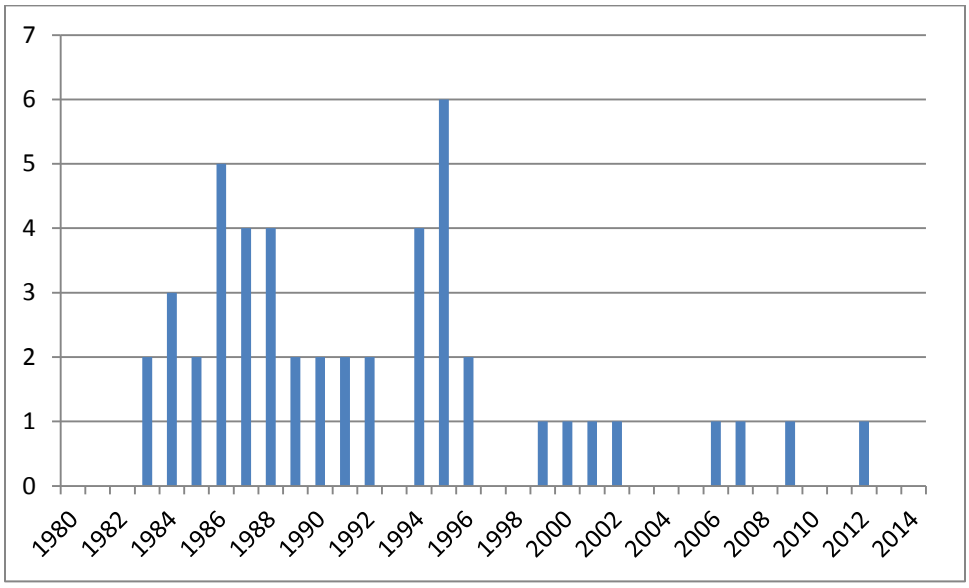


Figure 3.1b – Number of States that Introduced Licensure of Dietitians and Nutritionists per Year

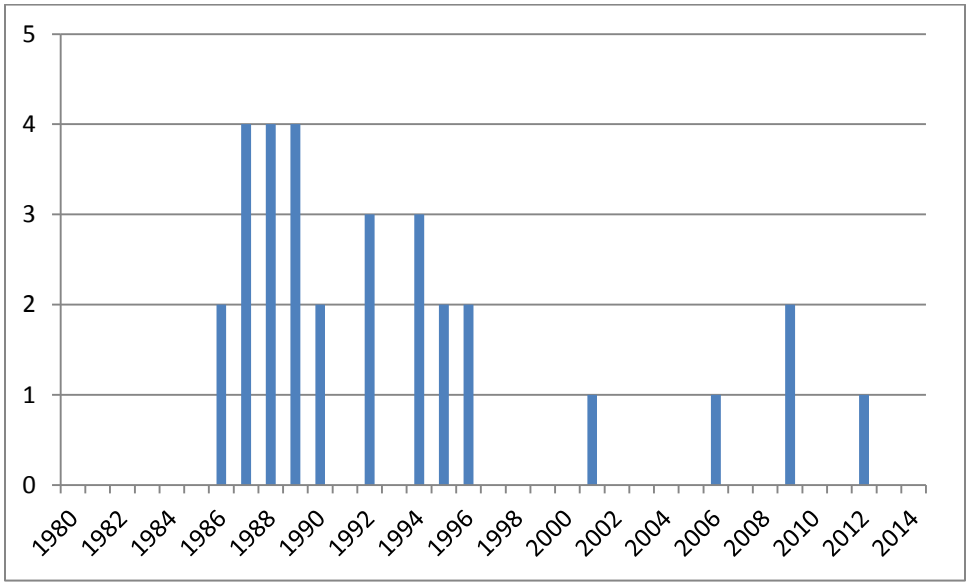


Figure 3.2a – Number of States that Introduced Regulation of Social Workers per Year

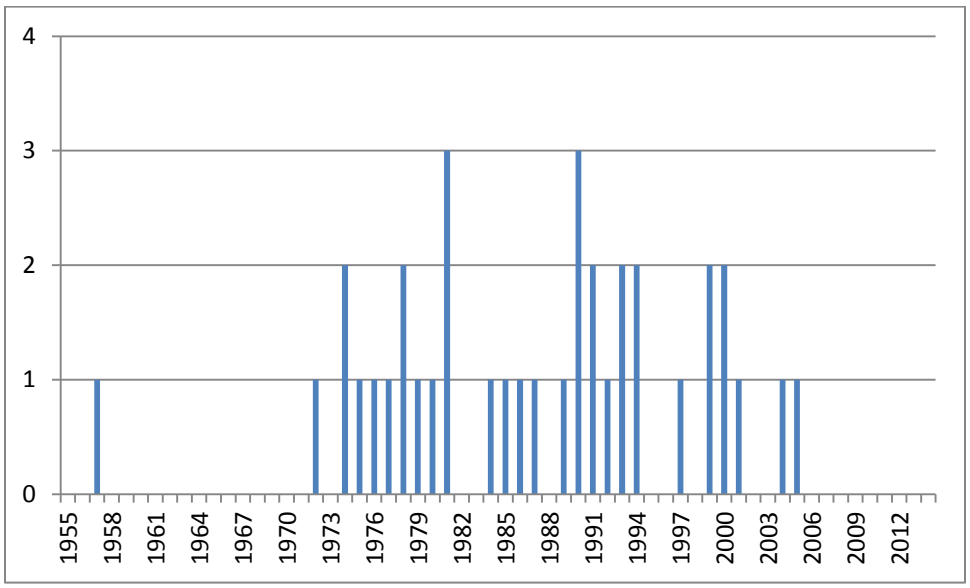


Figure 3.2b – Number of States that Introduced Licensure of Social Workers per Year

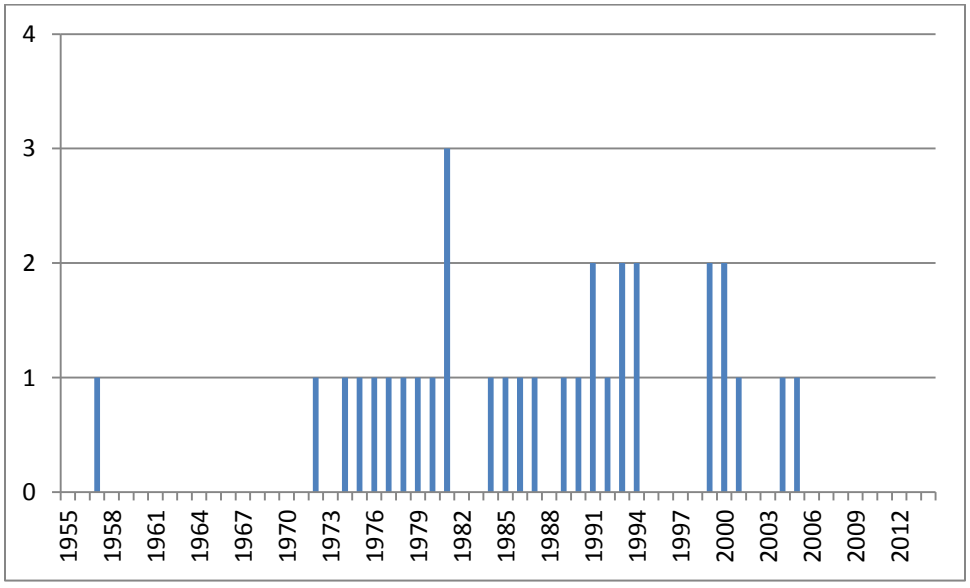


Table 3.1: Summary Statistics for the State-Level Datasets for Dietitians and Nutritionists and Social Workers

Dietitians and Nutritionists	1980	1990	2000
Total Number of DNs using data from 50 States	25,920	38,640	42,360
Total Number of DNs using data from 41 States that Regulate DNs by Year 2000	21,620	32,740	35,300
Number of Exempt DNs using data from 41 States that Regulate DNs by Year 2000	6,420	8,480	8,860
Number of Not-Exempt DNs using data from 41 States that Regulate DNs by Year 2000	15,200	24,260	26,440
Social Workers	1980	1990	2000
Total Number of SWs using data from 50 States	269,540	378,000	421,400
Total Number of SWs using data from 33 States that Regulate SWs by Year 2000	148,680	200,800	245,740
Number of Exempt SWs using data from 33 States that Regulate SWs by Year 2000	39,520	46,320	43,820
Number of Not-Exempt SWs using data from 33 States that Regulate SWs by Year 2000	109,160	154,480	201,920

Numbers of DNs and SWs are extrapolated from 1980, 1990, 2000 5% Census Series, keeping DNs and SWs who are currently employed and working for wages and have at least a bachelor's degree.
State regulation data for DNs are from the Commission on Dietetic Registration.
State regulation data for SWs are from the Association of Social Work Boards.
Exempt DNs or SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs or SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.

Table 3.2: Effect of Any Regulation on the Number of Dietitians and Nutritionists

	Dependent Variable			
Model	Number of DNs using data from 50 States	Number of DNs using data from 41 States that Regulate DNs by 2000	Number of Exempt DNs using data from 41 States that Regulate DNs by 2000	Number of Not-Exempt DNs using data from 41 States that Regulate DNs by 2000
Any Regulation	102.084 (84.207)	170.377 (113.614)	14.509 (67.086)	155.869 (120.129)
Year 1990	108.001 (153.681)	90.369 (191.380)	182.351 (234.214)	-91.982 (284.755)
Year 2000	32.773 (245.311)	-9.069 (306.347)	388.711 (398.849)	-397.780 (466.873)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	41	41	41
n	150	123	123	123

Exempt DNs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3.3: Effect of Regulation Named Licensure on the Number of Dietitians and Nutritionists

	Dependent Variable			
Model	Number of DNs using data from 50 States	Number of DNs using data from 41 States that Regulate DNs by 2000	Number of Exempt DNs using data from 41 States that Regulate DNs by 2000	Number of Not-Exempt DNs using data from 41 States that Regulate DNs by 2000
Regulation Named Licensure	44.582 (66.697)	68.557 (81.239)	5.345 (100.744)	63.212 (115.254)
Year 1990	141.264 (160.720)	138.904 (207.540)	186.932 (279.021)	-48.027 (326.122)
Year 2000	93.225 (253.556)	71.969 (324.999)	396.537 (496.543)	-324.568 (543.910)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	41	41	41
n	150	123	123	123

Exempt DNs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3.4: Effect of Licensure on the Number of Dietitians and Nutritionists

	Dependent Variable			
Model	Number of DNs using data from 50 States	Number of DNs using data from 41 States that Regulate DNs by 2000	Number of Exempt DNs using data from 41 States that Regulate DNs by 2000	Number of Not-Exempt DNs using data from 41 States that Regulate DNs by 2000
Licensure	22.402 (67.889)	38.608 (76.661)	94.419** (41.949)	-55.812 (63.975)
Year 1990	165.352 (167.257)	175.398 (217.821)	128.687 (191.936)	46.711 (274.539)
Year 2000	145.218 (240.682)	150.641 (316.074)	284.266 (321.037)	-133.625 (407.129)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	41	41	41
n	150	123	123	123

Exempt DNs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3.5: Effect of Any Regulation on the Number of Social Workers

	Dependent Variable			
Model	Number of SWs using data from 50 States	Number of SWs using data from 41 States that Regulate SWs by 2000	Number of Exempt SWs using data from 41 States that Regulate SWs by 2000	Number of Not-Exempt SWs using data from 41 States that Regulate SWs by 2000
Any Regulation	-491.545 (612.194)	-143.477 (443.058)	-155.599 (294.809)	12.123 (426.045)
Year 1990	1687.565 (1697.448)	-327.530 (1654.553)	416.967 (707.252)	-744.497 (1631.969)
Year 2000	3980.554 (3043.56)	469.911 (3058.278)	826.462 (1515.752)	-356.551 (3049.649)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	33	33	33
n	150	99	99	99

Exempt SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3.6: Effect of Regulation Named Licensure on the Number of Social Workers

	Dependent Variable			
Model	Number of SWs using data from 50 States	Number of SWs using data from 41 States that Regulate SWs by 2000	Number of Exempt SWs using data from 41 States that Regulate SWs by 2000	Number of Not-Exempt SWs using data from 41 States that Regulate SWs by 2000
Regulation Named Licensure	-161.493 (555.904)	-44.441 (354.318)	180.856 (172.996)	-225.296 (347.375)
Year 1990	1461.71 (1693.181)	-385.397 (1542.859)	185.479 (608.033)	-570.877 (1583.628)
Year 2000	3444.271 (2909.118)	319.465 (2811.329)	272.242 (1322.499)	47.224 (2992.273)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	33	33	33
n	150	99	99	99

Exempt SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3.7: Effect of Licensure on the Number of Social Workers

	Dependent Variable			
Model	Number of SWs using data from 50 States	Number of SWs using data from 41 States that Regulate SWs by 2000	Number of Exempt SWs using data from 41 States that Regulate SWs by 2000	Number of Not-Exempt SWs using data from 41 States that Regulate SWs by 2000
Licensure	-609.869 (648.660)	-305.821 (507.260)	-184.927 (317.283)	-120.894 (502.713)
Year 1990	1678.643 (1699.429)	-258.522 (1681.554)	415.223 (702.271)	-673.745 (1674.511)
Year 2000	4019.954 (3036.23)	668.237 (3138.86)	837.799 (1507.72)	-169.562 (3184.862)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	33	33	33
n	150	99	99	99

Exempt SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Chapter 4: Effect of Occupational Licensure on the Wages of Practitioners

4.1 Introduction

This chapter continues the empirical analysis of the economic effects of occupational licensure on two occupations: dietitians and nutritionists (DNs) and social workers (SWs). I estimate the effect of licensure on the wages of practitioners in these occupations. The effect of licensure on wages is a topic of interest because some of the literature on occupational licensure supports the hypothesis of a wage premium due to licensure[64] while some of the literature does not.[65] Empirical results depend on the occupation studied, education requirements of the occupation, wages of practitioners prior to regulation, and the employment setting. Occupations that require advanced degrees, pay high wages without regulation, and determine wages on an individual basis because practitioners work primarily in the quasi-private sector tend to realize higher wage increases due to occupational licensure than occupations that require less formal education, pay lower wages without regulation, and determine wages on a group basis because practitioners work primarily in institutional settings (Kleiner 2006b).

DNs and SWs occupy a middle ground, since they are professional occupations that require a minimum of a bachelor's degree, but average wages in the two professions are low compared to other occupations that require a bachelor's degree and a substantial fraction of the practitioners in both occupations work in institutional settings (e.g., hospitals and educational institutions). In addition, the majority of DNs and SWs are women and many of the practitioners

[64] Examples of empirical analysis estimating a wage premium due to occupational licensure include: Shephard (1978), Kleiner (2000), and Kleiner and Kudrle (2000), who studied dentists; Kleiner (2000) and Tenn (2001), who studied lawyers; Kugler and Sauer (2005), who studied physicians in Israel; Benham and Benman (1975) and Feldman and Begun (1985), who studied optometrists; Timmons and Thornton (2007), who studied radiologic technologists; and Timmons and Thornton (2010), who studied barbers.

[65] Examples of empirical analysis finding no wage premium due to occupational licensure include: White (1978), who studied clinical lab personnel; White (1980), who studied nurses; and Kleiner (2000), who studied barbers and cosmetologists.

in both occupations work part time (35 or fewer hours per week).[66] It is unclear how this combination of factors (high percentages of women, part time workers, and institutional workers in both occupations; and below average wages in both occupations) will affect the wage premium due to licensure. Table 4.1 for DNs and Table 4.2 for SWs present summary statistics for the work and wage related variables mentioned here, based on the datasets of professional DNs and SWs derived from the 5% Census surveys for 1980, 1990, and 2000 in Chapter 3.

The economic theory that predicts a wage increase due to licensure depends on the practice restriction component of licensure that allows licensing boards to control entry into the occupation. Thus, an increase in wages may result from a decrease in the supply of labor due to licensure. In Chapter 3, I found that, for both DNs and SWs, the impact of licensure on the number of practitioners is very small and not significant. Therefore, there was no evidence to support the hypothesis that licensure reduces the number of practitioners in those occupations. As a result, licensure may not cause a shift in the supply of labor for DNs and SWs and there may not be a wage premium due to licensure for those occupations. As noted in Chapter 2, the literature for RNs and public school teachers suggests that licensure does not impact the number of practitioners or cause a lasting wage premium. However, a shift in demand for the services of DNs or SWs due to licensure could still impact wages, since consumers who are loss averse may enter the market for the services of DNs or SWs only when practitioners in those occupations are licensed. To investigate further, I model the effect of licensure on the wages of DNs and SWs

[66] The Bureau of Labor Statistics defines part time work as 35 hours or less per week. Some professions (for example, medical professions) define full time work as 35 hours per week.

for the same 20-year period (1980 through 2000)[67] that I used for modeling the effect of licensure on the number of DNs and SWs in Chapter 3.

4.2 Research Design

Empirical studies of the impact of occupational licensure include models of different measures of financial compensation, including income, earnings, and wages.[68] Wages are typically viewed as a subset of earnings, while earnings are a subset of income. Care must be taken when comparing empirical results based on different compensation measures. In three separate studies based on U.S. Census data, for example, Pfeffer (1974) models median *incomes* in licensed occupations, Kleiner (2006b) models hourly *earnings* of physicians and dentists, and White (1980) models median *wages* of nurses. In this dissertation, I estimate models for the impact of various aspects of occupational regulation on the wages of practitioners in the regulated occupations. I use wages as self-reported in the Census data, and I include individuals who are paid a salary or a wage by a public or private company and individuals who are self-employed, but report earning a wage. I ignore any income derived from other sources.

I use the 1980, 1990, and 2000 5% Census Public Use Microdata Series (Ruggles et al. 2004) as the source for data about the wages of practitioners in the DN and SW occupations over the time period from 1980 to 2000. This is the same source data that I used in Chapter 3 to model the impact of licensure on the number of practitioners. Filtering of the data to create a dataset for DNs and a dataset for SWs suitable for estimating the impact of licensure on wages is described in Section 4.3.3. As previously noted, the U.S. Census data includes annual wage for

[67] The 20 year time period from 1980 to 2000 was a period of active state regulation of DNs and SWs, since it captures approximately 87.5% of state regulation activity for DNs and approximately 62% of state regulation activity for SWs.

[68] The U.S. Census defines Total Income as the sum of Wages, Business Income, Farm Income, Social Security Income, Welfare Income, Investment Income, Retirement Income, and Other Income.

each observation and enough information to compute an hourly wage.[69] In this chapter, I estimate separate models for annual wage and hourly wage.

The importance of modeling hourly wage is due to the high percentage of female practitioners and part time workers in the DN and SW occupations. This is particularly true if the percentage of females or the percentage of part-time workers varies over the 20-year observation interval for an occupation. Tables 4.1 and 4.2 show the percentage of males and females in the datasets for DNs and SWs, respectively. Roughly 93% of DNs and 70% of SWs are female. There is little variation in the percentage of females in the DN occupation over the 20-year interval, but the percentage of females in the SW occupation grows from 62% in 1980 to 78% in 2000.

The U.S. Bureau of Labor Statistics reports that in 1998, 28.4% of females and 12.7% of males in the labor force worked part time (less than 36 hours per week).[70] Thus, a higher percentage of female practitioners is likely to be associated with a higher percentage of part time workers.[71] Tables 4.1 and 4.2 also show the percent of part time workers in the datasets for DNs and SWs, respectively, in each observation year. For DNs, the percentage of part time workers tended to increase over the 20-year interval, while, for SWs, the percentage of part time workers tended to decrease over the same interval.

In summary, the DN occupation maintained a roughly constant percentage of females, but saw an increase in the percentage of part time workers, while the SW occupation saw an increase in the percentage of females, coupled with an unexpected decrease in the percentage of part time

[69] Hourly wage = (annual wage)/((weeks worked per year)*(hours worked per week)).
[70] The source for data about part time workers in 1998 is the Bureau of Labor Statistics, www.bls/opub/ted/2000/Feb/wk4/art02.htm
[71] The report on the 1999 ADA membership database (Bryk 2001) indicates that 31.6 percent of RDs work 30 hours or less per week, 63.3 percent work 31 to 40 hours per week, and only 5.1 percent work more than 40 hours per week.

workers. Although an annual wage model could control for both gender and hours worked per week, I choose to estimate separate models for annual wage and hourly wage. This allows me to isolate the impact of licensure on hourly wages, separate from any social forces that may influence the percentage of part time workers in the two occupations. With models for both annual and hourly wage, I am also in a position to compare my empirical results to others who have modeled either wage measure.

I implement three sets of wage models for DNs and SWs so that I can explore various aspects of the effect of occupational regulation on wages.[72] For ease of reference, I label the sets of models: (1) regulation-level models, (2) years-of-regulation models, and (3) regulation-strictness models. All models are human capital earnings models of the natural log of wages as a function of regulation variables, either year dummies or years of regulation variables, individual demographic variables, exogenous state variables, and state dummies.

Regulation-level models control for a single level of occupational regulation, where levels are related to, but not exactly equal to, the types of regulation defined in Chapter 1. I look at three different regulation levels: (1) any regulation, (2) regulation that is named licensure (with or without practice restriction), and (3) licensure (with practice restriction). For DNs, any regulation is true if the individual is subject to title protection, certification, or licensure in the observation year, since there are no examples of the regulation type registration for DNs. Similarly, for SWs, any regulation is true if the individual is subject to title protection or

[72] I formulated a fourth set of wage models using the Difference-in-Difference-in-Differences (DDD) methodology. Treatment states are states that regulate the occupation, while control states are states that do not regulate the occupation. The treatment period is the time after regulation is enacted, while the control period is the time before regulation is enacted in treatment states. The treatment group is individuals with at least a bachelor's degree (subject to regulation), while the control group is individuals without a bachelor's degree. Using education level to identify the treatment group is problematic, since higher education levels are generally associated with higher wages, even in the absence of occupational regulation. There is no consistent way to separate the wage effect due to education from the wage effect due to regulation. The DDD models also do not give significant results, so I have chosen not to include them.

licensure in the observation year, since there are no examples of the regulation types registration or certification for SWs.

The intent of the regulation-level models is to explore whether or not there is a wage premium due to licensure. If there is a wage premium, the intent is to learn whether it is the practice restriction component of licensure, or the name licensure, or just the existence of any type of regulation that leads to the wage premium. Due to the strong influence of the CDR for DNs and the ASWB for SWs, state statutes for title protection and certification are very similar to statutes for licensure. Therefore, an individual who earns the title protection credential in one state (or the certification credential, in the case of DNs) has demonstrated the same level of competence as an individual who earns the licensure credential in another state. To the extent that this is true, any regulation might have the same impact on wages as licensure.

Years-of-regulation models control for the absence of a single level of occupational regulation and some measure of the duration of that level of occupational regulation. For example, one model controls for no regulation (which is true if the individual is not subject to any regulation in the observation year) and the natural log of the number of years of any regulation (if the individual is subject to any regulation in the observation year). I look at three different controls for the absence of regulation: (1) no regulation (which is the opposite of any regulation), (2) no regulation or regulation that is not named licensure (which is the opposite of regulation that is named licensure), and (3) no regulation or regulation that is not licensure (which is the opposite of licensure). For each of these three cases, I control for the years of that level of occupational regulation either with the natural log of the years of regulation or with years of regulation and the square of years of regulation.

The intent of the years-of-regulation models is to capture non-linear effects of occupational regulation and the lag nature of grandfather effects and to explore whether any wage premium due to licensure varies over time. Models that control for the natural log of years of regulation are suited to cases where wages increase with years of regulation, but the rate of increase slows with increasing years, or wages decrease with years of regulation, but the rate of decrease slows with increasing years. Similarly, models that control for years of regulation and the square of years of regulation are suited to cases where occupational regulation initially increases wages, but the wage premium due to regulation evaporates over time.

Regulation-strictness models control for the type of occupational regulation (title protection, certification, or licensure for DNs; and title protection or licensure for SWs) and the various elements of the state statutes that contribute to the strictness of the regulation. These models are estimated using subsets of the DN and SW datasets that include only individuals who are subject to occupational regulation in the observation year. This means that the individual's state has occupational regulation in effect and the individual is not exempt from that regulation.

The intent of the regulation-strictness models is to explore whether any wage premium due to regulation can be attributed to the strictness of the type of regulation or to the strictness of the specific elements of the state statutes. Licensure is stricter than certification, for example, and certification is stricter than title protection. Elements that contribute to the strictness of occupational regulation include requirements to obtain credentials (degree, exam, practice or experience hours, and application fees), requirements to maintain credentials (continuing education hours and renewal fees), and the fraction of the state board that is comprised of practitioners of the occupation. These are discussed in more detail in Section 4.3.

For the regulation-level and years-of-regulation models, I estimate a series of models. First, I estimate the impact of regulation on wages using an ordinary least squares (OLS) model. Given the possibility that OLS coefficients may be biased and inconsistent due to endogeneity from both omitted variable bias and simultaneous/reverse causality, I then estimate both a state fixed effects (FE) model and a two stage least squares (2SLS) model.[73] The FE model controls for unobservable state attributes that are constant over time. This allows me to focus on the effect of changes in regulation within states, without the effect of heterogeneity among states. The 2SLS model with an instrumental variable (IV) for either regulation level or absence of regulation level focuses on the endogeneity originating from the uncertain causality between wages and regulation. When practitioners of an occupation work in a state where wages for that occupation are low, practitioners may request regulation to secure higher wages. In this case, low wages initiate a push for occupational regulation. However, if licensure of an occupation is just an indication that state occupational associations are successful in limiting entry into the occupation, then OLS estimates of the effect of regulation on wages might be too high (Timmons 2006). For the regulation-strictness models, I only estimate an OLS model, because the state-by-state variation in the components of the state statutes causes an omitted variable problem when I try to control for state FEs and the large number of regulation variables makes it too difficult to find IVs for each one. All models employ clustering of standard errors by state because the regulation variable varies at the state level. In addition, all models control for either Census year or some measure of years of regulation.

The use of IVs in the literature on the effect of occupational licensure on the wages of practitioners is rare. I found only one case (Timmons 2006) where IVs were used for licensure

[73] For 2SLS years-of-regulation models, I estimated the models using a maximum likelihood treatment effect specification (via treatreg command in STATA) and results were similar to those with xtivreg, so I report the xtivreg results in the empirical results.

variables. Timmons' empirical models used data from only one Census sample at a time, while I use data from three different Census samples over a 20-year period. I believe that using Census data from multiple years adds to the challenge of identifying appropriate IVs. My search for possible IVs that are conceptually valid and can be substantiated included testing a large number of variables that describe state revenue from occupational licensure, the prevalence of occupational licensure in the state, the political climate in the state, and the makeup and dynamics of the state legislature. Variables that describe the makeup and dynamics of the state legislature proved to be the most promising IVs, since it is the members of the state legislature who must write, introduce, debate, and vote on bills for occupational regulation.

I select two IVs for use in my empirical models. Suitable IVs must be logically correct (correlated with regulation, but not correlated with wages), have the correct sign in the first stage (regulation variable as a function of the IV), yield the correct sign for wages as a function of the regulation variable in the second stage, and yield satisfactory statistics. The test statistic when standard errors are clustered is the Kleibergen-Paap rk Wald F-statistic. Based on the Staiger and Stock (1997) rule-of-thumb, when the F-statistic is 10 or more, an IV has sufficient power for use in the models. For the regulation-level models, I use the percentage of Democrat state legislators minus the percentage of Republican state legislators two years before the first year of any regulation of the occupation in the state as an IV for any regulation, regulation that is named licensure, and licensure.[74] Democrat legislators are more likely to adopt occupational regulation than Republican legislators. So, a higher value of this IV should be associated with a higher probability of the state adopting occupational regulation. Since it can take a couple of years to

[74] Timmons (2006 Dissertation) used the percentage of Republicans in the state legislature as an instrument for various licensure variables for massage therapists and barbers.

introduce a new occupational regulation bill, gather support, and get the bill passed, I look at the makeup of the state legislature two years before the first year of any regulation.

For the years-of-regulation models, I use the percentage turnover in the state House in the first year of any regulation of the occupation in the state as an IV for (1) no regulation (which is the opposite of any regulation), (2) no regulation or regulation that is not named licensure (which is the opposite of regulation that is named licensure), and (3) no regulation or regulation that is not licensure (which is the opposite of licensure).[75] The idea is that a high level of turnover in the state legislature has a negative impact on producing legislation. So, higher values of this IV should be associated with a lower probability of the state adopting occupational regulation. I look at the turnover rate in the state House (instead of the state Senate), because occupational regulation is typically introduced in the state House. Also, I look at the turnover rate in the first year of any regulation, since that is the year during which passage of occupational regulation is most likely to be affected by churn in the makeup of the state House.

Summarizing the research plan, I build on the DN and SW datasets derived from the 1980, 1990, and 2000 U.S. Census samples in Chapter 3 and use data on state regulations from the CDR for DNs and from the ASWB for SWs to create datasets suitable for modeling the effect of occupational licensure on the wages of practitioners. Because of the high percentage of female practitioners and part time workers in the two occupations, I create separate models for annual wage and hourly wage. I define three sets of wage models for DNs and SWs so that I can explore various aspects of the effect of occupational regulation on both wage measures. For ease of reference, I label the models: regulation-level models, years-of-regulation models, and regulation-strictness models. For each set of wage models, I outline a series of regressions to

[75] Smith (1982) examined factors that affect occupational licensure, including the dynamics of the makeup of the state legislature. Timmons (2006) used turnover rate of the state legislature as an instrument for various licensure variables for radiologic technologists, massage therapists, and barbers.

implement, including OLS, FE, and 2SLS for the regulation-level and years-of-regulation models and OLS for the regulation-strictness models. To support the 2SLS regressions, I identify appropriate IVs to use for the regulation level and absence of regulation level variables.

4.3 Data

To study the effect of state regulation on wages, I use the datasets of professional members of the DN and SW occupations created in Chapter 3 using the 1980, 1990, and 2000 Census samples. The datasets include individuals who are currently employed and working for wages and have earned at least a bachelor's degree. Previous empirical studies that used wage data from the U.S. Census to estimate the effect of occupational licensure on wages include Stigler (1971),[76] Kleiner (2006b),[77] Timmons (2006),[78] and Kleiner (2013).[79] Stigler and Timmons used data from a single Census year, while Kleiner (2006b) combined data from the 1990 and 2000 decennial Census surveys, and Kleiner (2013) combined data from the 2001 through 2009 annual ACS surveys.

Census variables important for empirical analysis of the effect of licensure on wages of practitioners include: year, annual wage, age, gender, race, education, marital status, number of children less than five years old, state where employed, industry where employed, and an indication of whether or not the individual works in a metropolitan area. Also included are the

[76] Stigler (1971) used data from the 1960 Census and found that unregulated occupations earn one-third less than regulated occupations. However, Stigler did not employ control variables for human capital or regional differences.
[77] Kleiner (2006b) used data from the 1990 and 2000 Census to estimate the impact of licensing on hourly wages for selected occupations by comparing wages for licensed occupations to wages for comparable unregulated occupations that have similar education and experience requirements. Kleiner found that being in a licensed occupation enhanced the hourly earnings of the regulated occupations by about ten percent.
[78] Timmons (2006) used data from the 2000 Census to estimate the impact of licensing on annual wages of massage therapists and barbers and found that specific licensing provisions were associated with increases in annual wages. For example, a 100-hour increase in education requirements is associated with an estimated 3.6%-5.8% increase in annual wages for massage therapists. Similarly, an apprenticeship requirement is associated with an estimated 9.1%-22.4% increase in annual wages for barbers.
[79] Kleiner (2013) used data from the 2001 through 2009 annual American Community Survey (ACS) to estimate the impact of regulation on the wages of interior designers. Kleiner found little influence of individual regulation variables on measures of hourly wage determination.

number of weeks worked per year and the usual number of hours worked per week, which I use to compute an hourly wage.[80] The computed hourly wage is used to remove outliers. All dollar amounts for annual and hourly wages are converted to year 2000 dollars.

The industry[81] where employed is the work setting and economic sector in which an individual performs an occupation.[82] It does not refer to a specific technical function or job. There are 267 industry codes spread across 17 industry groups in the 2000 Census. The 1980 and 1990 Census have fewer industry codes[83] and slightly different industry groups, so I map the industry code for each individual from the 1980 and 1990 Census to the appropriate industry group from the 2000 Census to allow for a consistent set of industry groups across all three Census samples.[84]

I use state regulation data from the Commission on Dietetic Registration (CDR) for DNs and from the Association of Social Work Boards (ASWB) for SWs to create the various regulation variables needed to support implementation of the different wage models defined in Section 4.2. For the regulation-level models, I create pairs of dummy variables for (1) any regulation versus no regulation, (2) regulation that is named licensure versus no regulation or regulation that is not named licensure, and (3) regulation that is licensure (with practice restriction) versus no regulation or regulation that is not licensure. In addition, for the years-of-

[80] Hourly wage = (annual wage)/((weeks worked per year)*(hours worked per week)).
[81] The source for Census industry definitions is: https://usa.ipums.org/usa-action/variables/IND#description_section
[82] Individuals who worked in more than one industry were asked to report the industry in which he/she first earned the most money, or, second, spent the most time.
[83] There are 245 industry codes in 1990 and 234 industry codes in 1980.
[84] The 17 industry groups from the 2000 Census are: Agriculture, Forestry, Fishing and Hunting; Mining; Construction; Manufacturing; Wholesale Trade; Retail Trade; Transportation and Warehousing; Utilities; Information and Communications; Finance, Insurance, Real Estate, and Rental and Leasing; Professional, Scientific, Management, Administrative, and Waste Management; Educational, Health, and Social Services; Arts, Entertainment, Recreation, Accommodations, and Food Services; Other Services (Except Public Administration); Public Administration; Armed Forces; and Unemployed. Since a majority of DNs and SWs work in the Educational, Health, and Social Services industry group and that group can logically be divided, I define four subgroups: Educational Services, Health Services (not Hospitals), Hospitals, and Social Services. This distributes the observations more evenly across industry groups, which makes control for industry groups more meaningful in the empirical models.

regulation models, I create variables for (1) years of any regulation, square of years of any regulation, and natural log of years of any regulation, (2) years of regulation that is named licensure, square of years of regulation that is named licensure, and natural log of years of regulation that is named licensure, and (3) years of licensure, square of years of licensure, and natural log of years of licensure. Finally, for the regulation-strictness models, I create variables for the type of state regulation and the various elements of the state statutes that contribute to the strictness of the regulation. As discussed in Chapter 3, the types of regulation are no regulation, title protection, certification, and licensure for DNs and no regulation, title protection, and licensure for SWs. Elements of the state statutes that contribute to the strictness of the regulation include degree, exam, practice or experience hours, and application fee requirements to obtain credentials; yearly continuing education hours[85] and renewal fee requirements to maintain credentials; and the fraction of the state board that is comprised of practitioners of the occupation.[86] For states that schedule renewal of credentials every second or third year, I compute an annual renewal fee. For states that combine application and yearly fees for the first year or two, I subtract the yearly fee(s) from the application fee. All dollar amounts for application and renewal fees are converted to year 2000 dollars.[87]

The datasets also include year and state dummies and a number of exogenous state variables for the observation year, including: natural log of state population,[88] natural log of state

[85] Adams (1996) suggests that a higher requirement for continuing education hours leads to higher wages because consumers are willing to pay more for services when practitioners have more continuing education requirements. Therefore, higher continuing education requirements make a regulation statute stricter.
[86] Graddy and Nichol (1989) argue that the state will have less stringent regulation if there are more public members on the licensing board. This suggests that strictness of regulation will increase with the fraction of the state board that is comprised of practitioners of the occupation.
[87] Some states include application and renewal fees in the state statutes, while other states do not. It is difficult to track the exact progression of regulation fees year-by-year. I take the correct fee amounts for a year where I can verify the fees and then convert them to year 2000 dollars.
[88] The source for state population data is the U.S. Census (http://www.census.gov).

per-capita gross domestic product in year 2000 dollars,[89] total average state tax burden (state and local taxes),[90] percentage of females age 25 and over in the state who have earned at least a bachelor's degree,[91] percentage of males age 25 and over in the state who have earned at least a bachelor's degree,[92] ratio of per capita state debt to per capita income,[93] percentage of state population on Medicare,[94] percentage of state population below the poverty line,[95] and percentage of state population living in urban areas.[96] I include exogenous state variables in all of my wage models to control for state variables that change over time that may impact wages. Since some of the exogenous state variables are not available for the District of Columbia, the observations for D.C. drop out of the empirical models.

For the empirical analysis of the effect of state regulation on wages, I remove the observations in the exempt category defined in Chapter 3. In states that regulate the occupation by the year 2000, the exempt category includes individuals who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation. In states that do not regulate the occupation by the year 2000, there are no observations in the exempt category. This simplifies the interpretation of the coefficients of the regulation variables in my empirical models. Exemptions from state regulations for DNs and SWs are listed in Tables 1.1 and 1.2, respectively.

For the purpose of sensitivity analysis, I also use an alternate definition of exempt, where an observation is exempt only if the state regulates the occupation in the observation year and the

[89] The source for state per-capita gross domestic product is the Bureau of Economic Analysis (http://www.bea.gov).
[90] The source for average state tax burden is Tax Foundation (http://www.taxfoundation.org).
[91] The source for educational attainment data for females is the U.S. Census (http://www.census.gov).
[92] The source for educational attainment data for males is the U.S. Census (http://www.census.gov).
[93] The source for per capita state debt and state per capita income is the Council of State Governments' *Book of the States*.
[94] The source for percentage of state population on Medicare is the U.S. Census (http://www.census.gov).
[95] The source for percentage of state population below the poverty line is the U.S. Census (http://www.census.gov).
[96] The source for percentage of state population in urban areas is the U.S. Census (http://www.census.gov).

state statute exempts the individual's industry or job position. With this definition, no observations in a state are exempt from regulation unless regulation is in effect in the state. This leaves more observations in the dataset for the years prior to regulation taking effect. Summary statistics and empirical results for this alternate definition of exempt are included in the Appendix for Chapter 4.

4.3.1 Data for Dietitians and Nutritionists

Although filtering of the dataset of professional members of the DN occupation is described in Section 3.3.1, I summarize the filtering here for completeness and because additional filtering is done in this chapter. I begin with 14,266 DN[97] observations and I drop 2 individuals who work outside the United States; 3,218 individuals who are unemployed, on leave, or not in the workforce; 9 individuals who do not work for wages; 5,195 individuals who have not earned at least a bachelor's degree;[98] 474 individuals with hourly wages below the lowest state minimum wage; and 22 individuals with hourly wages more than five standard deviations above the mean. This leaves 5,346 observations in the DNs dataset. I then delete 1188 individuals who are exempt from regulation and 37 individuals from the District of Columbia, since some of the exogenous state variables are not available for D.C.[99] This leaves 4,121 observations in the DNs dataset. Summary statistics for the professional dataset for DNs based on the 1980, 1990, and 2000 Census samples are included in Table 4.3.

Regulation variables for DNs are derived from the data available through the Committee of Dietetic Registration (CDR). I add dummies for regulation type (no regulation, title

[97] In 1980 and 1990, the choice of occupational codes includes Dietitians, but not Nutritionists. In 2000, Dietitians and Nutritionists share the same occupational code.
[98] Kleiner (2006b) used the same technique of dropping individuals who did not report meeting the minimum expected level of education for an occupation from the Census data before empirical analysis.
[99] With the alternate definition of exempt in the Chapter 4 Appendix, only 545 exempt DN observations are removed, instead of 1188.

protection, certification, and licensure) and regulation level (any regulation, regulation that is named licensure, and licensure (with practice restriction)) to the DN dataset for each observation. I also add variables for the number of years regulation has been in effect, including years, square of years, and natural log of years for any regulation, regulation that is named licensure, and licensure. Summary statistics for the regulation variables in the context of the DN dataset are included in Table 4.4. Included are regulation type, regulation level, and years of regulation.

By design, each observation can be subject to only one regulation *type*. If a state regulation statute includes both title protection and practice restriction, for example, then DNs with a bachelor's degree in that state are subject to licensure. For this case, the licensure variable is true, while the no regulation, title protection, and certification variables are false. Consequently, the entire dataset is partitioned into non-overlapping regulation *types* and the percent columns for regulation *type* in Table 4.4 sum to (approximately) 100%. So, it is reasonable to control for more than one regulation *type* in a single empirical model. The percentage of observations subject to no regulation decreases from 1980 to 1990 to 2000, while the percentage of observations subject to other regulation *types* increases over the same time interval as states adopt regulation of DNs.

Regulation *level* dummies can overlap. If an individual is subject to a state statute that is called licensure and includes practice restriction, then any regulation, regulation that is named licensure, and licensure are all true. However, if an individual is subject to a state statute that is called licensure, but does not include practice restriction, then any regulation and regulation that is named licensure are true, but licensure is false. Thus, it is not reasonable to control for more than one regulation *level* in a single empirical model. It follows that Table 4.4 does not include percent columns for regulation *level*.

The summary statistics for duration of regulation variables in Table 4.4 reflect how regulation of DNs did not occur until after 1980, since the maximum value for years of regulation is 17. The mean number of years of any regulation, years of regulation named licensure, and years of licensure are 8.94, 8.34, and 7.32, respectively. Since the intent of the years-of-regulation models is to explore whether any wage premium due to licensure varies over time, these models should be able to capture the impact of licensure on wages of DNs if that impact is evident roughly eight years after licensure takes effect.

Elements of the state statutes for occupational regulation of DNs are listed in Table 4.5. Each element affects the strictness of the state regulation. For each state, the type of regulation of DNs (none, title protection, certification, or licensure) in effect in the year 2000 is listed, although the type of regulation in effect in 1980 and 1990 may be different. In the dataset for DNs, the correct regulation dummies and statute elements are used for each observation year. All dollar amounts for initial fees and renewal fees are in year 2000 dollars. Several statute elements set requirements for earning the appropriate credential (title protection, certification, or licensure). These include degree, exam, practice hours, and reciprocity requirements and the initial (application) fee.[100] Other statute elements set requirements for maintaining or renewing the credential. These include annual continuing education requirements and an annual renewal fee.[101] The fraction of the state regulation board that is comprised of DNs is also of interest when looking at the strictness of state regulation, since credentialed DNs are likely to set higher entrance requirements for the occupation than other board members who are not practitioners of the occupation. In some cases, there are no DNs on the state regulation board, either because

[100] For states that combine application and yearly fees for the first year or two, I subtract the yearly fee(s) from the application fee.

[101] For states that schedule renewal of credentials every second or third year, I compute an annual continuing education requirement and annual renewal fee.

DNs are not governed by a regulation board or because DNs are governed by the state medical board in that state.

As noted in Section 1.4.1.2, the CDR defines uniform, national RDN credentials that have been widely adopted as the basis for regulation requirements by states that regulate DNs. As a result, regulation requirements are nearly identical in all states that regulate DNs.[102] Minimum degree and examination requirements are uniform, and all states include an ethics code and a reciprocity agreement with other regulating states. There is some state-to-state variability in the number of practice hours required to earn credentials (most states require 900 hours, but New York requires 800 hours) and in the number of annual continuing education hours required to maintain credentials. Application fees and annual renewal fees vary considerably, as does the fraction of the regulation board that is comprised of DNs. However, even though there is little difference in regulation requirements for DNs across states, there are important differences in the type of regulation (licensure, certification, title protection, or none), the date regulation took effect, and the specific job positions that are exempt from regulation.

4.3.2 Data for Social Workers

Again, filtering of the dataset of professional members of the SW occupation is described in Section 3.3.2, but I summarize the filtering here for completeness and because additional filtering is done in this chapter. I begin with 98,270 SW observations and I drop 12 observations who work outside the United States; 16,560 individuals who are unemployed, on leave, or not in the workforce; 60 individuals who do not work for wages; 26,164 individuals who have not earned at least a bachelor's degree;[103] 1,876 individuals with hourly wages below the lowest state

[102] State licensing laws for Dietitians can be found at the links provided at the Commission on Dietetic Registration, Certification and Licensure, http://www.cdrnet.org/certifications/licensure/agencylist.htm, 10/6/2008.
[103] Kleiner (2006b) used the same technique of dropping individuals who did not report meeting the minimum expected level of education for an occupation from the Census data before empirical analysis.

minimum wage; and 151 individuals with hourly wages more than five standard deviations above the mean. This leaves 53,447 observations in the SWs dataset. I then delete 6,529 individuals who are exempt from regulation and 309 individuals from the District of Columbia, since some of the exogenous state variables are not available for D.C.[104] This leaves 46,609 observations in the SWs dataset. Summary statistics for the professional dataset for SWs based on the 1980, 1990, and 2000 Census samples are included in Table 4.6.

Regulation variables for SWs are derived from the data available through the Association of Social Work Boards (ASWB). Again, I add dummies for regulation type (no regulation, title protection, certification, and licensure) and regulation level (any regulation, regulation that is named licensure, and licensure (with practice restriction)) to the SW dataset for each observation. I also add variables for the years of regulation including years, square of years, and natural log of years for any regulation, regulation that is named licensure, and licensure. Summary statistics for the regulation variables in the context of the SW dataset are included in Table 4.7 regulation type, regulation level, and years of regulation.

For SWs, the dataset is partitioned into non-overlapping regulation *types* for no regulation, title protection, or licensure, so it is reasonable to control for more than one regulation *type* in a single empirical model. Thus, the percent columns in Table 4.7 sum to (approximately) 100%. The percentage of observations subject to no regulation decreases from 1980 to 1990 to 2000, while the percentage of observations subject to the other regulation *types* increases over the same time interval as states adopt regulation of SWs.

The regulation *level* dummies in Table 4.7 can overlap, so it is not reasonable to control for more than one regulation *level* in a single empirical model. Thus, it follows that Table 4.7

[104] With the alternate definition of exempt in the Chapter 4 Appendix, only 4,052 exempt SW observations are removed, instead of 6,529.

does not include percent columns. While regulation *types* differ for DNs and SWs (DNs have certification as a regulation type, while SWs do not), regulation *levels* are the same for DNs and SWs and the same logic for setting the regulation *level* dummies applies to both occupations. Therefore, if an individual SW is subject to a state statute that is called licensure but does not include practice restriction, then any regulation and regulation that is named licensure are true for that individual SW, but licensure is false.

The summary statistics for the years of regulation variables in Table 4.7 reflect how regulation of SWs first occurred before 1980, since the maximum value for years of regulation is 43. The mean number of years of any regulation, years of regulation named licensure, and years of licensure are 11.62, 13.32, and 12.63, respectively. Years-of-regulation models should be able to capture the impact of licensure on wages of SWs if that impact is evident roughly 12 years after licensure takes effect. It is possible that the early introduction of state regulation of SWs relative to the 20-year time interval associated with the data used in the empirical analysis may make it more difficult to detect the impact of licensure on the wages of SWs, than on the wages of DNs.

Elements of the state statutes for occupational regulation of SWs are listed in Table 4.8. Each element affects the strictness of the state regulation. For each state, the type of regulation of SWs (none, title protection, or licensure) in effect in the year 2000 is listed, although the type of regulation in effect in 1980 and 1990 may be different. In the dataset for SWs, the correct regulation dummies and statute elements are used for each observation year. All dollar amounts for initial fees and renewal fees are in year 2000 dollars. Several statute elements set requirements for earning the appropriate credential (title protection or licensure). These include

degree, exam, experience hours, and reciprocity requirements and the initial (application) fee.[105] Other statute elements set requirements for maintaining or renewing the credential. These include annual continuing education requirements and an annual renewal fee.[106] The fraction of the state regulation board that is comprised of SWs is also of interest, since credentialed SWs are likely to set higher entrance requirements for the occupation than other board members who are not practitioners of the occupation.

As noted in Section 1.4.2.2, the ASWB administers the SW licensing examinations and provides a model practice act that states generally use as a template for SW regulations. As a result, regulation requirements are very similar in all states that regulate SWs at the bachelor's level, although there is more variability in state statutes for SWs than there is in state statutes for DNs. Minimum degree requirements are uniform, and all states include an ethics code and a reciprocity agreement with other regulating states. There is some state-to-state variability in the exam requirements, the number of experience hours required to earn credentials, and in the number of continuing education hours required to maintain credentials. No exam is required in Louisiana, Nebraska, and New Jersey. The only states with requirements for experience hours are Michigan, Missouri, Oklahoma, and Virginia. Continuing education requirements vary from zero hours per year in Utah to 24 hours per year in Arkansas. Application fees and annual renewal fees vary considerably, as does the fraction of the regulation board that is comprised of SWs. As was the case for DNs, in addition to the statute elements in Table 4.8, there are important state-to-state differences in the type of regulation (licensure, title protection, or none), the date regulation took effect, and the specific job positions that are exempt from regulation.

[105] For states that combine application and yearly fees for the first year or two, I subtract the yearly fee(s) from the application fee.

[106] For states that schedule renewal of credentials every second or third year, I compute an annual continuing education requirement and annual renewal fee.

4.4 Empirical Analysis

Following the research design in Section 4.2 and using the datasets constructed in Section 4.3, I estimate three sets of wage models (regulation-level, years-of-regulation, and regulation-strictness) for the DN and SW occupations. Each model is estimated separately for the effect of occupational regulation on hourly wages and annual wages. I begin this section with a description of a general empirical form that applies to all of the wage models. I then describe the empirical analysis for each set of wage models in detail, including theoretical results and actual results for DNs and SWs.

4.4.1 General Empirical Model

To estimate the effect of state regulation of DNs and SWs on the wages of practitioners in each occupation, I use a general human capital earnings model of the form:

$$\ln Wage_{it} = \beta_0 + \boldsymbol{\beta}_1' \boldsymbol{R}_{st} + \boldsymbol{\beta}_2' \boldsymbol{D}_{it} + \boldsymbol{\beta}_3' \boldsymbol{S}_{st} + \gamma_s + \tau_t + \varepsilon_{it}$$

where the dependent variable ln(Wage) is one of two wage measures for individual i in year t, **R** is a vector of regulation variables in state s in year t, **D** is a vector of demographic variables for individual i in year t, **S** is a vector of exogenous state characteristics in state s in year t, γ includes state fixed effects, τ includes year fixed effects, and ε is a random disturbance term for individual i in year t. The composition of $\boldsymbol{R}_{st}$ depends on the specific wage model. Year dummies are used in the regulation-level and regulation-strictness models and state dummies are used in the fixed effects (FE) models. The individual demographic variables and exogenous state variables are the same for all wage models.

Individual demographic variables include gender, age, age-squared, number of children less than five years, marital status, race, education level, an indication of whether the individual works in a metropolitan area, and place-of-work industry. Annual wages should decrease with

increases in the number of children less than five years, since the number of hours per year an individual can work tends to decrease with increasing numbers of preschool children. Hourly wages, however, should increase with increases in the number of children less than five years, because an individual will probably choose not to work for an hourly wage that is not sufficient to cover childcare costs. These relationships between wages and the number of preschool children are particularly true for women. Both DNs and SWs work in positions spread across a number of industry groups. I control for each industry group that accounts for at least one percent of the DN or SW population in the professional datasets.[107]

To investigate the expected sign of the year dummies in the regulation-level and regulation-strictness models, I compute ratios of each individual's hourly and annual wages to the average hourly and annual wages of persons with a bachelor's degree in the state in the observation year. I use the 1980, 1990, and 2000 Census samples and retain only those individuals who have earned at least a bachelor's degree, but no higher degree. I then remove any individuals who are unemployed, on leave, or not in the workforce, and any outliers.[108] What remains is a reference dataset for individuals with a bachelor's degree in the state. I remove any observations in the occupation of interest (either DNs or SWs) and compute the average hourly and annual wage for the remaining observations.

For each occupation in the professional DN and SW datasets, I compute the ratio of the individual's hourly and annual wages to the reference average hourly and annual wages. I then

[107] For DNs, I control for the following industry groups: Wholesale Trade; Professional, Scientific, Management, Administrative, and Waste Management; Educational Services; Health Services (not Hospitals); Hospitals; Social Services; Arts, Entertainment, Recreation, Accommodations, and Food Services; Other Services (Except Public Administration); and Public Administration. For SWs, I control for a slightly different set of industry groups: Professional, Scientific, Management, Administrative, and Waste Management; Educational Services; Health Services (not Hospitals); Hospitals; Social Services; Other Services (Except Public Administration); and Public Administration.

[108] I use the same criteria to remove outliers from this dataset (used to compute the average hourly and annual wage with a bachelor's degree) that I used to remove outliers from the DN and SW datasets.

average the individual ratios across all observations for that occupation in all states in an observation year. Results for DNs and SWs are shown in Tables 4.1 and 4.2, respectively. For DNs, the average hourly wage is 79.42% of the average hourly wage of people with a bachelor's degree in the state in 1980. This ratio falls to 77.55% in 1990 and to 75.98% in 2000. So, on average, DN hourly wages did not keep pace with average hourly wages for those with a bachelor's degree over the 20-year interval from 1980 to 2000. Thus, I would expect the coefficients of the year dummies for 1990 and 2000 in the regulation-level hourly wage models to be negative. A similar pattern of falling average ratios of DN and SW wages to average wages of people with a bachelor's degree is seen for annual wages of DNs in Table 4.1 and for hourly and annual wages of SWs in Table 4.2.

Tables 4.1 and 4.2 were computed using all observations in the professional DN and SW datasets, which corresponds with the regulation-level wage models. The regulation-strictness wage models, on the other hand, use only those observations in the DN and SW datasets that are subject to regulation in the observation year. Tables 4.1 and 4.2 for DNs and SWs, respectively, show the average ratios of DN and SW wages to average wages of people with a bachelor's degree in the state using only the observations in the DN and SW datasets that are subject to regulation. A pattern of falling average ratios of DN and SW wages to average wages of people with a bachelor's degree is seen for hourly wages of DNs in Table 4.1 and for hourly and annual wages of SWs in Table 4.2. In the case of annual wages of DNs, however, the average ratio of DN wages to average wages of people with a bachelor's degree actually increases from 68.80% in 1990 to 70.26% in 2000. This would suggest that the coefficient of the year 2000 dummy might be positive for the regulation-strictness annual wage models for DNs.

To investigate the expected sign of the absence of regulation dummies in the years-of-regulation wage models, I examine how the per capita personal income in states that regulate DNs and SWs compares to the mean per capita personal income across all states in the observation year. Figure 4.1 shows a map of the United States with states shaded to indicate the state per capita personal income in 1980. The two tables below the map show the number of states that have any regulation or licensure of DNs (top table) or SWs (bottom table) in that year. Below each table is the percentage of states that regulate or license the occupation that have a per capita personal income that is below the mean. No states regulate DNs in 1980. For SWs, 55% of the states that regulate SWs in 1980 have per capita personal incomes below the mean, while 44% of the states that license SWs at the bachelor's level in 1980 have per capita personal incomes below the mean. Figures 4.2 and 4.3 show the same information for 1990 and 2000, respectively.

In all three years, the majority of states that have any regulation of DNs or SWs have incomes below the mean. This is also true for licensure of DNs and SWs in 1990 and 2000. To the extent that hourly or annual wages for DNs and SWs are correlated with per capita personal income, this suggests that wages for practitioners of those occupations tend to be higher in states that do not regulate the occupation and in states that do not license the occupation. As a result, I expect the coefficient of the absence of regulation dummies in the years-of-regulation wage models to be positive.

The other regulation variables in the years-of-regulation wage models are used to capture how the effect of occupational regulation varies over time. In the models that control for the natural log of years of regulation, I expect a positive effect on wages due to increases in the natural log of years of regulation. This is true if regulation refers to any regulation, regulation

that is named licensure, or licensure. Similarly, in the models that control for years of regulation and the square of years of regulation, I expect a positive effect on wages due to increases in the years of regulation and a negative effect due to increases in the square of years of regulation.

4.4.2 Regulation–Level Models

I estimate the effect of regulation level on the wages of practitioners in the DN and SW occupations using the general empirical model in Section 4.4.1 with the vector of regulation variables $\boldsymbol{R}_{st}$ equal to one of three regulation levels: any regulation, regulation that is named licensure, or licensure. For each occupation, I estimate an OLS model, a FE model, and, for models where the selected IV has enough power, a 2SLS model with an IV for regulation level. I am not able to estimate a FE 2SLS model, since the selected IV (the percentage of Democrat state legislators minus the percentage of Republican state legislators two years before the first year of any regulation of the occupation in the state) does not have sufficient power[109] for that model. Empirical results for the regulation-level wage models are discussed in Sections 4.4.2.1 and 4.4.2.1 for DNs and SWs, respectively.

4.4.2.1 Regulation–Level Models – Empirical Results for Dietitians and Nutritionists

Results for the OLS, FE, and 2SLS models that estimate the effect of any regulation on the wages of DNs are shown in Table 4.9. The three columns on the left are for the dependent variable natural log of hourly wage and the three columns on the right are for the dependent variable natural log of annual wage. Estimated coefficients for the any regulation variable, year dummies, and individual demographic variables are shown. Coefficients for place-of-work industry group and exogenous state variables are not included in the table. Corresponding tables for the effect of regulation named licensure and the effect of licensure on the wages of DNs are

[109] The Kleibergen-Paap rk Wald F-statistic is less than 10.

included in Tables 4.10 and 4.11, respectively. The 2SLS results in Tables 4.9, 4.10, and 4.11 are for 2SLS without FE.

The coefficients of the year dummies and individual characteristic variables have the expected signs for all of the models in Tables 4.9, 4.10, and 4.11, except the coefficient of married for annual wage is negative and significant in every model.[110] For the effect of any regulation on wages of DNs in Table 4.9, there are no significant coefficients of the any regulation variable and all of the coefficients are positive (except for the OLS coefficient for the natural log of hourly wage model). This suggests that any regulation of DNs has a positive, but not a significant effect on wages. In the case of regulation named licensure in Table 4.10, the OLS and FE coefficients are negative, while the 2SLS coefficients are positive. The FE coefficients are comparable to the OLS coefficients in magnitude and have larger standard errors than the OLS coefficients, so the OLS coefficients are probably not biased by endogeneity due to omitted variable bias. The OLS coefficient for natural log of annual wage (-.046) is statistically significant. I find a 4.5 percent decrease in annual wages of DNs, on average, due to regulation named licensure. Since the Kleibergen-Paap rk Wald F Statistic for the 2SLS models (without FE) is 55.95, the selected IV is not weak. The positive sign of the 2SLS coefficients compared to the negative signs of the OLS and FE coefficients suggests that there may be endogeneity due to reverse causality. Therefore, the correct sign for the coefficient of the regulation named licensure variable is uncertain and the decrease in annual wages indicated by the OLS coefficient may not be correct. For the effect of licensure on wages of DNs in Table 4.11, there are no

[110] The negative coefficient for married is unexpected, since individuals who are married generally earn higher wages than individuals who are not married. However, this might be explained by differences in the number of hours worked per year by married and unmarried individuals in the DN dataset. The mean number of hours worked per year by married DNs is 1,740, while the mean number of hours worked per year by unmarried DNs is 1,878. Since married DNs typically work fewer hours per year than unmarried DNs, the negative coefficient for married in the annual wage models seems reasonable.

significant coefficients of the licensure variable. Once again, the OLS and FE coefficients are negative, while the 2SLS (without FE) coefficients are positive. Overall, I find that any regulation has a positive, but not significant, impact on wages of DNs, while the directional effect of regulation named licensure and licensure on wages is uncertain.

4.4.2.2 Regulation–Level Models – Empirical Results for Social Workers

Empirical results for the effect of regulation level on the wages of SWs are included in Tables 4.12 (for the effect of any regulation), 4.13 (for the effect of regulation named licensure), and 4.14 (for the effect of licensure). These tables have the same format as the corresponding tables for DNs. Estimated coefficients for the regulation level variable, year dummies, and individual demographic variables are shown, but coefficients for place-of-work industry group and exogenous state variables are not included in the tables. The coefficients of the year dummies and individual characteristic variables have the expected signs for all of the models in Tables 4.12, 4.13, and 4.14. In contrast to the corresponding empirical results for DNs, being married has a positive effect on both hourly and annual wages for SWs, although the coefficients for annual wage are small and not statistically significant.

Only the regulation-level model for the effect of regulation named licensure in Table 4.13 includes 2SLS (without FE) estimates, due to a weak IV problem. This is possibly because SW regulation began in 1957, well before the 1980-2000 time interval covered by my models. As a result, the wage effects due to SW regulation in states that regulated early may be more difficult to detect and so would require an IV with more power. The Kleibergen-Paap rk Walk F Statistic in Table 4.13 is 10.95, just barely above the minimum test statistic of 10.

There are no significant coefficients of the regulation level variables in Tables 4.12, 4.13, and 4.14. The OLS and FE coefficients of the any regulation variable in Table 4.12 are negative,

and the FE coefficients are larger in magnitude than the OLS coefficients and have smaller standard errors. This suggests that the OLS coefficients may be biased due to endogeneity. The lack of significance in the FE coefficients suggests that they may be imprecisely estimated due to limited statistical power. In the absence of 2SLS estimates, the directional effect of any regulation on wages of SWs is unknown. For the effect of regulation named licensure on wages of SWs in Table 4.13, the OLS, FE, and 2SLS (without FE) coefficients are all positive for the hourly wage models, but have mixed signs for the annual wage models, since the OLS and FE coefficients are negative, while the 2SLS coefficient is positive. This suggests that regulation named licensure of SWs has a positive, but not a significant effect on hourly wages, but the directional effect of regulation named licensure on annual wages is uncertain. For the effect of licensure on wages of SWs in Table 4.14, the OLS coefficients appear to be biased due to endogeneity, since the magnitude of the OLS and FE coefficients are quite different and the standard errors for the FE coefficients are smaller than those for the OLS coefficients. The FE coefficient of the licensure variable is positive for the hourly wage model, but negative for the annual wage model. The lack of significance in the FE coefficients suggests that they may be imprecisely estimated due to limited statistical power. In the absence of 2SLS estimates, the directional effect of licensure on wages of SWs is unknown. Overall I find that regulation named licensure has a positive, but not significant, impact on hourly wages of SWs, while the directional effect of the other regulation levels on wages of SWs is uncertain.

4.4.3 Years-of-Regulation Models

I estimate the effect of years of regulation on the wages of practitioners in the DN and SW occupations using the general empirical model in Section 4.4.1 with the vector of regulation variables $\boldsymbol{R}_{st}$ equal to the combination of a variable that controls for the absence of a single level

of occupational regulation and one of two measures of the years of that level of occupational regulation.[111] For each occupation, I estimate an OLS model, a FE model, and, for two SW models where the selected IV has enough power, a 2SLS with FE model with an IV for the absence of a regulation level.[112] There are no 2SLS with FE models for DNs. I am also not able to estimate a 2SLS model without FE for DNs or SWs, since the selected IV (the percentage turnover in the state House in the first year of any regulation of the occupation in the state) does not have sufficient power. Empirical results for the years-of-regulation wage models are discussed in Sections 4.4.3.1 and 4.4.3.2 for DNs and SWs, respectively.

4.4.3.1 Years-of-Regulation Models – Empirical Results for Dietitian and Nutritionists

The tables with empirical results for the effect of years of regulation on the wages of DNs have the same format as the regulation-level tables. Years-of-regulation wage models control for the absence of a specific regulation level and for some measure of years of regulation. Since there are two different measures of years of regulation, there are two sets of tables for empirical results for each occupation. For the case where years of regulation are modeled by the natural log of years of regulation, results for DNs are tabulated in Tables 4.15 (for any regulation), 4.16 (for regulation named licensure), and 4.17 (for licensure). Similarly, for the case where years of regulation are modeled by years of regulation and the square of years of regulation, results for DNs are tabulated in Tables 4.18 (for any regulation), 4.19 (for regulation named licensure), and 4.20 (for licensure).

In all years-of-regulation models for DNs, the coefficients of the absence of regulation level terms are positive and frequently significant. This reflects the pattern where the majority of

[111] As noted in Section 4.2, the two measures of the duration of regulation are (1) natural log of years of regulation, and (2) years of regulation and years of regulation squared.
[112] Table 4.22 contains the 2SLS with FE models for hourly and annual wages of SWs as a function of the natural log of years of regulation named licensure.

states that have any regulation of DNs have per capita incomes below the mean. Thus, wages tend to be higher in states that do not regulate, so the coefficients of the absence of regulation level terms tend to be positive.

I begin with a discussion of the empirical results of years-of-regulation wage models in terms of the natural log of years of regulation. The coefficients of the individual characteristic variables have the expected signs for all of the models in Tables 4.15, 4.16, and 4.17.[113] The estimated coefficients of the natural log of years of regulation level are positive for all models in Tables 4.15 through 4.17. This suggests that wages increase with years of regulation. OLS coefficients are mostly larger than FE coefficients (except for annual wage models for years of any regulation), but standard errors are mostly larger for FE coefficients (except for hourly wage models for years of licensure). The FE estimates are mostly not statistically significant and so may be imprecisely estimated due to limited statistical power, but they are generally consistent with the OLS estimates. This indicates that the OLS estimates are probably not confounded by unobservables that are time invariant over the time gaps between decennial Census samples, but still may be too large. For the models of the effect of the natural log of years of any regulation on wages, the significant FE coefficient for the annual wage model indicates an elasticity of annual wages with respect to years of any regulation of 0.073. For the models of the effect of the natural log of years of any regulation on hourly wages and the natural log of years of licensure on hourly wages, the OLS coefficients are significant, but may be biased due to endogeneity.

I next focus on a discussion of the empirical results of years-of-regulation wage models in terms of years of regulation and the square of years of regulation. These results are included

[113] The coefficient of married for annual wage is negative and significant in every model. The coefficient of the number of children less than five years is positive and significant for hourly wage models, but negative and significant for annual wage models.

in Tables 4.18 (for years of any regulation), 4.19 (for years of regulation named licensure), and 4.20 (for years of licensure). The coefficients of years of regulation are nearly always positive (except for the hourly wage models in Table 4.19) and the coefficients of years of regulation squared are nearly always negative (again, except for the hourly wage models in Table 4.19). The coefficients that do not have the expected sign are very small in magnitude and not significant. DN wages tend to increase with years of regulation and decrease with the square of years of regulation. There are no significant coefficients of the years of regulation variables in the models in Tables 4.18 and 4.19. The only significant coefficients in Table 4.20 are OLS coefficients that may be biased due to endogeneity, since they are larger than the FE coefficients that are not significant.

Based on the years-of-regulation models for DNs, I find that the coefficients of the absence of regulation level variables are positive because wages tend to be higher in states that do not regulate. Years-of-regulation models in terms of the natural log of years of regulation are a better fit to the data than years-of-regulation models in terms of years of regulation and the square of years of regulation. Coefficients in the years-of-regulation models in terms of years of regulation and the square of years of regulation sometimes do not have the expected sign and are often very close to zero. However, DN wages tend to increase with years of regulation and decrease with the square of years of regulation, but this result is not significant. For the models of the effect of the natural log of years of any regulation on wages, I find that wages increase with the natural log of years of regulation, but the increase in wages is not statistically significant. However, I do find a significant FE coefficient for the annual wage model that indicates an elasticity of annual wages with respect to years of any regulation of 0.073.

4.4.3.2 Years-of-Regulation Models – Empirical Results for Social Workers

The tables with empirical results for the effect of years of regulation on the wages of SWs have the same format as the regulation-level tables. Years-of-regulation wage models control for the absence of a specific regulation level and for some measure of years of regulation. Again, there are two sets of tables for empirical results for each occupation. For the model where the natural log of wages is a function of the natural log of years of regulation, results for SWs are tabulated in Tables 4.21 (for any regulation), 4.22 (for regulation named licensure), and 4.23 (for licensure). Similarly, for the model where the natural log of wages is a function of years of regulation and years of regulation squared, results for SWs are tabulated in Tables 4.24 (for any regulation), 4.25 (for regulation named licensure), and 4.26 (for licensure). As was the case for the years-of-regulation models for DNs, the coefficients of the absence of regulation level terms are usually positive and frequently significant for SWs. Again, this reflects the pattern where the majority of states that have any regulation of SWs have per capita incomes below the mean, so wages tend to be higher in states that do not regulate and the coefficients of the absence of regulation level terms tend to be positive.

I begin with a discussion of the empirical results of years-of-regulation wage models in terms of the natural log of years of regulation. The coefficients of the individual characteristic variables have the expected signs for all of the models in Tables 4.21, 4.22, and 4.23.[114] The estimated coefficients of the natural log of years of regulation-level are positive for all models in Tables 4.21 through 4.23. Significant coefficients include the OLS coefficients for annual wage in Tables 4.21 and 4.23 and the FE coefficient for annual wage in Table 4.21. In most models, the FE estimates have the same sign, roughly the same magnitude, and roughly the same standard error as OLS estimates. So, again the FE estimates may be imprecisely estimated due to

[114] The coefficient of married is positive for every model. The coefficient of the number of children less than five years is positive and significant for hourly wage models, but negative and significant for annual wage models.

limited statistical power, but they are generally consistent with the OLS estimates. The OLS estimates are probably not confounded by unobservables that are time invariant over the time gaps between decennial Census samples. The selected IV has power for the 2SLS with FE model for the effect of the natural log of years of regulation named licensure on the natural log of wages, but estimated coefficients are small and not significant.

For the models of the effect of the natural log of years of any regulation on wages, the significant OLS and FE coefficients for the annual wage model indicate elasticities of annual wage with respect to years of any regulation of 0.02 and 0.022, respectively. For the models of the effect of the natural log of years of regulation named licensure, there are no significant results, but the 2SLS with FE coefficients for the hourly and annual wage models indicate (insignificant) elasticities of 0.016 and 0.016, respectively. For the models of the effect of the natural log of years of licensure on wages, the significant OLS coefficient for the annual wage model indicates an elasticity of 0.015.

I next focus on a discussion of the empirical results of years-of-regulation wage models in terms of years of regulation and the square of years of regulation. These results are included in Tables 4.24 (for years of any regulation), 4.25 (for years of regulation named licensure), and 4.26 (for years of licensure). Coefficients of the individual characteristic variables have the expected signs with the usual exceptions.[115] None of the coefficients of the years of regulation or the years of regulation squared variables in Tables 4.24, 4.25, and 4.26 are significant. SW wages tend to increase with years of regulation and decrease with the square of years of regulation, but the effects are very small. The coefficients of years of regulation are nearly always positive or near zero and the coefficients of years of regulation squared are near zero for SWs. Once again, wage effects due to SWs may be reduced in states that regulated early (before

[115] Married is highly significant for hourly wage, but not for annual wage.

1980), making the SW coefficients small, particularly for the years of regulation squared variables.

Based on the years-of-regulation models for SWs, I find that the coefficients of the absence of regulation level variables are positive because wages tend to be higher in states that do not regulate. Years-of-regulation models in terms of the natural log of years of regulation are a better fit to the data than years-of-regulation models in terms of years of regulation and the square of years of regulation. Coefficients in the years-of-regulation models in terms of years of regulation and the square of years of regulation sometimes do not have the expected sign and are often very close to zero. However, SW wages tend to increase with years of regulation and decrease or remain the same with the square of years of regulation, but this result is not significant. For the models of the effect of the natural log of years of any regulation on wages, I find significant elasticities of annual wages with respect to years of any regulation of approximately 0.02. For the models of the effect of the natural log of years of regulation named licensure, I find statistically insignificant elasticities of hourly and annual wages with respect to years of regulation named licensure of 0.016. For the models of the effect of the natural log of years of licensure on wages, I find significant elasticity of annual wages with respect to licensure of 0.015.

4.4.4 Regulation–Strictness Models

I estimate the effect of strictness of regulation on the wages of practitioners in the DN and SW occupations using the general human capital earnings function model in Section 4.4.1 with the vector of regulation variables $\boldsymbol{R}_{st}$ equal to a combination of regulation types and statute elements. For each occupation, I estimate an OLS model for hourly wage and an OLS model for annual wage. Empirical results for the regulation-strictness wage models are included in Table

4.27 for DNs and in Table 4.28 for SWs and results are discussed in Sections 4.4.4.1 and 4.4.4.2 for DNs and SWs, respectively.

The models for regulation-strictness are OLS models only, since FE models are not possible due to the collinearity between state variables and the many state-specific strictness variables, and 2SLS models are precluded by the difficulty in identifying six or more IVs for the various strictness measures. Confidence in the validity of the OLS coefficients is low due to some specification issues resulting in highly significant coefficients that have an unexpected sign for some strictness variables. For DNs there is a large negative coefficient of the fraction of the board comprised of DNs for annual wage and a large positive coefficient of the year dummy for hourly wage. For SWs, the licensure variable has a large negative coefficient for both hourly wage and annual wage. Statistically significant results that have the expected sign include an annual wage premium due to certification and additional continuing education hours for DNs and an hourly and an annual wage premium due to additional continuing education hours and the application fee for SWs.

4.4.4.1 Regulation–Strictness Models – Empirical Results for Dietitians and Nutritionists

Results for the OLS models that estimate the effect of regulation-strictness on the hourly and annual wages of DNs are shown in Table 4.27. Columns (1) and (2) include the estimated coefficients for the hourly and annual wage models, respectively. The individual characteristic variables have the expected signs, but the sign and significance of the year dummy for 2000 for the hourly wage model is unexpected. The significant negative coefficient for the fraction of the board comprised of DNs for the annual wage model is also unexpected, since more DNs on the board should lead to stricter regulation and higher wages for practitioners. Only the coefficients of certification, fraction of the board comprised of DNs, continuing education hours per year,

and practice hours for initial credentials for the annual wage models are statistically significant. I find the percentage increase in annual wages due to certification, relative to title protection, is 26.7; the percentage decrease in annual wages due to an increase of 1 in the fraction of the board comprised of DNs is 11.0; the percentage increase in annual wages due to a one unit increase in the number of continuing education hours required per year is 1.1; and the percentage decrease in annual wages due to a one unit increase in the number of practice hours for initial credentials is 0.2.

4.4.4.2 Regulation–Strictness Models – Empirical Results for Social Workers

Results for the OLS models that estimate the effect of regulation-strictness on the hourly and annual wages of SWs are shown in Table 4.28. Columns (1) and (2) include the estimated coefficients for the hourly and annual wage models, respectively. The individual characteristic variables have the expected signs, but the sign and high significance of the licensure dummy for both the hourly and annual wage models is unexpected. Only the coefficients of licensure, continuing education hours per year, application fee, and experience hours are statistically significant for both wage measures, but the coefficients of experience hours are essentially zero. I find the percentage decrease in wages due to licensure, relative to title protection, is 4.8 for hourly wage and 6.3 for annual wage; the percentage increase in wages due to a one unit increase in the number of continuing education hours required per year is 0.4 for hourly wage and 0.6 for annual wage; and the percentage increase in wages due to a one dollar increase in the application fee is .02 for both hourly and annual wages.

4.5 Conclusions and Discussion

Although I did not find evidence of a decrease in the number of practitioners in the DN and SW occupations due to regulation in Chapter 3, the possibility of a shift in demand due to consumers

entering the market after licensing suggests that there could still be a wage effect due to regulation. In this chapter, I investigate the impact of state regulation of DNs and SWs on the wages of practitioners using regulation-level, years-of-regulation, and regulation-strictness models for both hourly and annual wages.

The intent of the regulation-level models is to explore whether or not there is a wage premium due to the level of regulation (any regulation, regulation named licensure, or licensure). For DNs, I find that any regulation of DNs has a small, positive, but not significant, impact on both hourly and annual wages. The direction of the effect of the other regulation levels (regulation named licensure and licensure) on DN wages is uncertain, and also not statistically significant. Similarly, for SWs, I find that regulation named licensure has a small, positive, but not significant, impact on hourly wages of SWs, while the effect on annual wages is not clear. The direction of the effect of the other regulation levels (any regulation and licensure) on SW wages is also uncertain and not statistically significant.

With the years-of-regulation models, the goal is to capture any non-linear effects of occupational regulation and the lag nature of grandfather effects and to explore whether any wage premium due to licensure varies over time. I find that the coefficients of the absence of regulation level variables are positive in most models because wages of both DNs and SWs tend to be higher in states that do not regulate those occupations. Years-of-regulation models that capture non-linear effects in terms of the natural log of years of regulation are a better fit to the data than years-of-regulation models in terms of years of regulation and the square of years of regulation for both DNs and SWs. Estimated coefficients for the models in terms of the natural log of years of regulation consistently have the expected sign, have non-zero magnitude, and are sometimes statistically significant; while estimated coefficients for the models in terms of years

of regulation and the square of years of regulation sometimes do not have the expected sign and are often very close to zero. The models for the natural log of wages as a function of the natural log of years of regulation suggest that wages increase with years of regulation, but the rate of increase slows as the years of regulation increases. The coefficient of the natural log of years of regulation can be interpreted as the elasticity of wages with respect to years of regulation. For DNs, I find that wages increase with the natural log of years of regulation, but the increase in wages is not statistically significant. However, I do find a significant FE coefficient for the annual wage model that indicates an elasticity of annual wages with respect to years of any regulation of 0.073. For SWs, in the models of the effect of the natural log of years of regulation on wages, I find significant elasticities of annual wages with respect to years of any regulation of approximately 0.02, statistically insignificant elasticities of hourly and annual wages with respect to years of regulation named licensure of 0.016, and significant elasticity of annual wages with respect to licensure of 0.015.

The purpose of the regulation-strictness models is to explore whether any wage premium due to regulation can be attributed to the strictness of the type of regulation or to the strictness of the specific elements of the state statutes. For the regulation-strictness models, I find some specification issues that may invalidate any conclusions. However, I find that certification (relative to title protection), fraction of the board comprised of DNs, number of continuing education hours required per year, and number of practice hours required for initial credentials appear to have significant impacts on wages for DNs. Similarly, I find that licensure (relative to title protection), number of continuing education hours required per year, and application fee appear to have significant impacts on wages for SWs.

Compared to the literature for the effect of licensure on wages of RNs and public school teachers where no lasting wage premium due to licensure is found, my empirical results suggest a slightly different result for DNs and SWs. Overall, I find a small, positive impact on wages of DNs and SWs due to regulation of those occupations. This impact is evident in the small, positive, and not significant impact on hourly and annual wages of DNs due to any regulation and on hourly wages of SWs due to regulation named licensure. It is also evident in the positive elasticities of annual wages of DNs with respect to increases in years of any regulation and the positive elasticities of annual wages of SWs with respect to increases in years of all three regulation levels. The positive elasticities found from the models of the natural log of wages as a function of the natural log of years of regulation suggest that there is a lasting wage premium due to regulation of DNs and SWs.

I had only limited success in estimating 2SLS models with IVs for regulation variables due to a weak IV problem. The use of IVs in the literature on the wage effects of occupational licensure is rare. I found no examples where IVs were used for regulation variables in datasets that spanned multiple years. The IVs I selected[116] were too weak for some of the models, but a thorough evaluation of a large number of other possible IVs did not identify any that had more power for the models of interest.

I find very little evidence to suggest differences in how regulation level affects wages. In most of the models, empirical results for different regulation levels are similar in magnitude, sign, and significance of the estimated coefficients. I do not find evidence that licensure has a greater impact on wages of DNs and SWs than any regulation or regulation named licensure. This may be a result of the strong influence of the occupational associations for DNs and SWs

[116] The IVs I chose are (1) the percentage of Democrat state legislators minus the percentage of Republican state legislators two years before any regulation of the occupation, and (2) the percentage turnover in the state house in the first year of any regulation of the occupation in the state.

that set strict professional standards apart from state regulation, such that earning state credentials adds little additional information about a person's qualifications to practice.

As an aside to the wage effects of occupational regulation, I find that hourly wages increase with the number of children less than five years old, but annual wages decrease with the number of children less than five years old. This expected result is true for both DNs and SWs. I also find that being married increases hourly wages for both DNs and SWs, but it decreases annual wages for DNs, while increasing annual wages for SWs. This appears to be a result of married DNs working fewer hours per year, on average, than unmarried DNs. As expected, being female has a negative effect on both hourly and annual wages. However, the negative effect of being female on annual wages is much larger and more significant than that on hourly wages.

4.6 Tables and Figures

Table 4.1: Summary Statistics for Dietitians and Nutritionists – Work and Wage Variables

Males and Females				
	1980	1990	2000	All Years
Males	7.30%	6.46%	7.28%	6.99%
Females	92.70%	93.54%	92.72%	93.01%
Part Time Workers (35 or fewer hours per week)				
	1980	1990	2000	All Years
Males	9.86%	10.42%	16.53%	12.85%
Females	24.86%	30.19%	32.64%	29.92%
All Observations	23.77%	28.92%	31.47%	28.73%
Institutional Employment (Hospitals or Educational Institutions)				
	1980	1990	2000	All Years
Hospitals	61.73%	52.45%	42.00%	50.42%
Educational Institutions	6.69%	5.38%	4.03%	5.14%
Totals	68.42%	57.83%	46.03%	55.56%
Average Ratio of DN Wages to Average Wages with a Bachelor's Degree in the State – All Observations In Professional Dataset				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	0.8011	0.7775	0.7640	0.7776
Annual Wage	0.7413	0.6957	0.6962	0.7067
Average Ratio of DN Wages to Average Wages with a Bachelor's Degree in the State – Just Observations Subject to Any Regulation				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	-	0.7805	0.7680	0.7725
Annual Wage	-	0.6915	0.7025	0.6986

Table 4.2: Summary Statistics for Social Workers - Work and Wage Variables

Males and Females				
	1980	1990	2000	All Years
Males	38.37%	31.66%	21.59%	29.25%
Females	61.63%	68.34%	78.41%	70.75%
Part Time Workers (35 or fewer hours per week)				
	1980	1990	2000	All Years
Males	12.67%	11.91%	11.57%	12.05%
Females	23.03%	23.08%	20.12%	21.75%
All Observations	19.06%	19.54%	18.27%	18.91%
Institutional Employment (Hospitals or Educational Institutions)				
	1980	1990	2000	All Years
Hospitals	11.47%	11.96%	13.64%	12.52%
Educational Institutions	5.46%	4.89%	6.54%	5.69%
Totals	16.93%	16.85%	20.18%	18.21%
Average Ratio of SW Wages to Average Wages with a Bachelor's Degree in the State – All Observations In Professional Dataset				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	0.7762	0.7408	0.6815	0.7256
Annual Wage	0.7707	0.7258	0.6631	0.7116
Average Ratio of SW Wages to Average Wages with a Bachelor's Degree in the State – Just Observations Subject to Any Regulation				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	0.7708	0.7475	0.6771	0.7096
Annual Wage	0.7512	0.7245	0.6659	0.6938

Table 4.3: Summary Statistics for Dietitians and Nutritionists – Individual Demographic Variables

Summary Statistics for Dietitians and Nutritionists							
Census Year	**Number**		**Highest Degree Earned**	**Number**		**Place of Work State**	**Number**
1980	972		Bachelors	2,503		Arkansas	8
1990	1,487		Masters	1,295		California	550
2000	1,662		Professional	218		Colorado	68
			Doctorate	105		Connecticut	70
Sex	**Number**					Delaware	14
Female	3,833		**Place of Work**	**Number**		Florida	92
Male	288		Metropolitan Area	2,818		Georgia	73
			Non-Metropolitan Area	1,303		Hawaii	28
Age Range	**Number**					Idaho	23
19	0		**Industry Group**	**Number**		Illinois	130
20 – 24	313		Agriculture	15		Indiana	127
25 - 29	764		Mining	0		Iowa	59
30 - 34	721		Construction	2		Kansas	63
35 - 39	592		Manufacturing	2		Kentucky	42
40 - 44	535		Wholesale Trade	78		Louisiana	37
45 - 49	441		Retail Trade	40		Maine	15
50 - 54	336		Transportation and Warehousing	45		Maryland	84
55 - 59	233					Massachusetts	91
60 - 64	108		Utilities	2		Michigan	179
65 - 69	44		Information and Communications	3		Minnesota	37
70 - 74	21					Mississippi	35
75 - 79	6		Finance, Insurance, Real Estate, and Rental and Leasing	6		Missouri	116
80 - 84	3					Montana	12
85 - 89	3					Nebraska	41
90 - 94	1		Professional, Scientific, Management, Administrative, and Waste Management	72		Nevada	27
Mean Age	38.50					New Hampshire	28
						New Jersey	187
Number of Children Aged Less Than 5 Years	**Number**					New Mexico	18
			Educational Services	212		New York	466
			Health Services (not Hospitals)	913		North Carolina	20
0	3,421					North Dakota	17
1	507		Hospitals	2,078		Ohio	197
2	179		Social Services	181		Oklahoma	53
3	14		Arts, Entertainment, Recreation, Accommodations, and Food Services	110		Oregon	62
4	0					Pennsylvania	255
						Rhode Island	4
Marital Status	**Number**					South Carolina	48
Married	2,753		Other Services (Except Public Administration)	133		South Dakota	12
Not Married	1,368					Tennessee	9
			Public Administration	229		Texas	305
Race	**Number**		Armed Forces	0		Utah	43
White	3,546		Unemployed	0		Vermont	13
Black	222					Virginia	106
Asian	292		**Place of Work State**	**Number**		Washington	88
Other	33		Alabama	16		West Virginia	32
			Alaska	10		Wisconsin	141
Total	**4,121**		Arizona	61		Wyoming	9

Table 4.4: Summary Statistics for Dietitians and Nutritionists – Regulation Variables

Regulation Type				
	1980	1990	2000	All Years
No Regulation	100%	51.58%	21.78%	50.98%
Title Protection	0%	15.40%	15.52%	11.82%
Certification	0%	17.08%	33.27%	19.58%
Licensure	0%	15.94%	29.42%	17.62%
Regulation Level				
	1980	1990	2000	All Years
No Regulation	972	767	362	2,101
Any Regulation	0	720	1,300	2,020
Regulation that is Named Licensure	0	430	709	1,139
Licensure (with Practice Restriction)	0	237	489	726
Years of Regulation				
	Mean	Standard Deviation	Minimum	Maximum
For the 2,020 observations subject to any regulation:				
years of any regulation	8.77	4.91	1	17
square of years of any regulation	100.97	96.94	1	289
natural log of years of any regulation	1.97	0.71	0	2.83
For the 1,139 observations subject to regulation named licensure:				
years of regulation named licensure	8.06	5.04	1	16
square of years of regulation named licensure	90.30	90.40	1	256
natural log of years of regulation named licensure	1.82	0.82	0	2.77
For the 726 observations subject to licensure:				
years of licensure	7.16	4.29	1	14
square of years of licensure	69.67	64.82	1	196
natural log of years of licensure	1.71	0.80	0	2.64

Table 4.5: Statute Elements that Affect Strictness of State Regulation of Dietitians and Nutritionists at the Bachelor's Level

Table 4.5 - Strictness of State Regulation of Dietitians and Nutritionists – Page 1 of 2						
State	Type of Regulation in 2000	Practice Hours	DN Fraction of Board	Continuing Education Hours/year	Initial Fee	Renewal Fee/year
Alabama	Licensure	900	0.667	15	$192.08	$57.62
Alaska	None	-	-	-	-	-
Arizona	None	-	-	-	-	-
Arkansas	Licensure	900	0.571	12	$84.51	$38.42
California	Title Protection	900	0.0	15	$0	$0
Colorado	None	-	-	-	-	-
Connecticut	Certification	900	0.0	15	$145.98	$76.83
Delaware	Certification	900	0.6	15	$131.38	$63.31
District of Columbia	Licensure	900	0.667	15	$189.39	$55.32
Florida	Licensure	900	0.8	15	$134.45	$40.34
Georgia	Licensure	900	0.857	15	$57.62	$19.21
Hawaii	None	-	-	-	-	-
Idaho	Certification	900	0.75	15	$61.46	$34.57
Illinois	Licensure	900	0.857	15	$76.83	$38.42
Indiana	Certification	900	0.571	15	$15.37	$7.68
Iowa	Licensure	900	0.6	15	$92.20	$46.10
Kansas	Licensure	900	0.0	7.5	$107.56	$51.86
Kentucky	Licensure	900	0.857	15	$38.42	$38.42
Louisiana	Licensure	900	0.571	15	$69.15	$46.10
Maine	Licensure	900	0.6	15	$126.77	$107.56
Maryland	Licensure	900	0.778	15	$192.08	$106.79
Massachusetts	Certification	900	0.8	15	$150.59	$49.94
Michigan	None	-	-	-	-	-
Minnesota	Licensure	900	0.667	15	$220.89	$57.62
Mississippi	Licensure	900	1.0	15	$76.83	$38.42
Missouri	Licensure	900	0.833	15	$38.42	$7.68
Montana	Licensure	900	0.071	15	$44.95	$38.42
Nebraska	Licensure	900	0.4	15	$87.59	$43.79
Nevada	Certification	900	1.0	15	$50.07	$0
New Hampshire	None	-	-	-	-	-
New Jersey	None	-	-	-	-	-
New Mexico	Licensure	900	0.75	15	$153.66	$57.62
New York	Certification	800	0.769	0	$225.88	$0
North Carolina	Licensure	900	0.286	15	$230.49	$96.04
North Dakota	Licensure	900	0.8	15	$46.10	$34.57
Ohio	Licensure	900	0.8	15	$96.04	$72.99
Oklahoma	Certification	900	0.6	15	$92.20	$76.83
Oregon	Licensure	900	0.571	15	$96.04	$57.62
Pennsylvania	None	-	-	-	-	-
Rhode Island	Licensure	900	0.556	10	$69.15	$65.31

Table 4.5 - Strictness of State Regulation of Dietitians and Nutritionists – Page 2 of 2						
State	Type of Regulation in 2000	Practice Hours	DN Fraction of Board	Continuing Education Hours/year	Initial Fee	Renewal Fee/year
South Carolina	None	-	-	-	-	-
South Dakota	Licensure	900	1.0	15	$53.78	$26.89
Tennessee	Licensure	900	0.833	0	$99.88	$34.57
Texas	Certification	900	0.667	6	$82.98	$34.57
Utah	Certification	900	0.8	0	$46.10	$14.21
Vermont	Certification	900	1.0	15	$76.83	$76.83
Virginia	Title Protection	900	0.0	15	$0	$0
Washington	Certification	900	0.0	15	$76.83	$53.78
West Virginia	Licensure	900	0.8	10	$38.42	$38.42
Wisconsin	Certification	900	0.75	0	$57.62	$28.81
Wyoming	None	-	-	-	-	-
Data Source: Academy of Nutrition and Dietetics (Formerly the American Dietetic Association) – State Licensure Agency Contact List – http://www.eatright.org/HealthProfessionals/content.aspx?id=7093						

All states that regulate Dietitians and Nutritionists require a bachelor's degree and an exam and all regulation statutes include reciprocity.

Table 4.6: Summary Statistics for Social Workers – Individual Demographic Variables

Census Year	Number		Highest Degree Earned	Number		Place of Work State	Number
1980	11,419		Bachelors	25,896		Arkansas	222
1990	16,447		Masters	18,712		California	5,284
2000	18,743		Professional	1,114		Colorado	710
			Doctorate	887		Connecticut	992
Sex	**Number**					Delaware	146
Female	32,975		**Place of Work**	**Number**		Florida	2,308
Male	13,634		Metropolitan Area	30,425		Georgia	1,216
			Non-Metropolitan Area	16,184		Hawaii	76
Age Range	**Number**					Idaho	155
19	3		**Industry Group**	**Number**		Illinois	2,545
20 – 24	2,677		Agriculture	6		Indiana	936
25 - 29	8,032		Mining	1		Iowa	574
30 - 34	7,974		Construction	14		Kansas	482
35 - 39	6,976		Manufacturing	24		Kentucky	348
40 - 44	6,417		Wholesale Trade	45		Louisiana	751
45 - 49	5,490		Retail Trade	13		Maine	331
50 - 54	4,295		Transportation and Warehousing	50		Maryland	1,048
55 - 59	2,694					Massachusetts	1,168
60 - 64	1,374		Utilities	18		Michigan	2,188
65 - 69	419		Information and Communications	18		Minnesota	1,178
70 - 74	165					Mississippi	290
75 - 79	64		Finance, Insurance, Real Estate, and Rental and Leasing	370		Missouri	537
80 - 84	25					Montana	131
85 - 89	3					Nebraska	241
90 - 94	1		Professional, Scientific, Management, Administrative, and Waste Management	502		Nevada	54
Mean Age	39.19					New Hampshire	219
						New Jersey	770
Number of Children Aged Less Than 5 Years	**Number**					New Mexico	273
			Educational Services	2,654		New York	6,442
			Health Services (not Hospitals)	3,844		North Carolina	1,402
0	39,767					North Dakota	97
1	5,485		Hospitals	5,834		Ohio	1,033
2	1,271		Social Services	19,715		Oklahoma	181
3	85		Arts, Entertainment, Recreation, Accommodations, and Food Services	94		Oregon	639
4	1					Pennsylvania	2,830
						Rhode Island	299
Marital Status	**Number**					South Carolina	631
Married	26,581		Other Services (Except Public Administration)	1,516		South Dakota	145
Not Married	20,028					Tennessee	821
			Public Administration	11,891		Texas	2,447
Race	**Number**		Armed Forces	0		Utah	311
White	37,478		Unemployed	0		Vermont	158
Black	6,850					Virginia	175
Asian	829		**Place of Work State**	**Number**		Washington	1,035
Other	842		Alabama	681		West Virginia	286
			Alaska	111		Wisconsin	1,029
Total	**46,609**		Arizona	627		Wyoming	56

Table 4.7: Summary Statistics for Social Workers – Regulation Variables

Regulation Type				
	1980	1990	2000	All Years
No Regulation	83.97%	69.62%	50.55%	65.47%
Title Protection	2.15%	9.16%	13.82%	9.32%
Licensure	13.87%	21.22%	39.07%	26.60%
Regulation Level				
	1980	1990	2000	All Years
No Regulation	9,589	11,451	9,475	30,515
Any Regulation	1,830	4,996	9,268	16,094
Regulation that is Named Licensure	1,784	3,764	6,193	11,741
Licensure (with Practice Restriction)	1,584	3,490	7,323	12,397
Years of Regulation				
	Mean	Standard Deviation	Minimum	Maximum
For the 16,094 observations subject to any regulation:				
years of any regulation	11.65	9.85	0	43
square of years of any regulation	232.81	355.95	0	1849
natural log of years of any regulation	1.97	1.15	0	3.76
For the 11,741 observations subject to regulation named licensure:				
years of regulation named licensure	13.47	10.62	0	43
square of years of regulation named licensure	294.20	397.02	0	1849
natural log of years of regulation named licensure	2.12	1.17	0	3.76
For the 12,397 observations subject to licensure:				
years of licensure	12.72	10.18	0	43
square of years of licensure	265.45	387.74	0	1849
natural log of years of licensure	2.10	1.11	0	3.76

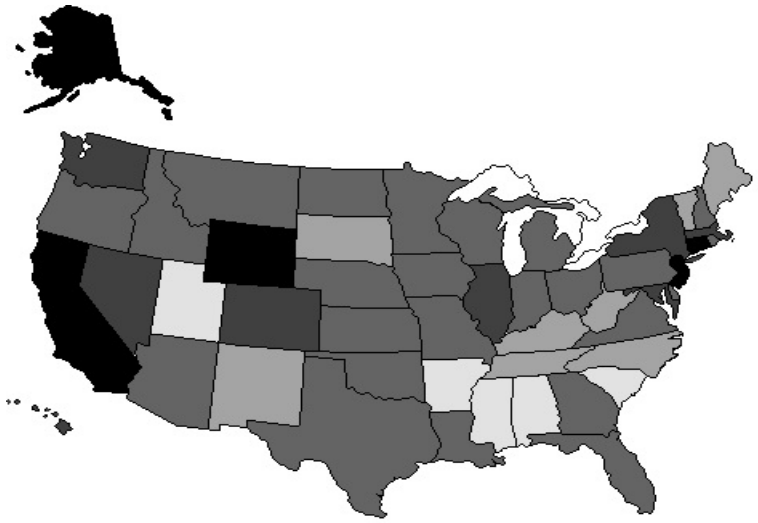
Table 4.8: Statute Elements that Affect Strictness of State Regulation of Social Workers at the Bachelor's Level

Table 4.8 - Strictness of State Regulation of Social Workers – Page 1 of 2							
State	Type of Regulation in 2000	Exam Required (Y/N)	Experience Hours	SW Fraction of Board	Continuing Education Hours/year	Initial Fee	Renewal Fee/year
Alabama	Title Protection	Y	0	1.0	15	$60.68	$24.27
Alaska	None	-	-	-	-	-	-
Arizona	None	-	-	-	-	-	-
Arkansas	Licensure	Y	0	0.667	24	$80.91	$32.36
California	None	-	-	-	-	-	-
Colorado	None	-	-	-	-	-	-
Connecticut	None	-	-	-	-	-	-
Delaware	None	-	-	-	-	-	-
District of Columbia	Licensure	Y	0	0.8	20	$40.46	$34.39
Florida	None	-	-	-	-	-	-
Georgia	None	-	-	-	-	-	-
Hawaii	Licensure	Y	0	0.6	0	$194.18	$49.36
Idaho	Licensure	Y	0	0.833	20	$40.46	$40.46
Illinois	None	-	-	-	-	-	-
Indiana	None	-	-	-	-	-	-
Iowa	Licensure	Y	0	0.714	13.5	$80.91	$24.27
Kansas	Licensure	Y	0	0.636	20	$80.91	$40.46
Kentucky	Licensure	Y	0	0.857	5	$40.46	$13.49
Louisiana	Licensure	N	0	0.857	20	$40.46	$20.23
Maine	Licensure	Y	0	0.714	12.5	$97.09	$28.32
Maryland	Licensure	Y	0	0.833	20	$80.91	$30.34
Massachusetts	Licensure	Y	0	1.0	7.5	$178.00	$21.85
Michigan	Licensure	Y	4000	0.667	22.5	$32.36	$16.18
Minnesota	None	-	-	-	-	-	-
Mississippi	Licensure	Y	0	1.0	20	$89.00	$44.50
Missouri	Licensure	Y	3000	0.9	15	$0	$26.30
Montana	None	-	-	-	-	-	-
Nebraska	Licensure	N	0	0.8	16	$20.23	$10.11
Nevada	Licensure	Y	0	0.8	30	$80.91	$60.68
New Hampshire	None	-	-	-	-	-	-
New Jersey	Licensure	N	0	0.778	10	$117.32	$28.32
New Mexico	Licensure	Y	0	0.571	15	$60.68	$20.23
New York	None	-	-	-	-	-	-
North Carolina	Title Protection	Y	0	0.714	20	$80.91	$24.27
North Dakota	Licensure	Y	0	0.667	15	$80.91	$30.34
Ohio	Licensure	Y	0	0.8	15	$48.55	$24.27
Oklahoma	Licensure	Y	4000	0.857	16	$60.68	$80.91
Oregon	Title Protection	Y	0	0.571	10	$80.91	$0

Table 4.8 - Strictness of State Regulation of Social Workers – Page 2 of 2							
State	Type of Regulation in 2000	Exam Required (Y/N)	Experience Hours	SW Fraction of Board	Continuing Education Hours/year	Initial Fee	Renewal Fee/year
Pennsylvania	Title Protection	Y	0	0.769	15	$36.41	$30.34
Rhode Island	None	-	-	-	-	-	-
South Carolina	Licensure	Y	0	0.857	20	$36.41	$36.41
South Dakota	Licensure	Y	0	0.714	15	$56.64	$28.32
Tennessee	Licensure	Y	0	0.909	7.5	$323.64	$48.55
Texas	Licensure	Y	0	0.667	15	$40.46	$12.14
Utah	Licensure	Y	0	0.857	0	$68.77	$31.55
Vermont	None	-	-	-	-	-	-
Virginia	Licensure	Y	3000	0.778	7.5	$80.91	$44.50
Washington	None	-	-	-	-	-	-
West Virginia	Licensure	Y	0	0.833	25	$60.68	$26.30
Wisconsin	Licensure	Y	0	0.7	15	$144.02	$25.49
Wyoming	Licensure	Y	0	0.667	22.5	$202.28	$30.34
Data Source: Association of Social Work Boards (http://www.aswb.org)							

All states that regulate Social Workers require a bachelor's degree and all regulation statutes include reciprocity.

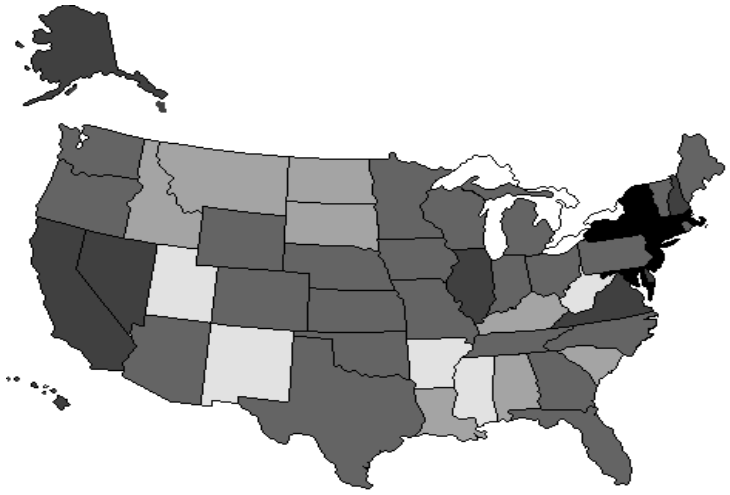
Figure 4.1: Per Capita Personal Income in States that Regulate/License Dietitians and Nutritionists or Social Workers in 1980



Per Capita Personal Income in States that Regulate/License Dietitians and Nutritionists in 1980				
			Number of States	
			Any Regulation	Licensing
	$10,966-$13,007		0	0
	$10,103-$10,848		0	0
	$8,021-$10,059		0	0
	$7,679-$7,957		0	0
	$6,573-$7671		0	0
Mean	$9,205	Total Number of States that Regulate or License	0	0
		% Below Mean	0	0
		% Above Mean	0	0

Per Capita Personal Income in States that Regulate/License Social Workers in 1980				
			Number of States	
			Any Regulation	Licensing
	$10,966-$13,007		0	0
	$10,103-$10,848		2	2
	$8,021-$10,059		3	3
	$7,679-$7,957		3	2
	$6,573-$7671		3	2
Mean	$9,205	Total Number of States that Regulate or License	11	9
		% Below Mean	55	44
		% Above Mean	45	56

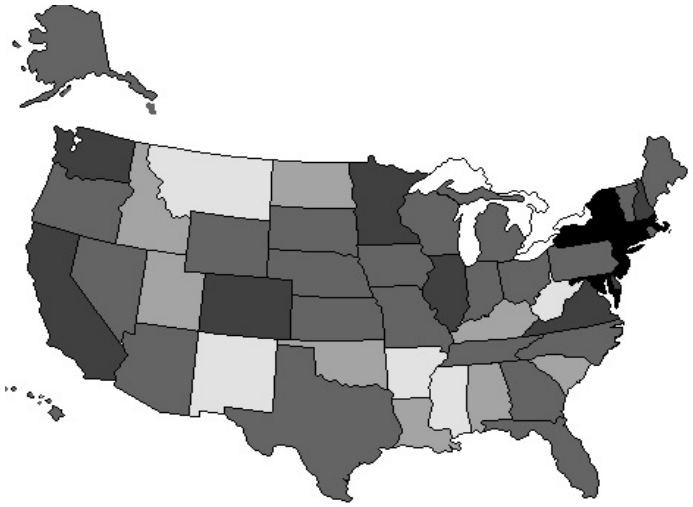
Figure 4.2: Per Capita Personal Income in States that Regulate/License Dietitians and Nutritionists or Social Workers in 1990



Per Capita Personal Income in States that Regulate/License Dietitians and Nutritionists in 1990				
			Number of States	
			Any Regulation	Licensing
	$22,681-$26,198		1	1
	$20,042-$22,594		1	0
	$16,077-$19,821		12	8
	$15,171-$16,075		4	4
	$13,117-$14,847		3	1
Mean	$18,509	Total Number of States that Regulate or License	21	14
		% Below Mean	76	79
		% Above Mean	24	21

Per Capita Personal Income in States that Regulate/License Social Workers in 1990				
			Number of States	
			Any Regulation	Licensing
	$22,681-$26,198		2	2
	$20,042-$22,594		1	1
	$16,077-$19,821		10	8
	$15,171-$16,075		5	3
	$13,117-$14,847		3	3
Mean	$18,509	Total Number of States that Regulate or License	21	17
		% Below Mean	71	71
		% Above Mean	29	29

Figure 4.3: Per Capita Personal Income in States that Regulate/License Dietitians and Nutritionists or Social Workers in 2000



Per Capita Personal Income in States that Regulate/License Dietitians and Nutritionists in 2000				
			Number of States	
			Any Regulation	Licensing
	$34,623-$41,920		4	1
	$31,009-$34,102		6	2
	$26,292-$30,977		19	13
	$23,554-$25,592		7	4
	$21,555-$23,457		5	5
Mean	$29,080	Total Number of States that Regulate or License	41	25
		% Below Mean	66	84
		% Above Mean	34	16

Per Capita Personal Income in States that Regulate/License Social Workers in 2000				
			Number of States	
			Any Regulation	Licensing
	$34,623-$41,920		3	3
	$31,009-$34,102		1	1
	$26,292-$30,977		17	15
	$23,554-$25,592		8	6
	$21,555-$23,457		4	3
Mean	$29,080	Total Number of States that Regulate or License	33	28
		% Below Mean	73	71
		% Above Mean	27	29

Table 4.9: Effect of Any Regulation on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Any Regulation	-.008 (.027)	.001 (.026)	.039 (.071)	.003 (.034)	.029 (.046)	.041 (.079)
Year 1990	-.134*** (.029)	-.137** (.067)	-.160*** (.083)	-.149*** (.054)	-.037 (.118)	-.169*** (.065)
Year 2000	-.113* (.050)	-.160 (.125)	-.158* (.083)	-.193* (.100)	-.010 (.208)	-.230* (.125)
Female	-.020 (.030)	-.021 (.030)	-.021 (.030)	-.256*** (.049)	-.250*** (.049)	-.256*** (.048)
Age	.037*** (.004)	.036*** (.005)	.037*** (.004)	.077*** (.008)	.077*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.040*** (.011)	.042*** (.011)	.040*** (.011)	-.172*** (.029)	-.173*** (.030)	-.172*** (.029)
Married	.038* (.021)	.041* (.021)	.037* (.021)	-.067** (.028)	-.068** (.028)	-.067** (.027)
White	.197*** (.058)	.196*** (.058)	.197*** (.057)	.240*** (.081)	.245*** (.080)	.241*** (.079)
Black	.198*** (.060)	.193*** (.061)	.198*** (.059)	.361*** (.085)	.361*** (.085)	.361*** (.084)
Asian	.151** (.062)	.137** (.061)	.153** (.062)	.217*** (.075)	.208*** (.074)	.218*** (.074)
Master's Degree	.077*** (.013)	.076*** (.013)	.077*** (.013)	.070*** (.025)	.068** (.026)	.070*** (.025)
Professional Degree	.022 (.037)	.020 (.039)	.023 (.037)	.032 (.040)	.043 (.041)	.032 (.039)
Doctorate	.215*** (.058)	.228*** (.059)	.216*** (.057)	.308*** (.066)	.321*** (.066)	.308*** (.066)
Metropolitan Area	.034** (.015)	.030** (.015)	.036** (.014)	.085*** (.030)	.082*** (.031)	.086*** (.029)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
N	4121	4121	4121	4121	4121	4121
K-P F			15.96			15.96

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4.10: Effect of Regulation Named Licensure on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Regulation Named Licensure	-.026 (.023)	-.030 (.037)	.028 (.051)	-.046* (.027)	-.051 (.051)	.029 (.057)
Year 1990	-.129*** (.027)	-.124* (.068)	-.149*** (.029)	-.131** (.051)	.003 (.113)	-.158*** (.053)
Year 2000	-.105** (.046)	-.032 (.127)	-.137** (.050)	-.164 (.099)	.073 (.197)	-.207** (.101)
Female	-.019 (.030)	-.021 (.030)	-.021 (.029)	-.255*** (.049)	-.249*** (.049)	-.256*** (.048)
Age	.037*** (.004)	.036*** (.005)	.037*** (.004)	.077*** (.008)	.077*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.040*** (.011)	.042*** (.011)	.040*** (.011)	-.172*** (.029)	-.173*** (.029)	-.172*** (.029)
Married	.038* (.021)	.041* (.021)	.038* (.021)	-.066** (.028)	-.068** (.028)	-.067** (.027)
White	.197*** (.058)	.197*** (.058)	.196*** (.058)	.241*** (.080)	.247*** (.079)	.240*** (.080)
Black	.201*** (.060)	.195*** (.060)	.196*** (.061)	.365*** (.085)	.365*** (.084)	.358*** (.084)
Asian	.151** (.062)	.138** (.060)	.152** (.062)	.216*** (.074)	.211*** (.072)	.217*** (.074)
Master's Degree	.076*** (.013)	.076*** (.013)	.077*** (.014)	.069*** (.025)	.068** (.026)	.070*** (.025)
Professional Degree	.022 (.037)	.020 (.039)	.023 (.037)	.031 (.040)	.043 (.041)	.032 (.039)
Doctorate	.217*** (.058)	.227*** (.059)	.214*** (.058)	.310*** (.066)	.319*** (.066)	.307*** (.065)
Metropolitan Area	.034*** (.015)	.029** (.015)	.035** (.014)	.084*** (.030)	.081** (.031)	.086*** (.029)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
N	4121	4121	4121	4121	4121	4121
K-P F			55.95			55.95

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4.11: Effect of Licensure on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Licensure	-.016 (.028)	-.059 (.041)	.040 (.074)	-.021 (.033)	-.041 (.064)	.042 (.082)
Year 1990	-.135*** (.026)	-.112* (.065)	-.148*** (.029)	-.142*** (.051)	-.001 (.115)	-.157*** (.053)
Year 2000	-.114** (.045)	-.112 (.119)	-.136*** (.052)	-.182* (.099)	.061 (.201)	-.207** (.102)
Female	-.019 (.030)	-.021 (.030)	-.021 (.029)	-.255*** (.049)	-.249*** (.049)	-.257*** (.048)
Age	.037*** (.004)	.036*** (.005)	.037*** (.004)	.077*** (.008)	.077*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.040*** (.011)	.041*** (.011)	.040*** (.011)	-.172*** (.029)	-.173*** (.029)	-.172*** (.029)
Married	.038* (.021)	.041* (.021)	.038* (.021)	-.066** (.028)	-.068** (.028)	-.067** (.027)
White	.198*** (.058)	.197*** (.058)	.194*** (.059)	.241*** (.080)	.246*** (.080)	.238*** (.081)
Black	.200*** (.060)	.194*** (.060)	.195*** (.061)	.362*** (.084)	.363*** (.084)	.357*** (.085)
Asian	.152** (.062)	.138** (.061)	.150** (.063)	.218*** (.075)	.210*** (.073)	.215*** (.075)
Master's Degree	.077*** (.013)	.075*** (.013)	.077*** (.014)	.069*** (.025)	.068** (.026)	.070*** (.025)
Professional Degree	.023 (.037)	.021 (.039)	.021 (.036)	.032 (.040)	.043 (.041)	.031 (.040)
Doctorate	.216*** (.058)	.227*** (.059)	.215*** (.057)	.309*** (.066)	.319*** (.066)	.307*** (.065)
Metropolitan Area	.034*** (.015)	.028* (.015)	.036** (.014)	.084*** (.030)	.081** (.031)	.086*** (.029)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
N	4121	4121	4121	4121	4121	4121
K-P F			16.98			16.98

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4.12: Effect of Any Regulation on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
Any Regulation	-.001 (.019)	-.009 (.014)	-.013 (.020)	-.018 (.018)
Year 1990	-.172*** (.018)	-.225*** (.027)	-.137*** (.022)	-.223*** (.033)
Year 2000	-.257*** (.038)	-.361*** (.061)	-.195*** (.043)	-.394*** (.077)
Female	-.060*** (.004)	-.059*** (.004)	-.180*** (.008)	-.179*** (.007)
Age	.048*** (.002)	.048*** (.002)	.086*** (.004)	.086*** (.004)
Age Squared	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.035*** (.004)	.035*** (.004)	-.022*** (.008)	-.022*** (.008)
Married	.033*** (.004)	.033*** (.004)	.001 (.008)	.0002 (.008)
White	-.019* (.011)	-.016 (.011)	-.010 (.013)	-.009 (.014)
Black	.019* (.010)	.024** (.011)	.046** (.018)	.046** (.019)
Asian	-.031** (.015)	-.036** (.015)	-.052* (.027)	-.054* (.028)
Master's Degree	.143*** (.004)	.142*** (.004)	.124*** (.005)	.123*** (.006)
Professional Degree	.106*** (.014)	.106*** (.014)	.061*** (.020)	.061*** (.020)
Doctorate	.130*** (.016)	.133*** (.016)	.125*** (.018)	.128*** (.018)
Metropolitan Area	.056*** (.008)	.056*** (.008)	.061*** (.009)	.064*** (.009)
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.13: Effect of Regulation Named Licensure on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Regulation Named Licensure	.009 (.021)	.004 (.016)	.025 (.036)	-.004 (.023)	-.010 (.015)	.004 (.040)
Year 1990	-.176*** (.018)	-.232*** (.027)	-.182*** (.023)	-.142*** (.023)	-.228*** (.033)	-.145*** (.029)
Year 2000	-.267*** (.037)	-.374*** (.060)	-.282*** (.052)	-.208*** (.043)	-.405*** (.076)	-.215*** (.063)
Female	-.060*** (.004)	-.059*** (.004)	-.060*** (.004)	-.180*** (.008)	-.179*** (.008)	-.180*** (.007)
Age	.048*** (.002)	.048*** (.002)	.048*** (.002)	.086*** (.004)	.086*** (.004)	.086*** (.004)
Age Squared	-.0005*** (.0000)	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.035*** (.004)	.035*** (.004)	.035*** (.004)	-.022*** (.008)	-.022*** (.008)	-.022*** (.008)
Married	.033*** (.004)	.033*** (.004)	.033*** (.004)	.001 (.006)	.0002 (.008)	.001 (.007)
White	-.020* (.011)	-.016 (.011)	-.021* (.011)	-.011 (.013)	-.009 (.014)	-.011 (.014)
Black	.018* (.009)	.023** (.011)	.017 (.010)	.045** (.018)	.046** (.019)	.044** (.019)
Asian	-.031** (.015)	-.036** (.015)	-.031** (.015)	-.052* (.027)	-.054* (.028)	-.052* (.0257
Master's Degree	.142*** (.004)	.142*** (.004)	.142*** (.004)	.124*** (.005)	.123*** (.006)	.124*** (.005)
Professional Degree	.106*** (.014)	.107*** (.014)	.106*** (.014)	.061*** (.019)	.061*** (.020)	.060*** (.019)
Doctorate	.130*** (.016)	.133*** (.016)	.130*** (.016)	.125*** (.018)	.128*** (.018)	.125*** (.018)
Metropolitan Area	.056*** (.008)	.056*** (.008)	.055*** (.008)	.061*** (.009)	.064*** (.009)	.061*** (.009)
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
N	46,609	46,609	46,609	46,609	46,609	46,609
K-P F			10.95			10.95

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4.14: Effect of Licensure on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
Licensure	-.001 (.021)	.004 (.011)	-.010 (.022)	-.004 (.014)
Year 1990	-.172*** (.018)	-.231*** (.026)	-.141*** (.022)	-.231*** (.032)
Year 2000	-.258*** (.036)	-.374*** (.058)	-.204*** (.041)	-.412*** (.073)
Female	-.060*** (.004)	-.059*** (.004)	-.180*** (.008)	-.179*** (.007)
Age	.048*** (.002)	.048*** (.002)	.086*** (.004)	.086*** (.004)
Age Squared	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.035*** (.004)	.035*** (.004)	-.022*** (.008)	-.022*** (.008)
Married	.033*** (.004)	.033*** (.004)	.001 (.008)	.0002 (.008)
White	-.019* (.011)	-.016 (.011)	-.010 (.013)	-.009 (.014)
Black	.019* (.009)	.023** (.011)	.046** (.018)	.046** (.019)
Asian	-.031** (.015)	-.036** (.015)	-.052* (.027)	-.054* (.028)
Master's Degree	.143*** (.004)	.142*** (.004)	.124*** (.005)	.123*** (.006)
Professional Degree	.106*** (.014)	.107*** (.014)	.061*** (.020)	.061*** (.020)
Doctorate	.130*** (.016)	.133*** (.016)	.125*** (.018)	.128*** (.018)
Metropolitan Area	.056*** (.008)	.056*** (.008)	.061*** (.009)	.064*** (.009)
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.15: Effect of Natural Log of Years of Any Regulation on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.093* (.047)	.043 (.052)	.094* (.050)	.073 (.072)
ln(Years of Any Regulation)	.038* (.022)	.025 (.027)	.042 (.026)	.073* (.038)
Female	-.018 (.030)	-.021 (.030)	-.253*** (.048)	-.251*** (.049)
Age	.035*** (.004)	.035*** (.005)	.075*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.036*** (.011)	.040*** (.011)	-.176*** (.029)	-.173*** (.029)
Married	.037* (.021)	.040* (.021)	-.067** (.028)	-.067** (.028)
White	.193*** (.058)	.195*** (.058)	.237*** (.080)	.245*** (.080)
Black	.201*** (.057)	.193*** (.060)	.364*** (.084)	.361*** (.085)
Asian	.147** (.061)	.136** (.060)	.215*** (.073)	.207*** (.073)
Master's Degree	.080*** (.013)	.077*** (.013)	.072*** (.025)	.068** (.026)
Professional Degree	.026 (.038)	.022 (.039)	.035 (.040)	.042 (.041)
Doctorate	.218*** (.058)	.228*** (.059)	.310*** (.067)	.319*** (.067)
Metropolitan Area	.012 (.012)	.025 (.015)	.065** (.027)	.081*** (.030)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	4121	4121	4121	4121

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.16: Effect of Natural Log of Years of Regulation Named Licensure on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation Named Licensure	.110** (.054)	.061 (.066)	.136** (.051)	.113 (.083)
ln(Years of Regulation Named Licensure)	.038 (.024)	.017 (.028)	.042 (.026)	.042 (.041)
Female	-.018 (.031)	-.021 (.030)	-.253*** (.047)	-.249*** (.048)
Age	.035*** (.004)	.035*** (.005)	.076*** (.008)	.076*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.036*** (.011)	.040*** (.011)	-.176*** (.029)	-.174*** (.029)
Married	.036* (.021)	.040* (.021)	-.067** (.027)	-.068** (.027)
White	.193*** (.058)	.196*** (.058)	.237*** (.079)	.246*** (.079)
Black	.201*** (.058)	.194*** (.060)	.365*** (.084)	.364*** (.084)
Asian	.146** (.062)	.136** (.060)	.214*** (.073)	.210*** (.072)
Master's Degree	.079*** (.013)	.077*** (.013)	.071*** (.025)	.068** (.026)
Professional Degree	.025 (.038)	.021 (.040)	.034 (.040)	.042 (.042)
Doctorate	.220*** (.058)	.228*** (.059)	.313*** (.066)	.319*** (.066)
Metropolitan Area	.011 (.013)	.024 (.015)	.065** (.028)	.079** (.030)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	4121	4121	4121	4121

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.17: Effect of Natural Log of Years of Licensure on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.131** (.055)	.102* (.060)	.119* (.065)	.095 (.098)
ln(Years of Licensure)	.062** (.029)	.024 (.024)	.052 (.037)	.037 (.044)
Female	-.018 (.030)	-.021 (.030)	-.253*** (.048)	-.249*** (.049)
Age	.035*** (.004)	.036*** (.005)	.075*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.035*** (.011)	.039*** (.011)	-.177*** (.029)	-.174*** (.029)
Married	.037* (.021)	.040* (.021)	-.067** (.027)	-.068** (.028)
White	.190*** (.058)	.195*** (.058)	.235*** (.079)	.243*** (.079)
Black	.199*** (.058)	.193*** (.060)	.363*** (.083)	.361*** (.084)
Asian	.145** (.062)	.135** (.060)	.214*** (.073)	.208*** (.072)
Master's Degree	.079*** (.013)	.076*** (.013)	.072*** (.025)	.068** (.026)
Professional Degree	.027 (.038)	.022 (.039)	.037 (.040)	.043 (.042)
Doctorate	.221*** (.059)	.228*** (.059)	.313*** (.067)	.321*** (.066)
Metropolitan Area	.012 (.013)	.023 (.015)	.065** (.028)	.080** (.030)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	4121	4121	4121	4121

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.18: Effect of Years of Any Regulation and Years-Squared on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.069 (.057)	.011 (.071)	.105 (.067)	.046 (.103)
Years of Any Regulation	.005 (.012)	.001 (.014)	.019 (.016)	.019 (.021)
Years of Any Regulation – Squared	.0001 (.0006)	-.0002 (.0007)	-.0007 (.0008)	-.0006 (.0011)
Female	-.016 (.031)	-.021 (.030)	-.253*** (.049)	-.250*** (.049)
Age	.035*** (.004)	.036*** (.005)	.075*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.037*** (.011)	.041*** (.011)	-.176*** (.029)	-.173*** (.029)
Married	.037* (.021)	.041* (.021)	-.067** (.028)	-.067** (.028)
White	.197*** (.059)	.197*** (.058)	.235*** (.082)	.244*** (.081)
Black	.206*** (.059)	.195*** (.061)	.361*** (.086)	.361*** (.086)
Asian	.150** (.062)	.137** (.060)	.213*** (.075)	.207*** (.075)
Master's Degree	.079*** (.013)	.077*** (.013)	.072*** (.025)	.068** (.026)
Professional Degree	.026 (.038)	.022 (.039)	.035 (.040)	.042 (.041)
Doctorate	.217*** (.058)	.228*** (.059)	.310*** (.067)	.320*** (.067)
Metropolitan Area	.014 (.012)	.025 (.015)	.066** (.027)	.081*** (.030)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	4121	4121	4121	4121

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.19: Effect of Years of Regulation Named Licensure and Years-Squared on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation Named Licensure	.075 (.070)	.018 (.094)	.144* (.075)	.131 (.125)
Years of Regulation Named Licensure	-.0007 (.017)	-.008 (.023)	.018 (.020)	.023 (.034)
Years of Regulation Named Licensure – Squared	.0005 (.0008)	.0006 (.0012)	-.0007 (.0010)	-.001 (.002)
Female	-.017 (.031)	-.020 (.030)	-.253*** (.048)	-.249*** (.049)
Age	.035*** (.004)	.035*** (.005)	.076*** (.008)	.076*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.036*** (.011)	.040*** (.011)	-.176*** (.029)	-.174*** (.029)
Married	.036* (.021)	.040* (.021)	-.067** (.027)	-.068** (.027)
White	.195*** (.059)	.197*** (.058)	.236*** (.079)	.245*** (.079)
Black	.204*** (.059)	.196*** (.060)	.365*** (.084)	.363*** (.084)
Asian	.150** (.063)	.138** (.060)	.213*** (.072)	.209*** (.072)
Master's Degree	.079*** (.013)	.077*** (.013)	.071*** (.025)	.068** (.026)
Professional Degree	.025 (.038)	.022 (.040)	.033 (.041)	.042 (.042)
Doctorate	.218*** (.058)	.227*** (.059)	.313*** (.066)	.320*** (.066)
Metropolitan Area	.013 (.013)	.023 (.015)	.065** (.028)	.079** (.030)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	4121	4121	4121	4121

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.20: Effect of Years of Licensure and Years-Squared on Wages of Dietitians and Nutritionists

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.181** (.076)	.133 (.102)	.181* (.104)	.141 (.176)
Years of Licensure	.046* (.025)	.021 (.032)	.046* (.034)	.032 (.055)
Years of Licensure – Squared	-.002 (.002)	-.001 (.002)	-.003 (.002)	-.002 (.003)
Female	-.019 (.030)	-.021 (.030)	-.254*** (.048)	-.250*** (.049)
Age	.035*** (.004)	.036*** (.005)	.075*** (.008)	.077*** (.008)
Age Squared	-.0003*** (.0001)	-.0003*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.035*** (.011)	.039*** (.011)	-.177*** (.029)	-.174*** (.029)
Married	.037* (.021)	.040* (.021)	-.067** (.028)	-.068** (.028)
White	.189*** (.058)	.194*** (.058)	.234*** (.079)	.243*** (.080)
Black	.198*** (.058)	.193*** (.060)	.361*** (.083)	.361*** (.085)
Asian	.144** (.061)	.135** (.060)	.212*** (.073)	.207*** (.072)
Master's Degree	.080*** (.013)	.076*** (.013)	.072*** (.025)	.068** (.026)
Professional Degree	.027 (.038)	.022 (.039)	.037 (.040)	.044 (.042)
Doctorate	.221*** (.059)	.228*** (.059)	.314*** (.067)	.320*** (.066)
Metropolitan Area	.012 (.013)	.023 (.015)	.064** (.028)	.079** (.030)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	4121	4121	4121	4121

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.21: Effect of Natural Log of Years of Any Regulation on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.043* (.024)	.036** (.015)	.066*** (.023)	.054*** (.016)
ln(Years of Any Regulation)	.011 (.007)	.013 (.009)	.020*** (.007)	.022** (.009)
Female	-.061*** (.004)	-.060*** (.004)	-.181*** (.008)	-.180*** (.008)
Age	.046*** (.002)	.047*** (.002)	.084*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.023*** (.008)	-.022*** (.008)
Married	.032*** (.004)	.033*** (.004)	-.0002 (.007)	.0001 (.008)
White	-.014 (.011)	-.015 (.011)	-.007 (.013)	-.009 (.014)
Black	.027*** (.009)	.025** (.011)	.050*** (.017)	.048** (.019)
Asian	-.028* (.015)	-.037** (.015)	-.050* (.027)	-.055* (.028)
Master's Degree	.149*** (.004)	.144*** (.004)	.129*** (.005)	.126*** (.005)
Professional Degree	.124*** (.016)	.112*** (.015)	.075*** (.020)	.065*** (.020)
Doctorate	.155*** (.018)	.139*** (.016)	.145*** (.019)	.133*** (.018)
Metropolitan Area	.039*** (.010)	.052*** (.008)	.047*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.22: Effect of Natural Log of Years of Regulation Named Licensure on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
No Regulation Named Licensure	.016 (.033)	.031** (.014)	.109* (.059)	.044 (.033)	.051*** (.014)	.064 (.069)
ln(Years of Regulation Named Licensure)	.003 (.009)	.006 (.013)	.016 (.016)	.013 (.009)	.014 (.013)	.016 (.018)
Female	-.061*** (.004)	-.060*** (.004)	-.060*** (.004)	-.181*** (.008)	-.180*** (.008)	-.180*** (.007)
Age	.046*** (.002)	.047*** (.002)	.047*** (.002)	.084*** (.005)	.086*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	.035*** (.004)	-.023*** (.008)	-.022*** (.008)	-.022*** (.008)
Married	.032*** (.004)	.033*** (.004)	.033*** (.004)	-.0001 (.008)	.0001 (.008)	.0001 (.007)
White	-.014 (.011)	-.016 (.011)	-.015 (.012)	-.006 (.013)	-.009 (.014)	-.009 (.014)
Black	.028*** (.010)	.025** (.011)	.026** (.010)	.052*** (.017)	.047** (.019)	.047** (.019)
Asian	-.027* (.016)	-.036** (.016)	-.037** (.015)	-.049* (.027)	-.055* (.028)	-.055** (.028)
Master's Degree	.150*** (.004)	.144*** (.004)	.144*** (.004)	.130*** (.005)	.125*** (.005)	.125*** (.005)
Professional Degree	.124*** (.016)	.112*** (.015)	.111*** (.015)	.076*** (.020)	.065*** (.020)	.065*** (.020)
Doctorate	.155*** (.018)	.139*** (.016)	.138*** (.016)	.1346*** (.019)	.133*** (.018)	.132*** (.017)
Metropolitan Area	.037*** (.010)	.052*** (.008)	.052*** (.008)	.045*** (.010)	.060*** (.009)	.060*** (.009)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	Yes	No	Yes	Yes
N	46,609	46,609	46,609	46,609	46,609	46,609
K-P F			12.40			12.40

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4.23: Effect of Natural Log of Years of Licensure on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.025 (.030)	.013 (.016)	.051 (.031)	.034** (.016)
ln(Years of Licensure)	.006 (.009)	.008 (.010)	.015* (.009)	.016 (.010)
Female	-.061*** (.004)	-.060*** (.004)	-.181*** (.008)	-.180*** (.008)
Age	.046*** (.002)	.047*** (.002)	.084*** (.005)	.085*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.023*** (.008)	-.022*** (.008)
Married	.032*** (.004)	.033*** (.004)	-.0000 (.008)	.0001 (.008)
White	-.014 (.011)	-.016 (.011)	-.006 (.013)	-.009 (.014)
Black	.028*** (.009)	.025** (.011)	.051*** (.017)	.047** (.019)
Asian	-.027* (.016)	-.036** (.015)	-.050* (.027)	-.055* (.028)
Master's Degree	.150*** (.004)	.144*** (.004)	.130*** (.005)	.125*** (.005)
Professional Degree	.124*** (.016)	.112*** (.015)	.076*** (.020)	.065*** (.020)
Doctorate	.155*** (.018)	.139*** (.016)	.147*** (.019)	.133*** (.018)
Metropolitan Area	.037*** (.010)	.051*** (.008)	.045*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.24: Effect of Years of Any Regulation and Years-Squared on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.038 (.024)	.032** (.016)	.056** (.024)	.046** (.018)
Years of Any Regulation	.002 (.002)	.002 (.002)	.003 (.002)	.004 (.003)
Years of Any Regulation – Squared	-.0000 (.0000)	-.0000 (.0000)	-.0001 (.0001)	-.0001 (.0001)
Female	-.060*** (.004)	-.060*** (.004)	-.181*** (.008)	-.170*** (.008)
Age	.046*** (.002)	.047*** (.002)	.084*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.023*** (.008)	-.022*** (.008)
Married	.032*** (.004)	.033*** (.004)	-.0001 (.008)	.0001 (.008)
White	-.014 (.011)	-.015 (.011)	-.006 (.013)	-.009 (.014)
Black	.027*** (.009)	.025** (.011)	.051*** (.017)	.047** (.019)
Asian	-.028* (.016)	-.037** (.015)	-.050* (.027)	-.054* (.028)
Master's Degree	.149*** (.004)	.144*** (.004)	.129*** (.005)	.126*** (.005)
Professional Degree	.124*** (.016)	.111*** (.015)	.075*** (.020)	.065*** (.020)
Doctorate	.155*** (.018)	.139*** (.016)	.146*** (.019)	.133*** (.018)
Metropolitan Area	.039*** (.010)	.052*** (.008)	.047*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.25: Effect of Years of Regulation Named Licensure and Years-Squared on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation Named Licensure	.011 (.032)	.028* (.015)	.033 (.032)	.044*** (.015)
Years of Regulation Named Licensure	-.0000 (.002)	.0008 (.003)	.001 (.002)	.001 (.003)
Years of Regulation Named Licensure – Squared	.0000 (.0000)	.0000 (.0000)	-.0000 (.0000)	-.0000 (.0001)
Female	-.061*** (.004)	-.060*** (.004)	-.181*** (.008)	-.180*** (.008)
Age	.046*** (.002)	.047*** (.002)	.084*** (.005)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0009*** (.0001)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.023*** (.008)	-.022** (.008)
Married	.032*** (.004)	.033*** (.004)	-.0001 (.008)	.0000 (.008)
White	-.014 (.011)	-.016 (.012)	-.007 (.013)	-.009 (.014)
Black	.027*** (.009)	.025** (.011)	.051*** (.017)	.047** (.019)
Asian	-.027* (.016)	-.037** (.015)	-.049* (.027)	-.055* (.028)
Master's Degree	.150*** (.004)	.144*** (.004)	.130*** (.005)	.125*** (.005)
Professional Degree	.124*** (.016)	.111*** (.015)	.076*** (.020)	.065*** (.020)
Doctorate	.155*** (.018)	.139*** (.016)	.146*** (.019)	.133*** (.018)
Metropolitan Area	.037*** (.010)	.052*** (.008)	.045*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.26: Effect of Years of Licensure and Years-Squared on Wages of Social Workers

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.020 (.029)	.008 (.015)	.039 (.030)	.022 (.018)
Years of Licensure	.0006 (.002)	.001 (.002)	.002 (.002)	.002 (.003)
Years of Licensure – Squared	-.0000 (.0000)	-.0000 (.0001)	-.0000 (.0000)	-.0000 (.0001)
Female	-.061*** (.004)	-.060*** (.004)	-.181** (.008)	-.180*** (.008)
Age	.046*** (.002)	.047*** (.002)	.084*** (.005)	.085*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.023*** (.008)	-.022*** (.008)
Married	.032*** (.004)	.033*** (.004)	.0000 (.008)	.0001 (.008)
White	-.014 (.011)	-.016 (.011)	-.007 (.013)	-.009 (.014)
Black	.027*** (.009)	.025** (.011)	.051*** (.017)	.047** (.019)
Asian	-.027* (.016)	-.036** (.015)	-.050* (.027)	-.055* (.028)
Master's Degree	.145*** (.004)	.144*** (.004)	.129*** (.005)	.125*** (.005)
Professional Degree	.124*** (.016)	.112*** (.015)	.076*** (.020)	.065*** (.020)
Doctorate	.155*** (.017)	.139*** (.016)	.146*** (.019)	.133*** (.018)
Metropolitan Area	.037*** (.010)	.051*** (.008)	.045*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
N	46,609	46,609	46,609	46,609

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4.27: OLS Estimates of the Effect of Regulation-Strictness on Wages of Dietitians and Nutritionists

	(1)	(2)
	Dependent Variable = Natural Log of Hourly Wage	Dependent Variable = Natural Log of Annual Wage
Regulation-Strictness Variables:		
Licensure	.050 (.068)	.146 (.090)
Certification	.095 (.072)	.237*** (.085)
Fraction of Board Comprised of DNs	-.050 (.051)	-.117* (.061)
Continuing Education Hours per Year	.005 (.004)	.011*** (.004)
Practice Hours for Initial Credentials	-.001 (.001)	-.002* (.001)
Application Fee	-.0003 (.0004)	-.0004 (.0006)
Yearly Renewal Fee	-.0003 (.0007)	-.0005 (.0008)
Year 2000	.085* (.045)	-.033 (.076)
Female	-.002 (.047)	-.199** (.075)
Age	.034*** (.006)	.069*** (.011)
Age Squared	-.0003*** (.0001)	-.0007*** (.0001)
Number of Children Less than 5 Years	.038*** (.012)	-.173*** (.034)
Married	.077*** (.022)	-.030 (.030)
White	.229*** (.070)	.320*** (.091)
Black	.273** (.095)	.457*** (.122)
Asian	.174** (.074)	.247** (.105)
Master's Degree	.075*** (.026)	.042 (.038)
Professional Degree	.021 (.052)	.009 (.060)
Doctorate	.217*** (.077)	.291*** (.107)
Metropolitan Area	.081*** (.027)	.145*** (.044)
Other Control Variables		
Industry Groups	Yes	Yes
Exogenous State Variables	Yes	Yes
State Fixed Effects	No	No
Number of States	40	40
N	2020	2020

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. Robust standard errors are in parentheses.

Table 4.28: OLS Estimates of the Effect of Regulation-Strictness on Wages of Social Workers

	(1)	(2)
	Dependent Variable = Natural Log of Hourly Wage	Dependent Variable = Natural Log of Annual Wage
Regulation-Strictness Variables:		
Licensure	-.049***	-.065***
	(.016)	(.020)
Fraction of Board	.051	.031
Comprised of SWs	(.061)	(.076)
Continuing Education	.004***	.006***
Hours per Year	(.001)	(.001)
Experience Hours	.0000***	.0000***
for Initial Credentials	(.0000)	(.0000)
Application Fee	.0002**	.0002**
	(.0001)	(.0001)
Yearly Renewal Fee	-.0003	-.0000
	(.0007)	(.0007)
Bachelor's Exam	.0005	.009
	(.027)	(.041)
Year 1990	-.183***	-.136***
	(.023)	(.026)
Year 2000	-.267***	-.205***
	(.045)	(.048)
Female	-.051***	-.170***
	(.009)	(.016)
Age	.042***	.080***
	(.004)	(.004)
Age Squared	-.0004***	-.0008***
	(.0000)	(.0001)
Number of Children	.030***	-.028**
Less than 5 Years	(.006)	(.012)
Married	.046***	.009
	(.008)	(.011)
White	-.002	.034
	(.018)	(.026)
Black	.025	.080**
	(.021)	(.037)
Asian	-.084**	-.165*
	(.040)	(.096)
Master's Degree	.139***	.124***
	(.007)	(.009)
Professional Degree	.090*	.067
	(.046)	(.055)
Doctorate	.131***	.181***
	(.033)	(.054)
Metropolitan Area	.065***	.064***
	(.007)	(.011)
Other Control Variables		
Industry Groups	Yes	Yes
Exogenous State Variables	Yes	Yes
State Fixed Effects	No	No
Number of States	33	33
N	16,094	16,094

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. Robust standard errors are in parentheses.

Chapter 5: Quality of Service under Occupational Licensure

5.1 Introduction

From a public policy perspective, important justifications for occupational licensure are that licensure improves the quality of service rendered to consumers and licensure protects consumers by reducing the availability of un-credentialed substitutes. By meeting licensure requirements, licensees demonstrate some minimum level of competency in the occupation. Individuals who cannot meet the licensure requirements are excluded from the occupation via the practice restriction component of licensure. Thus, licensure can be seen as a "signal" of quality that demonstrates to other members of the occupation and to consumers that an individual is committed to the work of the occupation (Spence 1973).

To the extent that licensure requirements are correlated with the actual skills needed to provide quality service, licensure may increase the average quality of service provided by practitioners in the occupation. However, the requirements for licensure do not always correlate well with the occupational skills required to provide the service. African-style hair braiders in 39 states, for example, must obtain a cosmetology[117] license involving up to 2,100 hours of training that is unrelated to braiding (Goldstein 2012; Institute for Justice 2015). Since the licensure requirements for cosmetology are unrelated to the skills needed to provide service as a hair braider, it is unlikely that licensure increases the quality of hair braiding. Thus, there is no guarantee that licensure will increase the average quality of service provided.

As noted in Chapter 1, there are very few empirical studies of the quality effects of occupational licensure. These studies yield mixed results, with most failing to find evidence of quality improvements. In the long run, minimum quality standards associated with licensure

[117] In some states, hair braiders are required to obtain a hairdressing license instead of a cosmetology license, but the hairdressing license does not include instruction on African-style hair braiding.

may actually provide a ceiling on the quality of services delivered to consumers (Ryoo 1996). The result may be a lower average quality of service under licensure than was available when the occupation was unregulated.

Economic theory suggests that occupational licensure may decrease the number of practitioners in an occupation and increase the price of service. These effects are likely to reduce access to the service for some consumers, because the supply is constrained when providers are not available or services are too expensive in the immediate area. For occupations where the quality of service may be improved by licensure, the increase in quality is only available to consumers who can afford to pay the higher price for service or who have insurance that covers the service (e.g., medical insurance that covers physician's services). Failure to obtain service can be viewed as a reduction in the quality of service for those who are excluded.

5.2 Research Design

Practitioners in health and social services occupations have the potential to impact the physical and emotional well-being of consumers, so an argument can be made that licensing those occupations to ensure competency of practitioners and improve the quality of service is in the public interest. Few studies have attempted to empirically test the public interest hypothesis to assess the impact of occupational licensure on quality. As noted in Chapter 2, empirical studies have found either no quality improvement due to licensure of public school teachers or uncertain effects on quality as measured by student achievement test scores.[118] I am not aware of any studies of the impact of licensure of registered nurses (RNs), dietitians and nutritionists (DNs), or social workers (SWs) on the quality of services provided by practitioners of those occupations.

[118] These studies include Kleiner and Petree (1988), Kane, Rockoff, and Staiger (2005), and Kane and Staiger (2005).

This chapter analyzes whether licensing DNs and SWs, both health and social services occupations, has impacted the quality of the services they provide to consumers.

Measuring the quality of services provided by DNs and SWs is challenging. I am not aware of any generally available data that associates specific actions by a DN or SW with specific outcomes for consumers. Thus, there is no visibility into individual cause and effect scenarios, so it is not possible to directly measure whether or not, on average, a licensed DN or SW provides a higher quality of service than an unlicensed DN or SW. Also, the scope of both the DN and SW occupations encompasses a number of specialized practice areas. This makes it difficult to isolate one particular variable to use as a measure of quality. The field of dietetics, for example, includes clinical dietitians, who provide nutritional services to patients in hospitals and other health care facilities; community dietitians, who counsel individuals and groups on nutritional practices to prevent disease and promote health; management dietitians, who oversee large-scale meal planning and preparation in various institutions; and consultant dietitians, who perform nutrition screenings and offer advice on diet-related concerns such as weight loss and cholesterol control. The field of social work, on the other hand, includes direct-service social workers, who help people solve and cope with problems in their everyday lives; and clinical social workers, who diagnose and treat mental disorders and emotional issues.

Since both DNs and SWs are health and social services occupations, it is reasonable to expect that the services provided by DNs and SWs should improve, or at least not adversely affect, the physical and mental health of the consumers of their services. I measure the quality of services provided by DNs and SWs using individual-level health indicators that may improve when the consumer purchases those services. One example of such a health indicator is whether or not an individual has high blood pressure. Dietary improvements suggested by DNs may

lower blood pressure. Similarly, resolution of emotional issues in consultation with SWs may also lower blood pressure. Thus, modeling a health indicator as a function of licensure of DNs or SWs provides a way to estimate whether licensure of DNs or SWs improves the quality of service provided, where the measure of the quality of service is the improvement in the health indicator.

Typically, empirical models for the quality of service under licensure analyze data for a single state or data that is aggregated by state. I take a different approach and analyze individual level survey data that includes observations from different states over several decades and an assortment of health indicators that can be used as measures of the quality of service provided. With individual level data, I am able to control for individual demographic variables, as well as state and year fixed effects and the type of regulation in effect during the observation year. I estimate separate health indicator models for DNs and SWs for the case of any regulation of the occupation and for licensure of the occupation.

5.3 Data

To analyze whether licensure has had an impact on the quality of service provided by DNs and SWs, I use data from the Behavioral Risk Factor Surveillance System (BRFSS)[119] that includes health survey responses by individuals over the period from 1984 through 2013. The BRFSS is a cross-sectional telephone survey conducted monthly by state health departments with technical and methodological assistance provided by the Center for Disease Control (CDC). BRFSS data include year, state, basic individual-level demographic information, and individual responses to a number of health-related questions that generate information about health risk behaviors, clinical preventive practices, and health care access and use, primarily related to chronic disease and

[119] The Behavioral Risk Factor Surveillance System data is available through the Center for Disease Control and Prevention website (http://www.cdc.gov/brfss/).

injury. Some states did not begin conducting surveillance of BRFSS data until after 1984. Table 5.1 shows the states conducting surveillance of BRFSS data by year and also the year of first regulation of DNs and SWs by state.

Options for health indicators are limited by data availability, since the health-related questions and possible responses sometimes change from year to year. There are five indicators that may be impacted by the work of DNs and three indicators that may be impacted by the work of SWs and can be defined from the available data. For DNs, these include: BMI (Body Mass Index),[120] Obesity (BMI >= 30),[121] Exerciser ("Do you participate in any physical activity or exercise?"), High Blood Pressure ("Have you been told that you have high blood pressure?"), and High Cholesterol ("Have you been told that you have high cholesterol?"). For SWs, these include: High Blood Pressure, Smoker ("Do you smoke?"), and Poor Mental Health Days ("How many days in a month would you say your mental health was poor?"). Table 5.2 shows the years of availability of these health indicators in the BRFSS data.

The exact questions in the BRFSS survey sometimes change from one year to the next, so construction of the health indicator variables required finding variable definitions that remain constant over the survey years, despite the changes in survey questions. The relevant survey questions and how the response choices are mapped to health indicator variables are included in the appendix of this chapter. The resulting health indicator variables for obesity, exerciser, high blood pressure, high cholesterol, and smoker are all binary variables with values 0 (for no) and 1 (for yes), irrespective of intensity.[122] BMI is proportional to the ratio of an individual's weight in

[120] BMI (body mass index) is a measure of body fat based on height and weight that applies to adult men and women.
[121] The Center for Disease Control defines obesity as a BMI >= 30, http://www.cdc.gov/obesity/adult/defining.html .
[122] For obesity, yes means the individual has a BMI that is greater than or equal to 30. For exerciser, yes means the individual currently participates in physical activity or exercise. For high blood pressure, yes means the individual has been told that he or she has high blood pressure. For high cholesterol, yes means the individual has been told that he or she has high cholesterol. For smoker, yes means the individual is currently a smoker.

pounds to the square of the individual's height in inches.[123] Therefore, BMI is a normalized, continuous variable. The number of poor mental health days in the last month is a constrained, count variable with minimum value 0 and maximum value 30. Summary statistics are included in Table 5.3. If licensure of DNs or SWs increases the quality of service provided, licensure may be associated with improvement in the health indicator variables. This improvement would appear as a reduction in BMI or the number of poor mental health days; as a reduction in the probability that an individual is obese, is a smoker, or has high blood pressure or high cholesterol; or as an increase in the probability that an individual is an exerciser.

5.4 Empirical Model

To estimate the effect of state licensure of DNs and SWs on quality of service, I use a fixed effects model of the form:

$$H_{it} = \beta_0 + \beta_1 R_{st} + \boldsymbol{\beta}_2' \boldsymbol{D}_{it} + \boldsymbol{\beta}_3' \boldsymbol{S}_{st} + \gamma_s + \tau_t + \varepsilon_{it}$$

where the dependent variable H is one of eight health indicators for individual i in year t, R is a regulation variable (any regulation or licensure) in state s in year t, **D** is a vector of characteristics for individual i in year t, **S** is a vector of exogenous state characteristics in state s in year t, γ includes state fixed effects, τ includes year fixed effects, and ε is a random disturbance term for individual i in year t. The health indicators derived from the health-related questions in the BRFSS data serve as measures of the quality of service provided by DNs or SWs.

For each occupation (DNs and SWs), I estimate separate empirical models for each combination of one of several health indicator variables and one of two state regulation variables (any regulation and licensure). Year dummies are for the 30 years from 1984 through 2013, except for the high blood pressure, high cholesterol, and poor mental health day variables for

[123] BMI = (weight in pounds * 703)/(height in inches * height in inches).

which BRFSS data was not available in some years as noted in Table 5.2. Individual characteristic variables include gender (female, male), age, age-squared, marital status (married, not married), race (white, black, Asian, other), education (less than high school, high school, some college, a bachelor's degree or higher), employment status (employed, not employed), number of adults in the household, and income level (very low income, low income, medium income, high income).[124] The state characteristic variables are state population[125] and per capita state GDP.[126]

I estimate fixed effects linear models for BMI and the six binary variables (obese, drinker, exerciser, high blood pressure, high cholesterol, and smoker). For the number of poor mental health days indicator variable, I estimate a two-part model. The first part is a fixed effects model for the number of poor mental health days using data for all individuals that respond to the mental health days question on the BRFSS survey. The second part is a fixed effects model for the natural log of the number of poor mental health days using data just for individuals who reported having a non-zero number of poor mental health days during the last month. Using the same IVs used for regulation variables in the wage models in Chapter 4, I also estimate 2SLS models for all of the health indicator variables.

5.5 Empirical Results

This section discusses the results of the empirical analysis for both DNs and SWs.

5.5.1 Dietitians and Nutritionists

The top row of Table 5.4 (labeled FE) reports the FE estimates of the effect of any regulation of DNs on five health indicator variables (BMI, obesity, exerciser, high blood pressure, and high

[124] For 1984-1993, very low income = $14,999 or less, low income = $15,000 - $24,999, medium income = $25,000 - $49,000, and high income = $50,000 or more. For 1994-2013, very low income = $24,999 or less, low income = $25,000 - $49,999, medium income = $50,000 - $74,999, and high income = $75,000 or more.
[125] The source for state population data is the U.S. Census (http://www.census.gov).
[126] The source for state per-capita gross domestic product is the Bureau of Economic Analysis (http://www.bea.gov).

cholesterol) that may be impacted by services provided by DNs. FE models control for endogeneity caused by within state variations over time. Each column in the FE row of Table 5.4 is a separate model. All FE models control for year and state fixed effects and cluster standard errors at the state level. The coefficient of the any regulation variable is negative for every health indicator variable, indicating that regulation of DNs is associated with a reduction in BMI, a reduction in the probability that an individual is obese or an exerciser, and a reduction in the probability that an individual has high blood pressure or high cholesterol. Except for the exerciser variable, the negative coefficients indicate an improvement in the health indicators due to regulation. Coefficients are statistically significant for BMI, obesity, and exerciser. On average, regulation of DNs is associated with a .103 decrease in BMI, a 0.4 percentage point decrease in the probability that an individual is obese, and a 2.9 percentage point decrease in the probability that an individual is an exerciser.[127]

I tested both of the IVs[128] used for regulation variables in the wage models in Chapter 4 to determine if (1) they are correlated with the regulation variables, but not with the health indicator variables, (2) they have the correct directional sign in the first stage, and (3) they have enough power as instruments for any regulation or licensure of DNs to be used in 2SLS models to estimate the impact of any regulation or licensure of DNs on the health indicator variables. The test statistic when standard errors are clustered is the Kleibergen-Paap rk Wald F-statistic. Based on the Staiger and Stock (1997) rule-of-thumb, when the F-statistic is 10 or more, the IVs have sufficient power for use in the models. Neither of the two IVs from Chapter 4 has the power to be used as an instrument for licensure of DNs. One IV, percentage of Democrats in the

[127] The BMI scale ranges from 12 to 69, so a change of .103 ranges from an 8.33% to a .15% decrease in BMI due to regulation of DNs.

[128] The IVs used for regulation variables in Chapter 4 were (1) percentage of Democrats in the state legislature minus the percentage of Republicans in the state legislature two years before any regulation of DNs in the state, and (2) percentage turnover in the State House in the first year of any regulation of DNs in the state.

state legislature minus the percentage of Republicans in the state legislature two years before any regulation of DNs in the state, does have enough power to be used as an instrument for any regulation of DNs, but only in models that do not control for state FEs.

The second row of Table 5.4 (labeled 2SLS (without FE)) reports the 2SLS estimates of the effect of any regulation of DNs on the five health indicator variables that may be impacted by services provided by DNs. The 2SLS models control for possible endogeneity due to uncertain causality between the health indicator variables and regulation of DNs. Again, each column in the 2SLS row of Table 5.4 is a separate model. All 2SLS models control for year fixed effects and cluster standard errors at the state level. The Kleibergen-Paap rk Wald F-statistic is shown for each model. Values are greater than 10, but not by much, indicating that the selected IV may be weak. The coefficient of the any regulation variable is positive for BMI, obesity, and high blood pressure, and negative for exerciser and high cholesterol. Except for the high cholesterol variable, the coefficients indicate a worsening of the health indicators due to regulation. Coefficients are statistically significant for exerciser and high blood pressure. On average, regulation of DNs is associated with an 18.2 percentage point decrease in the probability that an individual is an exerciser and a 3.6 percentage point increase in the probability that an individual has been told that he or she has high blood pressure. The latter could be due to increased reporting of negative health indicators (such as high blood pressure) when individuals who are loss averse seek the services of a DN when regulation is enacted.

Since the selected IV does not have sufficient power to be used in 2SLS models with FE, I cannot control for both within state variations over time and uncertain causality. Therefore, the impact of any regulation of DNs on the five health indicator variables in Table 5.4 is uncertain. There appears to be a decrease in the probability that an individual is an exerciser that is

statistically significant and a decrease in the probability that an individual has high cholesterol that is not significant. The signs of the coefficients of the BMI, obesity, and high blood pressure health indicator variables flip between the FE and 2SLS (without FE) models, so the significant negative FE coefficients (for BMI and obesity) and positive 2SLS coefficient (for high blood pressure) may not be accurate. The FE coefficients for BMI and obesity indicate a very small positive impact on the health indicators. At the sample mean BMI of 26.43, a .103 reduction in BMI is only a 0.39% reduction; and the coefficient for obesity indicates only a 0.4 percentage point decrease in the probability that an individual is obese. So, any positive impact on health indicators due to regulation of DNs is uncertain and very small (less than 0.5%).

Table 5.5 reports the FE estimates of the effect of licensure of DNs on the five health indicator variables that may be impacted by services provided by DNs. Again, each column is a separate model and all FE models control for year and state fixed effects and cluster standard errors at the state level. Table 5.5 does not include a row of coefficients estimated by 2SLS, since the selected IV does not have enough power to be used as an instrument for licensure of DNs in the quality models. The FE coefficients of the licensure variable are positive for every health indicator variable except high cholesterol, which indicates a worsening of the health indicators for BMI, obesity, and high blood pressure. All of the coefficients are small and only the coefficient of the licensure variable for the high blood pressure model is statistically significant. On average, licensure of DNs is associated with a 1.4 percentage point increase in the probability that an individual has been told that he or she has high blood pressure. Again, this could be due to increased reporting of negative health indicators due to licensure of DNs, instead of a reduction in the quality of service provided. I find no evidence that licensure of DNs improves the quality of service provided to consumers.

5.5.2 Social Workers

Tables 5.6 and 5.7 report the FE estimates of the effect of any regulation and licensure of SWs, respectively, on three health indicator variables (high blood pressure, smoker, and poor mental health days) plus the natural log of the number of poor mental health days, all of which may be impacted by services provided by SWs. Again, each column is a separate model and all FE models control for year and state fixed effects and cluster standard errors at the state level. Neither table for SWs includes coefficients estimated by 2SLS, because neither of the IVs used for regulation variables in the wage models in Chapter 4 has enough power to be used as an instrument for any regulation or licensure of SWs in the quality models.

The coefficient of the any regulation variable is positive for every health indicator variable in Table 5.6, which indicates a worsening of the health indicators due to any regulation. Only the coefficient of the any regulation variable for the model for the natural log of the number of poor mental health days is statistically significant. I find that any regulation of SWs is associated with a 1.41 percentage increase in the number of poor mental health days for individuals reporting a non-zero number of poor mental health days, and I find no evidence that any regulation of SWs improves the quality of service provided to consumers.

In Table 5.7, the coefficient of the licensure variable is negative for high blood pressure and poor mental health days, indicating an improvement in those health indicators, and positive for smoker and the natural log of poor mental health days, indicating a worsening of those health indicators. Only the coefficients of the licensure variable for smoker and the number of poor mental health days are statistically significant. I find a .7 percentage point increase in the probability that an individual is a smoker due to licensure of SWs. I also find that licensure is associated with a decrease of .054 in the number of poor mental health days. At the sample

mean number of poor mental health days of 3.32 days, licensure of SWs cause a 1.6% decrease, on average, in the number of poor mental health days. This is a small, yet statistically significant improvement in the quality of service due to licensure of SWs.

5.6 Conclusions and Discussion

In this chapter, I use primarily FE analysis, with some 2SLS (without FE) analysis, to determine the impact of any regulation or licensure of DNs and SWs on the quality of service provided by modeling how regulation impacts a number of health indicator variables selected for each occupation. For DNs, I find very small improvements in two health indicator variables due to any regulation. The improvements are a 0.39% decrease in BMI at the sample mean and a 0.4 percentage point decrease in the probability of obesity. However, I find no evidence that licensure of DNs improves the quality of service. For SWs, I find no evidence that any regulation of SWs improves the quality of service. However, I find a very small (.054) decrease in the number of poor mental health days due to licensure of SWs. Thus, I find small improvements in quality due to any regulation of DNs (as measured by BMI and the probability of obesity) and due to licensure of SWs (as measured by the number of poor mental health days).

These results for DNs and SWs can be compared with those found in the literature for RNs and public school teachers. In the case of RNs, no studies of the impact of licensure on the quality of service are found. Like DNs and SWs, the broad scope of the RN occupation, which encompasses a number of specialized practice areas, makes it difficult to identify individual cause and effect scenarios that can be used to study the quality of service provided by RNs. For public school teachers, the availability of achievement test scores provides a measure of quality of service by teachers that was used by Kleiner and Petree (1998), but yielded uncertain results on the impact of licensure on quality of service. Other studies found no quality improvement for

teachers due to licensure. I also find no impact on quality for DNs and SWs in some cases (licensure of DNs and any regulation of SWs) and uncertain impact in other cases (any regulation of DNs). However, my results differ from those for public school teachers because I find small improvements in the quality of service due to any regulation of DNs and licensure of SWs in some cases.

With observations from up to 30 survey years for each health indicator variable, there are between one and six million observations for each empirical model. However, there is no way to know from the BRFSS data whether or not an individual who responded to the survey actually consumed services provided by DNs or SWs. Instead, this analysis focuses on the effect of licensure of DNs and SWs on the health indicator variables for individuals in the state, independent of whether or not an individual survey responder consumed the services of DNs or SWs.

Caution is warranted when interpreting changes in the health indicator variables. There are population groups (such as athletes and the elderly) for whom an increase in BMI may indicate health improvement. Also, the BRFSS survey identifies an individual as having high blood pressure (or high cholesterol) if the individual was ever told that he or she had that condition. Thus, the BRFSS data will not capture cases where an individual with high blood pressure or high cholesterol is able to successfully manage that condition, perhaps due to the services of a DN or a SW. It is also possible that an individual who is loss averse will seek the services of a DN or SW when licensure is enacted and learn that he or she is obese or has high blood pressure or high cholesterol as a result of that service. This may result in increased reporting of negative health indicators as a result of licensure, even though they do not result from poor quality of service by practitioners. However, there may also be individuals who are

denied access to the services of licensed DNs or SWs due to supply constraints and higher prices. For those individuals, there may be a decrease in the reporting of negative health indicators as a result of licensure. Therefore, the net effect of licensure on reporting of negative health indicators in the survey population is unclear.

The effectiveness of this empirical study is subject to a few limitations. First, the BRFSS data is collected via a telephone survey that asks personal questions about height, weight, medical history, mental state, and personal habits. Individuals might lie when answering these questions over the phone and this could introduce bias into the data. Second, the reason for using the BRFSS data over other possible options is to take advantage of the individual level data; however, there is no way to know which individuals consumed the services of DNs or SWs and whether the health indicators derived from the BRFSS data are suitable proxies for quality of service. In the case of DNs, for example, instead of knowing whether an individual was ever told that he or she had high blood pressure or high cholesterol, it would be more useful to know if an individual who has high blood pressure or high cholesterol is able to manage or reverse those conditions via dietary choices. Similarly, for SWs, in addition to the number of poor mental health days per month, it would be useful to know how long it has been since the individual experienced a life event (such as divorce, death, job loss, family violence, etc.) that might trigger poor mental health days. Third, in the case of SWs, 13 of the 36 states that regulate SWs by 2013 began that regulation before 1984, the first year of the BRFSS survey data. Therefore, any immediate improvement in quality of service due to regulation requirements for those 13 states that regulated SWs before 1984 will not affect the empirical results. Finally, there is considerable variation in the BRFSS questions and response options from one year to the

next. This reduces the number of health indicators that can be used as quality of service measures.

Despite these limitations stemming from the use of the BRFSS data, the empirical results in this chapter have important policy implications. Although I find evidence of a positive effect on some health indicators due to any regulation or licensure of DNs or SWs, the effects are small and, in some cases, uncertain. As a result, my findings do not strongly support the public interest theory that licensure of DNs and/or SWs is justified primarily based on improvements in the quality of service provided to the consumer. This is in contrast to both the Academy of Nutrition and Dietetics[129] and the American Social Work Boards[130] which promote licensure of DNs and SWs, respectively, as a means to signal higher quality of service.

5.7 Tables

[129] The website for the Academy of Nutrition and Dietetics is http://www.eatright.org .
[130] The website for the American Social Work Boards is http://www.aswb.org .

Table 5.1: States Conducting Surveillance of BRFSS Data, by Year

Table 5.1 – Page 1 of 2			
State	Year	First Year of Regulation of DNs	First Year of Regulation of SWs
Alabama	1986-2013	1984 TP; 1989 L	1978 TP
Alaska	1991-2013	2000 C	2001 L
Arizona	1984-2013	-	2004 L
Arkansas	1991, 1993-2013	1989 L	1981 L
California	1984-2013	1983 TP	-
Colorado	1990-2013	-	-
Connecticut	1985, 1988-2013	1994 C	-
Delaware	1990-2013	1994 C; 2009 L	-
Florida	1985-2013	1988 L	-
Georgia	1985-2013	1984 C; 1994 L	-
Hawaii	1986-2013	2009 L	1994 L
Idaho	1984-2013	1995 C	1993 L
Illinois	1984-2013	1992 L	-
Indiana	1984-2013	1994 C	-
Iowa	1988-2013	1986 L	1985 L
Kansas	1992-2013	1989 L	1974 L
Kentucky	1985-2013	1988 C; 1994 L	1974 TP
Louisiana	1990-2013	1987 C; 1988 L	2000 L
Maine	1987-2013	1985 C; 1988 L	1977 L
Maryland	1987-2013	1986 C; 1989 L	1957 L
Massachusetts	1986-2013	1999 C	1980 L
Michigan	1988-2013	2007 C	1978 L
Minnesota	1984-2013	1995 L	2005 L
Mississippi	1990-2013	1986 C; 1994 L	1972 L
Missouri	1986-2013	1995 L	1989 L

L = Licensure; C = Certification; TP = Title Protection

Table 5.1 – Page 2 of 2			
State	Year	First Year of Regulation of DNs	First Year of Regulation of SWs
Montana	1984-2013	1983 TP; 1987 L	-
Nebraska	1987-2013	1988 L	1993 L
Nevada	1992-2013	1995 C	1999 L
New Hampshire	1987-2013	2001 L	-
New Jersey	1991-2013	-	1991 L
New Mexico	1986-2013	1990 L	1990 L
New York	1985-2013	1991 C	-
North Carolina	1984-2013	1992 L	1992 L
North Dakota	1985-2013	1986 L	1987 L
Ohio	1984-2013	1987 L	1984 L
Oklahoma	1988-2013	1985 C	1981 L
Oregon	1989-2013	1990 L	1990 TP
Pennsylvania	1989-2013	2002 C	1990 TP
Rhode Island	1984-2013	1991 C; 1992 L	-
South Carolina	1984-2013	2006 L	1976 L
South Dakota	1987-2013	1996 L	1975 L
Tennessee	1984-2013	1987 L	1986 L
Texas	1987-2013	1984 C	1999 L
Utah	1984-2013	1986 C	1994 L
Vermont	1990-2013	1995 C	-
Virginia	1989-2013	1995 TP	1979 L
Washington	1987-2013	1988 C	-
West Virginia	1984-2013	1996 L	1997 TP
Wisconsin	1984-2013	1994 C	1991 L
Wyoming	1993-2013	2012 L	2000 L

L = Licensure; C = Certification; TP = Title Protection

Table 5.2: Years of Availability for Health Indicators Derived from BRFSS Data

Health Factor	Years of Available BRFSS Data
BMI	1984-2013
Obese	1984-2013
Drinker	1984-2013
High Blood Pressure	1984 - 2005, 2007, 2009, 2011, 2013
High Cholesterol	1987 - 2005, 2007, 2009, 2011, 2013
Smoker	1984-2013
Poor Mental Health Days	1993-2013

Table 5.3: Summary Statistics for Health Indicators Derived from BRFSS Data

Summary Statistics for Health Indicators								
Quality Measure	Mean	Standard Deviation	Min	Max	Observations	Average Age	Female	Male
BMI	26.43	5.96	12	69	5734116	45.25	50%	50%
Obese	0.21	0.41	0	1	5734116	45.25	50%	50%
Exerciser	0.65	0.48	0	1	5728834	45.25	50%	50%
High Blood Pressure	0.42	0.49	0	1	3397205	45.00	51%	49%
High Cholesterol	0.17	0.38	0	1	4199863	45.03	51%	49%
Smoker	0.22	0.41	0	1	5730501	45.25	50%	50%
Poor Mental Health Days	3.32	7.38	0	30	5734116	45.25	50%	50%

Summary Statistics for BRFSS Data					
Average Age		45		Education	
Average Number of Adults Per Household		2.2		Less Than High School	21%
Sex				High School	26%
	Female	50%		Some College	24%
	Male	50%		College – Bachelor's Degree or More	29%
Marital Status				Employment Status	
	Married	59%		Employed	61%
	Not Married	41%		Not Employed	39%
Race				Income Level	
	White	75%		Very Low Income	21%
	Black	10%		Low Income	23%
	Asian	4%		Medium Income	27%
	Other	11%		High Income	29%

Table 5.4: Coefficients of Any Regulation Variable for FE and 2SLS (without FE) Models Estimating the Impact of Any Regulation on Different Health Indicators for Dietitians and Nutritionists

Dependent Variables =	BMI	Obesity	Exerciser	High Blood Pressure	High Cholesterol
Models					
FE	-.103** (.042)	-.004* (.002)	-.029** (.012)	-.006 (.005)	-.010 (.007)
2SLS (without FE)	.136 (.290)	.012 (.019)	-.182*** (.053)	.036*** (.013)	-.006 (.013)
Kleibergen-Paap Wald rk F Statistic	11.28	11.28	11.27	12.67	11.88
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Clustering by State	Yes	Yes	Yes	Yes	Yes
N	5734116	5734116	5728834	3397205	4199863

Each column represents a different health indicator and a different empirical model. In addition to the any-regulation dummy, other control variables include the number of adults in the household, age, age-squared, gender, race (white, black, Asian, and other), marital status (married and not married), education status (less than high school, high school, some college, bachelor's degree or more), employment status (employed, not employed), income level (very low income, low income, medium income, and high income), population, and per-capita state GDP. Robust standard errors are in parentheses. * Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

Table 5.5: Coefficients of Licensure Variable for FE Models Estimating the Impact of Licensure on Different Health Indicators for Dietitians and Nutritionists

Dependent Variables =	BMI	Obesity	Exerciser	High Blood Pressure	High Cholesterol
Model					
FE	.031 (.085)	.004 (.004)	.008 (.015)	.014* (.007)	-.010 (.007)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Clustering by State	Yes	Yes	Yes	Yes	Yes
N	5734116	5734116	5728834	3397205	4199863

Each column represents a different health indicator and a different empirical model. In addition to the licensure dummy, other control variables include the number of adults in the household, age, age-squared, gender, race (white, black, Asian, and other), marital status (married and not married), education status (less than high school, high school, some college, bachelor's degree or more), employment status (employed, not employed), income level (very low income, low income, medium income, and high income), population, and per-capita state GDP. Robust standard errors are in parentheses. * Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

Table 5.6: Coefficients of Any Regulation Variable for FE Models Estimating the Impact of Any Regulation on Different Health Indicators for Social Workers

Dependent Variables =	High Blood Pressure	Smoker	Poor Mental Health Days	ln(Poor Mental Health Days)
Model				
FE	.031 (.085)	.004 (.004)	.008 (.015)	.014* (.007)
Year Fixed Effects	Yes	Yes	Yes	Yes
Clustering by State	Yes	Yes	Yes	Yes
N	3397205	5730501	5734116	1680509

Each column represents a different health indicator and a different empirical model. In addition to the any-regulation dummy, other control variables include the number of adults in the household, age, age-squared, gender, race (white, black, Asian, and other), marital status (married and not married), education status (less than high school, high school, some college, bachelor's degree or more), employment status (employed, not employed), income level (very low income, low income, medium income, and high income), population, and per-capita state GDP. Robust standard errors are in parentheses. * Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

Table 5.7: Coefficients of Licensure Variable for FE Models Estimating the Impact of Licensure on Different Health Indicators for Social Workers

Dependent Variables =	High Blood Pressure	Smoker	Poor Mental Health Days	ln(Poor Mental Health Days)
Model				
FE	-.006 (.007)	.007*** (.003)	-.054** (.021)	.011 (.012)
Year Fixed Effects	Yes	Yes	Yes	Yes
Clustering by State	Yes	Yes	Yes	Yes
N	3397205	5730501	5734116	1680509

Each column represents a different health indicator and a different empirical model. In addition to the licensure dummy, other control variables include the number of adults in the household, age, age-squared, gender, race (white, black, Asian, and other), marital status (married and not married), education status (less than high school, high school, some college, bachelor's degree or more), employment status (employed, not employed), income level (very low income, low income, medium income, and high income), population, and per-capita state GDP. Robust standard errors are in parentheses. * Significant at the 10% level; ** Significant at the 5% level; and *** Significant at the 1% level.

Chapter 6: Summary and Conclusions

The long history of occupational regulation in the United States has resulted in a large number of regulated occupations and a large percentage of the U.S. workforce that is subject to regulation. There are four types of occupational regulation: registration, title protection, certification, and licensure. These types of regulation differ by how restrictive they are for the regulated individual and by how much information they provide to the consumer. Licensure is the most restrictive form of occupational regulation, since it includes practice restriction, making practice in a licensed profession illegal without a license.

The practice restriction component of licensure leads to economic effects. When state licensure boards manipulate licensure requirements to control the number of practitioners in an occupation, the result may be a reduction in the number of practitioners and reduced access to services for consumers. This reduction in supply may increase wages for practitioners and increase the price of services paid by consumers. The expectation is that licensure improves the quality of service provided to consumers through minimum competency requirements that practitioners must meet to acquire a license. Literature on the economic effects of occupational licensure is mixed, with results depending on the occupation studied.

There are two contrasting theories about why states license occupations. The public interest theory focuses on the consumer protection aspect of occupational licensure, while the rent capture theory focuses on the restricted entry aspect of occupational licensure. The two economic theories look at occupational licensing from different viewpoints, but both perspectives are important to an understanding of the topic. Practitioners must request licensure in order for the state legislature to consider it, while the proposed legislation must benefit

consumers in order for the state legislature to pass it. Characteristics of both the occupation and the state (including the state legislature) affect whether an occupation is licensed in that state.

In this dissertation, I extend the existing literature by investigating the economic effects of state regulation of two occupations: dietitians and nutritionists (DNs) and social workers (SWs). These occupations have not been extensively studied in the literature and they share several characteristics that set them apart from some other regulated occupations that require a bachelor's degree, including high percentages of female, part time, and institutional workers; strong occupational associations; and different types of state regulations. In a number of ways that affect the likelihood of occupational regulation, DNs and SWs are similar to registered nurses (RNs) and public school teachers, two occupations that have been studied in the literature. All four occupations deal with the health and welfare of consumers, require a minimum of a bachelor's degree, and have strong professional associations, high percentages of institutional and female employment, and low wages relative to other occupations that require a bachelor's degree. These similarities suggest that the literature on the economic effects of licensure of RNs and public school teachers might provide insight into the economic effects of licensure of DNs and SWs. For RNs and public school teachers, licensure is not found to affect the number of practitioners or the quality of service provided by practitioners, and there is also no evidence of a lasting wage premium due to licensure. I compare my empirical results for DNs and SWs to those for RNs and public school teachers.

I use data from the 1980, 1990, and 2000 5% Census samples to construct datasets of professional DNs and SWs for use in deriving the number of practitioners in each Census year and for estimating the effect of regulation on wages. Using data from multiple years allows me to capture non-linear effects. There are few examples in the literature of the use of multi-year

datasets and none that I know of model non-linear effects of occupational licensure using individual-level data. I also use individual-level data from the BRFSS to measure the effect of regulation on the quality of service provided by defining health indicator variables that act as proxies for the quality of service. I believe this is the first use of individual-level data to measure the effect of occupational regulation on quality.

Empirical analysis of the economic effects of licensure on DNs and SWs is complicated by several factors. First, different states employ different types of regulation for the same occupation, and the name of the state regulation does not always match the type of regulation in the state statute. To deal with this, I define three regulation levels and estimate separate models for each. The regulation levels are any regulation, regulation named licensure (with or without practice restriction), and licensure (with practice restriction). Second, the state statutes for occupational regulation of DNs and SWs often include exemptions from regulation for certain industries and job positions. To address this, I identify observations for individuals who work in an industry or job position that the state exempts from regulation, even if regulation was enacted after the year of the observation, and I remove those exempt observations from the dataset before estimating wage models. Third, both DNs and SWs have high percentages of part time practitioners, for whom hourly wage is a better measure of wages than annual wage. To address part time employment, I calculate an hourly wage for each observation and estimate both hourly wage and annual wage models. For models of the effect of regulation on wages, I estimate OLS models, FE models to control for endogeneity due to unobservable state attributes that are constant over time, and, where possible, 2SLS models with IVs for regulation variables to control for possible endogeneity due to uncertain causality between regulation variables and

wages. Models for the number of practitioners are FE models, while models for the quality of service include both FE and, where possible, 2SLS models.

In Chapter 3, I investigate the impact of state regulation of DNs and SWs on the number of practitioners. For both occupations, I find no evidence to support the hypothesis that licensure reduces the number of practitioners, since the impact of different types of regulation on the number of DNs or SWs is small and not significant. This result for DNs and SWs is consistent with the literature for RNs and public school teachers, where licensure is not found to affect the number of practitioners for those occupations. I find that licensure is associated with a statistically significant increase in the number of DNs in job positions that are exempt from regulation (possibly to avoid having to comply with licensure requirements), together with a decrease in the number of DNs in job positions that are not exempt from regulation that is not significant. This shift between exempt and not exempt job positions is not evident for SWs. Analysis of movement between job positions within an occupation that are exempt or not exempt from regulation is not found in the literature.

In Chapter 4, I analyze the impact of state regulation on the wages of DNs and SWs using three types of wage models. Regulation-level models control for a single regulation level (any regulation, regulation named licensure, or licensure) and look for linear effects of regulation on wages. Years-of-regulation models control for the absence of a single level of occupational regulation and some measure of the duration of that level of occupational regulation and are designed to capture non-linear effects of regulation on wages. Regulation-strictness models control for regulation type and specific elements of the state statutes and examine whether any wage premium due to regulation can be attributed to the strictness of regulation.

Using regulation-level models, I find that any regulation (title protection, certification, or licensure) of DNs has a small, positive, but not significant, impact on both hourly and annual wages, and that regulation named licensure has a small, positive, but not significant, impact on hourly wages of SWs. For the regulation-strictness models, I find some specification issues that may invalidate any conclusions. However, I find that certification (relative to title protection), fraction of the board comprised of DNs, number of continuing education hours required per year, and number of practice hours required for initial credentials appear to have significant impacts on wages for DNs. Similarly, I find that licensure (relative to title protection), number of continuing education hours required per year, and application fee appear to have significant impacts on wages for SWs.

From the years-of-regulation models, I find that the coefficients of the absence of regulation level variables are mostly positive because wages of both DNs and SWs tend to be higher in states that do not regulate those occupations. Years-of-regulation models that capture non-linear effects in terms of the natural log of years of regulation are a better fit to the data than years-of-regulation models in terms of years of regulation and the square of years of regulation for both DNs and SWs. The models for the natural log of wages as a function of the natural log of years of regulation suggest that wages increase with years of regulation, but the rate of increase of wages slows as the years of regulation increase. The coefficient of the natural log of years of regulation is interpreted as the elasticity of wages with respect to years of regulation. For DNs, I find an elasticity of annual wages with respect to years of any regulation of 0.073. For SWs, I find an elasticity of annual wages with respect to years of any regulation of approximately 0.02, statistically insignificant elasticities of hourly and annual wages with respect

to years of regulation named licensure of 0.016, and an elasticity of annual wages with respect to licensure of 0.015.

Compared to the literature for the effect of licensure on wages of RNs and public school teachers where no lasting wage premium due to licensure is found, my empirical results suggest a slightly different result for DNs and SWs. Overall, I find a small, positive impact on wages of DNs and SWs due to regulation of those occupations. The positive elasticities found from the models of the natural log of wages as a function of the natural log of years of regulation suggest that there is a lasting wage premium due to regulation of DNs and SWs.

I find little evidence to suggest differences in how regulation level affects wages. In most of the models, empirical results for different regulation levels are similar in magnitude, sign, and significance of the estimated coefficients. I do not find evidence that licensure has a greater impact on wages of DNs and SWs than any regulation or regulation named licensure. This may be a result of the strong influence of the occupational associations for DNs and SWs that set strict professional standards apart from state regulation, such that earning state credentials adds little additional information about a person's qualifications to practice. I also do not find important differences in how occupational regulation of DNs and SWs affects the hourly and annual wage measures.

In Chapter 5, I analyze the impact of licensure of DNs and SWs on the quality of service provided by modeling how regulation impacts a number of health indicator variables selected for each occupation. For DNs, I find very small improvements in two health indicator variables due to any regulation. The improvements are a 0.39% decrease in BMI at the sample mean and a 0.4 percentage point decrease in the probability of obesity. For SWs, I find a very small (.054) decrease in the number of poor mental health days due to licensure of SWs. These results for

DNs and SWs can be compared with those found for RNs and public school teachers. No studies of the impact of licensure on the quality of service by RNs are found in the literature, possibly due to the broad scope of the RN occupation, which makes it difficult to identify individual cause and effect scenarios that can be used to study the quality of service. For public school teachers, licensure is found to have uncertain impact on achievement test scores and, otherwise, no impact on the quality of service. My results differ from those for public school teachers because I find small improvements in the quality of service (as measured by health indicators) due to any regulation of DNs and licensure of SWs.

In the context of the overall body of literature on the economic effects of occupational licensure, my empirical results for DNs and SWs are not surprising. In addition to expanding the list of occupations that have been studied to include DNs and SWs, my dissertation extends the existing literature in several ways. I manage the problem of regulation types not matching regulation names by introducing regulation levels and analyzing whether effects are due to any type of regulation, regulation that is named licensure (with or without practice restriction), or actual licensure (with practice restriction). I recognize that the state regulation statutes frequently exempt practitioners in certain job positions from regulation and use that information to estimate separate models for exempt and not exempt observations to look for evidence of movement of practitioners towards exempt job positions when regulation is enacted. I capture non-linear effects of regulation on wages by controlling for the absence of regulation and the natural log of years of regulation, which allows me to estimate wage elasticities with respect to years of regulation. I use health indicator variables derived from survey responses as measures of the quality of service provided by practitioners and estimate models for the impact of regulation on the quality of service using individual-level health survey data. These new

approaches may prove useful in future empirical investigations of the economic effects of licensure for other occupations.

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Chapter 3 Appendix: Models of the Effect of Years-of-Regulation on the Number of Practitioners

This appendix reports the empirical results for models of the effect of years-of-regulation on the number of practitioners. These models are designed to capture non-linear effects of occupational regulation and the lag nature of grandfather effects and to explore whether any effect on the numbers of practitioners due to licensure varies over time.[131] The empirical results are included in this appendix, instead of in the body of Chapter 3, because there are no significant coefficients to report. However, there are some patterns revealed in the signs of the coefficients, and those patterns are reported here.

Each of the following tables includes two non-linear models for the four measures of the number of DNs or SWs. First, the number of DNs or SWs is modeled as a function of a dummy for no regulation and a variable for years-of-regulation. Second, the number of DNs or SWs is modeled as a function of a dummy for no regulation and variables for years-of-regulation and years-of-regulation squared. There are three tables of empirical results for each occupation. Tables 3A.1, 3A.2, and 3A.3 are for DNs. Table 3A.1 is for the effect of years-of-any regulation, Table 3A.2 is for the effect of years-of-regulation named licensure, and Table 3A.3 is for the effect of years-of-licensure. Similarly, Tables 3A.4, 3A.5, and 3A.6 are for SWs. Table 3A.4 is for the effect of years-of-any regulation, Table 3A.5 is for the effect of years-of-regulation named licensure, and Table 3A.6 is for the effect of years-of-licensure.

For the models of the number of practitioners as a function of the natural log of years of regulation, in all but two cases (one for DNs and one for SWs) the coefficients of the natural log of years of regulation variables are negative in the first two columns of the tables. This suggests

[131] Years-of-regulation models are introduced in Chapter 4 to analyze non-linear effects of licensure on wages of practitioners.

that the number of practitioners may decrease with increasing years of regulation. In every case, the coefficients of the natural log of years of regulation variables are positive in column three and negative in column four. This suggests that increasing years of regulation are associated with an increase in the number of practitioners who are exempt from regulation and a decrease in the number of practitioners who are not exempt from regulation.

For the models of the number of practitioners as a function of years of regulation and years of regulation squared, the coefficient of the years of regulation variable is positive and the coefficient of the years of regulation squared variable is negative for DNs in the first two columns. However, for SWs, the coefficient of both the years of regulation and the years of regulation squared variables are negative (with one exception) in the first two columns. It is possible that the earlier introduction of state regulation of SWs compared to DNs may result in estimated coefficients that show the number of SWs decreasing with years of regulation, while the number of DNs appears to be increasing with years of regulation. The coefficients of the years of regulation variables for DNs are positive in column three and are either smaller in magnitude or negative in column four. For SWs, the coefficients of the years of regulation variables are positive in column three and negative in column four. Again, this suggests that increasing years of regulation may be associated with an increase in the number of practitioners who are exempt from regulation and a decrease in the number of practitioners who are not exempt from regulation, particularly for the SW occupation.

Because none of the estimated coefficients in this appendix are statistically significant, the discussion of the patterns revealed in the signs of the coefficients includes observations, but not empirical results to be reported. Instead, these observations may suggest areas for further empirical investigation into how years of regulation affect the number of practitioners.

Table 3A.1: Effect of Years-of-Any Regulation on the Number of Dietitians and Nutritionists

	Dependent Variable			
Model	Number of DNs using data from 50 States	Number of DNs using data from 41 States that Regulate DNs by 2000	Number of Exempt DNs using data from 41 States that Regulate DNs by 2000	Number of Not-Exempt DNs using data from 41 States that Regulate DNs by 2000
No Regulation	-108.307 (99.147)	-128.913 (104.119)	64.905 (131.600)	-193.817 (158.453)
ln(Years of Any Regulation)	-5.412 (59.724)	53.173 (95.013)	101.837 (98.185)	-48.664 (136.866)
No Regulation	143.488 (157.911)	121.204 (157.436)	140.584 (158.373)	-19.380 (228.328)
Years of Any Regulation	80.413 (55.314)	87.357 (60.515)	54.715 (41.598)	32.642 (78.815)
Years of Any Regulation Squared	-5.200 (3.111)	-5.322 (3.196)	-2.777 (1.945)	-2.545 (3.960)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	41	41	41
n	150	123	123	123

Exempt DNs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3A.2: Effect of Years-of-Regulation Named Licensure on the Number of Dietitians and Nutritionists

	Dependent Variable			
Model	Number of DNs using data from 50 States	Number of DNs using data from 41 States that Regulate DNs by 2000	Number of Exempt DNs using data from 41 States that Regulate DNs by 2000	Number of Not-Exempt DNs using data from 41 States that Regulate DNs by 2000
No Regulation Named Licensure	-102.115 (103.613)	-108.389 (106.926)	38.112 (162.519)	-146.501 (172.429)
ln(Years of Regulation Named Licensure)	-45.553 (59.045)	-36.541 (74.681)	39.866 (65.754)	-76.407 (85.957)
No Regulation Named Licensure	20.601 (134.847)	21.661 (138.346)	103.737 (207.335)	-82.076 (238.789)
Years of Regulation Named Licensure	31.003 (43.051)	36.002 (46.267)	39.931 (44.286)	-3.929 (62.098)
Years of Regulation Named Licensure Squared	-2.541 (2.560)	-2.754 (2.639)	-2.234 (2.332)	-0.519 (3.451)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	41	41	41
n	150	123	123	123

Exempt DNs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3A.3: Effect of Years-of-Licensure on the Number of Dietitians and Nutritionists

	Dependent Variable			
Model	Number of DNs using data from 50 States	Number of DNs using data from 41 States that Regulate DNs by 2000	Number of Exempt DNs using data from 41 States that Regulate DNs by 2000	Number of Not-Exempt DNs using data from 41 States that Regulate DNs by 2000
No Licensure	-52.140 (110.578)	-47.883 (115.460)	-86.937 (60.142)	39.054 (90.802)
ln(Years of Licensure)	-22.662 (53.648)	-7.944 (66.004)	6.408 (35.300)	-14.352 (63.087)
No Licensure	6.947 (150.476)	17.197 (156.989)	-57.977 (89.125)	75.175 (123.843)
Years of Licensure	17.275 (40.975)	23.951 (44.366)	13.670 (29.278)	10.281 (40.930)
Years of Licensure Squared	-1.614 (2.553)	-1.900 (2.675)	-0.862 (1.883)	-1.038 (2.316)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	41	41	41
n	150	123	123	123

Exempt DNs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt DNs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3A.4: Effect of Years-of-Any Regulation on the Number of Social Workers

	Dependent Variable			
Model	Number of SWs using data from 50 States	Number of SWs using data from 33 States that Regulate SWs by 2000	Number of Exempt SWs using data from 33 States that Regulate SWs by 2000	Number of Not-Exempt SWs using data from 33 States that Regulate SWs by 2000
No Regulation	368.119 (550.101)	40.341 (437.270)	245.280 (327.163)	-204.939 (479.439)
ln(Years of Any Regulation)	-129.599 (300.274)	-189.648 (366.640)	164.907 (154.782)	-354.555 (405.374)
No Regulation	520.371 (599.653)	369.123 (498.560)	103.679 (265.443)	265.444 (595.464)
Years of Any Regulation	-27.434 (66.618)	-66.710 (86.447)	30.171 (37.182)	-96.881 (98.968)
Years of Any Regulation Squared	-0.538 (1.559)	-0.027 (1.410)	-0.208 (0.952)	0.181 (1.569)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	33	33	33
n	150	99	99	99

Exempt SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3A.5: Effect of Years-of-Regulation Named Licensure on the Number of Social Workers

	Dependent Variable			
Model	Number of SWs using data from 50 States	Number of SWs using data from 33 States that Regulate SWs by 2000	Number of Exempt SWs using data from 33 States that Regulate SWs by 2000	Number of Not-Exempt SWs using data from 33 States that Regulate SWs by 2000
No Regulation Named Licensure	179.076 (607.849)	-25.988 (420.139)	34.613 (267.504)	-60.600 (481.354)
ln(Years of Regulation Named Licensure)	16.487 (272.737)	-76.868 (308.887)	235.170 (152.393)	-312.038 (344.023)
No Regulation Named Licensure	161.811 (591.590)	-6.075 (403.354)	-111.367 (249.428)	105.292 (458.440)
Years of Regulation Named Licensure	-9.059 (64.075)	-34.723 (74.616)	49.285 (35.253)	-84.009 (89.334)
Years of Regulation Named Licensure Squared	-0.405 (1.516)	0.343 (1.423)	-0.466 (0.890)	0.809 (1.732)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	33	33	33
n	150	99	99	99

Exempt SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Table 3A.6: Effect of Years-of-Licensure on the Number of Social Workers

	Dependent Variable			
Model	Number of SWs using data from 50 States	Number of SWs using data from 33 States that Regulate SWs by 2000	Number of Exempt SWs using data from 33 States that Regulate SWs by 2000	Number of Not-Exempt SWs using data from 33 States that Regulate SWs by 2000
No Licensure	487.260 (639.398)	147.271 (527.238)	378.013 (427.073)	-230.743 (620.471)
ln(Years of Licensure)	-97.823 (320.589)	-160.542 (388.818)	195.513 (165.419)	-356.055 (442.415)
No Licensure	618.917 (638.074)	335.157 (534.180)	249.329 (347.774)	85.828 (629.248)
Years of Licensure	-11.269 (68.500)	-37.255 (76.325)	29.893 (39.236)	-67.148 (89.772)
Years of Licensure Squared	-0.865 (1.677)	-0.194 (1.533)	-0.428 (1.105)	0.234 (1.767)
Other Control Variables				
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Number of States	50	33	33	33
n	150	99	99	99

Exempt SWs are those who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation.
Not-exempt SWs are those who work in an industry or job position that the state statute does not exempt from regulation, even if regulation was enacted after the year of the observation.
Control for Exogenous State Variables: Includes control for natural log of per capita income, unemployment rate, percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percentage tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.
Robust standard errors are in parentheses.

Chapter 4 Appendix: Sensitivity Analysis for the Impact of Regulation on Wages Using Alternate Definition of Exempt

This appendix includes empirical results for the regulation-level, years-of-regulation, and regulation-strictness models for DNs and SWs using an alternate definition of exempt. In the body of Chapter 4, the exempt category is defined as follows: In states that regulate the occupation by the year 2000, the exempt category includes individuals who work in an industry or job position that the state statute exempts from regulation, even if regulation was enacted after the year of the observation. In states that do not regulate the occupation by the year 2000, there are no observations in the exempt category. However, in this appendix, the alternate definition of the exempt category is defined as follows: An observation is exempt only if the state regulates the occupation in the observation year and the state statute exempts the individual's industry or job position. With this definition, no observations in a state are exempt from regulation unless regulation is in effect in the state. This leaves more observations in the dataset for the years prior to regulation taking effect. Summary statistics and empirical results for this alternate definition of exempt are included in this appendix. Each table in the appendix refers to the corresponding table in the body of Chapter 4.

Comparing the results in this appendix to those in the body of Chapter 4, I find very similar empirical results for the two definitions of exempt. There are some differences worth noting. First, for the alternate definition of exempt used in this appendix, the selected IV for the absence of regulation variable has enough power to be used in the model for the effect of the natural log of years of regulation named licensure on hourly wages of DNs, and the resulting 2SLS (with FE) coefficient in Table 4A.14 (.240) is highly significant. However, the Kleibergen-Paap rk Wald F statistic is only 10.20, just barely above the minimum value of 10, which means that the IV is weak and the estimated coefficient may not be correct. In Table 4.16

in the body of Chapter 4, the IV does not have enough power and a 2SLS coefficient is not estimated for the effect of the natural log of years of regulation named licensure on hourly wages of DNs. Second, while the magnitude and signs of the estimated coefficients are similar with the two definitions of exempt, more estimated coefficients are statistically significant for the alternate definition of exempt in this appendix. This is true for quite a few models. Since the alternate definition of exempt used in this appendix keeps more observations and many of those observations are from before regulation takes effect, it is possible that the models with the alternate definition of exempt find a more significant change in wages due to regulation. However, given that the individuals who are kept in the dataset due to the alternate definition of exempt should not be affected by regulation, the additional significance resulting from including them in the models tends to obscure the effect of regulation on the wages of individuals who are not exempt from regulation. Therefore, the empirical results in the body of Chapter 4 are preferred.

Table 4A.1: Summary Statistics for Dietitians and Nutritionists – Work and Wage Variables (compare to Table 4.1)

Males and Females				
	1980	1990	2000	All Years
Males	7.42%	6.64%	6.96%	6.97%
Females	92.58%	93.36%	93.04%	93.03%
Part Time Workers (35 or fewer hours per week)				
	1980	1990	2000	All Years
Males	11.46%	12.07%	16.67%	13.55%
Females	24.05%	29.29%	31.11%	28.53%
All Observations	25.06%	30.51%	32.19%	29.65%
Institutional Employment (Hospitals or Educational Institutions)				
	1980	1990	2000	All Years
Hospitals	61.25%	52.57%	42.14%	51.15%
Educational Institutions	7.66%	5.84%	3.83%	5.60%
Totals	68.91%	58.41%	45.97%	56.75%
Average Ratio of DN Wages to Average Wages with a Bachelor's Degree in the State – All Observations In Professional Dataset				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	0.7942	0.7755	0.7598	0.7749
Annual Wage	0.7398	0.6971	0.6965	0.7085
Average Ratio of DN Wages to Average Wages with a Bachelor's Degree in the State – Just Observations Subject to Any Regulation				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	-	0.7774	0.7625	0.7678
Annual Wage	-	0.6880	0.7026	0.6974

Table 4A.2: Summary Statistics for Social Workers - Work and Wage Variables (compare to Table 4.2)

Males and Females				
	1980	1990	2000	All Years
Males	38.04%	31.80%	21.63%	29.45%
Females	61.96%	68.20%	78.37%	70.55%
Part Time Workers (35 or fewer hours per week)				
	1980	1990	2000	All Years
Males	13.26%	12.38%	11.44%	12.40%
Females	19.41%	19.90%	18.13%	19.09%
All Observations	23.19%	23.41%	19.98%	21.88%
Institutional Employment (Hospitals or Educational Institutions)				
	1980	1990	2000	All Years
Hospitals	10.94%	11.56%	13.45%	12.14%
Educational Institutions	5.68%	5.14%	6.36%	5.76%
Totals	16.62%	16.70%	19.81%	17.90%
Average Ratio of SW Wages to Average Wages with a Bachelor's Degree in the State – All Observations In Professional Dataset				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	0.7742	0.7430	0.6818	0.7272
Annual Wage	0.7676	0.7277	0.6634	0.7130
Average Ratio of SW Wages to Average Wages with a Bachelor's Degree in the State – Just Observations Subject to Any Regulation				
Wage Measure	1980	1990	2000	All Years
Hourly Wage	0.7708	0.7451	0.6779	0.7094
Annual Wage	0.7512	0.7233	0.6664	0.6938

Table 4A.3: Summary Statistics for Dietitians and Nutritionists – Individual Demographic Variables (compare to Table 4.3)

Census Year	Number		Highest Degree Earned	Number		Place of Work State	Number
1980	1,293		Bachelors	2,841		Arkansas	14
1990	1,748		Masters	1,570		California	550
2000	1,723		Professional	234		Colorado	68
			Doctorate	119		Connecticut	72
Sex	**Number**					Delaware	19
Female	4,432		**Place of Work**	**Number**		Florida	121
Male	332		Metropolitan Area	3,158		Georgia	107
			Non-Metropolitan Area	1,606		Hawaii	28
Age Range	**Number**					Idaho	23
19	0		**Industry Group**	**Number**		Illinois	192
20 – 24	374		Agriculture	15		Indiana	127
25 - 29	901		Mining	0		Iowa	69
30 - 34	830		Construction	2		Kansas	63
35 - 39	694		Manufacturing	2		Kentucky	67
40 - 44	609		Wholesale Trade	79		Louisiana	51
45 - 49	502		Retail Trade	42		Maine	15
50 - 54	362		Transportation and Warehousing	47		Maryland	92
55 - 59	272					Massachusetts	134
60 - 64	125		Utilities	2		Michigan	179
65 - 69	55		Information and Communications	3		Minnesota	93
70 - 74	24					Mississippi	37
75 - 79	8		Finance, Insurance, Real Estate, and Rental and Leasing	8		Missouri	123
80 - 84	4					Montana	13
85 - 89	3					Nebraska	48
90 - 94	1		Professional, Scientific, Management, Administrative, and Waste Management	73		Nevada	27
Mean Age	38.37					New Hampshire	28
						New Jersey	187
Number of Children Aged Less Than 5 Years	**Number**					New Mexico	28
			Educational Services	268		New York	497
0	3,965		Health Services (not Hospitals)	1,065		North Carolina	82
1	583					North Dakota	17
2	199		Hospitals	2,438		Ohio	242
3	17		Social Services	189		Oklahoma	55
4	0		Arts, Entertainment, Recreation, Accommodations, and Food Services	117		Oregon	62
						Pennsylvania	255
Marital Status	**Number**					Rhode Island	29
Married	3,162					South Carolina	48
Not Married	1,602		Other Services (Except Public Administration)	135		South Dakota	13
						Tennessee	34
			Public Administration	279		Texas	305
Race	**Number**		Armed Forces	0		Utah	43
White	4,059		Unemployed	0		Vermont	13
Black	304					Virginia	106
Asian	334		**Place of Work State**	**Number**		Washington	88
Other	67		Alabama	46		West Virginia	32
			Alaska	11		Wisconsin	141
Total	**4,764**		Arizona	61		Wyoming	9

Table 4A.4: Summary Statistics for Dietitians and Nutritionists – Regulation Variables (compare to Table 4.4)

Regulation Type				
	1980	1990	2000	All Years
No Regulation	100%	56.01%	21.01%	55.29%
Title Protection	0%	13.10%	14.97%	10.22%
Certification	0%	16.48%	30.82%	17.19%
Licensure	0%	14.42%	33.20%	17.30%
Regulation Level				
	1980	1990	2000	All Years
No Regulation	1,293	979	362	2,634
Any Regulation	0	769	1,361	2,130
Regulation that is Named Licensure	0	471	739	1,210
Licensure (with Practice Restriction)	0	252	572	824
Years of Regulation				
	Mean	Standard Deviation	Minimum	Maximum
For the 2,130 observations subject to any regulation:				
years of any regulation	8.94	4.78	1	17
square of years of any regulation	102.70	95.85	1	289
natural log of years of any regulation	2.02	0.64	0	2.83
For the 1,210 observations subject to regulation named licensure:				
years of regulation named licensure	8.34	4.81	1	16
square of years of regulation named licensure	92.32	88.14	1	256
natural log of years of regulation named licensure	1.91	0.71	0	2.77
For the 824 observations subject to licensure:				
years of licensure	7.32	4.27	1	14
square of years of licensure	71.84	65.15	1	196
natural log of years of licensure	1.75	0.78	0	2.64

Table 4A.5: Summary Statistics for Social Workers – Individual Demographic Variables (compare to Table 4.6)

Census Year	Number		Highest Degree Earned	Number		Place of Work State	Number
1980	12,613		Bachelors	27,501		Arkansas	210
1990	17,370		Masters	19,461		California	5,284
2000	19,077		Professional	1,163		Colorado	710
			Doctorate	935		Connecticut	992
Sex	**Number**					Delaware	146
Female	34,612		**Place of Work**	**Number**		Florida	2,308
Male	14,448		Metropolitan Area	31,935		Georgia	1,216
			Non-Metropolitan Area	17,125		Hawaii	179
Age Range	**Number**					Idaho	155
19	3		**Industry Group**	**Number**		Illinois	2,545
20 – 24	2,866		Agriculture	9		Indiana	936
25 - 29	8,579		Mining	1		Iowa	574
30 - 34	8,443		Construction	14		Kansas	482
35 - 39	7,327		Manufacturing	24		Kentucky	341
40 - 44	6,736		Wholesale Trade	47		Louisiana	751
45 - 49	5,676		Retail Trade	13		Maine	331
50 - 54	4,472		Transportation and Warehousing	52		Maryland	1,048
55 - 59	2,813					Massachusetts	1,168
60 - 64	1,443		Utilities	18		Michigan	2,188
65 - 69	442		Information and Communications	19		Minnesota	1,178
70 - 74	171					Mississippi	290
75 - 79	66		Finance, Insurance, Real Estate, and Rental and Leasing	379		Missouri	667
80 - 84	26					Montana	131
85 - 89	3					Nebraska	251
90 - 94	1		Professional, Scientific, Management, Administrative, and Waste Management	508		Nevada	126
Mean Age	39.09					New Hampshire	219
						New Jersey	1,645
Number of Children Aged Less Than 5 Years	**Number**					New Mexico	273
			Educational Services	2,824		New York	6,442
0	41,861		Health Services (not Hospitals)	3,884		North Carolina	1,402
						North Dakota	97
1	5,771		Hospitals	5,956		Ohio	2,167
2	1,335		Social Services	20,813		Oklahoma	286
3	92		Arts, Entertainment, Recreation, Accommodations, and Food Services	95		Oregon	639
4	1					Pennsylvania	2,830
						Rhode Island	299
Marital Status	**Number**					South Carolina	631
Married	27,935		Other Services (Except Public Administration)	1,524		South Dakota	145
Not Married	21,125					Tennessee	823
			Public Administration	12,880		Texas	2,447
Race	**Number**		Armed Forces	0		Utah	316
White	39,372		Unemployed	0		Vermont	158
Black	7,300					Virginia	174
Asian	904		**Place of Work State**	**Number**		Washington	1,035
Other	1,484		Alabama	681		West Virginia	290
			Alaska	111		Wisconsin	1,056
Total	**49,060**		Arizona	627		Wyoming	60

Table 4A.6: Summary Statistics for Social Workers – Regulation Variables (compare to Table 4.7)

Regulation Type				
	1980	1990	2000	All Years
No Regulation	85.49%	69.25%	49.67%	65.81%
Title Protection	1.95%	8.66%	10.17%	7.52%
Licensure	12.56%	22.10%	40.16%	26.67%
Regulation Level				
	1980	1990	2000	All Years
No Regulation	10,783	12,028	9,475	32,286
Any Regulation	1,830	5,342	9.602	16,774
Regulation that is Named Licensure	1,784	4.110	6,557	12,451
Licensure (with Practice Restriction)	1,584	3,838	7,622	13,084
Years of Regulation				
	Mean	Standard Deviation	Minimum	Maximum
For the 16,774 observations subject to any regulation:				
years of any regulation	11.62	9.70	0	43
square of years of any regulation	229.21	349.66	0	1849
natural log of years of any regulation	1.99	1.13	0	3.76
For the 12,451 observations subject to regulation named licensure:				
years of regulation named licensure	13.32	10.39	0	43
square of years of regulation named licensure	285.47	387.85	0	1849
natural log of years of regulation named licensure	2.12	1.14	0	3.76
For the 13,084 observations subject to licensure:				
years of licensure	12.63	9.98	0	43
square of years of licensure	259.29	379.14	0	1849
natural log of years of licensure	2.11	1.09	0	3.76

Table 4A.7: Effect of Any Regulation on Wages of Dietitians and Nutritionists (compare to Table 4.9)

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Any Regulation	-.015 (.026)	-.024 (.023)	.057 (.072)	-.006 (.031)	.008 (.041)	.034 (.086)
Year 1990	-.120*** (.030)	-.102 (.062)	-.163*** (.054)	-.131** (.051)	-.078 (.101)	-.155** (.071)
Year 2000	-.097* (.0520)	-.106 (.113)	-.181* (.100)	-.172* (.088)	-.107 (.182)	-.218* (.131)
Female	-.030 (.027)	-.027 (.028)	-.033 (.027)	-.252*** (.041)	-.247*** (.042)	-.253*** (.040)
Age	.038*** (.004)	.037*** (.004)	.037*** (.004)	.080*** (.008)	.080*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.041*** (.011)	.042*** (.011)	.042*** (.011)	-.167*** (.025)	-.168*** (.025)	-.167*** (.025)
Married	.037* (.019)	.037* (.020)	.036* (.019)	-.066** (.026)	-.069** (.026)	-.066*** (.026)
White	.163*** (.060)	.163*** (.059)	.164*** (.058)	.228*** (.084)	.229*** (.084)	.229*** (.082)
Black	.168*** (.060)	.163*** (.060)	.169*** (.058)	.358*** (.090)	.352*** (.091)	.359*** (.088)
Asian	.134** (.064)	.123* (.062)	.136** (.063)	.242*** (.083)	.233*** (.082)	.243*** (.082)
Master's Degree	.076*** (.014)	.075*** (.014)	.077*** (.014)	.062*** (.021)	.061*** (.021)	.063*** (.021)
Professional Degree	.023 (.036)	.024 (.038)	.022 (.036)	.041 (.041)	.045 (.042)	.041 (.040)
Doctorate	.214*** (.053)	.226*** (.053)	.214*** (.052)	.329*** (.063)	.344*** (.063)	.330*** (.062)
Metropolitan Area	.037*** (.013)	.032** (.013)	.039*** (.012)	.076*** (.026)	.071** (.028)	.077*** (.026)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
n	4764	4764	4764	4764	4764	4764
K-P F			14.18			14.18

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4A.8: Effect of Regulation Named Licensure on Wages of Dietitians and Nutritionists (compare to Table 4.10)

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Regulation Named Licensure	-.027 (.023)	-.041 (.030)	.041 (.052)	-.031 (.027)	-.023 (.044)	.024 (.061)
Year 1990	-.116*** (.028)	-.101* (.059)	-.149*** (.036)	-.120** (.048)	-.061 (.097)	-.146*** (.054)
Year 2000	-.090* (.048)	-.010 (.110)	-.151** (.061)	-.151* (.086)	-.070 (.176)	-.200** (.096)
Female	-.030 (.027)	-.028 (.028)	-.032 (.027)	-.251*** (.040)	-.246*** (.041)	-.253*** (.040)
Age	.038*** (.004)	.037*** (.004)	.037*** (.004)	.080*** (.008)	.080*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0003*** (.0000)	-.0009*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.041*** (.011)	.042*** (.010)	.041*** (.011)	-.167*** (.026)	-.168*** (.025)	-.167*** (.025)
Married	.037* (.019)	.037* (.020)	.037* (.019)	-.066** (.026)	-.069** (.026)	-.066*** (.026)
White	.164*** (.059)	.164*** (.059)	.162*** (.060)	.229*** (.084)	.230*** (.083)	.228*** (.083)
Black	.170*** (.060)	.164*** (.060)	.165*** (.060)	.361*** (.090)	.353*** (.090)	.356*** (.090)
Asian	.135** (.064)	.124** (.062)	.134** (.064)	.243*** (.083)	.234*** (.082)	.242*** (.083)
Master's Degree	.076*** (.014)	.074*** (.014)	.077*** (.014)	.062*** (.021)	.060*** (.021)	.063*** (.021)
Professional Degree	.023 (.036)	.023 (.038)	.023 (.036)	.041 (.041)	.046 (.042)	.041 (.040)
Doctorate	.215*** (.052)	.227*** (.053)	.211*** (.052)	.331*** (.063)	.343*** (.063)	.328*** (.063)
Metropolitan Area	.037*** (.013)	.032** (.013)	.039*** (.012)	.075*** (.026)	.071** (.028)	.077*** (.026)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
n	4764	4764	4764	4764	4764	4764
K-P F			38.56			38.56

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4A.9: Effect of Licensure on Wages of Dietitians and Nutritionists (compare to Table 4.11)

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Licensure	-.008 (.027)	-.043 (.036)	.056 (.072)	-.009 (.032)	-.016 (.052)	.033 (.083)
Year 1990	-.127*** (.026)	-.101* (.060)	-.143*** (.032)	-.132*** (.047)	-.065 (.096)	-.143*** (.051)
Year 2000	-.110** (.044)	-.104 (.109)	-.141** (.057)	-.175** (.084)	-.081 (.174)	-.195** (.091)
Female	-.030 (.027)	-.028 (.028)	-.033 (.027)	-.252*** (.040)	-.246*** (.041)	-.253*** (.039)
Age	.038*** (.004)	.037*** (.004)	.037*** (.004)	.080*** (.008)	.080*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.041*** (.011)	.042*** (.011)	.042*** (.011)	-.167*** (.025)	-.168*** (.025)	-.167*** (.025)
Married	.037* (.019)	.037* (.020)	.037* (.019)	-.066** (.026)	-.069** (.026)	-0.66*** (.025)
White	.163*** (.060)	.164*** (.059)	.159*** (.061)	.229*** (.083)	.230*** (.084)	.226*** (.084)
Black	.169*** (.060)	.163*** (.060)	.164*** (.061)	.359*** (.090)	.352*** (.090)	.356*** (.090)
Asian	.135* (.064)	.124* (.062)	.132** (.065)	.243*** (.083)	.233*** (.082)	.241*** (.083)
Master's Degree	.076*** (.014)	.074*** (.014)	.077*** (.014)	.062*** (.021)	.061*** (.021)	.063*** (.021)
Professional Degree	.023 (.036)	.024 (.038)	.021 (.035)	.042 (.041)	.046 (.042)	.040 (.041)
Doctorate	.214*** (.053)	.226*** (.053)	.212*** (.052)	.330*** (.063)	.343*** (.063)	.328*** (.063)
Metropolitan Area	.037*** (.013)	.032** (.013)	.039*** (.012)	.076*** (.026)	.071** (.028)	.077*** (.026)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
n	4764	4764	4764	4764	4764	4764
K-P F			15.85			15.85

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4A.10: Effect of Any Regulation on Wages of Social Workers (compare to Table 4.12)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
Any Regulation	-.006 (.019)	-.025 (.017)	-.017 (.020)	-.042** (.018)
Year 1990	-.161*** (.020)	-.214*** (.029)	-.124*** (.023)	-.202*** (.032)
Year 2000	-.226*** (.042)	-.336*** (.063)	-.162*** (.044)	-.350*** (.075)
Female	-.058*** (.004)	-.058*** (.004)	-.176*** (.007)	-.176*** (.007)
Age	.049*** (.002)	.049*** (.002)	.087*** (.004)	.087*** (.004)
Age Squared	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.035*** (.004)	.035*** (.004)	-.020*** (.008)	-.020*** (.008)
Married	.034*** (.004)	.034*** (.004)	.004 (.007)	.003 (.007)
White	-.019* (.011)	-.015 (.012)	-.008 (.014)	-.006 (.014)
Black	.019** (.009)	.024** (.011)	.047*** (.018)	.048** (.018)
Asian	-.042** (.017)	-.036** (.015)	-.055** (.025)	-.045 (.027)
Master's Degree	.138*** (.005)	.137*** (.004)	.117*** (.007)	.117*** (.007)
Professional Degree	.104*** (.014)	.103*** (.014)	.060*** (.019)	.060*** (.019)
Doctorate	.122*** (.015)	.1251*** (.014)	.112*** (.018)	.115*** (.018)
Metropolitan Area	.058*** (.008)	.057*** (.008)	.063*** (.009)	.064*** (.008)
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.11: Effect of Regulation Named Licensure on Wages of Social Workers (compare to Table 4.13)

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
Regulation Named Licensure	.006 (.021)	-.007 (.016)	.026 (.037)	-.005 (.022)	-.024* (.014)	.008 (.041)
Year 1990	-.166*** (.020)	-.223*** (.028)	-.175*** (.026)	-.131*** (.024)	-.212*** (.033)	-.137*** (.032)
Year 2000	-.238*** (.042)	-.358*** (.061)	-.258*** (.059)	-.178*** (.044)	-.374*** (.075)	-.191*** (.068)
Female	-.058*** (.004)	-.058*** (.004)	-.059*** (.004)	-.176*** (.007)	-.177*** (.007)	-.177*** (.007)
Age	.049*** (.002)	.049*** (.002)	.049*** (.002)	.087*** (.004)	.087*** (.004)	.087*** (.004)
Age Squared	-.0005*** (.0000)	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.035*** (.004)	.035*** (.004)	.035*** (.004)	-.020*** (.008)	-.020** (.008)	-.020*** (.007)
Married	.034*** (.004)	.034*** (.004)	.034*** (.004)	.004 (.007)	.003 (.007)	.004 (.007)
White	-.020* (.010)	-.016 (.012)	-.021* (.011)	-.008 (.013)	-.007 (.014)	-.009 (.014)
Black	.018* (.009)	.023** (.011)	.016 (.010)	.047** (.018)	.047** (.018)	.045** (.018)
Asian	-.042** (.017)	-.036** (.015)	-.042** (.017)	-.055** (.025)	-.044 (.028)	-.056** (.025)
Master's Degree	.138*** (.005)	.137*** (.004)	.137*** (.005)	.117*** (.007)	.117*** (.007)	.117*** (.007)
Professional Degree	.103*** (.014)	.103*** (.014)	.103*** (.014)	.060*** (.019)	.059*** (.019)	.060*** (.019)
Doctorate	.122*** (.015)	.125*** (.014)	.121*** (.015)	.111*** (.018)	.115*** (.018)	.111*** (.018)
Metropolitan Area	.058*** (.008)	.057*** (.008)	.057*** (.008)	.062*** (.009)	.063*** (.008)	.062*** (.009)
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	No	Yes	No
n	49,060	49,060	49,060	49,060	49,060	49,060
K-P F			10.81			10.81

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4A.12: Effect of Licensure on Wages of Social Workers (compare to Table 4.14)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
Licensure	-.004 (.020)	-.015 (.017)	-.012 (.021)	-.031* (.018)
Year 1990	-.162*** (.020)	-.223*** (.027)	-.129*** (.023)	-.216*** (.031)
Year 2000	-.229*** (.040)	-.353*** (.060)	-.173*** (.042)	-.374*** (.072)
Female	-.058*** (.004)	-.058*** (.004)	-.176*** (.007)	-.177*** (.007)
Age	.049*** (.002)	.049*** (.002)	.087*** (.004)	.087*** (.004)
Age Squared	-.0005*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.035*** (.004)	.035*** (.004)	-.020*** (.008)	-.020*** (.008)
Married	.034*** (.004)	.034*** (.004)	.004 (.007)	.003 (.007)
White	-.019* (.011)	-.016 (.012)	-.008 (.014)	-.007 (.014)
Black	.019** (.009)	.023** (.011)	.047*** (.018)	.048** (.018)
Asian	-.042** (.017)	-.036** (.015)	-.056** (.025)	-.044 (.028)
Master's Degree	.138*** (.005)	.137*** (.004)	.117*** (.007)	.117*** (.007)
Professional Degree	.104*** (.014)	.109*** (.014)	.060*** (.019)	.060*** (.019)
Doctorate	.122*** (.015)	.125*** (.014)	.112*** (.018)	.115*** (.018)
Metropolitan Area	.058*** (.008)	.057*** (.008)	.063*** (.009)	.064*** (.008)
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.13: Effect of Natural Log of Years of Any Regulation on Wages of Dietitians and Nutritionists (compare to Table 4.15)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.138*** (.044)	.081* (.041)	.104* (.057)	.084 (.067)
ln(Years of Any Regulation)	.061*** (.020)	.037* (.020)	.043 (.028)	.063* (.035)
Female	-.027 (.027)	-.027 (.028)	-.248*** (.039)	-.247*** (.041)
Age	.036*** (.004)	.037*** (.004)	.079*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.037*** (.010)	.041*** (.010)	-.171*** (.025)	-.169*** (.025)
Married	.036* (.019)	.038* (.019)	-.066** (.026)	-.067** (.026)
White	.159*** (.059)	.161*** (.059)	.225*** (.083)	.228*** (.084)
Black	.173*** (.058)	.163*** (.060)	.363*** (.089)	.352*** (.091)
Asian	.131** (.064)	.122* (.062)	.242*** (.082)	.232*** (.082)
Master's Degree	.079*** (.014)	.075*** (.014)	.065*** (.021)	.061*** (.021)
Professional Degree	.027 (.037)	.025 (.038)	.046 (.041)	.045 (.042)
Doctorate	.218*** (.053)	.228*** (.054)	.333*** (.064)	.344*** (.064)
Metropolitan Area	.018 (.011)	.029** (.012)	.059** (.024)	.069** (.027)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	4764	4764	4764	4764

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.14: Effect of Natural Log of Years of Regulation Named Licensure on Wages of Dietitians and Nutritionists (compare to Table 4.16)

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
No Regulation Named Licensure	.152*** (.050)	.091* (.048)	.637*** (.198)	.134** (.063)	.091 (.079)	-.016 (.281)
ln(Years of Regulation Named Licensure)	.059*** (.022)	.032 (.022)	.240*** (.084)	.045 (.030)	.042 (.039)	.001 (.110)
Female	-.027 (.028)	-.027 (.028)	-.022 (.028)	-.248*** (.039)	-.246*** (.041)	-.247*** (.040)
Age	.036*** (.004)	.037*** (.004)	.036*** (.004)	.079*** (.008)	.080*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.036*** (.010)	.040*** (.010)	.036*** (.010)	-.171*** (.025)	-.170*** (.025)	-.169*** (.024)
Married	.035* (.019)	.037* (.019)	.040** (.019)	-.067** (.026)	-.068** (.026)	-.069*** (.025)
White	.158** (.059)	.162*** (.059)	.164*** (.059)	.225*** (.082)	.229*** (.083)	.228*** (.082)
Black	.171*** (.059)	.163*** (.060)	.163*** (.059)	.364*** (.089)	.352*** (.090)	.352*** (.088)
Asian	.131** (.064)	.123* (.062)	.130** (.063)	.242*** (.081)	.233*** (.081)	.231*** (.080)
Master's Degree	.078*** (.014)	.075*** (.014)	.069*** (.014)	.064*** (.021)	.061*** (.021)	.062*** (.021)
Professional Degree	.027 (.037)	.025 (.038)	.020 (.039)	.046 (.041)	.046 (.042)	.046 (.041)
Doctorate	.220*** (.053)	.228*** (.054)	.222*** (.054)	.335*** (.064)	.343*** (.063)	.335*** (.061)
Metropolitan Area	.017 (.012)	.028** (.012)	.025* (.013)	.058** (.024)	.069** (.027)	.069*** (.026)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	Yes	No	Yes	Yes
n	4764	4764	4764	4764	4764	4764
K-P F			10.20			10.20

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4A.15: Effect of Natural Log of Years of Licensure on Wages of Dietitians and Nutritionists (compare to Table 4.17)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.129** (.054)	.094* (.054)	.114* (.065)	.093 (.085)
ln(Years of Licensure)	.066** (.027)	.030 (.023)	.055 (.033)	.049 (.039)
Female	-.029 (.027)	-.028 (.028)	-.250*** (.039)	-.247*** (.041)
Age	.036*** (.004)	.037*** (.004)	.078*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.036*** (.010)	.040*** (.010)	-.172*** (.025)	-.068*** (.026)
Married	.036* (.019)	.037* (.019)	-.066** (.026)	-.068** (.026)
White	.154** (.059)	.162*** (.059)	.222*** (.082)	.228*** (.083)
Black	.169*** (.058)	.162*** (.060)	.361*** (.088)	.351*** (.090)
Asian	.128* (.063)	.121* (.062)	.240*** (.081)	.231*** (.081)
Master's Degree	.080*** (.013)	.075*** (.014)	.065*** (.021)	.061*** (.021)
Professional Degree	.028 (.037)	.025 (.038)	.047 (.041)	.046 (.043)
Doctorate	.221*** (.054)	.228*** (.054)	.336*** (.064)	.344*** (.063)
Metropolitan Area	.017 (.012)	.028** (.012)	.058** (.024)	.070** (.027)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	4764	4764	4764	4764

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.16: Effect of Years of Any Regulation and Years-Squared on Wages of Dietitians and Nutritionists (compare to Table 4.18)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.119** (.059)	.069 (.055)	.122 (.075)	.048 (.095)
Years of Any Regulation	.017 (.012)	.010 (.011)	.021 (.017)	.014 (.019)
Years of Any Regulation - Squared	-.0004 (.0006)	-.0003 (.0005)	-.0008 (.0008)	-.0003 (.0010)
Female	-.027 (.027)	-.027 (.028)	-.249*** (.040)	-.247*** (.042)
Age	.036*** (.004)	.037*** (.004)	.079*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.037*** (.010)	.041*** (.010)	-.171*** (.025)	-.169*** (.025)
Married	.036* (.019)	.038* (.019)	-.066** (.026)	-.068** (.026)
White	.160** (.019)	.162*** (.059)	.222** (.084)	.229*** (.084)
Black	.174*** (.060)	.163*** (.060)	.360*** (.090)	.353*** (.091)
Asian	.132** (.064)	.122* (.062)	.240*** (.082)	.233*** (.082)
Master's Degree	.079*** (.014)	.075*** (.014)	.065*** (.021)	.061*** (.021)
Professional Degree	.027 (.037)	.025 (.038)	.046 (.041)	.045 (.042)
Doctorate	.217*** (.053)	.228*** (.054)	.333*** (.064)	.343*** (.064)
Metropolitan Area	.019* (.011)	.029** (.012)	.059** (.024)	.070** (.027)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	4764	4764	4764	4764

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.17: Effect of Years of Regulation Named Licensure and Years-Squared on Wages of Dietitians and Nutritionists (compare to Table 4.19)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation Named Licensure	.150** (.072)	.079 (.071)	.180** (.087)	.118 (.113)
Years of Regulation Named Licensure	.021 (.017)	.008 (.018)	.033 (.022)	.026 (.030)
Years of Regulation Named Licensure - Squared	-.0007 (.0008)	-.0002 (.0009)	-.0015 (.0011)	-.0012 (.0015)
Female	-.027 (.028)	-.027 (.028)	-.249*** (.039)	-.247*** (.041)
Age	.036*** (.004)	.037*** (.004)	.079*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.036*** (.010)	.040*** (.010)	-.172*** (.024)	-.170*** (.025)
Married	.035* (.019)	.037* (.019)	-.066** (.026)	-.068** (.026)
White	.158** (.060)	.163*** (.059)	.222*** (.082)	.228*** (.083)
Black	.172*** (.059)	.163*** (.059)	.361*** (.089)	.351*** (.090)
Asian	.131** (.064)	.123* (.062)	.239*** (.080)	.232*** (.081)
Master's Degree	.078*** (.014)	.075*** (.014)	.064*** (.021)	.061*** (.021)
Professional Degree	.027 (.037)	.025 (.038)	.045 (.041)	.045 (.042)
Doctorate	.220*** (.053)	.228*** (.054)	.337*** (.064)	.344*** (.064)
Metropolitan Area	.018 (.012)	.028** (.012)	.058** (.025)	.069** (.027)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	4764	4764	4764	4764

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.18: Effect of Years of Licensure and Years-Squared on Wages of Dietitians and Nutritionists (compare to Table 4.20)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.177** (.077)	.128 (.092)	.199* (.104)	.147 (.142)
Years of Licensure	.045* (.023)	.025 (.029)	.057* (.033)	.040 (.046)
Years of Licensure - Squared	-.002 (.001)	-.001 (.001)	-.003 (.002)	-.002 (.003)
Female	-.030 (.027)	-.028 (.028)	-.251*** (.040)	-.247*** (.041)
Age	.036*** (.004)	.037*** (.004)	.079*** (.008)	.080*** (.008)
Age Squared	-.0003*** (.0000)	-.0003*** (.0000)	-.0008*** (.0001)	-.0008*** (.0001)
Number of Children < 5 Yrs	.035*** (.010)	.040*** (.010)	-.172*** (.024)	-.170*** (.025)
Married	.036* (.019)	.037* (.019)	-.066** (.026)	-.068** (.026)
White	.154** (.059)	.161*** (.059)	.221*** (.082)	.227*** (.083)
Black	.168*** (.058)	.162*** (.060)	.359*** (.088)	.351*** (.090)
Asian	.127** (.063)	.121* (.062)	.239*** (.081)	.231*** (.081)
Master's Degree	.080*** (.013)	.075*** (.014)	.066*** (.021)	.061*** (.021)
Professional Degree	.028 (.037)	.025 (.038)	.047 (.041)	.046 (.043)
Doctorate	.221*** (.054)	.229*** (.054)	.336*** (.064)	.345*** (.063)
Metropolitan Area	.017 (.012)	.028** (.012)	.058** (.024)	.070** (.027)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	4764	4764	4764	4764

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the DNs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.19: Effect of Natural Log of Years of Any Regulation on Wages of Social Workers (compare to Table 4.21)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.047* (.024)	.047*** (.017)	.071*** (.024)	.070*** (.017)
ln(Years of Any Regulation)	.011 (.007)	.009 (.010)	.020*** (.007)	.014 (.011)
Female	-.059*** (.004)	-.059*** (.004)	-.177*** (.007)	-.177*** (.007)
Age	.047*** (.002)	.048*** (.002)	.085*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.022*** (.007)	-.020*** (.008)
Married	.033*** (.004)	.034*** (.004)	.033 (.007)	.003 (.007)
White	-.014 (.011)	-.015 (.012)	-.005 (.013)	-.0060 (.014)
Black	.026*** (.009)	.025** (.011)	.051*** (.016)	.049** (.018)
Asian	-.035** (.015)	-.036** (.015)	-.051** (.025)	-.045 (.027)
Master's Degree	.1448*** (.005)	.140*** (.004)	.123*** (.007)	.119*** (.007)
Professional Degree	.122*** (.016)	.108*** (.014)	.074*** (.019)	.064*** (.019)
Doctorate	.146*** (.016)	.131*** (.015)	.131*** (.019)	.120*** (.018)
Metropolitan Area	.040*** (.009)	.053*** (.008)	.049*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.20: Effect of Natural Log of Years of Regulation Named Licensure on Wages of Social Workers (compare to Table 4.22)

	Dependent Variable = Natural Log of Hourly Wage			Dependent Variable = Natural Log of Annual Wage		
Model	OLS	FE	2SLS	OLS	FE	2SLS
No Regulation Named Licensure	.022 (.032)	.036** (.015)	.133** (.064)	.047 (.033)	.060*** (.016)	.105 (.069)
ln(Years of Regulation Named Licensure)	.004 (.009)	.005 (.013)	.021 (.018)	.013 (.009)	.011 (.013)	.018 (.018)
Female	-.059*** (.004)	-.059*** (.004)	-.058*** (.004)	-.177*** (.007)	-.177*** (.007)	-.177*** (.007)
Age	.047*** (.002)	.048*** (.002)	.048*** (.002)	.085*** (.004)	.086*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0004*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	.035*** (.004)	-.022*** (.008)	-.020** (.008)	-.020*** (.007)
Married	.033*** (.004)	.034*** (.004)	.034*** (.004)	.003 (.007)	.003 (.007)	.003 (.007)
White	-.014 (.011)	-.015 (.012)	-.014 (.012)	-.005 (.013)	-.006 (.014)	-.006 (.014)
Black	.027*** (.009)	.025** (.011)	.025** (.010)	.053*** (.017)	.048** (.018)	.049*** (.018)
Asian	-.034** (.015)	-.036** (.015)	-.036** (.015)	-.050** (.025)	-.045 (.028)	-.045* (.027)
Master's Degree	.145*** (.005)	.140*** (.004)	.139*** (.004)	.123*** (.007)	.119*** (.007)	.119*** (.007)
Professional Degree	.122*** (.015)	.108*** (.014)	.109*** (.014)	.075*** (.019)	.064*** (.019)	.064*** (.019)
Doctorate	.147*** (.016)	.131*** (.015)	.130*** (.015)	.132*** (.019)	.119*** (.018)	.119*** (.018)
Metropolitan Area	.039*** (.010)	.052*** (.008)	.053*** (.008)	.047*** (.010)	.060*** (.009)	.060*** (.009)
Other Control Variables						
Industry Groups	Yes	Yes	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	Yes	No	Yes	Yes
n	49,060	49,060	49,060	49,060	49,060	49,060
K-P F			12.16			12.16

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. K-P F = Kleibergen-Paap rk Wald F statistic.

Table 4A.21: Effect of Natural Log of Years of Licensure on Wages of Social Workers (compare to Table 4.23)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.029 (.0301)	.024 (.016)	.054* (.031)	.051*** (.017)
ln(Years of Licensure)	.006 (.008)	.004 (.011)	.016* (.009)	.010 (.011)
Female	-.059*** (.004)	-.059*** (.004)	-.177*** (.007)	-.177*** (.007)
Age	.047*** (.002)	.048*** (.002)	.085*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.022*** (.008)	-.020*** (.008)
Married	.033*** (.004)	.034*** (.004)	.003 (.007)	.003 (.007)
White	-.014 (.011)	-.015 (.012)	-.005 (.013)	-.006 (.014)
Black	.027*** (.009)	.025** (.011)	.053*** (.017)	.049** (.018)
Asian	-.035** (.016)	-.036** (.015)	-.051** (.025)	-.045 (.028)
Master's Degree	.145*** (.005)	.140*** (.004)	.123*** (.007)	.119*** (.007)
Professional Degree	.122*** (.015)	.108*** (.014)	.075*** (.019)	.064*** (.019)
Doctorate	.147*** (.016)	.131*** (.015)	.1320*** (.019)	.120*** (.018)
Metropolitan Area	.039*** (.009)	.052*** (.008)	.047*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.22: Effect of Years of Any Regulation and Years-Squared on Wages of Social Workers (compare to Table 4.24)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation	.042* (.024)	.044** (.017)	.060** (.024)	.063*** (.019)
Years of Any Regulation	.002 (.002)	.002 (.002)	.004 (.002)	.002 (.003)
Years of Any Regulation - Squared	-.0000 (.0000)	-.0000 (.0000)	-.0000 (.0001)	-.0000 (.0001)
Female	-.059*** (.004)	-.059*** (.004)	-.177*** (.007)	-.177*** (.007)
Age	.047*** (.002)	.048*** (.002)	.085*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.022*** (.007)	-.020*** (.008)
Married	.033*** (.004)	.034*** (.004)	.003 (.007)	.003 (.007)
White	-.014 (.011)	-.015 (.012)	-.005 (.013)	-.006 (.014)
Black	.027*** (.009)	.025** (.011)	.052*** (.017)	.049** (.018)
Asian	-.034** (.015)	-.036** (.015)	-.050** (.025)	-.045 (.027)
Master's Degree	.145*** (.005)	.140*** (.004)	.123*** (.007)	.119*** (.007)
Professional Degree	.122*** (.016)	.108*** (.014)	.074*** (.019)	.064*** (.019)
Doctorate	.146*** (.016)	.132*** (.015)	.131*** (.019)	.120*** (.018)
Metropolitan Area	.040*** (.009)	.053*** (.008)	.049*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.23: Effect of Years of Regulation Named Licensure and Years-Squared on Wages of Social Workers (compare to Table 4.25)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Regulation Named Licensure	.017 (.032)	.032** (.015)	.036 (.032)	.051*** (.016)
Years of Regulation Named Licensure	-.0001 (.0020)	.0005 (.0029)	.0011 (.0021)	.0006 (.0030)
Years of Regulation Named Licensure - Squared	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0001)
Female	-.059*** (.004)	-.059*** (.004)	-.177*** (.007)	-.177*** (.007)
Age	.047*** (.002)	.048*** (.002)	.085*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.022*** (.008)	-.020** (.008)
Married	.033*** (.004)	.034*** (.004)	.003 (.007)	.003 (.007)
White	-.014 (.011)	-.016 (.012)	-.005 (.013)	-.007 (.014)
Black	.027*** (.009)	.024** (.011)	.052*** (.017)	.048** (.018)
Asian	-.034** (.015)	-.036** (.015)	-.050** (.025)	-.045 (.027)
Master's Degree	.145*** (.005)	.140*** (.004)	.123*** (.007)	.119*** (.007)
Professional Degree	.122*** (.015)	.108*** (.014)	.075*** (.019)	.064*** (.019)
Doctorate	.146*** (.016)	.131*** (.015)	.131*** (.019)	.119*** (.018)
Metropolitan Area	.039*** (.010)	.052*** (.008)	.047*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percenage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.24: Effect of Years of Licensure and Years-Squared on Wages of Social Workers (compare to Table 4.26)

	Dependent Variable = Natural Log of Hourly Wage		Dependent Variable = Natural Log of Annual Wage	
Model	OLS	FE	OLS	FE
No Licensure	.024 (.029)	.020 (.016)	.042 (.029)	.040** (.018)
Years of Licensure	.0005 (.0020)	.0003 (.0027)	.0017 (.0022)	.0003 (.0028)
Years of Licensure - Squared	.0000 (.0000)	.0000 (.0001)	-.0000 (.0000)	.0000 (.0001)
Female	-.059*** (.004)	-.059*** (.004)	-.177*** (.007)	-.177*** (.007)
Age	.047*** (.002)	.048*** (.002)	.085*** (.004)	.086*** (.004)
Age Squared	-.0004*** (.0000)	-.0005*** (.0000)	-.0009*** (.0000)	-.0009*** (.0000)
Number of Children < 5 Yrs	.033*** (.004)	.035*** (.004)	-.022*** (.007)	-.020*** (.008)
Married	.033*** (.004)	.034*** (.004)	.003 (.007)	.003 (.007)
White	-.014 (.011)	-.016 (.012)	-.005 (.013)	-.007 (.014)
Black	.027*** (.009)	.024** (.011)	.052*** (.017)	.048** (.018)
Asian	-.034** (.016)	-.036** (.015)	-.051** (.025)	-.045 (.027)
Master's Degree	.145*** (.005)	.140*** (.004)	.123*** (.007)	.119*** (.007)
Professional Degree	.122*** (.015)	.108*** (.014)	.075*** (.019)	.064*** (.019)
Doctorate	.146*** (.016)	.131*** (.015)	.132*** (.019)	.120*** (.018)
Metropolitan Area	.039*** (.009)	.052*** (.008)	.047*** (.010)	.060*** (.009)
Other Control Variables				
Industry Groups	Yes	Yes	Yes	Yes
Exogenous State Variables	Yes	Yes	Yes	Yes
State Fixed Effects	No	Yes	No	Yes
n	49,060	49,060	49,060	49,060

Control for Industry Groups: Includes control for any industry group that includes more than 1% of the SWs in the dataset. Control for Exogenous State Variables: Includes control for percentage of female population with a bachelor's degree or higher, percentage of male population with a bachelor's degree or higher, state average percent tax rate (state and local taxes), ratio of per capita state debt to per capita income, natural log of per capita state GDP, natural log of state population, percentage of state population on Medicare, percentage of state population below the poverty level, and percentage of state population living in urban areas. Robust Standard Errors are in parentheses.
* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level.

Table 4A.25: OLS Estimates of the Effect of Regulation-Strictness on Wages of Dietitians and Nutritionists (compare to Table 4.27)

	(1)	(2)
	Dependent Variable = Natural Log of Hourly Wage	Dependent Variable = Natural Log of Annual Wage
Regulation-Strictness Variables:		
Licensure	.055 (.065)	.135 (.086)
Certification	.065 (.069)	.212** (.085)
Fraction of Board Comprised of DNs	-.090 (.059)	-.150** (.057)
Continuing Education Hours per Year	.003 (.004)	.009** (.004)
Practice Hours for Initial Credentials	-.0014 (.0011)	.0001 (.0014)
Application Fee	-.0002 (.0003)	.0003 (.0004)
Yearly Renewal Fee	-.0002 (.0006)	-.0013 (.0008)
Year 2000	.137*** (.043)	.004 (.061)
Female	-.002 (.045)	-.201*** (.070)
Age	.036*** (.005)	.068*** (.010)
Age Squared	-.0003*** (.0001)	-.0007*** (.0001)
Number of Children Less than 5 Years	.040*** (.011)	-.160*** (.031)
Married	.080*** (.023)	-.032 (.032)
White	.1793** (.070)	.266** (.100)
Black	.200** (.094)	.394*** (.126)
Asian	.144* (.075)	.226** (.106)
Master's Degree	.083*** (.027)	.060 (.038)
Professional Degree	.008 (.052)	-.011 (.062)
Doctorate	.217*** (.078)	.291*** (.106)
Metropolitan Area	.096*** (.025)	.170*** (.047)
Other Control Variables		
Industry Groups	Yes	Yes
Exogenous State Variables	Yes	Yes
State Fixed Effects	No	No
Number of States	40	40
n	2130	2130

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. Robust standard errors are in parentheses.

Table 4A.26: OLS Estimates of the Effect of Regulation-Strictness on Wages of Social Workers (compare to Table 4.28)

	(1)	(2)
	Dependent Variable = Natural Log of Hourly Wage	Dependent Variable = Natural Log of Annual Wage
Regulation-Strictness Variables:		
Licensure	-.041***	-.045**
	(.015)	(.021)
Fraction of Board Comprised of SWs	.063	.059
	(.062)	(.082)
Continuing Education Hours per Year	.004***	.006***
	(.001)	(.001)
Experience Hours for Initial Credentials	.0000***	.0000***
	(.0000)	(.0000)
Application Fee	.0002**	.0001
	(.0001)	(.0001)
Yearly Renewal Fee	-.0003	-.0001
	(.0007)	(.0007)
Bachelor's Exam	.010	.029
	(.027)	(.041)
Year 1990	-.180***	-.125***
	(.022)	(.026)
Year 2000	-.258***	-.190***
	(.044)	(.048)
Female	-.049***	-.164***
	(.004)	(.016)
Age	.043***	.081***
	(.004)	(.004)
Age Squared	-.0004***	-.0009***
	(.0000)	(.0001)
Number of Children Less than 5 Years	.030***	-.024*
	(.006)	(.012)
Married	.047***	.012
	(.007)	(.011)
White	-.003	.031
	(.018)	(.025)
Black	.023	.077**
	(.021)	(.036)
Asian	-.083**	-.154
	(.039)	(.093)
Master's Degree	.138***	.124***
	(.007)	(.009)
Professional Degree	.089*	.068
	(.046)	(.055)
Doctorate	.130***	.178***
	(.033)	(.054)
Metropolitan Area	.068***	.065***
	(.007)	(.011)
Other Control Variables		
Industry Groups	Yes	Yes
Exogenous State Variables	Yes	Yes
State Fixed Effects	No	No
Number of States	33	33
n	16,774	16,774

* Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level. Robust standard errors are in parentheses.

Chapter 5 Appendix: BRFSS Survey Questions for Health Indicators

Because the exact questions in the BRFSS data change over time, data cleaning is necessary to include as many years for each health indicator as possible in the analysis. For example, the health questions regarding an individual's smoking habits have different possible responses in different survey years. In the years 1984-1993, the question "Are you a smoker?" has five response choices: (1) current smoker, (2) former smoker, (3) never smoked, (4) irregular smoker, or (5) refuse to answer. In the years 1994-1995, the same question has seven response choices: (1) current smoker – smoked all of the past 30 days, (2) current smoker – smoked 1-29 days in the past 30 days, (3) current smoker – smoked 0 days in past 30 days, (4) current smoker – in past 30 days unknown number of days smoked, (5) former smoker, (6) never smoked, or (7) refused to answer. Finally, in the years 1996-2013, the same question has five response choices: (1) current smoker – smoke every day, (2) current – now smoke some days, (3) former smoker, (4) never smoked, or (5) don't know or refused to answer. To make data from different years compatible, I create a dummy variable for smoker, where the value 1 means yes, the individual is currently a smoker; and the value 0 means no, the individual currently does not smoke.

All of the other health indicators derived from the BRFSS dataset have similar definition issues and require the same type of data cleaning. The BRFSS questions for each health indicator and the mapping of possible responses from different survey years to the values of the health indicator variable are included in this appendix.

1. Body Mass Index (BMI) = an integer value between 12 and 69.
2. Obese = a dummy equal to 1 when BMI is greater than or equal to 30 and equal to 0 when BMI is less than 30.

3. Exerciser

Table 5A.1: Mapping of BRFSS Survey Responses for Exercise to Exerciser Health Indicator Variable

Survey Question = "Do you participate in any physical activity or exercise?"		Exerciser Health Indicator Variable Values		
Years	Possible Responses	Yes	No	Drop
1984-2013	yes	x		
	no		x	
	don't know/not sure			x
	refused			x

4. High Blood Pressure

Table 5A.2: Mapping of BRFSS Survey Responses for High Blood Pressure to High Blood Pressure Health Indicator Variable

Survey Question = "Have you been told that you have high blood pressure?"		High Blood Pressure Health Indicator Variable Values		
Years	Possible Responses	Yes	No	Drop
1984-1992	no		x	
	yes, by doctor	x		
	yes, by nurse	x		
	yes, by health professional	x		
	don't know/not sure			x
	refused			x
1993 - 2005, 2007, 2009, 2011, 2013	yes	x		
	no		x	
	don't know/not sure			x
	refused			x

Survey question for high blood pressure is not included in 2006, 2008, 2010, and 2012.

5. High Cholesterol

Table 5A.3: Mapping of BRFSS Survey Responses for High Cholesterol to High Cholesterol Health Indicator Variable

Survey Question = "Have you been told that you have high cholesterol?"		High Cholesterol Health Indicator Variable Values		
Years	Possible Responses	Yes	No	Drop
1987, 1989 - 2005, 2007, 2009, 2011, 2013	yes	x		
	no		x	
	don't know			x
	refused			x
1988	yes, by a doctor	x		
	yes, by a health professional	x		
	no		x	
	don't know/not sure			x
	Refused			x

Survey question for high cholesterol is not included in 2006, 2008, 2010, and 2012.

6. Smoker

Table 5A.4: Mapping of BRFSS Survey Responses for Smoking to Smoker Health Indicator Variable

Survey Question = "Are you a smoker?"		Smoker Health Indicator Variable Values		
Years	Possible Responses	Yes	No	Drop
1984-1993	current smoker	x		
	former smoker		x	
	never smoked		x	
	irregular smoker	x		
	refuse to answer			x
1994-1995	current smoker – smoked all of the past 30 days	x		
	current smoker – smoked 1-29 days in the past 30 days	x		
	current smoker – smoked 0 days in the past 30 days	x		
	current smoker – in the past 30 days unknown number of days smoked	x		
	former smoker		x	
	never smoked		x	
	refused to answer			x
1996-2013	current smoker – smoke every day	x		
	current smoker – now smoke some days	x		
	former smoker		x	
	never smoked		x	
	don't know or refused to answer			x

7. Number of Poor Mental Health Days = an integer value between 0 and 30.

8. Natural Log of the Number of Poor Mental Health Days = a value calculated by ln(number of poor mental health days) for a dataset that includes only individuals who report having a positive number of poor mental health days.

Vita

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Education

Lehigh University, Expected September 2015.
- Ph.D., Economics

Lehigh University, January 2007.
- M.S., Economics

Lafayette College, May 2005, Summa Cum Laude.
- B.S., Mathematics (with Honors)
- B.A., Economics and Business
- Environmental Science Minor

Field Exams

- Health Economics
- Macroeconomics
- Microeconomics

Fields: Health Economics, Labor Economics, and Microeconometrics

Research Areas

Health Economics	Labor Economics	Applied Econometrics
Applied Microeconomics	Applied Macroeconomics	Finance

Teaching Experience

Instructor: Monetary Economics – Baruch College **Fall 2010 – Fall 2012**
Course Description: A survey of monetary theory, specifically the forces responsible for the behavior of our monetary and credit system; mechanisms and objectives of monetary activity.

Instructor: Economic Issues – St. Francis University **Fall 2011**
Course Description: A one-semester introductory course on how to interpret and understand economics in the everyday world. A general understanding of both microeconomics and macroeconomics are required.

Instructor: Introduction to Macroeconomics – St. Francis University **Spring 2011**
Course Description: A one-semester course in the principles of macroeconomics.

Instructor: Options and Futures (Eco 324) – Lafayette College **Spring 2009**
Course Description: This course examines the practices and principal theories of major options and futures markets. Special emphasis is placed on the role of derivative securities in facilitating risk management.

TA: Money, Banking, & Financial Markets – Lehigh University **Spring 2009**
Course Description: The nature and functions of money. Global money and financial markets. The role of commercial and central banks. Effects of the interest rate, exchange rate, and the money supply on the economy. Examination and evaluation of current and past monetary policies.

TA: Principles of Economics - Lehigh University **Fall 2008**
Course Description: A one-semester course in the principles of economics. General topics covered are: supply and demand; pricing and production decisions of firms; the role of government in the economy; the determination of national income; money and banking; monetary and fiscal policy; and government finance.

Instructor: Principles of Economics – Lehigh University **Summer 2008**

GA: Applied Microeconomic Analysis– Lehigh University **Fall 2005 – Spring 2006**
Course Description: The application of economic analysis to managerial and public policy decision-making.

Work Experience

Aflac, New York City, NY **June 2014 - Present**
Vice President, Strategist and Economist

- Work independently creating the internal house view. Provide weekly updates about latest economic data and market movements, focusing mostly on monetary policy and movements in risk factors.

American Insurance Group (AIG), New York City, NY **September 2013-May 2014**
Director, Managing Economist, Head of Country Risk Analysis

- Took over the responsibility of managing the country risk analysis in AIG. AIG focuses on 50+ countries.

American Insurance Group (AIG), New York City, NY **August 2012-September 2013**
Director, Managing Economist, Head of Global Economics

- Managed a team of 5 economists where we were responsible for providing internal economic views to various business units within AIG. Our internal clients included AIG Property and Casualty, AIG Investments, United Guarantee, and Life and Retirement. In addition, routinely represented AIG at client meetings to provide AIG's internal economic view.

American Insurance Group (AIG), New York City, NY **June 2009 – August 2012**
Economist

- Worked with a team of five other economists where we applied macro-economic and econometric models to various business issues of the company. Solely responsible for forecasts, research updates, and sovereign risk ratings of Latin America, Canada, Austrasia, and India through reports and presentations at various management meetings. In addition, our team provided quarterly US forecasts and industry forecasts.

Air Products, Allentown, PA **May 2006 – January 2009**
Economics Research Assistant, Corporate Economics Department

- Conducted country risk analysis, worked heavily with AREMOS/Global Insight and SAP, and worked with contract accounting to suggest economic indices for contract billing.

Research Papers

Dissertation

- Katharine C. Wolchik. "The Economic Effects of Licensure of Dietitians and Nutritionists and Social Workers."

Publication

- Van der Goes, David, Justin Wang, and Katharine Wolchik. 2011 "Effect of State Health Insurance Mandates on Employer-Provided Health Insurance." *Eastern Economic Journal* 37.

Working Papers

- Working Paper, 2007: Katharine C. Wolchik, David van der Goes, and Dana Costea, "Effect of MLB Team Salaries on Winning Percentages."
- Working Paper, 2007: A. King and S. Zumas, "The Impact of U.S. Prospective Payment on Hospital Capital Formation: An Initial Analysis of the 1991 Change in Medicare Reimbursement for Capital Costs." - Performed regressions to assist King and Zumas.
- Senior Honors Thesis in Mathematics, Lafayette College, 2005, "Stock Portfolio Continuous Trading Strategies by Simulation" – Developed computational financial mathematics models of trading strategies for stock portfolio optimization using *Mathematica* to solve the associated stochastic differential equations.

Conferences and Presentations

- Southern Economic Association, 78th Annual Conference, Washington, D.C., November 2008, Presented: "Effect of State Health Mandates on Employer-Provided Health Insurance."
- National Conference on Undergraduate Research, Washington and Lee University, April 2005, Presented: "Stock Portfolio Continuous Trading Strategies by Simulation."
- Undergraduate Mathematics Research Conference, Moravian College, March 2005, Presented: "Stock Portfolio Continuous Trading Strategies by Simulation."
- Fed Fund College Debate Challenge, Federal Reserve Bank of Baltimore, MD, March, 2004 (Honorable Mention).
- Present several times per month at Aflac/AIG to clients both internally and externally.

Professional Memberships

- American Dietetic Association
- National Association of Business Economists
- New York Association of Business Economists
- Southern Economic Association
- Women in Business

Awards and Fellowships

- University Fellowship, Academic Years 2006-2007 and 2007-2008

Skills

- Statistical and Regression Analysis Tools: SAS, STATA, SPSS, MAPLE, EViews, WUMMSIM
- Proficient in AREMOS, SAP, *Mathematica*, MatLAB, Microsoft WORD, EXCEL, POWERPOINT
- Introductory knowledge of JAVA and C++ programming languages
- Intermediate proficiency in written and spoken French

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