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Essays in health and labor economics

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PH.D. THESIS

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To my Mom, Young Joo, and Ethan

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ABSTRACT

This thesis focuses on how health care policies affect the labor supply of physicians and beneficiaries. Further, I examine how the labor supply responses of physicians vary based on the level of competition.

In the first chapter, I focus on the labor supply response of physicians to two large public health insurance expansions, the State Children's Health Insurance Program (SCHIP) and the Affordable Care Act (ACA). These insurance programs have significantly increased the number of patients with public health insurance and the demand for medical services, but it is not clear whether providers will supply additional services for newly-insured patients. In response to the introduction of SCHIP, my estimates suggest that physicians reallocate their total working hours between patient care and non-patient care activities. The size of the impact was greater in areas with high level of physician concentration prior to the expansion. Physicians in high concentration areas tend to decrease time spent on direct patient care, but increase hours on non-direct patient care. In response to the ACA, physicians' working hours did not increase, but working hours and the probability of being employed increased for registered nurses. This suggests that physicians might utilize other healthcare providers to accommodate increases in demand for medical services after the expansion.

In the second chapter, we analyzed the impact of expanding Medicaid on health insurance coverage and labor market outcomes. Expansions of public health insurance have the potential to reduce the uninsured rate, but also to reduce coverage through employer-sponsored insurance (ESI), reduce labor supply, and increase job mobility. In January 2014, twenty-five states expanded Medicaid as part of the Affordable Care Act to low-income

parents and childless adults. We compare the changes in insurance coverage and labor market outcomes over time of adults in states that expanded Medicaid and in states that did not. Our estimates suggest that the recent expansion significantly increased Medicaid coverage with little decrease in ESI. Overall, the expansion did not impact labor market outcomes, including labor force participation, employment, and hours worked.

In the third chapter, I examined the impact of competition among dentists on the labor supply of dentists. I focus on how dentists' working hours will changes when the level of competition increases by examining the effect of the National Health Service Corps (NHSC). The NHSC was created to increase the supply of rural physicians, which might increase the competition in rural areas. I examine the number of dentists (extensive margins of labor supply) and the change in the working hours of dentists (intensive margins of labor supply) in response to the increased level of physician competition. I found that 1 percent increase in NHSC-approved sites increases 5.4% increases in the number of providers and 0.2% of competition in a rural county. In addition, I found that there is a positive relationship between the number of NHSC-approved sites and providers' working hours. If the competition among dentists increases about 1, then working hours of providers increase about 6 hours per week.

PUBLIC ABSTRACT

This thesis focuses on how health care policies affect the labor supply of physicians and beneficiaries. Further, I examine how the labor supply responses of physicians vary based on the level of competition.

In the first chapter, I focus on how physicians change their working hours after two large public health insurance expansions; the State Children's Health Insurance Program (SCHIP) and the Affordable Care Act (ACA). These insurance programs have significantly increased the number of patients with public health insurance and the demand for medical services, but it is not clear whether providers will supply additional medical services for newly-insured patients. In response to the introduction of SCHIP, I found that physicians reallocate their total working hours between patient care and non-patient care activities. Physicians spend less hours with their patients and more hours on other activities that can increase their Competitiveness. The size of the impact was greater in competitive areas prior to the expansion. Physicians in high competition areas tend to spend fewer with their patient, but increase hours on non-patient care hours. In response to the ACA, physicians' working hours did not increase, but working hours and the probability of being employed increased for registered nurses. This suggests that physicians might utilize other healthcare providers to accommodate increases in demand for medical services after the expansion.

In the second chapter, we analyzed the impact of expanding Medicaid on health insurance coverage and labor market outcomes. In the United States, employer-sponsored insurance (ESI) is the primary mechanism (55%) to obtain health insurance. Therefore, expansions of public health insurance have the potential to reduce the uninsured rate, but also to reduce coverage through ESI because individuals have the opportunity to enroll in

public health insurance program. Now individuals do not need to stick to a particular company, because he or she do not need to worry about health care benefits. Thus, expansions will reduce labor supply, and increase job mobility. In January 2014, twenty-five states expanded Medicaid as part of the Affordable Care Act to low-income parents and childless adults. We compare the changes in insurance coverage and labor market outcomes over time of adults in states that expanded Medicaid and in states that did not. Our estimates suggest that individuals are more likely to have Medicaid coverage and less likely to drop ESI after the recent expansion. Overall, the expansion did not impact labor market outcomes, including labor force participation, employment, and hours worked.

In the third chapter, I examined the impact of competition among dentists on the labor supply of dentists. I focus on how dentists' working hours will change if competition among dentists increases by examining the effect of the National Health Service Corps (NHSC) programs. The NHSC was created to increase the supply of rural physicians by providing financial incentives to medical students and healthcare providers. As the number of dentists increases, the competition among dentists would go up in rural areas. Greater competition leads to better quality of health services, high productivity of providers, and low medical price. However, the increases in competition could change working hours of dentists. In this chapter, I examine the number of dentists (extensive margins of labor supply) and the change in the working hours of dentists (intensive margins of labor supply) in response to the increased level of physician competition. I found that 1 percent increase in NHSC-approved sites increases 5.4% increases in the number of providers and 0.2% of competition in a rural county. In addition, I found that there is a positive relationship

between the number of NHSC-approved sites and providers' working hours. If there is an additional dentist per 1,000 population, then dentists work about 6 hours more per week.

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CHAPTER 1.
PUBLIC HEALTH INSURANCE EXPANSION AND PHYSICIANS' WORKING HOURS

1.1 Introduction

Over the past two decades, the public health insurance program, Medicaid, in the U.S., has expanded significantly. In 1978, Medicaid covered approximately 9% of the total U.S. population. In 2013, prior to the expansion of Medicaid through the Affordable Care Act (ACA), 18% of people were covered by Medicaid. By 2015, 20% of individuals received insurance through Medicaid. Medicaid provides health insurance to low-income individuals with little or no patient cost-sharing, but it provides relatively low reimbursement rates to physicians. As a result, physicians may prefer to treat patients with private coverage over patients with Medicaid. For example, Decker (2013) found that, between 2011 and 2012, nearly one third of physicians were not accepting new Medicaid patients, and many others put a limit on how many new Medicaid patients they would treat in 2011-2012. Henry (2015) surveyed primary care physicians after the ACA. They also found that one third of physicians, who were accepting Medicaid patients before the ACA, did not accept newly-insured Medicaid patients after the expansion. Thus, the increase in the number of publicly insured patients, which provide lower reimbursement rates to physicians than privately-insured patients, has the potential to influence physician's labor supply.

In this paper, I examine the impact of public health insurance expansions on physicians' working hours. The expansion of public health insurance increases the demand for medical services because of the newly-insured patients. Without increasing the number of health care workers, it would be more difficult for patients to access medical services after the expansion and health care practitioners would be overloaded with unmet demand. As a result, one potential response to the expansion of public health insurance programs is that physicians might work more hours to provide medical services to newly-insured patients. In the short run, changing working hours offers more flexibility than training new physicians, nurses, and other health professionals. Thus, the expansion could increase physicians' working hours.

On the other hand, physicians may reduce their working hours because of the low financial reimbursement from treating the newly covered patients. Previous studies (Cunningham and May, 2006; Perloff, Kletke, and Foessett, 1995) highlight that physicians are unwilling to participate in the public health insurance program because of the low reimbursement rate from publicly insured patients compared to privately insured patients. If public health insurance expansion crowds out private insurance, physicians would see decreases in their number of privately insured patients (LoSasso and Buchmueller, 2004; Ham and Shore-Sheppard, 2005; Gruber and Simon, 2005). As a result, physician may be incentivized to decrease working hours after the expansion.

The overall change in physicians' working hours due to expansions of public health insurance is likely to depend on the structure of the medical services market. The characteristics of the market structure determines competition. In my paper, I use the number of physicians per capita to determine competition. Competition affects the price that physicians receive from providing medical service, which is one of the important factors that changes the labor decision of physicians. According to the Government Accountability Office (2005), Metropolitan Statistical Areas (MSAs) with greater competition, measured by the concentration of physicians, tend to charge less for medical services in 2001. Staiger et al. (2010) found that there was a steady decrease in hours worked per week during the last decade for all physicians, in part due to an increase in competition, which reduced prices. As a result, greater competition might reduce incentives for physicians to work long hours, suggesting that physicians' working behavior might vary according to market structure.

Physicians in areas of high concentration may respond differently compared to physicians in areas of low concentration. Consider, for example, a physician with few competitors in the local market. In this market, physicians would have excess demand of privately-insured patients. Therefore, they will not be affected by new publicly-insured patients unless the number of privately-insured patients falls. Conversely, if the expansion were to cause a crowd out of privately-insured patients, then the number of privately-insured patients would decrease. In this case, a physician might start to treat newly insured patients. The other example is if a physician is practicing medicine in high competitive areas. In this case, she needs to compete for privately-insured patients. Thus, the physician

might spend hours on non-direct patient activities such as learning a new technology, conducting research, or participating in training to gain new skills to attract more privately-insured patients. Alternatively, she may lower her input cost or spend less time per patient by increasing her own productivity, allowing her to treat a large number of publicly insured patients to make up for income loss from the crowd out of private insurance. This paper is the first to provide evidence that the impact of public health expansions on physicians' working hours is dependent on the pre-expansion market conditions.

Previous studies on physicians' working hours are based on the model of Sloan et al. (1978). This model shows the effect of payments changes and eligibility expansions, but is not sufficient for explaining the impact of competition on physicians' response to a public health insurance expansion. As a result, in this paper I develop a model describing the potential changes of physicians' working hours after the expansion and the impact of competition on the magnitudes of the changes. My theoretical model suggests that physicians in high competition areas would be more affected by the expansion.

To understand the influence of public health insurance expansions on physicians' labor supply decisions, this paper examines two publicly funded insurance program expansions: (1) the implementation of the State Children's Health Insurance Program (SCHIP) in 1997 and (2) the enactment of the ACA in 2014. The SCHIP expansion provided public health insurance coverage to low-income children who did not qualify for coverage under traditional Medicaid. The ACA, however, expanded public health insurance coverage to adults with dependent children and childless adults whose income was below 138% of the federal poverty guidelines. Further, the ACA increased the number of private insurers by creating health insurance marketplaces and mandating that most people have health insurance. As a result, the ACA increases both the number of people with Medicaid and with private health plans. Therefore, the distinction between these two expansions could have different effects on physician responses. Comparing these two similar but different expansions provides a clearer explanation of how physicians' responses vary by levels of physician concentrations.

Using data from the Community Tracking Study (CTS) physician survey and the Current Population Survey (CPS) Annual Social and Economic March Supplements, I estimate the changes in physician working patterns after implementation of the SCHIP and

the ACA, respectively. In addition, I separately examine physicians practicing in relatively high poverty areas. Several previous studies (Fossett and Peterson,1989; Panetta and Mitchell, 1991; Perloff et al, 1995) suggest that physicians are likely to accept more Medicaid patients if they work in an area with more publicly insured patients.

I first examine the impact of SCHIP on physician's working hours by comparing working hours of pediatricians to internal medicine physicians before and after the expansion in high concentration areas compared to low concentration areas using a difference-in-differences-in-differences specification. I find that pediatric physicians who practice medicine in areas with the average level of physician concentration and above the national poverty rates significantly reduced their total working hours per week by about 1.78 hours per week. Physicians reduce their time on direct patient care activities about 1.97 hours per week, which is consistent from early studies (Enterline et al. 1973; Garthwaite 2012; He and White 2013). Physicians' working hours in competitive areas were more strongly impacted by the expansion. The reduction in direct patient care hours and the increase in non-direct patient care hours were larger in magnitude for physicians in highly competitive areas. Overall total working hours decreased less for physicians in competitive areas.

I examine the impact of the ACA on physicians' working hours by comparing working hours of physicians in states that expanded Medicaid and those in states did not in high concentration areas compared to low concentration areas using a difference-in-differences-in-differences specification. I find that physicians' total working hours did not change after the ACA. However, registered nurses worked approximately 3 hours more per week after the expansion. In addition, the probability of participating in the labor force increased by 17 percentage points and the probability of being employed increased by 16 percentage points. These results do not vary across the level of physician concentration. To provide additional services to the newly insured patients from Medicaid and private plans, physicians or hospitals employ more nurses after the expansion.

The results from both expansions suggest that public health insurance expansions change the labor supply of the medical service providers. Rather than changing their total working hours, physicians reallocate their hours into direct patient care and non-direct patient care differently from the previous allocation. After the expansion, physicians are

more likely to spend fewer hours on direct patient care, suggesting a change in the relationship between physicians and patients. Further, physicians utilize other health care workers to meet the increased demand for medical services.

1.2 Background

1.2.1 Physicians' Time Allocation

Physicians allocate their time among different activities to maximize their utility. Physicians' activities can be categorized into direct patient care, indirect patient care, professional activity, education and others. According to the general definition (O'Leary and Liebovitz 2006; Sinsky et al. 2016), direct patient care activities include time between physician and patients, or physician and staff included taking a history, performing a physician exam or procedure, and assessing, planning and discussing facts with a patient or with family members. Indirect patient care activities include reviewing test results and medical records, doing paperwork, communicating, setting up referrals and other non-medication and test orders, and doing administrative tasks. Administrative tasks include activity related to patients' health insurance. Professional activities are such as attending conferences, researching, or learning new technologies. Education includes teaching and performing didactic sessions with sub interns. Other activities are traveling and personal activities.

Hours spend on research or teaching are not related to physicians' income directly. However, those activities can affect physicians' utility. Some (2016) suggest that those activities may increase physicians influence and prestige which can increase physicians' utility. Clemens and Gottlieb (2017) assume those activities are one type of investments. Physicians invest in their skills to be more productive. They assume that the investment includes efforts to recruit patients, learning new technology, maintaining or expanding medical skills. Thus, hours spend on investments affect physicians' future earnings. In my paper, I also assume that hours spend on professional activities and education will affect physicians' income indirectly. Physicians can increase their market share of privately insured patients by spending hours on non-direct patient care activities. At the same time, physicians can be more productive and efficient in producing medical services. Then, they can treat a large number of patients given the same amount of time.

There are several papers studied how physicians allocate their time to activities. O'Leary et al. (2006) observed ten hospitalists in Northwestern Memorial Hospital (NMH) and found that hospitalists spend 18% of their time on doing direct patient care, 69% on indirect patient care, 7% on other activities and 3% each on professional development and education. Kahn et al. (2000) estimated time on billing and insurance-related work is 4.9 percent of physician time. Casalino et al. (2009) conducted a national survey and found that physicians spend 3 hours per week on administrative tasks. Woolhandler and Himmelstein (2014) quantified the time U.S. physicians spent on administrative tasks and found that physicians spend 16.6% of their total work week on administrative tasks. Sinsky et al. (2016) paper observed the 57 U.S. physicians in ambulatory care in 4 specialties (family medicine, internal medicine, cardiology, and orthopedics) in 4 states (Illinois, New Hampshire, Virginia, and Washington). According to their results, physicians spent 33.1% of their total time (430 hours) on direct patient clinical tasks, 49.2% of their time on HER and desk work, only 1.1% on admirative tasks and 19.9% on other tasks. Early studies used different type and size of physicians and time period, but the results were similar across their results. According to previous literature, physicians generally spend about 3 to 5 hours per week on administrative tasks.

In my paper, measures of time spend on each activity are based on the CTS physician survey which I use. The CTS physician survey provides hours in direct patient cares and total hours in medically related activities. According to CTS, total hours in medically related activities include hours on direct patient care, professional tasks, and administrative tasks, but exclude hours on personal activities. Direct patient care hours include not only direct clinical face time, but also paper works, HER and travel time to patients. The CTS does not provide hours on non-direct patient care activities, so I calculate it by subtracting direct patient care hours at the total hours in medically related activities. Non-direct patient care activities include doing admirative tasks, teaching, and researching. To separate the hours on non-direct patient care activities into professional and administrative tasks, I use the mean value (4 hours) from previous literature.

1.2.2 Literature Review

Compared with the large literature on the effect of Medicaid expansion on health insurance beneficiary, there is relatively little study on medical service providers. My paper builds on the several strands of literature. The first strand of literature studied is on the relationship between financial incentives and quantity of services provided by a physician, using Medicare data. The results of earlier studies are not consistent with the direction of the volume responses to the change in reimbursement rate. Early previous literatures found the negative relationship between quantity of services provided and fees. Feldstein (1970) and Nguyen and Derrick (1997) found that the volume of services decreases when reimbursement rates increased. However, Hadley et al. (2009) found that the volume of services is positively related to fees. Clemens and Gottlieb (2014) also suggested that a rise in payment rates leads to an increase in health care supply. In addition to the literatures focusing on financial incentives and quantity of services, several previous works estimated the relationship between working hours and financial incentives. Sloan (1975) estimated the wage elasticities on weekly hours worked using US census data. He suggested that there is a low degree of responsiveness of physician supply to wage. Staiger et al. (2010) found that physician's working hours are positively associated with physician fees at the geographic level. Recently, however, Kalb et al. (2015) find that working hours decreased when wage increased. These previous studies found mixed results on the relationship between financial incentives and quantity provided or working hours. Thus, it is hard to predict a labor supply response of physicians when a public health insurance expansion increases financial incentives.

Second strands of literature examined the relationship between financial incentives and physician concentration. Baker et al. (2014) suggested that physician practice consolidation increases the price of physician services. Austin and Baker (2015) found that physician practice concentration and prices are positively correlated. Counties with the highest average physician concentrations had higher price than in the lowest counties. These studies suggest that financial incentives vary by level of physician concentrations, which may affect physician's working hours.

There are several papers examined what factors affect physicians' decision on Medicaid participation. Fossett and Peterson (1989) find the residential segregation of

Medicaid patients and differences in the minimum-efficient scale of practice for treatment of Medicaid and private patients create incentives for physician in competitive urban areas to take either few Medicaid patients or many and make it costly to maintain a Medicaid practice share. In less competitive area, these incentives are weak. Mitchell (1991) finds that physicians accept more Medicaid patients when Medicaid fees are relatively high and when there are more publicly insured patients in their area. Perloff et al. (1995) find that increase in Medicaid reimbursement may convert limited participants into full participants, but they did not find any evidence that high level of competition among physicians increases the probability of full participation.

Finally, I build on literature examining the effects of public health program expansion on the labor supply of physicians. Enterline et al. (1973) examined the effect of a major coverage expansion on physician work patterns. The study measured how working hours and working patterns of physicians changed after the introduction of comprehensive health insurance in the Montreal metropolitan area. They found that physicians decrease their working hours by about 15 percent after the introduction of universal coverage. Several papers studied the effect of SCHIP implementation. Garthwaite (2011) found that the introduction of SCHIP decreased the number of hours spent with patients, but increased physicians' program participation. He and White (2013) examined the change in physicians' work hours in response to the SCHIP expansion. They found a large negative relationship between the magnitude of a SCHIP expansion and trends in pediatricians' work hours.

My basic research design is similar to Garthwaite paper in that I estimate the effect of Medicaid expansion on labor supply of physician, but different in that I include the pre-expansion concentration. None of the existing papers linked physician concentration and labor supply of physicians when a public health insurance program expands.

1.3 Empirical model

1.3.1 Conceptual Framework

Studies of physician behavior in Medicaid mostly follow a model developed by Sloan et al (1978). Their model shows the effect of payments changes and eligibility expansions, but it is not sufficient for explaining how competition or physician

concentration will affect physicians' behavior under public health insurance expansion. My model examines the effect of public health insurance expansion on a representative physician's response and how her response to expansion affected by level of physician market concentration.

I assumed that there are J number of physicians in the market. In a local market, there is a fixed number of population, N. Physicians have three types of patients. Patients are either covered by Medicaid (M), private insurance (PI), or have no insurance (UI). A proportion of each type of patient is θ^M, θ^{PI}, and θ^{UI} with $\theta^M + \theta^{PI} + \theta^{UI} = 1$.

Assume for a simplicity that there is only one insurance company and only one disease. The price charged for private patients p^{PI} is same for all physicians in the local market. The Medicaid reimbursement rate p^M set by the government. Price for uninsured patients is p^{UI}, which indicates how much physician values uninsured patients. Payment from private patient is most, Medicaid is less and the uninsured pay little or nothing. ($p^{PI} > p^M > p^{UI}$)

The physician has a time budget of T. She spends *t* hours on working and ℓ hours on leisure, with $\ell_j + t_j = \mathrm{T}$. She divides total working hours (t) between direct patient care (h) and non-direct patient care activities $(\tilde{e})$, $h_j + \tilde{e} = t_j$. Direct patient care hours are directly linked to her income. All the activities except the direct patient care, such as teaching, researching, and doing administrative tasks, are the non-direct patient care activities. These activities except for administrative tasks can interpret as an investment. A doctor can increase her skills, learn a new technology, and recruit patients by spending hours on non-direct patient care activities. Based on earlier studies, I assume that physicians spend about 4 hours per week for an administrative task. Thus, time that physicians spend on professional tasks is $e_j = \tilde{e} - 4$ hours. These activities increase a physician's productive $f(e_j)$, which I assumed that $f_e > 0$ and $f_{ee} < 0$. Along with productivity, time spend on non-direct patient care increases the prestige of physicians because it will affect human capital and unobservable components. Physician's reputation is also function of non-direct patient care and other characteristics (X) of physician j, $k_j = g(e_j; X_j)$, with $g_e > 0$ and $g_{ee} < 0$.

The total number of patients, which can also be called physician's capacity, determined by the productivity, $f(e_j)$, and physician's time budget. Physician's capacity is linear to the number of hours spent on direct patient care; She treats $Q_j^{TP} = f(e_j) \cdot h_j$ patients in h hours with a productivity $f(e_j)$ (Clemens and Gottlieb, 2017). I assumed that physician sells the homogeneous medical service to three types of patients. The number of privately insured patients treated decided by the physician's market share, proportion of private patients and total number of population in the local area; $Q_j^{PI} = M \cdot \theta^{PI} \cdot s_j^{PI}(k_j, k_{-j}; J)$. Physician j's market share for private patients increases with own prestige and decreases with other physicians' prestige. Also, market share changes with the exogenous variable J which is the number of physicians in the market.

The demand of non-private patients, however, is treated as a given by the physician. Physician prefers private patients to Medicaid or uninsured patients because of the higher fees, so physician will desire to serve private patients first before treating non-private patients. The number of non-private patients is determined after physician treats private patients with her remaining capacity, $Q_j^{NP} = f(e_j) \cdot h_j - Q_j^{PI}$. Thus, the number of non-private patients does not depend on prestige of physician. Among those non-private patients, physician need to decide how many Medicaid and uninsured patients that she is going to treat. Mitchell (1991) found that physicians treat more Medicaid patients when there is large number of people eligible for Medicaid in their area. Thus, I assume that the probability of treating Medicaid patients is $\beta_j(\theta^M)$ which is increasing with the proportion of Medicaid patients. Thus, physician has $Q_j^{NP}\beta_j$ number of Medicaid patients and $Q_j^{NP}(1-\beta_j)$ number of uninsured patients. I assumed the unit cost (c_j) is same for all types of patients, since physician sells homogenous medical services to patients.

Physician maximizes a quasilinear utility function, $\pi_j + v(\ell_j)$, where π_j is net income and ℓ_j is leisure. I assume $v_\ell > 0$ and $v_{\ell\ell} < 0$. Physician maximizes following constrained utility function:

$$\max U(e_j, t_j) = M\theta^{PI}s_j^{PI}(p_j^{PI} - c_j) + (f(e_j)(t_j - e_j) - M\theta^{PI}s_j^{PI})\{\beta_j(p^M - c_j) + (1-\beta_j)(p^{UI} - c_j)\} + v(T - t_j)$$

s.t

$$M\theta^{PI}s_j^{PI} \leq f(e_j)(t_j - e_j)$$

In the process of maximizing utility, the physician decides on level of e and t. Constraint means that physicians cannot accept private patients more than their own capacity.

Constraining physician spending on total working hours and non-direct patient care hours to be non-negative, the first-order conditions are:

$$[e]: M\theta^{PI}s_e^{PI}g_e(p^{PI}-c)+\{(f_e(t-e)-f)-M\theta^{PI}s_e^{PI}g_e\}\{\beta p^M+(1-\beta)p^{UI}-c+\lambda\}=0 \quad (1.1.a)$$

$$[t]: f\{\beta p^M+(1-\beta)p^{UI}-c+\lambda\}-v_l=0 \quad (1.1.b)$$

when constraint is non-binding, it means that physician receives both private and non-private patients. If constraint is binding, then physician only receives private patients. More formally, if the physician participates in both markets, the first-order conditions bind if not it is less than 0.

Using (1.1.a) and (1 b), $\{(f_e(t-e)-f)-M\theta^{PI}s_e^{PI}g_e\}$ term in (1.1.a) should be negative. It means that the changes in total output is smaller than the changes in the number of private patients from additional non-direct patient care hours. In other words, increasing the non-direct patient care hours decreases the number of non-private patients that physician treated. The optimum e^* is when the net income of private patients from additional non-direct patient hours equals to the net loss of non-private patients from additional non-direct patient hours. The optimum t^* is when the utility of net income from non-private patients from additional total working hours is equal to the marginal utility of leisure.

1.3.2 Physician Response to Public Health Insurance Expansion

The objective is to understand the impact of the exogenous variables that changed because of the Medicaid expansion. The comparative statics analysis yields unambiguous predictions of the effect of changes in the exogenous variables on the key decision variables of interest, e and t. I totally differentiate the first-order conditions with respect to Medicaid reimbursement rate pm and the proportion of types of patients in the local area θ^{PI} and θ^{M}. The table 1.1 shows a summary of the comparative statics results.

Table 1.1 Summary of the comparative statics results

Exogenous changes	Non-direct patient care	Total working hours	Predicted effects on output
Increase in Medicaid reimbursement	$\frac{\partial \mathrm{e}}{\partial \mathrm{p^m}} = -\frac{u_{tt}u_{ep^m} - u_{et}u_{tp^m}}{\Delta}$	$\frac{\partial \mathrm{t}}{\partial \mathrm{p^m}} = -\frac{-u_{te}u_{ep^m} + u_{ee}u_{tp^m}}{\Delta}$	? / ?
Decrease in proportion of privately insured patients	$\frac{\partial \mathrm{e}}{\partial \theta^{PI}} = -\frac{u_{tt}u_{e\theta^{PI}}}{\Delta}$	$\frac{\partial \mathrm{t}}{\partial \theta^{PI}} = -\frac{-u_{te}u_{e\theta^{PI}}}{\Delta}$	−/−
Increase in proportion of Medicaid patients	$\frac{\partial \mathrm{e}}{\partial \theta^{M}} = -\frac{u_{tt}u_{e\theta^{M}} - u_{et}u_{t\theta^{M}}}{\Delta}$	$\frac{\partial \mathrm{t}}{\partial \theta^{M}} = -\frac{-u_{te}u_{e\theta^{M}} + u_{ee}u_{t\theta^{M}}}{\Delta}$	? / ?

Notes: See Appendix A.

Assume Δ is positive, because it is equivalent to the second order Hessian matrix determinant, which must be positive for-profit function to reach a maximum. Only the change in the proportion of privately-insured patients is able to sign the impacts. If the Medicaid expansion decreases the proportion of privately-insured patients because of the crowd-out effect, then physicians will decrease their own non-direct patient care and total hours.

For other derivatives, it is impossible to sign them. The sign of derivatives for non-direct patient care will depend on following equation;

$$-v_{ll}((f_e(t-e)-f)-M\theta^{PI}s_e^{PI}g_e)+f_e f\{\beta(p^M-c)+(1-\beta)(p^{UI}-c)\}=-v_{ll}Q_e^{NP}+v_l f_e \quad (1.2)$$

The first term of equation (1.2) is negative and second term is positive that it is impossible to determine the sign. The sign of equation (1.2) depends on the functional form of leisure function. If absolute values of v_{ll} and v_l are equal, then the sign of equation (1.2) depend on the changes in non-private patients and in productivities from an additional hour on non-direct patient care activities. When the additional 1-time unit of non-direct patient care decrease 1-time unit of leisure (instead trading-off direct patient care hours and non-direct patient care hours, if physician trading-off leisure hours and non-direct patient care hours), if total number of patients increase more than the number of privately-insured patients from additional *e* then equation (1.2)

is positive. This means that additional *e* will increase both privately-insured patients and publicly-insured patients. Thus, physicians will increase hours on non-direct patient care hours if the reimbursement rate of Medicaid and the proportion of Medicaid patients goes up.

The sign of derivative for total working hours depends on following equation:

$$\{-f_e Q_e^{NP}(\beta p^M+(1-\beta)p^{UI}-c)+fU_{ee}\} \quad (1.3)$$

Sign of equation (1.3) decided by the functional form of productivity function, because the first term of (1.3) is positive and the second term is negative. Therefore, it is unable to determine the sign of equation (1.3). Assuming fe and f is equal, the sign is decided by the size of net loss of losing non-privately insured patients from additional *e* and how slow the utility function increase as *e* increase. If net loss is bigger than the decreasing rate of utility from additional *e*, then equation (1.3) is positive. Then, physicians will spend more hours on total working hours when Medicaid reimbursement and the proportion of Medicaid patients go up.

The physician concentration will affect the magnitude of the impacts. The level of physician concentrations influences the physician's market share for privately insured patients and the price for privately-insured patients. In my model, physician's market share is function of the number of physicians in local area. Therefore, s_e^{PI} in competitive areas is small. According to previous literatures, physicians in low competition areas will have greater p^{PI} compared to those in high competition areas. Physicians in high competition areas has a large positive effect than the physicians in low competition areas. As a result, the impacts on non-direct patient care hours and total working hours are greater in competitive areas in terms of size of the magnitude.

Using the empirical analysis, I investigate the sign and the magnitude for each impact on non-direct patient care and total working hours.

1.4 SCHIP Expansion

1.4.1 Backgrounds

The SCHIP was enacted as part of the Balanced Budget Act (BBA) of 1997 under the new title XXI of the Social Security Act (SSA). The implementation of SCHIP begun on October 1, 1997 and every state had their own SCHIP in 2000. SCHIP decreased the uninsured rate by providing health coverage to low-income children in families that earn income above Medicaid eligibility levels, but have no health insurance. The introduction of SCHIP has had a significant effect on insurance coverage among children. According to the Center for studying Health System Change (HSC), the proportion of low-income children who were uninsured dropped from 20.1 percent in 1997 to 16.1 percent in 2001. The official federal estimate provided by the Centers for Medicare and Medicaid Services (CMS) estimates that nationally 3.3 million children were enrolled in SCHIP at some time during FY 2000, ending September 30,2000 (U.S. Department of Health and Human Services, 2001).

States could choose one of three options to expand coverage; either expand Medicaid program, develop separate SCHIP programs, or combine those two programs. The type of program impacts the eligibility of programs. If states choose the Medicaid expansion program, the eligibility follows the Medicaid rules applied. If states use separate SCHIP programs, then it follows the Title XXI of SSA rules. In addition, they have the choice to choose which services to cover and to place limits on them. States that use a combination of two programs set SCHIP eligibility to start from where Medicaid eligibility ends and extend the eligibility to higher income levels. The difference between Medicaid expansion program and separate SCHIP programs is following. If states expand existing Medicaid, coverage is guaranteed even if SCHIP funding runs out. However, states that chose separate programs need to put applicants for SCHIP on a waiting list when federal funds ran out.

Depending on the type of programs, income eligibility cutoffs vary by states and with the age of the child. Thus, the size of program is different by states. Generally, coverage must be limited to children who are under 19 years of age, not eligible for existing Medicaid or other health insurance, and whose family income is below 200 percent of the FPL for their size of family. Federal authorized states to expand coverage to children in

families with income up to higher of 200 percent of poverty of 50 percentage points above the Medicaid eligibility level in effect on March 31, 1997.

SCHIP affected uninsured patients, but also influences the size of private insurance market. There are several papers that have estimated the crowd out. Cutler and Gruber (1996) found that the crowd out rate of 50 percent. Gruber and Simon (2008) also found that three out of five children covered under SCHIP come from private coverage and two out of five come from uninsured. There is disagreement about controversial on the magnitude of the crowd out, but SCHIP likely to move a child from uninsured to SCHIP and from private to SCHIP.

1.4.2 Data

To examine the effect of the implementation of SCHIP, I used the CTS from ICPSR. This dataset is a nationally-representative random sample survey of physicians. The dataset includes physicians who provide at least 20 hours of direct patient care per week. One of the benefits of using CTS is it has both panel and cross-sectional components. The longitudinal component of each wave is smaller than the cross-sectional components. In my paper, I used longitudinal components to estimate the effect of SCHIP on labor supply of physicians with different level of concentration.

I used the three rounds of the restricted use version of the survey: 1996-1997, 1997-1998, and 2000-2001. The number of pediatricians surveyed in each round was 1,627, 1,727 and 1,802. The sample size for the longitudinal component reduced to 714 pediatricians. The restricted use version provides geographic identifiers, the Federal Information Processing Standardization (FIPS) state and county codes, that identify the physician's practice location. With geographic identifiers, I can match the county level physician concentration for my estimation.

The labor market outcomes that used from the CTS physician survey are number of hours per week physicians spend on medical care (total working hours), direct patient care and non-direct patient care, whether the individual might accept Medicaid patients and percent of revenue from Medicaid patients.[1]

[1] Medically related activities include all time spent in administrative tasks, professional activities, and direct patient care. Direct patient care activities include face-to-face contact with patients, as well as patient

The size of SCHIP program varied by state because each state sets different income eligibility limit and coverage. To measure the scale of public program, I adopt a simulated eligibility measurement used in several previous studies (Currie and Gruber, 1996; Cutler and Gruber, 1996; Ham and Shore-Sheppard, 2001; LoSasso and Buchmueller, 2004). This measurement is preferred to the actual enrollment measurement for SCHIP, because the actual enrollment data usually correlated with local economic or demographic conditions which leads to the endogeneity issue. The local economic or demographic conditions may influence physician labor supply. For example, if there are many individuals living in poverty, then it will affect policymakers to set a generous income eligibility limit, but also affects the physicians' participation rate in a public program or practice styles. By using the simulated eligibility measurement, it is available to overcome the endogeneity issue.

For the simulated measure, I draw a fixed random national sample of 1,000 children ages 0 to 18 years using Integrated Public Use Microdata Series (IPUMS) CPS March 1996. I use each state's income eligibility rules from the annual reports by the National Governors Association (1996 and 2000) and Shore-Sheppard (2001). With a nationally representative sample of children and income eligibility rule of each state, I identified children who are eligible for SCHIP. A child is qualified for SCHIP if the child's family poverty cutoff is below the income eligibility rule for each children ages, state, and year. To calculate the child's family income, I add individual's personal income by Health Insurance Unit (HIU). I use the HIU, which is constructed by the State Health Access Data Assistance Center (SHADAC) at the University of Minnesota, because the definition of family or household in Census Bureau Surveys does not necessarily align with dependent coverage or public program eligibility. I divide the child's family income with the federal poverty guidelines based on the size of child's family to get a poverty cutoff and calculate the fraction of children who are eligible for SCHIP at the state-year level. The eligibility thresholds changed over time and across states, so the measurements also vary over time and across states.

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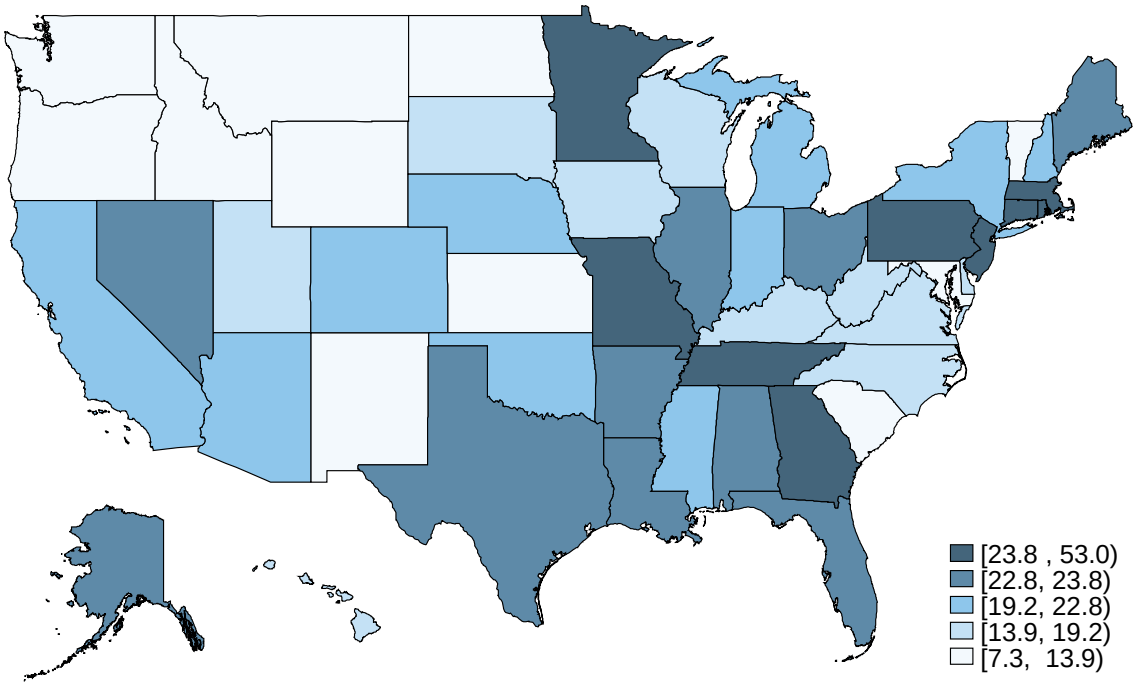
recording keeping and office work, travel time connected with seeing patients, and communication with other physicians, hospitals, pharmacies, and other places on a patient's behalf, but that exclude time spend in training, teaching, research, any hours on-call when not actually working, and travel between home and work at the beginning and end of the work day. CTS do not provide hours on non-direct patient care hours, so I subtract direct patient care hours from total working hours.

Figure 1.1 shows the change in the simulated eligibility measurement of SCHIP from 1996 to 2001 across states. Table B1 presents the descriptive statistics of the simulated eligibility measure of SCHIP expansion for the states that included in the CTS. The average size of Medicaid for children was 25.5 percentage points in 1996 and it increased to 49.0 percentage points in 2000. The mean average increase was 23.5 percentage points between 1996 and 2001. The smallest change was 12.9 percentage points and the larges change was 32.8 percentage points.

Figure 1.1 Change in the Size of SCHIP between 1996 and 2001



Notes: This figure shows the change in the size of SCHIP from 1996 to 2001. The change is measured by using simulated eligibility measurement. The smallest change was 7.4 percentage points and the largest change was 55.7 percentage points. The categories for the SCHIP expansion include state's simulated eligibility that changed more than 23.8 percentage points, at least 22.8 percentage points and less than 23.8 percentage points, at least 19.2 percentage points and less than 22.8 percentage points, at least 13.9 percentage points and less than 19.2 percentage points and less than 13.9 percentage points.

I include Medicaid reimbursement rates (1993, 1998, and 2003) from the Urban Institute Medicaid Managed Care Payment and Implementation Survey (Norton, 1994; Norton et al, 2000; Zuckerman et al, 2004) to control the changes in physicians' financial incentives. I matched these data to the closest respective years in the CTS as Garthwaite (2012) paper did.

I create variable measuring physician concentration from the Area Health Resources Files (AHRF), since my analysis relies on geographic variation in the level of physician concentration. The finest geographic-level that the AHRF and the CTS data provide is county. From the AHRF, I utilize the number of active physicians and the county population in 1996 to construct the pre-expansion concentration of physicians at county level.[2] After that, I match the level of physician concentration with the CTS data. Figure 1.2 the variation of the level of physician concentration across counties in the CTS physician survey. One concern is that the CTS might not reflect the physicians working patterns in rural areas. The CTS collect the data from 60 sites which is not based on the full population and 48 sites are from metropolitan areas. However, the CTS survey uses stratification, clustering, and oversampling to provide the basis for making national estimates. Figure B1 shows the distribution of physician concentration by sites; metropolitan over population 200,000, metropolitan under population 200,000, and non-metropolitan. The physician concentrations are distributed between 0 and 5 for all three sites that the data can be generalizable. Table B2 presents a summary statistics of physician concentrations for counties in my sample and for all counties. In my sample, the average value of physician concentration is 3.01 with standard deviation is 1.59. These statistics are larger than the national ones.

I use the Small Area Income and Poverty Estimates (SAIPE) 1995 to tabulate physicians with poverty rates. The SAIPE provides estimates of income and poverty statistics. I use the estimated percent of people, whose age below 18, in poverty at the county level to determine whether poverty rates of county are above the national average poverty rate. The national average poverty rates for children under 18 was 20.8% in 1995.

[2] In this paper, physician density indicates physician competition. Previous literature on competition in physician service markets use either physician density or physician HHI as a competition measurement. Bradford and Martin (1992) found that prices decrease as a physician density increases and Schneider et al. (2008) suggest that prices increase as the physician HHI increases. Both papers show that physician prices are low if there are more rivals in a marketplace. From the previous studies, using either of the competition measurements gave consistent results.

1.4.3 Empirical methods

I follow the approach similar to that previous literatures (Gaynor and Serra (2012), Garthwaite (2013), He and White (2013)). I use a triple difference model to estimate the impact of SCHIP on physicians' response and how the response varies by levels of physician concentrations.

For a triple difference model, I use pediatricians as a treatment group and internal medicine physician as a control group. Pediatricians are one type of a primary care physician who treat individuals age under 18, who were most affected by the implementation of SCHIP. The control group should be a group of physicians whose practice must be not affected, but the trend of outcomes should be similar to the treatment group if there was no SCHIP expansion. Garthwaite (2013) used physicians in specialties other than pediatricians as a control group. However, using all types of physicians in specialties might be not a good control group, because their practice patterns and reimbursement fees are different from pediatricians. For example, surgical specialties have different working patterns and more expensive reimbursement fees compared to pediatricians. For a control group, therefore, I focus on internal medicine physicians who are also primary care physician and whose practice is similar to that of pediatricians, but for adults.

In addition, I examine pediatricians and internal medicine physicians who are practicing medicine in counties with a poverty rate below the national average rate. Theoretically, it is possible to expect that areas with a large percentage of children living in poverty prior to the expansion to expansion to experience larger increases in SCHIP. Therefore, physicians providing medical services in relatively high poverty areas will expect a large increase in demand for medical services from newly insured children compare to physicians working in low poverty areas. The poverty rate that used for analysis is percent of children, whose age below 18, living below the official federal poverty level. The average poverty rate for children under 18 is 20.8% in 1995. About half of physicians (2,135) in my sample (5,076) were working in areas where poverty ratio is above the national average.

Table 1.2 presents the descriptive statistics of control and treatment groups. I show the sample means prior to and after expansion. Pediatricians spend fewer hours on medical

related and direct patient care than general internal medicine doctors. Prior to the expansion, pediatric physicians work about 49.97 hours per week and general internal physicians work 56.61 hours per week. After the SCHIP expansion, pediatric physicians and general internal physicians both reduce working hours to about 48.23 hours and 54.88 hours, respectively. For pediatricians, their direct patient care hours decreased from 41.57 hours to 41.40 hours after the expansion. However, general internal physicians increase their direct patient care hours to 46.93 hours from 45.68 hours per week. Pediatricians treat more Medicaid patients, but internal medicine physicians treat more Medicare patients. This difference comes from their different patient pool. Medicare generally covers individuals whose age over 65 and those individuals will see internal medicine physicians. The practice types of physicians are generally similar among pediatricians and internal medicine physicians. The sample means of other state characteristics were similar across the pre- and post-expansion periods.

Table 1.2 Summary Statistics for Pediatricians and Internal Medicine Physicians

	Pediatrician (n=714)		General Internal Medicine (n=907)	
	1996-1997	2000-2001	1996-1997	2000-2001
Male (%)	59.24	59.24	78.72	78.83
	(49.17)	(49.17)	(41.00)	(40.87)
Total working hours	49.97	48.23	56.51	54.88
	(13.68)	(14.62)	(15.35)	(16.15)
Hours spent on direct patient care	41.57	41.40	45.68	46.93
	(12.52)	(12.97)	(14.66)	(15.09)
Hours spend on non-direct patient care	8.39	6.83	10.83	7.95
	(8.59)	(8.42)	(10.62)	(10.02)
Percentage revenue from Medicaid	22.74	22.94	11.31	10.91
	(24.34)	(23.42)	(14.08)	(13.87)
Percentage revenue from Medicare	7.76	6.51	40.61	42.12
	(16.51)	(14.15)	(21.89)	(21.52)
Percentage revenue from Managed care	57.91	59.89	45.67	45.69
	(26.09)	(26.31)	(29.13)	(27.39)
Income	127,522	137,456	137,973	146,818
	(59,697)	(59,323)	(60,925)	(65,949)
Accept new Medicaid patient (%)	83.33	83.61	74.53	69.02
	(37.29)	(37.04)	(43.59)	(46.27)
Accept new private patient (%)	96.78	96.64	94.82	93.50
	(14.81)	(18.04)	(22.18)	(24.67)
Physician concentration (per 1,000)	2.93	2.93	3.51	3.51
	(1.92)	(1.92)	(2.02)	(2.02)
Simulated Eligibility measurement	0.27	0.48	0.27	0.51
	(0.05)	(0.08)	(0.05)	(0.09)
Medicaid fee index	0.99	1.00	1.01	1.01
	(0.22)	(0.24)	(0.22)	(0.22)
Poverty rate	19.97	19.97	20.10	20.10
	(8.97)	(8.97)	(8.97)	(8.97)

Source: Community Tracking Study Physician Survey, 1996-1997, 1998-1999, and 2000-2001.

I first estimate a simple difference in differences specification to measure the causal effect of the SCHIP on physicians' working hours:

$$y_{jst} = \beta_1 eligibility_{st} + \beta_2 eligibility_{st} \times Ped_j + \gamma_1 Fee_{st} + \gamma_2 Style_{jt} + \alpha_i + \delta_t + \epsilon_{jst} \text{ . (1.4.1)}$$

The dependent variables y_{jst} are total working hours, the number of hours spent on direct patient care activities and non-direct patient care activities during the last week, percent practice revenue from Medicaid, and whether physician accept new Medicaid patients for

physician j living in state s during CTS panel round t. I include α_j which is a physician fixed effect and δ_t that is a survey year dummy. $eligibility_{st}$ is the simulated eligibility measurement, Ped_j is an indicator variable for a pediatric physician, Fee_{st} is the Medicaid reimbursement index, and $Style_{jt}$ is physician j's practice style at time t.[3] The coefficient of interest is β_2, which is the estimate of the effect of SCHIP implementation. It is identified by comparing working hours of physicians based on the size of SCHIP. Using a simple difference in difference specification provides, it will give a sight whether my result is consistent with earlier studies and how it is varied from their results.

Next, I extend my estimation by including the pre-ACA physician concentrations. My first specification does not control the changes in the labor supply of pediatricians which might be systematically different across the level of the pre-ACA concentration in physician markets. The levels of physician concentrations have relationship with physicians' labor decision because it affects financial incentives of physicians and their patient pool. To exclude the changes in physicians' labor decision which results from the market structure rather than policy change, I control the level of competition among physicians prior to the expansion by using a triple difference specification:

$$y_{jcst} = \beta_1 eligibility_{st} + \beta_2 eligibility_{st} \times Pedd_j + \beta_3 eligibility_{st} \times C_c^* + \beta_4 Ped_j \times eligibility_{st} \times C_c^* + \gamma_1 Fee_{st} + \gamma_2 Style_{jt} + \alpha_i + \delta_t + \epsilon_{jcst} . \quad (1.4.2)$$

Variable, C_c^* is centered physician concentration ratio in 1996 at the county-level, which controls the level of physician competition. All other variables are defined as in equation (1.4.1). The coefficients of interest are β_2 and β_4. β_2 estimates the effect of SCHIP expansion on a pediatrician who is practicing medicine in areas with average level of competition. β_4 examines whether the impact of SCHIP very across the level of competition. This parameter captures the simulated eligibility change in averages for the pediatricians in the same concentration and then net out the change in means for the internal

[3] About half of physicians, except for physicians who practice as a solo or two, change their practice styles between the first (1996-1997) and second round (1998-1999) and the second (1998-1999) and third (2000-2001) round. More details are in the table A.3.

medicine physicians in the same level of concentration and the change in means for the pediatricians in the different levels of concentration areas.

For a robustness check, I perform a placebo test on model (1.4.1) and (1.4.2) using a fake treatment group. For a placebo test, surgical specialties are used as a fake treatment group. I exclude pediatric surgical specialties from a surgical specialty group. The purpose of this exercise is to assess the likelihood of finding a false positive when examining the effect of SCHIP on physicians' labor supply. Surgical specialties should not be affected or less affected by SCHIP, because SCHIP was targeted to children age under 19. I find no significant effect of SCHIP on surgical specialties' labor supply.

1.4.4 Results

I begin with a simple difference in difference to examine the changes in physicians' labor outcomes before and after SCHIP. Table 1.3 presents estimates of the effect of SCHIP on total working hours during the last week. As shown in Table 1.3, the key coefficient is β_2 the interaction of $eligibility_{ts}$ and Ped_j. To interpret this estimate, I calculate the marginal effect of mean expansion using the average changes in simulated eligibility of SCHIP between 1996-1997 and 2000-2001. Column 1 suggests pediatricians work 0.70 hours (42 minutes) less per week than internal medicine physicians after the SCHIP expansion. Column (2) and (3) shows that pediatricians spend 1.41 hours less on direct patient care and 0.71 hours more on non-direct patient cares. Only hours spending on direct patient care activities decreased statistically significantly at 0.05 level. Prior to the expansion, pediatricians spend 8.30 hours on non-direct patient cares. If physicians did not change hours on administrative tasks after the expansion, then pediatricians spent about 4.30 hours on professional activities prior to the expansion. Thus, pediatricians increase their hours on professional tasks about 16.51 percent more relative to the pre-expansion. Physicians spend about 3.39 percent less on direct patient care activities prior to the expansion. Column (4) to (6), after controlling for county-level poverty rates, suggest that the decreases in total working hours and direct patient care hours and increase in non-patient care hours are larger in counties for which the poverty rates are above the national average. Only the result for direct patient care hours is statistically significant. These results suggest that the expansion of SCHIP led physicians to reallocate their working hours by

decreasing hours on direct patient care activities and increasing hours on non-direct patient care activities. The impact of expansion on direct patient care is large in size of magnitude than it leads total working hours to fall.

Table 1.3 Difference-in-Differences Estimates of the Impact of SCHIP Expansion on Total Working Hours During the Last Week

	All regions			Area above the national poverty rates		
	(1)	(2)	(3)	(4)	(5)	(6)
	Total working hours	Direct patient care hours	Non-direct patient care hours	Total working hours	Direct patient care hours	Non-direct patient care hours
Eligibility × Pediatrician (β_2)	-2.97	-6.00**	3.04	-5.61	-8.79**	3.18
	(2.17)	(2.17)	(2.26)	(3.09)	(3.19)	(4.21)
Marginal effect of mean expansion	-0.70	-1.41	0.71	-1.32	-2.07	0.75
N	1,621	1,621	1,621	702	702	702
$N \times T$	4,668	4,668	4,668	1,965	1,965	1,965

Notes: Each cell shows the estimates from equation (3.1). Standard errors that allow for clustering within states are shown in parentheses. The marginal effect for the average change in the simulated eligibility measurement of SCHIP between 1996 and 2001 is calculated by multiplying 21.5% with the coefficient β_2. It represents the impact of SCHIP expansion for the average size of SCHIP. Column (1) to (3) estimate all pediatricians and internal medicine physicians. Column (4) to (6) only includes pediatricians and internal medicine physicians who are practicing medicine in areas with poverty rates above the national poverty level. The poverty rates are calculated with the fraction of children younger than age 18 living in households with incomes below the federal poverty guidelines. Additionally, variable included, but not shown, are Medicaid reimbursement rates, practice styles at time t, time fixed effects, and panel fixed effects.
*p<0.10, **p<0.05, ***p<0.01
Source: Community Tracking Study Physician Survey physician survey, 1996-1997, 1998-1999, and 2000-2001.

Table 1.4 presents estimates from equation (4.2) that estimates whether the impact of SCHIP expansion on working hours differs across the level of competition. Table 1.4 displays estimates for all physicians and physicians in areas with the national average poverty rates. The coefficients of interest are β_2 and β_4. β_2 captures the impact of SCHIP expansion at average level of competition. β_4 presents the marginal impact of SCHIP on pediatrician when level of physician concentration increases by 1. I use the 25th percentile cutoff and 75th percentile cutoff points to get the marginal impact of SCHIP in areas with low concentration and with high concentration.

The estimates suggest that pediatricians at an average level of physician concentrations reduce their total working hours by 0.76 hours per week. Physicians in areas with relatively low concentrations (25 percentile cutoff) reduce 1.07 hours and pediatricians in areas with relatively high concentrations (75^{th} percentile cutoff) reduce only 0.45 hours per week. Pediatricians who have many competitors likely to decrease less total working hours. Pediatricians work fewer hours on direct patient care hours and increase hours on non-direct patient care after the expansion and these trends became large in magnitude if the physician concentration increases. Pediatric physicians in high concentration areas likely to spend more hours on non-direct patient care hours. After the expansion of SCHIP, pediatrician's likely to accept new Medicaid increase by 5% compared to internal medicine physicians. This estimate does not affect by the level of physician concentrations and poverty rates. However, all the results except for the direct patient care hours are not statistically significant.

As shown in Table 1.4, the estimates for physicians in poor counties shows that the impact of SCHIP is larger than the results for all physicians. Pediatricians statistically significantly decrease their total working hours and the magnitude of decrease is very across the level of physician concentrations. Also, the direct patient cares hours decrease significantly but not statistically significantly affected by the competition. Hours on non-direct patient cares increase for pediatricians in high concentration areas, but decrease for those in low concentration areas.

Table 1.4 Triple Difference Estimates of the Impact of SCHIP Expansion on Labor Outcomes of Physicians

All sample	(1)	(2)	(3)	(4)	(5)
	Total working hours	Direct patient care hours	Non-direct patient care hours	Accept Medicaid	Revenue from Medicaid
Eligibility × Pediatrician(β_2)	-3.22	-6.07	2.85	0.20	-0.86
	(2.28)	(2.25)	(3.19)	(0.07)	(3.26)
Eligibility × Pediatrician × C*(β_4)	1.47	-0.15	1.62	-0.00	0.04
	(1.66)	(1.65)	(1.82)	(0.05)	(2.75)
Marginal effect of expansion at average physician concentration (C*= 0)	-0.76	-1.43	0.67	0.05	-0.20
Marginal effect of expansion at 1st quantile in physician concentration (C*=-0.9)	-1.07	-1.39	0.33	0.05	-0.21
Marginal effect of expansion at 3rd quantile in physician concentration (C*= 0.89)	-0.45	-1.46	1.01	0.05	-0.19
N	1,621	1,621	1,621	1,621	1,621
$N \times T$	4,668	4,668	4,668	4,668	4,668

Area above the national poverty rates	(1)	(2)	(3)	(4)	(5)
	Total working hours	Direct patient care hours	Non-direct patient care hours	Accept Medicaid	Revenue from Medicaid
Eligibility × Pediatrician(β_2)	-7.56*	-8.37**	0.78	0.21	3.34
	(3.39)	(3.15)	(4.90)	(0.11)	(5.45)
Eligibility × Pediatrician × C*(β_4)	3.36**	-0.44	3.78	-0.03	-2.74
	(1.52)	(1.96)	(2.26)	(0.04)	(3.48)
Marginal effect of expansion at average physician concentration (C*= 0)	-1.78	-1.97	0.18	0.05	0.78
Marginal effect of expansion at 1st quantile in physician concentration (C*= -0.9)	-2.49	-1.87	-0.62	0.06	1.36
Marginal effect of expansion at 3rd quantile in physician concentration (C*=0.89)	-1.07	-2.06	0.97	0.04	0.21
N	702	702	702	702	702
$N \times T$	1,965	1,965	1,965	1,965	1,965

Notes: Each cell shows the estimates from equation (3.2). Standard errors that allow for clustering within states are shown in parentheses. C* refers to the level of physician concentrations in 1996 (pre-expansion). C* is demeaned to have a mean of 0. The marginal

I additionally perform the analysis using the different measurement for physicians' concentrations by using different geographic units and different way to measure the health service market competition. Instead of using county-level measurement of concentration of physicians, I use Hospital Service Areas (HSA)-level physician concentration and county-level Hospital HHI to measure the impact of SCHIP on working hours.[4] The result of using HSAs-level physician concentration was similar to the result in Table 1.4. However, none of labor market outcomes of physicians are significant when I use the county-level HHI.

These results are consistent with my prediction in the section 1.3. In summary, physicians' total working hours decreased after the expansion of SCHIP but it was not significant and small in size of magnitude. Physicians spend fewer hours with patient care activities and more hours with non-direct patient care hours. Further, all physicians respond similar to the SCHIP expansion, but the size of magnitude of the impact is large in the areas with high competition. Physicians located in high competition areas tend to spend more hours on professional task after the expansion and this can be suggesting that more competitors might lead them to invest more on professional tasks.

1.5 The ACA

In this section, I focus on the recent expansion, the ACA. The ACA expanded Medicaid coverage to childless adults and adults with dependent children. Unlike expansion of SCHIP, Medicaid expansion did not crowd out private insurance (Callison and Sicillan, 2016; Leung and Mas, 2016; David and Jung, 2017) In addition, the ACA implemented the health insurance marketplace, also called health exchanges, to increase individuals' access to health insurance. As a result, the ACA increased both publicly and privately insured patients without crowd-out. These distinct changes of the ACA may lead to different physicians' responses compared to SCHIP.

[4] Instead of using regional boundary to measure the physician competition, I use service boundaries to measure the level of physician competition, HSAs is patient origins boundaries which identify the local health care markets for hospital care. In addition, I use different measure to control the level of competition in each county. I use county-level HHI variable in 1997 from Healthcare Cost and Utilization Project (HCUP) supplementary data. It measures hospital market competition, but still can know the intensity of competition at the county level.

1.5.1 Background

One of the primary concerns in the United States was a large number of people living without a health insurance. Uninsured rate peaked at 18 percent in 2013 and it has steadily decreased by 10.9 percent after enactment of the ACA in 2014.[5] One of the goals of the ACA was to lower the uninsured rate by expanding insurance coverage.

The health coverage provisions of the ACA significantly decreased the uninsured rate by several ways. First, the ACA expanded Medicaid eligibility thresholds for both adults with dependent children and childless adults. All adults, whose family income is below 138 percent of the poverty guidelines, became eligible for Medicaid as part of the ACA. Prior to the ACA, typically childless adults were not eligible for Medicaid. Several states provided coverage to childless adults through Section 1115 waiver before the ACA, but this coverage had limited benefit, ceilings on enrollment, and/or premium and cost sharing.[6] After the ACA's 2014 coverage expansion, the number of uninsured individual significantly decreased by expanding eligibility to childless adults and increasing the income eligibility threshold for adults with dependent children except for the states that decided not to expand Medicaid. Not all states expanded Medicaid under the ACA, because the United State Supreme Court held that state cannot be required to expand Medicaid eligibility. According to the Kaiser Family Foundation (2016), thirty-two states including the District of Columbia adopted the Medicaid expansion and nineteen states did not adopt by 2016.

Second, the ACA created health insurance marketplaces for people who wants to buy private insurance directly through online. Health insurance marketplace, also known as the insurance exchange, operated by the federal government for the most states.[7] Individuals, who lives in the U.S. with citizenship and who do not have Medicare, are eligible to purchase market health plan from the marketplace. The first enrollment in the marketplace began on October 1, 2013. As of April 19, 2014, 8.02 million people had signed up through the health marketplaces. The ACA provides subsidies to expand access

[5] The ACA was signed by a law in March 2010, but most of the provisions took effect on January 1, 2014.
[6] The ACA gave option to states to start the expansion before January 2014. Seven states (CA, CO, CT, DC, MN, NJ, and WA) expanded Medicaid coverage to childless adults on before 2014. Connecticut uses the ACA's pre-2014 state plan option. Other states use Section 1115 waiver.
[7] 14 states run their own Marketplace. (CA, CO, CT, DC, ID, MD, MA, MN, MI, NM, RI, UT, VM, and WA)

to affordable health insurance for individuals and families whose earnings are between 100 and 400 percent of federal poverty guidelines.[8] Adults with income below 100 percent of poverty guidelines are not eligible for federal subsidies. The ACA expected low-income individuals to be covered through Medicaid, so it does not offer subsidy to people below poverty. Thus, adults with dependent children and childless adults in non-expansion states are not eligible for subsidy if their income levels are below 100 percent and above Medicaid eligibility cutoff.

Third, the ACA mandated most individuals to have health insurance. If individuals could afford health insurances but choose not to buy it, they are required to pay a yearly financial penalty.[9] However, if individuals live in states that didn't expand Medicaid and earn income below 138% of federal poverty guidelines, then they can get an exemption from the penalty.

These coverage provisions significantly decreased the uninsured rate by increasing both individuals with Medicaid and private insurance. This would change the proportion of patients by types of health insurance coverage and influence physicians' labor supply decisions.

In addition, one of the ACA provisions affected the financial incentives of physicians. The ACA required insurers to cover ten specific services. Along with an increase in the number of reimbursements, the ACA increased Medicaid reimbursement rates during 2013 and 2014.[10] Especially, primary care physicians and general surgeons received a 10 percent bonus for opening or continuing to practice in medically underserved communities. The goal of these provisions is to promote physicians to accept patients with

[8] The ACA offers two kinds of subsidies; the advanced premium tax credit which lowers monthly health insurance payments or premiums and the cost sharing subsidy that reduce out-of-pocket cost.
[9] The penalty is calculated in two different ways; as a percentage of income and per person. Individuals will pay whichever is higher.
[10] According to the Kaiser Commission on Medicaid and the Uninsured (KCMU) Annual Medicaid Budget Survey (2014) and the Pew Charitable Trusts Stateline reports (2015), 15 states continues the fee increase in 2015 using state funds at their regular federal matching rate (AK, AL, CO, CT, DE, HI, IA, NE, NM, NV, ME, MD, MI, MS, and SC). According to Stateline, Indiana retain the higher reimbursement rate since 2015 and 335 PCPs and 600 other medical providers have begun accepting new Medicaid beneficiaries. Also, Colorado also has continued to keep reimbursement rate at the Medicare level and about 100 new providers participate in Medicaid each month. These evidences suggest that increase in reimbursement rate will affect physicians labor supply decisions.

Medicaid coverage. Therefore, physicians would have behaved differently after the ACA because of the changes in financial incentives.

1.5.2 Data

Primary data sets are the ACS 2011-2015 and the March CPS 2013 from the IPUMS. The IPUMS-CPS is an integrated set of data spanning more than 50 years of the CPS and the IPUMS-ACS consists of more than fifty high-precision samples of the American population drawn from fifteen federal censuses and from the ACS.

To estimate the effect of the ACA, I use the IPUMS-ACS, because the CTS physician survey stop surveying physicians after 2005. The downside of using the IPUMS-ACS is that it only provides the number of hours per week that the individuals usually worked during the past 12 months. Therefore, it is unavailable to examine the impact of the ACA on total working hours into direct patient care hours and non-direct patient care hours. However, the IPUMS-ACS provides large sample size compare to the CTS data and allows to control the physicians' demographic characteristics in relation to labor supply decisions. In addition, it is possible to examine the effect of the expansion on extensive labor supply outcomes and on other healthcare practitioners along with physicians.

My study sample consists of individuals who responded that their occupations are physicians or surgeons and registered nurse. Using the occupation code from the IPUMS-ACS, I identify whether a respondent is a physician or a registered nurse.[11] The sample sizes of physicians/surgeons and registered nurses in the IPUMS-ACS are 40,105 and 138,334, respectively.

The outcome variable is usual working hours per week. For registered nurses, I additionally look at the employment, and the labor force participation. I also create variables measuring the demographic characteristics from the IPUMS-ACS. These include age, sex, the number of children under age 18 in the household, race (white, black, and other race), marital status (married, single, divorced, or widowed), educational attainment

[11] Occupation code for physician is 3060 and for registered nurse is 3255. The ACS-IPUMS also provide the occupation code for physician assistants and nurse practitioners. The sample size for physician's assistants is 5,545 and for nurse practitioners is 4,72. Because of small sample size, I only focus on the registered nurses.

and class of worker (self-employed, work for private, work for non-profit, government employed).

Table 1.5 Physicians' Summary Statistics for States Expand Medicaid and States Did Not

	Expanded Medicaid on January 1, 2014		Did Not Expand Medicaid	
	Pre	Post	Pre	Post
Male (%)	0.63	0.63	0.70	0.68
Age	48.86	49.77	49.30	49.55
White	0.72	0.71	0.78	0.79
Black	0.03	0.04	0.05	0.04
other	0.25	0.25	0.17	0.17
Number of children	0.94	0.89	0.97	0.96
Married	0.78	0.79	0.81	0.81
widowed	0.01	0.01	0.01	0.01
divorced	0.07	0.07	0.08	0.07
single	0.14	0.13	0.11	0.11
Usual working hours	47.95	47.00	48.64	48.54
Income	211,337	224,515	210,967	227,581
Full practice	0.22	0.29	0.04	0.04
Restricted practice	0.36	0.43	0.20	0.27
Reduced practice	0.42	0.28	0.75	0.68
Physician concentration (per 1,000)	0.97	0.97	0.87	0.87
Medicaid fee bump	0.51	0.55	0.52	0.56
Medicaid simulated eligibility measurement	0.14	0.22	0.07	0.08
Market exchange simulated eligibility measurement	0.00	0.09	0.00	0.10
Poverty rate	14.46	14.48	16.03	16.00
N	10,898	10,893	8,988	9,236

Notes: This sample includes individuals whose occupation is physicians or surgeon between 2012 and 2015. 25 states expanded Medicaid on January 1, 2014. Six states expand Medicaid after January 2014; Michigan (4/1/2014), New Hampshire (8/15/2014), Pennsylvania (1/1/2015), Indiana (2/1/2015), Alaska (0/1/2015), and Montana (1/1/2016).
Source: IPUMS- ACS, 2012-2015.

Table 1.5 presents the descriptive statistics of sample for states that expanded Medicaid on January 1, 2014, expanded after January 1, 2014 and did not expand Medicaid. Table 1.5 displays the sample means prior to and after January 1, 2014 for states that expanded Medicaid on January 1, 2014 and did not expand Medicaid. For states that expanded after January 1, 2014, I compare the sample means prior to and after the date of the expansion. The demographic characteristics and labor market outcomes are summarized by occupation, physicians/surgeons and registered nurses.

The sizes of Medicaid expansion and Marketplace are measured with the simulated eligibility measurement as in the section 1.4. I use the IPUMS-CPS 2013 and Medicaid eligibility thresholds for adults with dependent children and childless adults by states and by year. Data source for state Medicaid eligibility thresholds is the Kaiser Family Foundation.

The sizes of Medicaid expansion and the market exchanges varies by state, because states had option to expand Medicaid in 2014 and set different income eligibility for adults with dependent children. I use a simulated eligibility instrument to measure the size of Medicaid expansion and the health insurance marketplace for each state.

To pick random subsamples of individuals using the IPUMS-CPS 2014, I follow Golberstein and Gonzales (2015) paper.[12] I first define the mutually exclusive cells based on age (26-38, 39-51, 52-64), size of family (1, 2, 3, and more than 4), race (white and non-white), and education (<=12 and >12years of education).[13] It yields 48 cells exclusively representing all combinations of demographic family types. I take 100 individuals from each cell. With a national sample, first I determine whether an individual is eligible for Medicaid using income eligibility thresholds for childless adults and adult with dependent children for each state in each year. Each individual's eligibility determined based on monthly family income, family size, and Medicaid eligibility threshold of the state where he/she lives. I calculate the fraction of adults eligible for coverage for each year and state.

Next, I estimate the potential size of the marketplace with a national sample. From a national sample, I identify the number of potential purchasers who are uninsured. From potential purchasers, I exclude following individuals. I exclude individuals who are eligible for Medicaid, because they will enroll in Medicaid instead of buying a health insurance plan from the marketplace. I also exclude individuals if they earn income less than 100% of federal poverty guidelines and live in a state that did not expand Medicaid. These individuals have incomes above the Medicaid eligibility limit, but below the lower limit for marketplace subsidies, so they will remain as uninsured. Last, I exclude individuals

[12] Total income and health insurance status in the March CPS data is reported for the previous calendar year.

[13] I exclude adults who are younger than 26, because the ACA allows young adults to be covered by their parent's health care plan until age 26. I also exclude adults who are older than 64 because they are eligible for Medicare and adults who served in the armed forces because they are eligible for veteran insurance program.

who have a source of employer sponsored insurance (ESI), because they prefer ESI rather than purchasing a health insurance from market exchange.

Figure 1.2 shows the change in the size of Medicaid program and Marketplace from 2013 and 2014. Table B4 presents the descriptive statistics of the simulated eligibility measures for the Medicaid expansion and the marketplaces under the ACA. The average change in the size of the Medicaid program between 2013 and 2014 is 4.32. The smallest change is -1.94 percentages points and the largest change is 17.49 percentage points.[14] The size of marketplace changed about 9.64 percentage points between 2013 and 2014. The smallest change is 5.4 percentage points and the largest change is 10.78 percentage points.

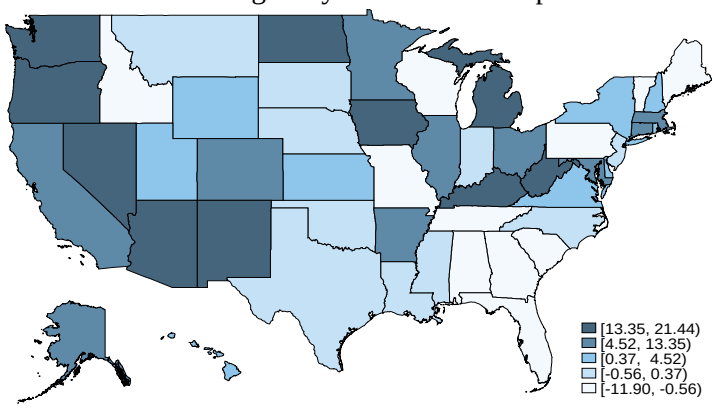
I use the AHRF 2013 to calculate the degree of physician concentration at county level. Table B5 shows the average value, 25 percentile cutoff value, and 75 percentile cutoff value of physician concentration in 2013 for my sample and national data. The values are higher in my sample, because ACS 1-year estimates contain geographic areas with a population above 65,000.

I also use the SAIPE 2013 to measure the county-level poverty rates as in the section 1.4.

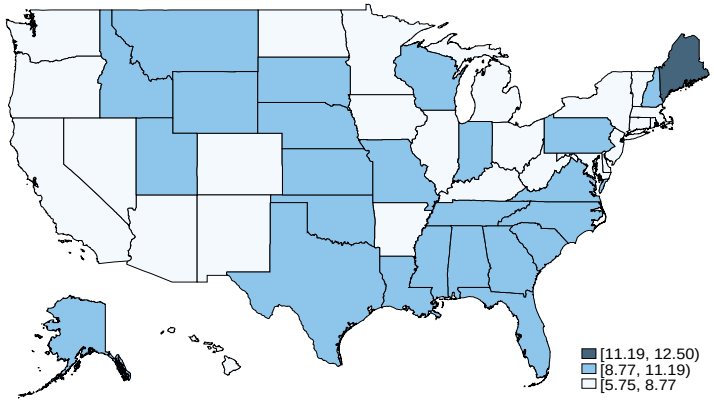
[14] Following states decreased Medicaid income eligibility limits for parents after the ACA; Alabama, Florida, Georgia, Idaho, Maine, Minnesota, Missouri, Montana, Nebraska, New Jersey, New York, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Vermont, and Wisconsin. Among these states, 13 states did not expand Medicaid on January 2014.

Figure 1.2 Change in the Size of Medicaid Program and Marketplace between 2013 and 2014

Simulated Eligibility for Medicaid Expansion



Simulated Eligibility for Marketplace



Notes: These figures show the change in the size of Medicaid program and Marketplace from 2013 and 2014. The changes are based on the simulated eligibility measurement, comparing the percentage of states residence eligible in 2014 to those eligible in 2013. The categories for Medicaid expansion include state's simulated eligibility changed more than 13.35 percentage points, at least 4.52 percentage points and less than 13.35 percentage points, at least 0.37 percentage points and less than 4.52 percentage points, at least -0.56 percentage points and less than 0.37 percentage points, and less than -0.56 percentage points.

Overall, the ACA increased the Medicaid eligibility thresholds but several states decreased the eligibility. The Medicaid eligibility thresholds for adults with dependent children decreased for following states; AL, FL, GA, ID, IL, MA, MO, MT, MN, NE, NJ, NY, NC, OK, PE, SC, RI, VT. Vermont is the only state that decreased the eligibility threshold for childless adults after expansion, from 150 to 138. The smallest change is negative 0.96 percentage points and the largest change in 17.5 percentage points for the Medicaid expansion. For the implementation of marketplaces, the categories include size of potential marketplace increased the threshold by 11.19 percentage points, at least 8.77 percentage points and less than 11.19 percentage points, and less than 8.77 percentage points. The range of the potential size of the marketplace is from 5.5 percentage points to 12.1 percentage points.

1.5.3 Empirical Method

Empirical approach to estimate the impact of the ACA is similar to the methods that used in section 4. Using a triple difference model, I examine how physician competition, which is determined before the ACA's implementation, influence the impact of the ACA on labor market outcomes of healthcare practitioners. I compare the changes over times in labor market outcomes in states that expanded Medicaid and in states that did not with pre-ACA concentration of physician markets.

I begin with a simple difference in differences model to understand the impact of the ACA. I compare the changes in labor market outcomes over time in states that expanded Medicaid and in states that did not. I estimate equation (3) as follows:

$$Y_{jst} = \beta_0 + \beta_1 SIMELIGMED_{st} + \beta_2 SIMELIGMKT_{st} + \lambda \mathrm{FeeBump}_{\mathrm{st}} + \Gamma X_{jst} + \gamma_s + \gamma_t + \epsilon_{jst} \quad (1.5.1)$$

For the dependent variable, I used usual working hours per week, being employed, and whether participating in the labor force of individual i in state s and year t. $SIMELIGMED_{st}$ is a simulated eligibility measurement for the Medicaid expansion and $SIMELIGMKT_{st}$ is for the health insurance marketplace. The coefficients of interest in this model are β_1 and β_2. The β_1 measures the effect of the Medicaid expansion on working hours and the β_2 examines the effect of the implementation of marketplace on working hours. Adding β_1 and β_2 give the total impact of the ACA.

I also include state (γ_s) and year (γ_t) fixed effects to control for common time trends in the outcomes across states and for time-invariant state characteristics. The vector, X_{ist} , represent individual characteristics including age, number of children, gender, and binary variables for male, race (white or black; other race is the omitted category) marital status (married, divorced or widowed; singled is the omitted category), class of worker (self-employed, work for private, work for non-profit, government employed; government employed is the omitted category) and educational attainments (high school graduate, some college, or bachelor degree; more than bachelor degree is the omitted category). $\mathrm{FeeBump}_{\mathrm{st}}$ is a binary variable which is equal to 1 if a state has increased Medicaid fees for primary care services in state s at time t. I also control the nurse

practitioner practice independency (full practice, restricted practice, and reduced practice; reduced practice is the omitted category).[15] Standard errors are clustered by state.

Next, I extend my empirical model by including the pre-ACA concentration of physician market. I use a triple difference model:

$$Y_{isct} = \beta_0 + \beta_1 SIMELIGMED_{st} + \beta_2 SIMELIGMKT_{st} + \beta_3 C_c^* + \beta_4 C_c^* \times Expansion_{st} + \beta_5 C_c^* \times Post_t + \beta_6 SIMELIGMED_{st} \times C_c^* + \beta_7 SIMELIGMKT_{st} \times C_c^* + \lambda \text{FeeBump}_{st} + \Gamma X_{ist} + \gamma_s + \gamma_t + \epsilon_{isct} \quad (1.5.2)$$

Here, C_c^* is demeaned physician concentration at county c in 2013. $Expansion_{st}$ is a binary indicator which is equal to one if the state expanded Medicaid on January 1, 2014 and $Post_t$ is a binary variable equal to one in 2014 or later and 0 otherwise.[16] All other variables are defined as in equation (1.5.1). β_1 is the impact of expanding Medicaid and β_2 is the effect of implementing health insurance market place at the average level of physician concentration ($C_c^* = 0$). Both measure the impact of a one percentage point change in the size of Medicaid program and of marketplace. The coefficients of interest are β_6 and β_7, which are the triple difference estimates. By controlling the pre-ACA physician competition, this triple difference model can address the concern that physicians labor decisions might related to the level of physician concentration in the area where they are providing medical services. Within areas with same level of physician concentration, physicians who lives in states that expanded Medicaid and non-expansion states would have behaved similarly in the absence of the implementation of the ACA.

As in section 4, I also estimate model (1.5.1) and (1.5.2) for healthcare practitioners working in areas with poverty above the national average.

[15] If state has approved full practice for nurse practitioners, then they can prescribe, diagnose, and treat patients without supervision of physicians. According to Kaiser Family Foundation, 19 states and District of Columbia gave full practice authority to nurse practitioners in 2014(AK, AZ, CO, CT, DC, HI, ID, IA, ME, MN, MT, NH, NM, ND, OR, RI, VT, WA, and WY). (https://www.kff.org/medicaid/issue-brief/tapping-nurse-practitioners-to-meet-rising-demand-for-primary-care/)

[16] Most of states expanded Medicaid on January 1, 2014. However, following seven states adopted the Medicaid after January 1, 2014: Michigan (4/1/2014), New Hampshire (8/15/2014), Pennsylvania (1/1/2015), Indiana (2/1/2015), Alaska (9/1/2015), Montana (1/1/2016) and Louisiana (7/1/2016). I exclude these states except for Montana and Louisiana. I treat Montana and Louisiana as not expanding Medicaid because the time period of my sample ends in 2015.

1.5.4 Results

1.5.4.1 Physicians and surgeons

As shown in Table 1.6, I estimate equation (1.5.1) and (1.5.2) on physicians' working hours. I begin by using a simple difference in differences model. Column (1) displays the results for all physicians and surgeons and Column (2) only look at the physicians and surgeons who live in counties that are above the national poverty rate. These results are small in magnitude and not statistically significant. However, the results suggest that physicians' usual working hours per week are likely to decrease after Medicaid expansion as part of the ACA. These results are consistent with the results from the expansion of SCHIP in section 4. On the other hands, physicians' usual working hours per week increased when the potential size of marketplace goes up. It is consistent with my prediction from comparative statistics.

Column (3) and (4) present estimates from a triple difference specification for all physicians and physicians in the poor counties. The results are not significant, but the results suggest that physicians' working hours might vary across the level of physician concentrations. For example, physicians who work in relatively low concentration areas (1^{st} quantile cutoff for physician concentration) spend about 1.17 hours more per week compared to those in high concentration areas. The coefficients β_6 and β_7 suggest that Medicaid expansions led physicians to work more hours per week, while creation of marketplaces led physicians to work fewer hours per week when the physician concentrations goes up.

IPUMS-ACS does not provide data regarding hours of patient care and non-patient care. Therefore, it is unable to investigate how physicians will reallocate their total working hours to patient care and non-patient cares to meet the pent-up demand for medical services after the ACA. Therefore, I additionally examine labor market outcomes of registered nurses in the next section.

Table 1.6 Estimates of the Impact of the ACA on Usual Working Hours of Physicians

	DD		DDD	
	(1)	(2)	(3)	(4)
	All regions	Area above the national poverty rates	All regions	Area above the national poverty rates
Medicaid Eligibility	-1.46	-4.06	-0.82	-1.24
	(2.85)	(4.42)	(4.59)	(6.78)
Marketplace Eligibility	7.52	-3.55	12.71	25.99
	(16.36)	(31.27)	(21.74)	(38.02)
Medicaid Eligibility ×C*			6.92	2.29
			(6.45)	(8.01)
Marketplace Eligibility ×C*			-67.48	-17.36
			(50.81)	(79.92)
Marginal effect	0.85	-0.56	1.49	3.07
Marginal effect of expansion at 1st quantile in physician concentration (C*= -0.18)			2.91	3.43
Marginal effect of expansion at 3rd quantile in physician concentration (C*= 0.15)			0.32	2.77
N	40,015	14,956	26,267	10,733

Notes: Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. Column (1) and (2) are DD estimates and (5.1) and (5.2) are DDD estimates. I exclude states that expand the Medicaid after January 2014. The marginal effects are calculated with the average change in the simulated eligibility measurement of Medicaid and Marketplaces from 2013 to 2014. It represents the impact of the ACA expansion. C* refers to the level of physician concentrations in 2013 (pre-expansion). C* is demeaned to have a mean of 0. The poverty rates are calculated with the fraction of individuals living in households with incomes below the federal poverty guidelines. Additionally, variable included, but not shown, are age, square of age, race (black and other, with white excluded), gender, marital status (widowed, divorced, and single, with married excluded), number of children, educational attainment (high school graduate, with high school dropout excluded), nurse practitioner practice independency (full practice, restricted practice, and reduced practice, with reduce practice excluded), year fixed effects, and state fixed effects.
*p<0.10, **p<0.05, ***p<0.01
Source: IPUMS- ACS, 2012-2015.

1.5.4.2 Registered nurses

I provide evidence on the effect of the ACA on labor market outcomes of registered nurses in Table 1.7 and 1.8, which shows the estimates from equation (1.5.1) and (1.5.2).

Table 1.7 provides the difference in differences estimates for following labor supply outcomes: usual working hours, participating in the labor force, and being employed. The results suggest that the ACA has a positive impact on labor market outcomes of registered

nurses, but those results are small in magnitudes and not statistically significant. The interesting thing is that the ACA has statistically significant impact on the labor market outcomes for the registered nurses working in counties with poverty rates above the national average. Probability of participating in the labor force and being employed increased significantly by 17% and 16% after the ACA. Changes in the size of Medicaid program only increase the probability of being employed and participating in the labor force by about 1 percentage point. However, the creation of marketplaces increases the probability by about 16 percentage points. Areas with high poverty rates expect to see a large increase in the number of patients with public and private insurance after the ACA. My results suggest that physicians and hospitals hired more registered nurses to provide additional medical services after the ACA.

Table 1.7 DD Estimates of the Impact of the ACA on Labor Supply Outcomes of Registered Nurses

	All regions			Above the national poverty rates		
	(1) Usual working hours	(2) LF	(3) Employment	(4) Usual working hours	(5) LF	(6) Employment
Medicaid Eligibility	1.00	0.03	0.03	7.85**	0.24***	0.23***
	(1.50)	(0.03)	(0.04)	(3.35)	(0.09)	(0.08)
Marketplace Eligibility	2.29	0.24	0.27	29.72	1.33**	1.30**
	(7.75)	(0.21)	(0.23)	(21.52)	(0.60)	(0.53)
Marginal effect	0.31	0.03	0.03	3.83	0.17	0.16
N	138,334	138,334	138,334	47,946	47,946	47,946

Notes: Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. I exclude states that expand the Medicaid after January 2014. The marginal effect is calculated with the average change in the simulated eligibility measurement of Medicaid and Marketplaces from 2013 to 2014. Thus, the estimates represent the impact of the ACA expansion. For additional notes, see Table 1.6.
*p<0.10, **p<0.05, ***p<0.01
Source: IPUMS- ACS, 2012-2015.

Table 1.8 displays the triple difference estimates which measured by equation (1.5.2). First, I look at all registered nurses to estimate whether the impact of the ACA differs in pre-ACA physician concentration in column (1) - (3). The results are not statistically significant and the impact of expansion does not vary across the level of

physician concentrations. Next, I focus on registered nurses in areas with above the national poverty rates. The probability of participating in the labor forces and being employed significantly increase by about 25% and 26%. The physician competition does not affect the labor outcomes of registered nurses significantly. However, the trend was similar to the SCHIP and consistent with my predictions.

Overall, the ACA has a positive impact on the labor market outcomes of registered nurses who work in relatively poor counties.

Table 1.8 Estimates of the Impact of the ACA on Labor Supply Outcomes of Registered Nurses

	All regions			Above the national poverty rates		
	(1)	(2)	(3)	(4)	(5)	(6)
	Usual working hours	LF	Employment	Usual working hours	LF	Employment
Medicaid Eligibility	1.07	0.02	0.01	8.22	0.24**	0.24***
	(2.80)	(0.04)	(0.05)	(5.61)	(0.09)	(0.08)
Marketplace Eligibility	7.48	0.15	0.22	48.63	1.99**	2.12**
	(11.51)	(0.27)	(0.32)	(34.57)	(0.82)	(0.77)
Medicaid Eligibility × C*	3.39	0.06	0.04	16.09*	0.23	0.12
	(5.74)	(0.07)	(0.07)	(8.44)	(0.21)	(0.23)
Marketplace Eligibility ×C*	37.06	1.15	1.51*	80.12	2.91	3.09
	(22.39)	(0.69)	(0.78)	(92.50)	(2.19)	(1.99)
Marginal effect at (C*= 0)	0.93	0.02	0.03	6.11	0.25	0.26
Marginal effect of expansion at 1st quantile in physician concentration (C*=-0.18)	0.11	-0.01	-0.01	4.28	0.18	0.19
Marginal effect of expansion at 3rd quantile in physician concentration (C*= 0.15)	1.62	0.04	0.05	7.63	0.30	0.32
N	74,662	74,662	74,662	28,189	28,189	28,189

Notes: Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. I exclude states that expand the Medicaid after January 2014. The marginal effect is calculated with the average change in the simulated eligibility measurement of Medicaid and Marketplaces from 2013 to 2014. Thus, the estimates represent the impact of the ACA expansion. For additional notes, see Table 1.6.
*p<0.10, **p<0.05, ***p<0.01
Source: IPUMS- ACS, 2012-2015.

1.6 Discussion and Conclusion

There were two large expansions in Medicaid history, SCHIP and the ACA. These expansions do not have the same features, but significantly expand enrollment in public health insurance coverage and decrease the uninsured rate. There are many studies that examine the effect of public health insurance coverage expansion on the patient side. However, there is a limited understanding of how the expansion changes the labor supply of physicians.

In this paper, I evaluate the impact of public health insurance expansion on physicians' working hours. Both SCHIP expansion and the ACA suggest that the expansion of public health insurance coverage has a negative impact on physicians' working hours. For SCHIP expansion, I found that physicians significantly decrease direct patient care hours (about 1.20 hours per week) and likely to increase non-direct patient cares hours. This trade-off between direct patient care and non-direct patient care hours might make the impact on total working hours smaller. Overall, the results suggest that physicians tend to work fewer hours per week and reallocate their hours into direct patient care and non-direct patient care activities differently prior to expansion. For ACA, physicians usual working hours likely to increase after the expansion because of the increases in privately-insured patients.

Physician responses are not statistically significantly differed across the level of competition, but results suggest that impact might be large in areas with high competition. Both SCHIP expansion and the ACA show that physicians with many competitors likely to work more hours compared to physicians with less competitors. By estimating the effect of SCHIP, I find that physicians in high competition tend to increase non-direct patient care hours and decrease patient-care hours.

To understand the decrease in direct patient care when the demand for medical services increases because of expansion, additional information about the visit duration is needed. If physicians improve their productivity by investing hours on non-direct patient care activities, then they can treat more patients per hours. If this is true, then physicians are just changing the patient-physician relationship to handle the pent-up demand result from the expansion. However, my dataset does not allow to examine whether it is true under the expansion. Garthwaite (2104) shows that physicians spend fewer hours per patients by using the NAMCS. However, there are several studies suggest that there is no trend of reduction in the duration of visit (Mechanic, 2001; Shaw and Davis, 2014). Additionally, results from the ACA suggest that the probability of being employed and participating in the labor force for registered nurses increased after the expansion. This suggests that physicians might spend fewer hours, but rely on other health care providers to provide simple medical services. Further research is needed to understand the impact on

the total number of patient, physician quality and whether direct patient care hours have changed after the ACA.

Results from this paper can also help policymakers and economists to understand physician responses to public health insurance expansion and further highlights the importance of the market structure in physician markets. Market structure in the health care market such as physician concentration influences physicians' response to the policy changes. Physicians in competitive areas are more likely to be impacted under the new policy. For example, physicians spend more hours on non-patient care activities when there are more competitors in the market. One possible explanation for the findings are that physicians who works in competitive areas will try to spend more hours on professional activities, which can improve their quality or effort of services, to compete for private patients with other physicians. However, spending hours to increase their prestige to attract private patients may decrease their hours to serve publicly-insured patients. Because lower fees from publicly-insured patients compared to private insured patients will discourage physicians to work longer hours. Thus, to increase the accessibility to medical services for patients with public health insurance, policymakers need to adjust the reimbursement fee of public health insurance based on the level of physician concentrations.

CHAPTER 2.
THE IMPACT OF EXPANDING MEDICAID ON HEALTH INSURANCE COVERAGE AND LABOR MARKET OUTCOMES

2.1 Introduction

Health insurance in the United States is primarily obtained through employer-sponsored insurance (ESI). In 2013, 55.7 percent of the population and 64.2 percent of insured individuals had ESI (U.S. Census Bureau, 2015). As a result, expansions of public health insurance have the potential to significantly influence labor market outcomes (Currie and Madrian, 1999). Individuals who are newly eligible for public insurance could be less likely to remain in the labor force or could reduce their hours worked in response to the potential in-kind transfer. Additionally, public insurance could increase job mobility as individuals are no longer tied to an employer for health insurance (Gruber and Madrian, 2004).

In this paper, we examine whether the expansions of Medicaid eligibility in January 2014 as part of the Affordable Care Act (ACA) influenced labor market outcomes. To do so, we first examine whether these expansions increased health insurance coverage and whether the increase in Medicaid coverage was partially offset by a decrease in ESI. Then, we examine whether the increased eligibility affected labor supply.

The ACA, which was enacted in March 2010, is one of the most significant changes to health insurance markets since the introduction of the Medicaid and Medicare programs (Roosevelt et al., 2014). To decrease the number of uninsured individuals, the ACA called for the expansion of Medicaid eligibility for adults with dependent children and childless adults. Previously, only low-income children, parents with dependent children, the elderly, or individual with disabilities were eligible for Medicaid in most states.[17] Thus, the expansion of Medicaid eligibility increased the income-eligibility thresholds for adults with dependent children, and childless adults became newly eligible for Medicaid insurance. Due to the June 2012 U.S. Supreme Court decision, states became able to

[17] Some states provided Medicaid to childless adults under Section 1115 Medicaid wavier demonstration authority; however, the expansions under this waiver program offer more limited benefit coverage, have enrollment caps, and can have county-specific coverage. According to Kaiser Family Foundation reports (2013), 9 states provided limited Medicaid to childless adults before January 2014: AZ, CO, CT, DE, DC, HI, MN, NY, and VT.

choose whether to expand Medicaid coverage under the terms of the ACA. Twenty-five states elected to expand Medicaid in January 2014. Among these states, the eligibility threshold for childless adults and adults with dependent children was 138% of federal poverty guidelines.[18] For states not expanding Medicaid, the median eligibility threshold was 46.5% for adults with dependent children and was 0% for childless adults in 2014 (Centers for Medicare and Medicaid Services, 2014). Additionally, in the states that did not expand Medicaid, individuals with income below 100% of the poverty guidelines are not eligible for the federal subsidies on the insurance exchanges, which are the state-specific online marketplaces where people can purchase health insurance that meets federally-determined requirements.[19]

Previous research from earlier expansions of the Medicaid program finds that increases in Medicaid coverage decrease ESI coverage, which suggests that public health insurance expansions crowd out private insurance (Gruber and Simon, 2008). Previous results of the impact of earlier Medicaid expansions on labor market outcomes are mixed, with the results varying for different expansions and different subgroups of the population. However, due to the near uniqueness of the ACA's expansion of Medicaid eligibility to childless adults, there has been relatively little research on this demographic group and most of the existing, published studies focus on changes within one state (Garthwaite, Gross, and Notowidigdo, 2014; Dague, DeLeire, Leininger, 2014). Concurrent with this paper, Callison and Sicilian (2017), Gooptu et al. (2016), Kaestner et al. (2017), and Leung and Mas (2016) have also examined the influence of the ACA's expansion of Medicaid eligibility on labor market outcomes.[20] Leung and Mas (2016) focus on childless adults and Kaestner et al. (2015) examine the effects on adults with dependent children and

[18] The District of Columbia and Minnesota set the eligibility threshold above 138% of the federal poverty guidelines for both childless adults and adults with dependent children, while Connecticut set the eligibility threshold above 138% only for adults with dependent children.

[19] Sixteen states and the District of Columbia are operating their own exchanges, while the federal government established the exchanges for 27 states. In seven states, both federal and state are running the exchanges. To be eligible to enroll in health coverage through the Marketplace, individuals must live in the United States, be a U.S. citizen or U.S. national, and not be incarcerated.

[20] Also related to this literature, Burns and Dague (2017) examine the effects of Medicaid expansion on Supplemental Security Income (SSI) participation for low-income childless adults who are eligible for Medicaid. Hall et al. (2017) examine the effects of Medicaid expansion on the labor supply of adults who have disabilities and qualify for SSI.

childless adults separately. Both Callison and Sicilian (2017) and Gooptu et al. (2016) examine all adults pooled together. All of these papers, except for Kaestner et al. (2017), focus on individuals with income below the federal poverty guidelines. Kaestner et al. (2017) examine individuals whose education level is high school or less and whose income is below 300% of the federal poverty guidelines. These recent papers compare Medicaid expansion states to non-expansion states, which treats all expansions as similar. However, the extent of the expansion of Medicaid eligibility varies across the expansion states. In this paper, we contribute to the literature by using an alternate definition of expanding Medicaid; we examine the effects of Medicaid expansion by using the actual changes in the Medicaid eligibility thresholds of states. Using this definition, we are able to examine the effect of expansion more clearly than other papers. Further, we separately examine the effects of expansion for childless adults and adults with dependent children with low levels of education and with income below the poverty guidelines. Thus, this paper presents more comprehensive evidence of the influence of one of the largest expansions of Medicaid eligibility for adults.

Using data from the 2011-2015 Current Population Survey (CPS) Annual Social and Economic (March) Supplements and a difference-in-differences specification, we compare the changes in labor market outcomes and insurance coverage over time of adults in states that expand Medicaid and in states that did not for both childless adults and parents with dependent children. We focus our analysis primarily on individuals with a high school degree or less, because education is correlated with income, so that individuals with lower levels of education are more likely to be eligible for Medicaid, and individuals are not likely to change their level of education in order to qualify for Medicaid. However, 56 percent of adults with a high school degree or less report an income above 200 percent of the poverty guidelines in the CPS data. As a result, we also examine the smaller sample of individuals without a high school degree (of which, 35 percent report an income above 200 percent of the poverty guidelines) and individuals with income below 100 percent of the poverty guidelines.

To understand the impact of the recent expansion of Medicaid on the labor market, we first examine the impact on health insurance coverage and the type of insurance. Our estimates suggest that the recent expansion significantly increased Medicaid coverage by

4.2 percentage points for childless adults. The decrease in ESI is not statistically significant, indicating that the expansion of Medicaid did not crowd-out ESI, in contrast to some policymakers' concerns.[21] Overall, we find that the expansion of Medicaid led to a decrease in the uninsured rate of 2.7 percentage points. For adults with dependent children, our estimates suggest that the impact is smaller, in part because the extent of expansion is more limited. We find that, for the average change in eligibility thresholds, the expansion increased Medicaid coverage by 1.4 percentage points with no change in ESI coverage and a decrease in the uninsured rate of 0.8 percentage points.

We find that the expansion of Medicaid through the ACA generally did not impact labor market outcomes for childless adults or adults with dependent children, including labor force participation, employment, and hours worked. Thus, our results suggest that, overall, the recent expansion of Medicaid reduced the uninsured rate among poor adults without crowding-out ESI and decreasing labor supply.

2.2 Background on the Expansion of Medicaid

2.2.1 Description of Medicaid and the Expansion in 2014

Medicaid is the largest public health insurance program in the United States. Medicaid was enacted in 1965 under Title XIX of the Social Security Act to provide health care services to disabled individuals and low-income families with dependent children. In 1986, Medicaid expanded so that pregnant women and infants (up to 1 year) with income up to 100 percent of federal poverty guidelines were eligible. The Balanced Budget Act of 1997 created the Children's Health Insurance Program (CHIP) that further expanded public health insurance coverage for children by increasing the income-eligibility thresholds to provide health coverage for millions of children. In 2013, prior to the latest expansion of Medicaid, the program provided coverage to 55 million individuals, which is 17.5 percent of the population (U.S. Census Bureau, 2015).

As part of the ACA, which was signed into law in March 2010, all adults whose family income was below 138 percent of the federal poverty guidelines became eligible for

[21] There were concerns among policymakers, which were also described in industry reports, that the ACA would crowd out ESI because of Medicaid expansion (e.g., Herrick and Gorman, 2013; Nowak et al., 2016).

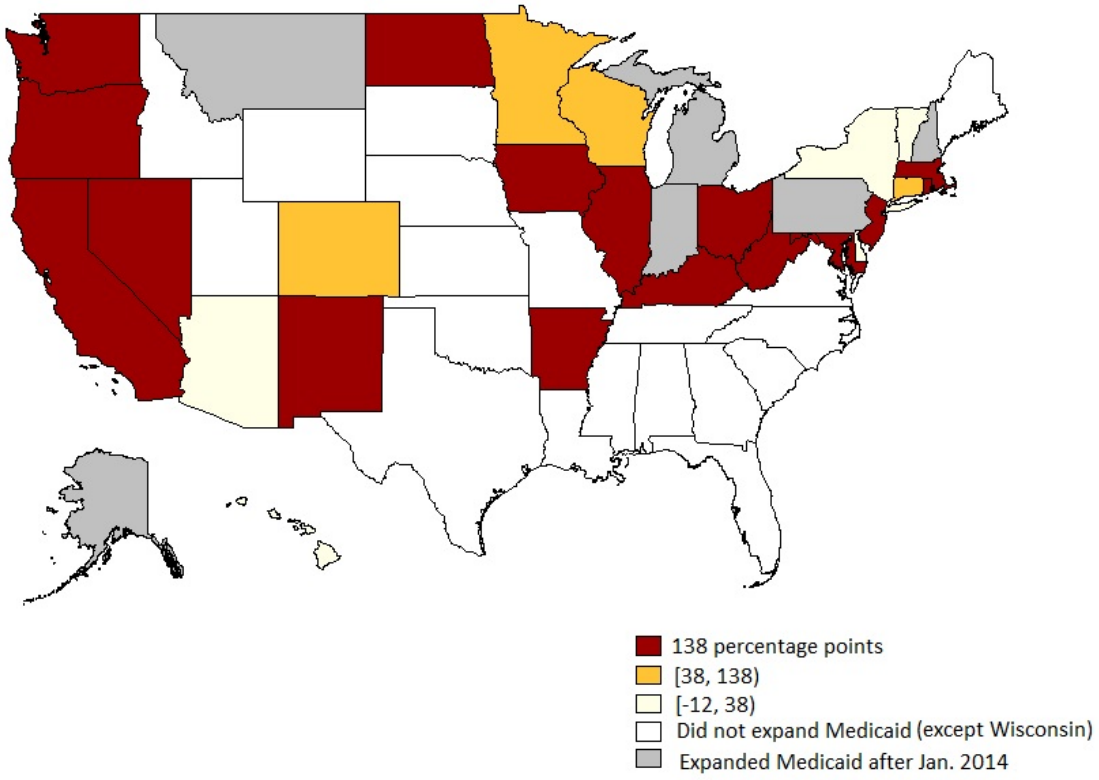
Medicaid. Previously, low-income children, parents with dependent children, the elderly, and individuals with disabilities were typically eligible, and the income thresholds for parents with dependent children were below 138 percent. States had the option to provide coverage to childless adults prior to the ACA through a Section 1115 waiver, but this coverage had limited benefits, ceilings on enrollment, and/or premium and cost sharing. Effective 2010, the ACA provided a new state option to expand coverage to childless adults before expanding Medicaid in 2014. If states expanded coverage through this option, then they were required to meet federal benefit and cost sharing requirements and could not cap enrollment. Seven states (CA, CT, CO, DC, MN, NJ, and WA) expanded coverage to childless adults through the new state option or Section 1115 waivers before 2014. Thus, the expansion of Medicaid through the ACA targeted nonelderly adults by expanding eligibility to childless adults and increasing the income threshold for parents with dependent children.

In June 2012, the United States Supreme Court held that states cannot be required to expand Medicaid eligibility. This decision made the expansion optional for states. As defined by the Centers for Medicare and Medicaid Services (CMS), twenty-four states plus the District of Columbia chose to expand Medicaid on January 1, 2014 and five additional states subsequently expanded Medicaid, through March 2015. Regardless of whether a state expands Medicaid, all states must implement the new eligibility and enrollment processes.

The variation in the extent to which states expanded Medicaid eligibility is shown in Figures 2.1 (for childless adults) and 2.2 (for adults with dependent children). Appendix Tables C1 and C2 display whether each state expanded Medicaid, the poverty thresholds used to establish eligibility for each year from 2011 through 2015, and the date of expansion for childless adults (Appendix Table C1) and adults with dependent children (Appendix Table C2). For childless adults nearly all states that expanded Medicaid adopted the income eligibility threshold of 138 percent. Only the District of Columbia and Minnesota adopted a higher threshold (215 percent and 205 percent, respectively). Of the 25 states that expanded Medicaid in January 2014, childless adults were previously not eligible for Medicaid in 16 of these states. Eight states previously provided benefits to childless adults and increased the eligibility threshold to at least 138 percent. Although

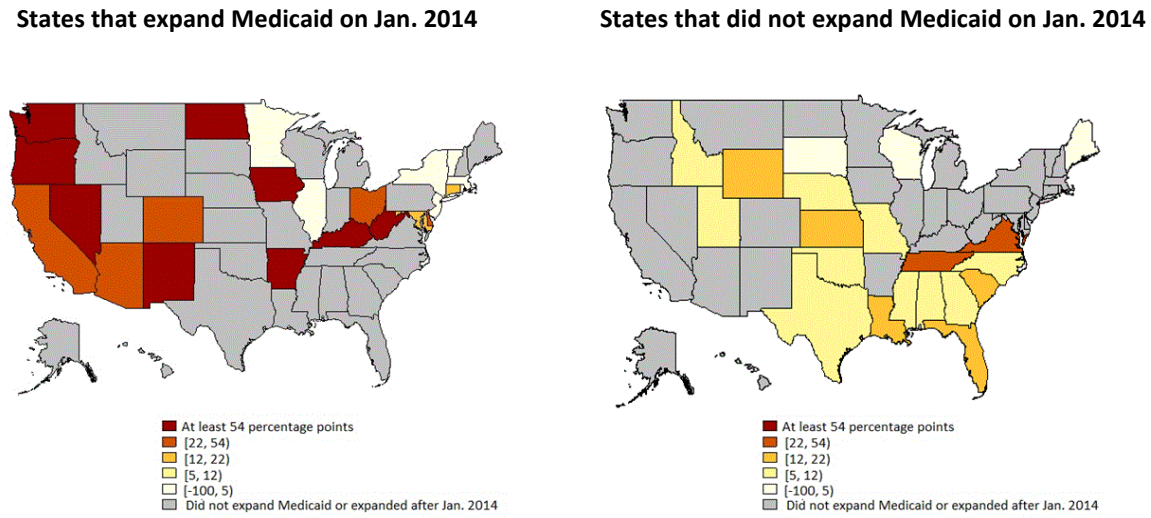
Vermont expanded Medicaid according to CMS, its threshold decreased from 150 percent to 138 percent in 2014 due to the expiration of a federal waiver permitting a higher income eligibility threshold. Childless adults were not eligible for Medicaid at any income level in states that did not expand Medicaid either before or after the expansion, except for Wisconsin, which did not fully expand Medicaid up to the 138 percent threshold of the ACA, but did receive a waiver from CMS to increase eligibility to 100 percent of poverty guidelines in 2015.

Figure 2.1 Change in Medicaid Eligibility for Childless Adults between 2013 and 2014



Notes: This figure shows the change in the Medicaid eligibility thresholds for childless adults for all states from 2013 to 2014. The categories include states that increased the threshold by 138 percentage points, at least 38 percentage points and less than 138 percentage points, and less than 38 percentage points; states that expanded Medicaid after January 2014; and states that did not expand Medicaid eligibility. As described in the text, the eligibility threshold in Wisconsin increased by 100 percentage points even though the state did not expand Medicaid through the ACA. Vermont is the only state that decreased the eligibility threshold after expansion, from 150 to 138.

Figure 2.2 Change in Medicaid Eligibility for Adults with Dependent Children between 2013 and 2014



Notes: This figure shows the change in the Medicaid eligibility thresholds for adults with dependent children for states that expanded Medicaid and states that did not from 2013 to 2014. The categories include states that increased the threshold at least 54 percentage points, at least 22 percentage points and less than 54 percentage points, at least 12 percentage points and less than 22 percentage points, at least 5 percentage points and less than 12 percentage points, and less than 5 percentage points. These categories are the quintiles of the change in the eligibility threshold.

The variation in the change in eligibility thresholds for adults with dependent children from 2013 to 2014 is shown in Figure 2.2 for both states that expanded Medicaid and those that did not. Although 25 states expanded Medicaid in January 2014 according to CMS, the income eligibility thresholds for adults with dependent children increased in only 20 of these states. The thresholds increased by more than 50 percentage points from 2013 to 2014 in only 9 of these states. In five states that expanded Medicaid, the threshold decreased, with New Jersey, New York, Rhode Island, and Vermont lowering the threshold to 138 percent and Minnesota decreasing the threshold to 205 percent. In all states, some adults with dependent children were eligible for Medicaid prior to the ACA, and, among states that did not expand Medicaid, the eligibility threshold increased for all but two states (Maine and Wisconsin). However, these increases were smaller changes compared to states that did expand Medicaid, and the thresholds for these states were all below 138 percent in 2014. Thus, eligibility for adults with dependent children changed in all states in 2014, so

there is more variation in the amount of the change in eligibility thresholds for adults with dependent children, but the increase in eligibility was less substantial than the increase for childless adults.

In addition to the expansion of Medicaid, the ACA influenced many aspects of health insurance and health care, and the most relevant other change for this analysis is the creation of health insurance marketplaces, which are also known as health insurance exchanges. The marketplaces provide a set of government-regulated and standardized health care plans for each state. The ACA health insurance exchanges began accepting applications on October 1, 2013. Individuals with family income between 100 and 400 percent of federal poverty guidelines are generally eligible for federal subsidies to purchase health insurance policies through the marketplaces. However, adults with income below 100 percent of poverty guidelines but above the Medicaid eligibility threshold established in the ACA are not eligible for federal subsidies. Thus, childless adults and adults with dependent children in states that did expand Medicaid are eligible for federal subsidies to purchase insurance through their state's marketplace if their income exceeds the eligibility threshold and is below 400 percent. In contrast, adults in states that did not expand Medicaid with income levels below 100 percent of federal poverty guidelines but above their state's Medicaid eligibility limits are not eligible for federal subsidies to purchase health insurance through their state's marketplace. This coverage gap occurs because the law was written with the presumption that all states would expand Medicaid (Kaiser Family Foundation, 2012), and the law was not changed after the U.S. Supreme Court decision granting states the ability to choose whether to expand Medicaid.

2.2.2 Why Medicaid Expansions Might Affect Labor Market Outcomes

ESI is a form of non-wage compensation that is often available to employees and is the primary mechanism through which individuals obtain health insurance in the United States. In 2014, 55.4 percent of adults aged 19 to 64 were covered through ESI (U.S. Census Bureau, 2015). Over 90 percent of privately-insured individuals obtain health insurance through ESI (U.S. Census Bureau, 2015). The Medicaid expansion increased the income-eligibility thresholds for childless adults and adults with dependent children. For these individuals with ESI who are newly eligible for Medicaid, the opportunity to

enroll in Medicaid reduces the relative value of the non-wage compensation through ESI. As a result, the expansion of Medicaid reduces the incentive for these individuals to remain employed and in the labor force. Additionally, the expansion of Medicaid reduces the incentive for individuals who are unemployed or out of the labor force to return to the labor force and seek employment. Thus, the Medicaid expansion could reduce labor force participation and employment.

On the other hand, Medicaid expansion could increase labor force participation and employment if individuals were previously remaining out of the labor force in order to be eligible for Medicaid (Yelowitz, 1995); this would be more likely to occur among adults with dependent children since these individuals were eligible for Medicaid, if their income was sufficiently low, prior to the expansion. The expansion of Medicaid could also decrease hours worked. Since Medicaid eligibility decreases the overall compensation from working at a firm offering ESI, hours worked may decrease.

On the other hand, hours worked may increase if individuals were previously keeping their hours low to remain eligible for Medicaid and subsequently increase hours worked once the eligibility threshold rises (Yelowitz, 1995). Further, if the expansion of Medicaid eligibility leads to greater Medicaid participation, which improves health, then there could be an increase in hours worked (or employment) due to a reduction in illness-related absences (Baicker et al., 2014).

2.2.3 Previous Literature and the Contribution of this Paper

Given the potential relationship between Medicaid expansions and labor market outcomes, a small but growing literature has developed in recent decades examining the impact of health insurance and Medicaid expansions, in particular. The results of the previous literature are mixed. Most of the prior research focuses on low-income women, who are the traditional beneficiaries of Medicaid. Gruber and Madrian (2004) review the earlier literature and conclude that health insurance does not significantly influence the labor supply of low-income, single, female-headed families, but that it does for secondary earners. More recently, Strumpf (2011) finds that the introduction of Medicaid did not significantly influence the labor supply of single women.

One concern of estimating the relationship between Medicaid and labor market outcomes during the early decades of the program is that Medicaid eligibility was linked to eligibility for cash welfare until the 1980s. Thus, it is difficult to distinguish the effect of Medicaid eligibility from the effect of welfare eligibility. Throughout the 1980s and 1990s, Medicaid eligibility expanded for pregnant women and children and was no longer tied to cash welfare. Ham and Shore-Sheppard (2005) find that these expansions did not significantly influence the labor force participation rates of women. In contrast, Dave et al. (2015) find that these expansions led to a sizeable decrease in the probability of employment and hours worked for pregnant women.

Hamersma and Kim (2009) find that Medicaid expansions between 1996 and 2003 reduced job lock among unmarried women, but not men or married women. In particular, they find that a $100 change in the income-eligibility threshold for Medicaid led to a 0.11 percentage point increase in voluntary job turnover for unmarried women. Tomohara and Lee (2007) find that the State Children's Health Insurance Program expansions in the late 1990s did not influence the labor force participation rates or hours worked of married women, on average, but did reduce labor supply for some groups of women.

Recent studies focus on demographic groups who have recently received eligibility for Medicaid. Baicker et al. (2014) examine the expansion of Medicaid in Oregon in 2008 to individuals below 100 percent of the federal poverty guidelines who were not categorically eligible for the state's traditional Medicaid program. The authors find that the expansion and Medicaid participation did not affect employment or earnings, and the authors are able to rule out declines in employment of more than 4.4 percentage points from Medicaid enrollment. Although these estimates would include childless adults, since this group would not be categorically eligible for traditional Medicaid in 2008, the results are not estimated separately for this demographic group and very few studies specifically examine childless adults.

Garthwaite, Gross, and Notowidigdo (2013) estimate the effect of losing Medicaid eligibility on the labor supply of childless adults in Tennessee in 2005 by comparing the changes for childless adults and other adults in Tennessee before and after the TennCare disenrollment, which is the name for Medicaid in Tennessee, to the corresponding changes in other states. Using CPS data, the authors find that TennCare disenrollment decreased

the probability of having public insurance by 7.3 percentage points and increased the probability of employment by 4.6 percentage points, the probability of working at least 20 hours per week by 4.4 percentage points, and the probability of having ESI by 4.2 percentage points for childless adults.

Dague, DeLeire, and Leininger (2014) examine the impact of Medicaid eligibility and participation on the labor market outcomes of childless adults in Wisconsin. In 2009, the state expanded Medicaid eligibility to include childless adults, but reversed this decision later in the year. Using administrative data from the state, the authors compare the labor market outcomes of individuals who enrolled in Medicaid in early 2009 to those who applied later in 2009 and were not able to enroll in Medicaid. The authors find that Medicaid enrollment decreases the probability of being employed by at least 2.4 percentage points.

The papers that specifically focus on childless adults in Tennessee and Wisconsin report estimates from changes in Medicaid eligibility and participation that are larger than most estimates for low-income women. Baicker et al. (2014) and Dave et al. (2015) suggest that the differences in results for labor market outcomes in the literature could be explained by differences in the magnitude of the crowd-out of ESI in different periods, states, and demographic groups. In particular, in Oregon, Finkelstein et al. (2012) find that Medicaid eligibility did not decrease ESI coverage, while Dave et al. (2011) find that the Medicaid expansions in the 1980s and 1990s led to a significant reduction in ESI for pregnant women. Further, the TennCare disenrollment included a significant increase in ESI coverage in addition to the substantial labor supply response (Garthwaite, Gross, and Notowidigdo, 2013). Thus, to provide context and better understand the influence of the Medicaid expansions in 2014, we examine the impact on health insurance coverage and whether there is a decrease in ESI coverage in addition to the impact on labor market outcomes.

Other recent papers examine the ACA's expansion of Medicaid eligibility, concurrent with the development of this paper., Kaestner et al. (2017) use data from the American Community Survey (ACS) and CPS and focus on individuals with a high school degree or less with income below 300% of the poverty guidelines. Leung and Mas (2016) also use ACS and CPS data and examine all childless adults and childless adults with

income below the poverty thresholds. Gooptu et al. (2016) and Callison and Sicilian (2016) use CPS data and examine the sample of individuals with income below 138 percent of the poverty thresholds. Gooptu et al. (2016) and Callison and Sicilian (2016) examine all adults pooled together, Leung and Mas (2016) examine only childless adults, and Kaestner et al. (2017) examine childless adults and adults with dependent children separately. All four papers use a difference-in-differences design and find that the expansion of Medicaid did not significantly influence labor market outcomes, except for Callison and Sicilian (2016). Callison and Sicilian (2016) find that labor force participation and employment increased after the expansion of Medicaid for white men and women. Additionally, all four papers treat state expansions of Medicaid eligibility as homogenous and define each state as either expanding Medicaid or not. As described above, particularly for the eligibility expansions for adults with dependent children, states varied in the extent of their expansion.

This paper contributes to the literature by providing further evidence of the impact of Medicaid eligibility on labor market outcomes for childless adults. In contrast to the prior research that consists of state-specific studies, we examine the largest expansion for childless adults that occurred in 25 states in January 2014. Since eligibility for TennCare for childless adults prior to the disenrollment did not depend on income, the results from losing eligibility in Tennessee are based on a higher-income sample and may not generalize to the lower-income population that gained eligibility in the expansions in 2014. Further, in our study, we examine the impact for childless adults and adults with dependent children who also gained eligibility due to the expansion of Medicaid in 2014 to better understand how the labor supply response varies across demographic groups. Finally, we examine changes in the eligibility thresholds, instead of treating all expansions in 2014 as homogenous.

2.3 Data

To examine the impact of the expansion of Medicaid, we utilize the Annual Social and Economic Supplement of the Current Population Survey (CPS), which is collected every March by the U.S. Census Bureau. The CPS is a monthly, nationally-representative survey of approximately 50,000 households containing information on labor market and

demographic characteristics. The March CPS supplements include more detailed information on income, work experience, and health insurance status.

Although the basic monthly CPS data include labor market outcomes, there are two primary advantages of using the March CPS data for our analysis. First, the March CPS data includes detailed information about family income, which we use to determine eligibility for Medicaid for part of our analysis, while the basic monthly data includes bracketed income categories.[22] Second, health insurance information is only available in the March CPS.

For our analysis, we use March CPS data from 2011 to 2015. Thus, we examine health insurance coverage from 2010 to 2015 and labor market outcomes from 2011 to 2015. We combine the individual-level data in the March CPS with state Medicaid policies and other state characteristics from 2010 through 2015.

In 2014, the CPS redesigned the questions on health insurance coverage. Prior to 2014, respondents were asked about their health insurance coverage status during the previous year. However, respondents answer as if they are asked about their coverage on the day of the survey (Swartz, 1986). Thus, in 2014, in addition to the traditional questionnaire about coverage during the prior year that was administered to 68,000 individuals, the Census Bureau introduced a redesigned questionnaire asking respondents about their health insurance coverage at the time of the interview that was administered to 30,000 randomly selected individuals. In 2015, all respondents were asked about their health insurance coverage at the time of the interview.

For the type of health insurance coverage, we create variables denoting whether the individual reports receiving Medicaid, ESI, or other private insurance and whether the individual is uninsured. For individuals prior to 2014 and who completed the traditional questionnaire in 2014, we code their responses as if they apply to the prior year. For

[22] The March CPS data include the family income to poverty ratio in bracketed groups: [0-50%], (50-100%], (100-150%], etc. As a result, we calculate a continuous measure using family income, family size, and the appropriate poverty guideline for that family size.

individuals in 2015 and who completed the redesigned questionnaire in 2014, we code their responses as if they apply to the current year.[23, 24]

The labor market outcomes that we examine using the March CPS data are labor force participation (either employed or unemployed), whether the individual is employed, hours per week that the individual usually works, hours per week that the individual worked during the prior week, and whether the individual is self-employed. Labor force participation and employment are reported based on the week prior to the survey, which is typically the week of the month that includes the 12th calendar day.

We also create variables measuring demographic characteristics from the March CPS. These include age, sex, the number of children under age 18 in the household, race (white, black, and other race), disability status, marital status (married, single, divorced, or widowed), and educational attainment (did not graduate high school and high school graduate).[25]

We include time-varying state characteristics from the University of Kentucky Center for Poverty Research National Welfare Data (2016). These data series include annual, state measures of population, employment, welfare, poverty, and politics from 2010 through 2015. We utilize variables that vary across states and over time that are potentially correlated with labor market outcomes. These include the state minimum wage and the AFDC/TANF benefit for a three-person family in the state.

State Medicaid policies include the eligibility thresholds for jobless individuals in each year for childless adults and adults with dependent children and the date the state expanded Medicaid, if applicable, based on data provided in the Kaiser Commission on Medicaid and the Uninsured (2015), which are shown visually in Figures 2.1 and 2.2 and

[23] Since the expansion of Medicaid occurred in January 2014 for most states, constructing health insurance variables in this manner may lead to an underestimate of the impact of Medicaid expansion on Medicaid participation and crowd-out. To examine the robustness of our main results, we exclude respondents from March 2014 who completed the traditional questionnaire. These individuals may have been reporting their health insurance coverage status for March 2014 instead of 2013. These results are similar to the main results.

[24] As a result of the potential for the redesigned questionnaire to influence the estimates, we also examine the impact of the Medicaid expansion on health insurance coverage using data from the American Community Survey. As shown in Appendix Table C3, these results are similar to the results shown in Table 2.2 using the March CPS. As a result, given our focus on the labor market outcomes in the CPS data, we present the health insurance results also using the CPS data in the main tables.

[25] The results reported below are robust to excluding these demographic characteristics.

described in Appendix Tables C1 and C2. Additionally, using information from Kaiser Commission on Medicaid and the Uninsured (2010, 2011, 2012, 2013, and 2014), we construct measures of whether the state had a comparable program to Medicaid, a limited Medicaid program, or offers premium assistance. A limited Medicaid program is defined as a program with fewer benefits, higher cost sharing, or enrollment caps. For premium assistance, we generate a measure of whether the state offers to pay premiums to purchase health insurance through private group health plans for low-income childless adults or adults with dependent children through the Health Insurance Premium Payment (HIPP) program, based on information from each state's Department of Human Services.

We restrict the sample to individuals between ages 26 and 64 who are not in the armed forces and primarily focus on individuals with a high school degree or less. Since the ACA allows young adults to receive health insurance coverage through their parent's insurance until age 26, we exclude adults who are younger than 26. We also exclude adults aged 65 and over because they are eligible for Medicare and individuals who served in the armed forces because they qualify for veteran's insurance programs.

We focus the analysis on individuals with a high school degree or less since these individuals are likely to be influenced by the Medicaid expansion. There are concerns to using income to select the analysis sample, since income is potentially affected by the expansion and labor market outcomes are the primary dependent variables of interest. Receiving a high school degree or less is correlated with poverty and, for the adults over age 25 in our sample, schooling was completed prior to the expansion of Medicaid and would not be affected by the expansion. However, only 20 percent of individuals in the March CPS with a high school degree or less have household income below 100 percent of the poverty guidelines and 56 percent have income above 200 percent of the poverty guidelines. As a result, we also examine the sample of individuals with less than a high school degree. This is a significantly smaller sample and only 33 percent of individuals with less than a high school degree has income below 100 percent of the poverty guidelines, while 35 percent have income above 200 percent of the poverty guidelines.

In addition to our primary focus on individuals with low levels of education, we examine individuals with income below 100 percent of the federal poverty guidelines. Total income in the March CPS data is reported for the previous calendar year, while the

labor market outcomes that we examine are reported for the previous week. Thus, for the labor market outcomes in 2014, the income measure used to construct the sample is based on 2013, which is prior to the expansion of Medicaid, which reduces the concern about using income to construct the sample. While we examine this sample to determine the robustness of the results with the samples constructed based on education, we also note three reasons for examining the sample of individuals in poverty, as defined by income during the prior year. First, this restriction creates a sample of individuals who were not substantially affected by the ACA in states that did not expand Medicaid. Although individuals in states that did expand Medicaid are typically eligible to enroll up to 138 percent, individuals in states that did not expand are eligible to receive federal subsidies through the health insurance marketplaces if their income is equal to or greater than 100 percent. Thus, by focusing on individuals below 100 percent, there is a sharp difference in the change in benefits due to the expansion of Medicaid through the ACA based on whether states adopted the expansion. Second, this reduces misclassification error of Medicaid eligibility. Due to possible income volatility, individuals who qualify for Medicaid at some point during the year could accurately report their annual income as above the Medicaid thresholds. By restricting the sample to individuals with reported income below 100 percent of the federal poverty guidelines, we reduce the potential misclassification of Medicaid eligibility and examine a sample that is likely eligible for Medicaid if the state adopted the expansion. Third, this reduces measurement error in Medicaid participation. Davern et al. (2009) find that CPS estimates of Medicaid participation are as high as 42 percent below actual enrollment and that this reporting error is most common among the elderly and individuals with higher income. By focusing on low-income individuals and individuals who are younger than 65 years old, we are able to minimize the influence of measurement error of health insurance coverage.[26]

We also exclude individuals residing in Hawaii, because Hawaii requires employers to provide health insurance coverage to employees. As described in the section below, we

[26] As a result of the focus on individuals with income below 100% of the federal poverty guidelines in order to contrast Medicaid eligibility with not being eligible for Medicaid or federal subsidies and to minimize measurement error, these results below may not generalize to the population with income between 100% and 138% of the federal poverty guidelines.

initially focus on states that expanded Medicaid when initially eligible in January 2014, but then include residents from all states except Hawaii in our sample.[27,28]

Table 2.1 presents the descriptive statistics of our sample for states that expanded Medicaid on January 1, 2014, expanded Medicaid after January 2014, and did not expand Medicaid. For states that expanded Medicaid on January 1, 2014 and states that did not expand Medicaid, we show the sample means prior to and after January 1, 2014. For states that expanded Medicaid after January 2014, we show the sample means prior to and after the date of expansion. The demographic characteristics and labor force outcomes are generally similar among the states that expanded Medicaid and those that did not. States that expanded Medicaid after January 2014 have lower labor force participation and employment than the other groups of states. States that did not expand Medicaid also provide lower TANF benefits and a lower minimum wage. The sample means of the demographic characteristics for each group of states are also generally similar across the pre- and post-expansion periods.

[27] Thus, we initially exclude residents of Michigan (which expanded on 4/1/2014), New Hampshire (8/15/2014), Pennsylvania (1/1/2015), and Indiana (2/1/2015). We also exclude residents of Wisconsin, which decided not to expand Medicaid, but has an income eligibility threshold for childless adults of 100 percent. As a result, for childless adults, we compare the changes in states that expanded Medicaid to a threshold of 138 percent of the poverty guidelines on January 1, 2014 to the changes in states that continue to not provide Medicaid to childless adults. Alaska and Montana expanded Medicaid in September 2015 and January 2016, respectively, which we treat as not expanding Medicaid for our analysis because our sample ends in March 2015.

[28] Beginning in 2011, some, but not all, counties in California expanded Medicaid. Thus, we treat California as not expanding Medicaid until January 2014, when the state expanded coverage. The results reported below are robust to excluding California from the sample.

Table 2.1 Sample Means Based on the Expansion Status of States

	Expanded Medicaid on January 1, 2014		Expanded Medicaid After January 2014		Did Not Expand Medicaid	
	Pre-expansion	Post-expansion	Pre-expansion	Post-expansion	Before Jan. 2014	After Jan. 2014
Medicaid coverage	0.19	0.25	0.19	0.23	0.12	0.15
Employer coverage	0.49	0.49	0.52	0.53	0.47	0.48
Private coverage (except EHI)	0.05	0.09	0.05	0.07	0.05	0.09
Uninsured	0.27	0.18	0.23	0.16	0.32	0.26
Labor Force Participation	0.72	0.70	0.66	0.65	0.72	0.70
Employed	0.64	0.64	0.58	0.60	0.66	0.66
Unemployed	0.08	0.05	0.08	0.05	0.06	0.04
Hours worked (usual)	23.12	23.36	20.79	22.31	23.96	24.60
Hours worked (last week)	24.03	24.30	22.14	22.02	25.14	25.53
Self-Employed	0.07	0.07	0.06	0.05	0.08	0.07
Childless Adult	58.22	59.81	61.06	67.72	58.97	60.34
Age	44.90	45.27	45.51	46.89	44.80	45.20
Male	0.51	0.52	0.51	0.53	0.51	0.52
Number of child (<18)	0.81	0.79	1.12	1.08	0.81	0.79
White	0.78	0.77	0.76	0.74	0.77	0.76
Black	0.12	0.12	0.19	0.21	0.17	0.19
Other	0.10	0.11	0.05	0.05	0.06	0.05
Disability	0.11	0.12	0.14	0.15	0.12	0.12
Married	0.59	0.57	0.58	0.52	0.60	0.59
Single	0.23	0.24	0.23	0.25	0.20	0.20
Divorced	0.16	0.16	0.16	0.20	0.18	0.17
Widowed	0.03	0.03	0.03	0.03	0.03	0.03
Less than a High School Education	0.29	0.29	0.19	0.21	0.28	0.28
High school graduate	0.71	0.71	0.81	0.79	0.72	0.72
TANF Benefits	532.88	531.78	492	492	328.68	323.54
Minimum Wage	7.64	8.38	7.40	8.15	7.09	7.25
Comparable Medicaid	0.23	-	0	-	0	-
Premium Assistance	0.01	-	0	-	0.08	-
Limited Medicaid	0.39	-	1	-	0.13	0.23
N	74,869	23,900	3,076	1,016	53,590	18,902

Notes: This sample includes childless adults and adults with dependent children between the ages of 25 and 64 who are not in the armed forces with a high school degree or less between 2011 and 2015. The list of states that expanded Medicaid and the dates of expansion are shown in Appendix Tables C1 and C2.
Source: Current Population Survey, March supplements, 2011-2015.

The percentage of individuals covered by Medicaid prior to January 2014 is approximately 7 percentage points higher in the states that expanded Medicaid than states that did not. Although there is an increase in Medicaid coverage of 3 percentage points in states that did not expand Medicaid, Medicaid coverage increases by 6 percentage points in states that expanded Medicaid on January 1, 2014. Similarly, for this sample, the percent of uninsured adults is 5 percentage points higher prior to January 2014 in states that did

not expanded Medicaid compared to states that expanded Medicaid when initially eligible. Over this time period when many aspects of the ACA were implemented, the percent uninsured fell, but this percent fell by a greater amount in states that expanded Medicaid. The rates of private coverage and ESI are similar prior to January 2014 and private coverage increased substantially for all states over this time period.

2.4 Methodology

To understand the impact of the expansion of Medicaid through the ACA, we first examine the impact on health insurance coverage and the type of insurance. Then, we examine the impact on labor market outcomes. Using a difference-in-differences specification, we compare the changes in these outcomes over time in states that expanded Medicaid and in states that did not for both childless adults and adults with dependent children.

For childless adults, since the Medicaid expansion changed the eligibility threshold similarly in most states, we begin by treating all expansions of Medicaid similarly. Then, we add additional variables reflecting the differences in eligibility thresholds and the presence of other programs. Specifically, we initially estimate:

$$Y_{ist} = \beta_0 + \beta_1 expansion_s \times post_t + X_{ist}\Gamma + \varphi_s + \gamma_t + \epsilon_{ist}, \qquad (2.1)$$

where Y_{ist} represents the health insurance status or labor market outcome of individual *i* in state *s* at time *t*. For health insurance coverage, we examine binary variables indicating Medicaid coverage, ESI coverage, direct-purchase private health insurance coverage, and uninsured. For labor market outcomes, we examine binary variables indicating labor force participation, being employed, and being self-employed and continuous variables measuring usual weekly hours worked and actual hours worked during the previous week. We estimate equation (2.1) for childless adults and adults with dependent children separately.

The variable $expansion_s$ is a binary variable indicating that the state expanded Medicaid on January 1, 2014 and $post_t$ is a binary variable equal to one for the period after January 1, 2014. The coefficient for the interaction of $expansion_s$ and $post_t$, β_1, is the

impact of expanding Medicaid; it measures the average change before and after January 1, 2014 in the outcome for individuals in states that expanded Medicaid compared to the change over the same time period for individuals in states that did not expand Medicaid.[29] Since we are initially interested in comparing states that initially expanded Medicaid to those that did not, we exclude residents of Michigan, New Hampshire, Pennsylvania, Indiana, and Wisconsin when estimating equation (2.1).

We also include year (γ_t) and state (φ_s) fixed effects to control for common time trends in the outcomes across states and for time-invariant state characteristics. The vector, X_{ist}, represents individual characteristics, including age, number of children, and binary variables for male, race (white and black; other race/ethnicity is the omitted category), marital status (married, divorced or widowed; single is the omitted category), educational attainment (high school graduate, with high school dropout the omitted category), and being disabled. Additionally, we control for time-varying state characteristics related to other social programs, including the state minimum wage and the AFDC/TANF benefit for three-person family. We cluster standard errors at the state level.

Equation (2.1) will estimate the impact of Medicaid expansions for states that expanded Medicaid when initially eligible and it treats all expansions as similar. For childless adults, the majority of states that expanded Medicaid changed their eligibility guidelines from not permitting childless adults to receive Medicaid benefits to allowing childless adults up to 138 percent of poverty guidelines to be eligible. But, the extent of the expansions for adults with dependent children varied across states. Thus, we adapt equation (2.1) to include the income-eligibility thresholds for each state in each year. Specifically, we estimate:

$$Y_{ist} = \alpha_0 + \alpha_1 T_{st} + X_{ist}\delta + \varphi_s + \gamma_t + \varepsilon_{ist}, \quad (2.2)$$

[29] An alternative research design would be to compare the changes before and after January 1, 2014 in states that did expand Medicaid and states that did not for income-eligible and income-ineligible adults using a difference-in-difference-in-differences framework. However, as mentioned above, measurement error could result from income volatility leading many individuals above the eligibility thresholds based on March data to report receiving Medicaid at some point during the prior year. Additionally, measurement error is more common among individuals with higher income (Davern et al., 2009). To minimize concerns related to measurement error and income volatility, we focus on individuals with low levels of education and also examine individuals with income below 100 percent and estimate a difference-in-differences specification.

where T_{st} represents the eligibility threshold for jobless childless adults or jobless adults with dependent children for state *s* in year *t*.[30] The coefficient α_1 represents the impact of a one percentage point change in the threshold for Medicaid eligibility. Additionally, we modify equation (2.2) to include measures of other programs or benefits provided by the state to childless adults or adults with dependent children. Specifically, we include whether the state offered a program with comparable coverage to Medicaid, Medicaid coverage with limited benefits, or a premium assistance program prior to the ACA.[31]

To determine the functional form of the eligibility threshold, we examine the AIC values of different specifications that include linear, quadratic, and cubic functions of the threshold. These estimates are shown in Appendix Tables C4 and C5. Based on the AIC values, a linear functional form is consistently the preferred specification; as a result, we report the values for the linear functional form below. Further, in Appendix Tables C6 – C9, we report estimates of the impact of the expansion of Medicaid for different values of the change in the eligibility threshold. These additional results generally show that the influence of larger eligibility expansions is greater than the influence for smaller changes in the eligibility threshold, particularly for adults with dependent children, which suggests that it is valuable to not treat all expansion as similar as in equation (2.1) and provides support for equation (2.2).

2.5 Results

2.5.1 Health Insurance coverage

We begin our analysis with the impact of Medicaid expansion on health insurance coverage. Table 2.2 displays the estimates for childless adults and adults with dependent children of the impact of Medicaid expansion on Medicaid coverage, ESI coverage, non-

[30] Prior to expanding Medicaid, states utilized different eligibility thresholds for jobless and working adults, with the eligibility thresholds generally higher for working adults. We focus on the threshold for jobless adults since we are interested in the influence of changes in these thresholds on labor force participation and other labor market outcomes.

[31] We use the actual thresholds for Medicaid eligibility in all years, which will account for the states that provided coverage to childless adults before the expansion. However, some of the early expansion states only provided coverage to subgroups of childless adults or to specific counties. In this case, using Medicaid eligibility levels for those states will underestimate the effect of the expansion. Thus, we include the variables that measures whether the states provided coverage prior to the ACA.

ESI private coverage, and being uninsured. The three columns for each demographic group display estimates from equation (2.1) and equation (2.2) with additional variables measuring related state programs. The estimates from the first column show the impact of expanding Medicaid when the state is initially eligible. The estimates for the second two columns in each group show the impact of a one percentage point increase in the threshold for Medicaid eligibility. To interpret these estimates, the figures shown in brackets represent the marginal effects multiplied by 1.38 for childless adults, which is the typical expansion for states that expanded Medicaid, and the marginal effects multiplied by 0.465 for adults with dependent children, which is the average change in the eligibility thresholds from 2013 to 2014 for states that expanded Medicaid.

As shown in Table 2.2, expanding Medicaid led to a statistically significant and sizeable increase in Medicaid coverage for childless adults. The estimates from equation (2.1) that compare changes in Medicaid participation before and after January 2014 in states that expanded Medicaid and those that did not show that Medicaid expansion increased Medicaid coverage by 5.0 percentage points. The estimates in column (3) show that a one percentage point increase in the eligibility threshold increases Medicaid participation by 0.03 percentage points; as a result, increasing the eligibility threshold from 0 to 138 percent increased Medicaid coverage by 4.2 percentage points. For comparison, the magnitude of this increase is 35 percent of the mean for all adults in states that did not expand Medicaid prior to January 2014. The estimates in column (2) and (3) are similar, which suggests that the results are not due to changes in related state programs.

Table 2.2 Estimates of the Impact of Medicaid Expansion on Health Insurance Coverage

Childless Adults					
	High School Degree or Less			Less than a High School Education	Income Below Poverty
	(1)	(2)	(3)	(4)	(5)
Medicaid	0.0495***	0.0288***	0.0307***	0.0405***	0.0598***
	(0.0085)	(0.0059)	(0.0061)	(0.0115)	(0.0112)
		[0.0397]	[0.0424]	[0.0559]	[0.083]
ESI	0.0004	-0.0059	-0.0074	-0.0197	-0.0114
	(0.0124)	(0.0071)	(0.0074)	(0.0122)	(0.0095)
		[-0.008]	[-0.0102]	[-0.0272]	[-0.016]
Private (non-ESI)	-0.0003	0.0032	0.0045	0.0114	0.0159**
	(0.0077)	(0.0047)	(0.0050)	(0.0079)	(0.0066)
		[0.0044]	[0.0062]	[0.0157]	[0.022]
Uninsured	-0.0364**	-0.0197**	-0.0197**	-0.0243**	-0.0505***
	(0.0138)	(0.0075)	(0.0069)	(0.0118)	(0.0122)
		[-0.0272]	[-0.0272]	[-0.0335]	[-0.070]
Observations	99,297	111,190	111,190	28,701	32,066
	Adults with Dependent Children				
	High School Degree or Less			Less than a High School Education	Income Below Poverty
	(1)	(2)	(3)	(4)	(5)
Medicaid	0.0362*	0.0291**	0.0308**	0.0444***	0.0408***
	(0.0181)	(0.0129)	(0.0124)	(0.0164)	(0.0195)
		[0.0135]	[0.0143]	[0.0206]	[0.019]
ESI	-0.0166	-0.0054	-0.0047	0.0026	-0.0014
	(0.0119)	(0.0073)	(0.0075)	(0.0134)	(0.0104)
		[-0.0025]	[-0.0022]	[0.0012]	[-0.001]
Private (non-ESI)	0.0083	-0.0027	-0.0026	-0.0066	0.0003
	(0.0084)	(0.0051)	(0.0051)	(0.0098)	(0.0092)
		[-0.0013]	[-0.0012]	[-0.0031]	[0.000]
Uninsured	-0.0083	-0.0150	-0.0170*	-0.0305**	-0.0210
	(0.0213)	(0.0097)	(0.0093)	(0.0139)	(0.0167)
		[-0.0070]	[-0.0079]	[-0.0142]	[-0.010]
Observations	69,737	77,064	77,064	23,315	26,976

Notes: Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. The figures in brackets represent the marginal effect for the average change in the eligibility threshold for Medicaid from 2013 to 2014 for states that expanded Medicaid. Thus, this estimate shows the impact of Medicaid expansion for the average state expansion. Column (1) excludes states that expand the Medicaid after January, 2014. Columns (2) and (3) include all states except for Hawaii. Column (1) treats all expansions as equivalent and shows the estimates for the variable Post*Expansion. Column (2) shows the estimates for the income eligibility thresholds as a percent of federal poverty guidelines. Column (3) is similar to (2) but also includes variables measuring whether the state has a comparable program to Medicaid, a limited Medicaid program, or a premium assistance program. Column (4) is similar to (3) but only includes individuals with less than a high school degree. Column (5) is similar to (3) but only includes individuals with household income below 100 percent of the federal poverty guidelines. ESI refers to employer-sponsored insurance. Additional variables included, but not shown, are age, race (black and other, with white excluded), gender, marital status (widowed, divorced, and single, with married excluded), number of children, disability status, educational attainment (high school graduate, with high school dropout excluded), the state TANF benefit for a 3-person family, the state minimum wage, year fixed effects, and state fixed effects. *p<0.10, **p<0.05, ***p<0.01

Source: Current Population Survey March Supplement 2011-2015.

For adults with dependent children, the estimates for Medicaid participation are smaller in magnitude. As a result of the variation in the income thresholds for adults with dependent children prior to the expansion of Medicaid and variation in the size of the expansion, the estimates shown in the first column and the estimates for the average-sized expansion in the third columns generally differ throughout the table. This highlights the importance of not treating all expansions as equivalent. As shown in column (3), a one percentage point change in the threshold for Medicaid eligibility increases Medicaid participation by 0.03 percentage points. Thus, the average change in the eligibility thresholds of 46.5 percentage points increased Medicaid participation by 1.4 percentage points.

The estimates for ESI are generally negative, consistent with the expansion of Medicaid crowding out ESI, but are not statistically significant and small in magnitude. The 95 percent confidence intervals, from the preferred estimates in column (3), suggest that we can rule out decreases in ESI of more than 0.02 percentage points from a one percentage point increase or 3.0 percentage points from an increase in the threshold from 0 to 138 percent. For adults with dependent children, the 95 percent confidence intervals suggest that we can rule out decreases in ESI of more than 0.02 percentage points from a one percentage point increase or 0.9 percentage points from the average expansion of Medicaid that occurred in 2014.

As a result of increasing the Medicaid eligibility threshold to 138 percent, the likelihood of being uninsured decreased by 2.7 percentage points for childless adults and by 0.8 percentage points for adults with dependent children.

Column (4) displays the estimates for the sample of individuals with less than a high school degree. For childless adults, the impact on Medicaid participation is larger than the estimates for individuals with a high school degree or less; increasing the eligibility threshold from 0 to 138 percent increased Medicaid coverage by 5.6 percentage points and reduced the uninsured rate by 3.4 percentage points. Column (5) displays the estimates for the sample of individuals with income below 100 percent of the poverty guidelines. For childless adults, the estimates are even larger. Increasing the Medicaid eligibility threshold from 0 to 138 percent increased Medicaid coverage by 8.3 percentage

points and decreased the uninsured rate by 7 percentage points. For adults with dependent children, the results are reasonably similar across the samples.

Overall, the expansion of Medicaid primarily affected childless adults with low-levels of education, and adults with dependent children to a lesser degree, by increasing Medicaid coverage and decreasing being uninsured. Thus, with the context that we find increases in Medicaid coverage with little crowd-out of ESI from the recent expansion of Medicaid, we turn to estimates of the impacts on labor market outcomes.

2.5.2 Labor market outcomes

Table 2.3 displays the estimates of the impact of Medicaid expansion on labor market outcomes. The format is similar to Table 2.2. The estimates are shown separately for childless adults and for adults with dependent children for the following outcomes, using the March CPS data: participating in the labor force, being employed, the usual amount of hours worked per week, the actual amount of hours worked in the previous week, and being self-employed.

For all five outcomes, for both demographic groups, only one of the estimates for all three specifications for the sample of individuals with a high school degree or less is statistically different from zero. Additionally, the estimates are all small in magnitude. The estimates from column (2) to (3), which add variables measuring related state programs, are similar for adults with dependent children but do vary for childless adults. However, the estimates are consistently small in magnitude and imprecisely estimated for both specifications.

Table 2.3 Estimates of the Impact of Medicaid Expansion on Labor Market Outcomes

	Childless Adults				
	High School Degree or Less			Less than a High School Education	Income Below Poverty
	(1)	(2)	(3)	(4)	(5)
Labor Force Participation	-0.0066	-0.0037	-0.0011	0.0053	0.0025
	(0.0069)	(0.0043)	(0.0050)	(0.0113)	(0.0083)
		[-0.0051]	[-0.0015]	[0.0073]	[0.0035]
Employed	0.0001	0.0010	-0.0006	0.0075	-0.0009
	(0.0076)	(0.0048)	(0.0057)	(0.0095)	(0.0077)
		[0.0014]	[-0.0008]	[0.0104]	[-0.0012]
Usual Hours Worked	-0.0700	-0.0137	-0.1240	0.0061	-0.3150
	(0.4060)	(0.2510)	(0.2730)	(0.4130)	(0.2920)
		[-0.0189]	[-0.1711]	[0.0084]	[-0.4347]
Actual Hours Worked	-0.1260	-0.0375	-0.1660	0.2020	0.0110
	(0.3320)	(0.2140)	(0.2330)	(0.3210)	(0.3090)
		[-0.0518]	[-0.2291]	[0.2788]	[0.0152]
Self employed	-0.0022	0.0007	0.0004	0.0008	-0.0030
	(0.0048)	(0.0028)	(0.0029)	(0.0048)	(0.0043)
		[0.0010]	[0.0006]	[0.0011]	[-0.0041]
Observations	99,297	111,190	111,190	28,701	32,066
	Adults with Dependent Children				
	High School Degree or Less			Less than a High School Education	Income Below Poverty
	(1)	(2)	(3)	(4)	(5)
Labor Force Participation	-0.0150**	0.0030	0.0030	0.0069	0.0157
	(0.0069)	(0.0060)	(0.0059)	(0.0151)	(0.0112)
		[0.0014]	[0.0014]	[0.0032]	[0.0073]
Employed	-0.0068	-0.0019	-0.0015	0.0034	0.0139
	(0.0072)	(0.0058)	(0.0058)	(0.0142)	(0.0119)
		[-0.0009]	[-0.0007]	[0.0016]	[0.0065]
Usual Hours Worked	-0.3980	-0.4620	-0.4420	-0.1150	0.3370
	(0.3760)	(0.2920)	(0.2960)	(0.6600)	(0.3880)
		[-0.2148]	[-0.2055]	[-0.0535]	[0.1567]
Actual Hours Worked	-0.3660	-0.4410	-0.4200	-0.6130	0.1410
	(0.3590)	(0.2770)	(0.2850)	(0.5920)	(0.3750)
		[-0.2051]	[-0.1953]	[-0.2850]	[0.0656]
Self employed	0.0084	0.0019	0.0020	-0.0019	-0.0043
	(0.0053)	(0.0036)	(0.0036)	(0.0102)	(0.0070)
		[0.0009]	[0.0009]	[-0.0009]	[-0.0020]
Observations	69,737	77,064	77,064	23,315	26,976

Notes: Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. The figures in brackets represent the marginal effect for the average change in the eligibility threshold for Medicaid from 2013 to 2014 for states that expanded Medicaid. Thus,

this estimate shows the impact of Medicaid expansion for the average state expansion. For additional notes, see Table 2.2. *p<0.10, **p<0.05, ***p<0.01
Source: Current Population Survey March Supplement 2011-2015.

For childless adults, the 95 percent confidence interval suggests that we can rule out decreases in employment larger than 1.6 percentage points for a typical state expansion of 138 percent. For comparison, in states that did not expand Medicaid, the percent of childless adults who were employed was 66 percent before January 2014. Thus, the 95 percent confidence interval allows us to reject a decline in employment of more than 2.4 percent, relative to the control states. For adults with dependent children, the 95 percent confidence interval suggests that we can rule out decreases in employment greater than 1.8 percentage points. Similarly, the estimates for labor force participation, being self-employed, hours worked in the previous week, usual hours worked, and hours worked in the last week conditional on being employed for both childless adults and adults with dependent children are small in magnitude and not statistically significant.

The estimates for individuals with less than a high school education and individuals with income below the poverty guidelines are qualitatively similar, in that they are all not statistically significant and are small in magnitude. Overall, the estimates suggest that the expansion of Medicaid did not have a negative effect on the labor supply of childless adults or adults with dependent children.[32]

2.6 Discussion and Conclusion

Medicaid is the largest public insurance program in the United States and the expansion of Medicaid through the ACA is one of the largest changes to the program in the last two decades. In this paper, we examine whether the expansion of Medicaid to childless

[32] In the appendix, we provide additional evidence that supports the identifying assumption that the pre-expansion trends in labor market outcomes are similar between expansion and non-expansion states. First, Appendix Table C10 displays regression estimates using a placebo date of the expansion of Medicaid, where each state's eligibility threshold is constructed by assuming that Medicaid expanded one year earlier. For all three samples and both demographic groups, the estimates are small in magnitude and not statistically significant. Second, using the basic monthly CPS with the higher frequency of observations, Appendix Figures C1 and C2 shows the pre-expansion trends in labor market outcomes for states that expanded Medicaid relative to states that did not. Based on an event study specification, in the figures, the confidence intervals for the estimates prior to expansion almost always include zero and the pre-expansion trends are near zero and approximately parallel, which is consistent with our identifying assumption. Appendix Table C11 displays the corresponding estimates and falsification test results using the basic monthly CPS data.

adults and adults with dependent children up to 138 percent of the poverty guidelines increased Medicaid coverage and crowded-out ESI. The results suggest that the likelihood of having Medicaid coverage increased by 4.2 percentage points for childless adults with a high school degree or less; 8.3 percentage points for poor, childless adults; 1.4 percentage points for adults with dependent children with a high school degree or less; and 1.9 percentage points for poor adults with dependent children. Further, the results suggest that the expansion of Medicaid coverage did not crowd-out ESI for either group of adults.

We also examine whether the expansion of Medicaid influenced labor market outcomes. The results suggest that, overall, the expansion of Medicaid coverage did not reduce labor supply. These results differ from the estimates of previous changes in Medicaid eligibility for childless adults in Tennessee and Wisconsin (Garthwaite et al., 2014; Dague et al., 2014). However, these results are consistent with the estimates from the changes in Medicaid coverage in Oregon, which included childless adults (Baicker et al., 2014). Additionally, these estimates are consistent with the conclusion that expansions of Medicaid that do not crowd-out ESI also have limited effects on labor market outcomes (Baicker et al., 2014; Dave et al., 2015). In our analysis, we focus on adults with low levels of education and also show estimates for individuals with income below 100 percent of the federal poverty guidelines, which is similar to the expansion in Oregon but lower income than the changes in Tennessee and Wisconsin. Overall, this body of research suggests that expansions of Medicaid to the poorest adults increases Medicaid coverages and health insurance coverage without crowding-out private insurance through employers and without decreasing labor supply.

CHAPTER 3.
LABOR SUPPLY RESPONSE TO INCREASE IN COMPETITION AMONG DENTISTS: EVIDENCE FROM THE NHSC

3.1 Introduction

The physician shortage is one of the problems in the United States. According to the Association Medical Colleges report (2015), the United States will face a shortfall of 46,000 to 90,000 physicians by 2025. It is especially problematic in rural areas, where more than 20% of the U.S. population resides but only 10 percent of physicians practice (American Academy of Family Physicians (AAFP)). The physician shortage will create challenges for patients who need access to health care. Moreover, the shortage may have an impact on value for patients. Generally, competition leads to better services and high productivity to satisfy the needs of customers. In other words, physicians with low competition might have fewer incentives to increase the utility of their patients. The labor supply decisions of physicians are directly related to patients' health outcome. Therefore, it is important to understand the relationship between competition and working hours of providers. However, little is known how about competition affects providers' working hours.

In this paper, I study whether the increase in competition among providers has an impact on their working hours. To examine my research question, I use the National Health Service Corps (NHSC) which is created in 1970. The NHSC was designed to increase the supply of rural physicians since it is hard to attract physicians to rural, underserved areas. There are 5,900 dental health HPSAs as of April 2018. According to Health Professional Shortage Area (HPSA) designations, the population-to-provider ration must be at least 5,000 to1. If a dentist needs to serve more than 5,000 population in the community, that area is short of dental care provider.

The NHSC has two types of programs, scholarship and loan repayment, to provide financial support to primary care physicians who commit to work at an NHSC-approved site. Facilities that are short of primary care physicians can apply to be an NHSC-approved site. Therefore, if the number of NHSC-approved sites increases in an area, then the number of dentists will increase. This increase will change the market structure where providers are practicing medicine. The market structure is one of the key factors that determine labor

supply decision. Thus, change in the number of NHSC-approved sites will affect working hours.

Providers in rural areas tend to work longer hours compared to those in urban areas because physicians in rural regions face less competition, but they have to spend more time in their practices (Weeks and Wallace, 2008; Doyle, 2014). The new NHSC-approved sites in a rural area may increase the competition among providers. This would affect the financial incentives of physicians. Existing literature demonstrates that physicians' financial incentive may decreases as competition goes up (Austin and Baker; 2015, Baker et al.;2014). Low financial incentives might discourage physicians to work longer hours (Staiger et al, 2010). Therefore, the NHSC program may have a negative impact on working hours of physicians in rural areas. However, the competition might have a positive impact on working hours. Several studies find that firms might expand their business hours in competitive environments. In my paper, I examined how providers respond to their environment becoming more competitive.

This paper study adult dental care, one of the primary care services. I estimate the effect of NHSC programs on dentists' extensive and intensive labor supply of margin from 2006 to 2010. I exclude the years 2011 and later because there was dental program expansion as part of the affordable care act (ACA) which might affect the labor supply of physicians. First, I examine that if the number of NHSC-approved sites increases, competition among dentists increases. I find that 1% change in the number of NHSC-approved sites increases 5.4% changes in the number of dentist in county and 0.2% changes in dentist concentration. These preliminary results may affect working hours of dentists by changing their financial incentives. Additional NHSC-approved sites increase providers' working hours by about 0.068 hours per week.

3.2 Background

The goal of the NHSC program is to expand the access to health care in United States' underserved communities. In 1970, the NHSC was designed by the Health Resources and Services Administrative (HRSA), which is the Federal program. The NHSC provides two types of programs, scholarship and loan repayment, to healthcare practitioners who provide medical services at approved sites located in Health Professional

Shortage Areas (HPSAs). HPSAs are designated by the HRSA if the areas have shortages of primary care, dental care, or mental health providers. These shortages could be geographic, population, or facility-based.[33] State PCOs can submit applications in the Shortage Designation Management System (SDSM) for primary care, dental, and mental health to get an HPSA score. Once a PCO applies for a review, the HRSA scores HPSAs on a scale of 0 to 25 for primary care and mental health and 0 to 26 for dental health. The higher scores indicate a greater need for physicians. The dental health HPSA score is determined by the four components; population-to-provider ratio (10 points max), percent of population below 100% of federal poverty guideline (5 points max), water fluoridation status (1-point max), and travel time to the nearest source of care (5 points max) outside the HPSA designation. For certain facilities as HPSAs, the HRSA automatically designate the score. In this case, facilities do not need to submit data to the HRSA.

A facility in an HPSAs can apply to become an NHSC-approved site. To be eligible to apply the programs, site must be in a federally designated HPSA, provide primary care medical, dental, or mental and behavior health services, provide services regardless of a patient's ability to pay, offer discounted fees to patients who qualify, and accept patients covered by Medicare, Medicaid, and Children's Health Insurance Program (CHIP).

The NHSC provides financial support to primary care providers in two ways; loan repayment and scholarship. The first scholarship was given in the 1970s and loan repayment program launched in the1980s.

The NHSC started offering a loan repayment option in 1987. Health practitioners can receive tax-free loan repayment assistance. There are three loan repayment programs: NHSC loan repayment program, students to services loan repayment program, and State Loan Repayment Program (SLRP). Licensed health care providers may earn up to $50,000 from NHSC if they commit to working at an NHSC-approved site for two years. They can choose to serve longer for additional loan repayment support. Priority is given to eligible applicants who choose an NHSC-approved site that has an HPSA score of 26 to 14, in descending order. Medical and dental students may earn up to $120,000 in their final year of school through the Students to Service Loan Repayment Program (S2S LRP) if they

[33] https://bhw.hrsa.gov/shortage-designation/hpsas

make a commitment to serving at least three years at an approved NHSC site. Primary care professions in HPSA can apply to a SLRP.

Health practitioners can also apply to the Scholarship program if they are committed to primary care and accepted to or enrolled in an accredited U.S. school in one of the following primary care disciplines: physicians, dentist, nurse practitioners, certified nurse-midwives, and physician assistants. If they commit to work at least 2 years at an NHSC-approved site then they receive the scholarship pays tuition, fees, other educational costs, and a stipend.

3.3 Literature Review

This paper builds upon several different streams of literature. The first area of literature is research on providers' response to the NHSC programs. Existing papers evaluate the performance of the NHSC on retention of health professionals in NHSC-assigned areas. Pathman, Konard, and Ricketts (1992) compare the retention of physicians serving NHSC scholarship program obligations in rural settings to that of non-NHSC physicians working in the same or similar practices. The retention of rural NHSC physicians is seen to be poor. Retention was highest for family physicians, those committed to longer periods of obligated services, and those who completed residency training when they were first assigned. Rosenblatt et al. (1996) find that only 25 percent of NHSC-assigned physicians remain in their original assignment counties. Cullen, Hart, Whitcomb, and Rosenblatt (1997) find that most NHSC physicians did not remain in their initial rural practice locations. However, a substantial minority are still rural practitioners. Early literature suggests that NHSC program have little effect on physician retention. According to Holmes (2005) paper, the program only shows bandage effect which means NHSC physicians tend to provide the access to underserved populations during their contract time periods. His paper also found that enrollment in the program may decrease the probability of remaining in the initial location but increase the probability of locating in underserved communities.

Other studies compare the differences between NHSC and non-NHSC physicians. Pathman, Konrad, and Ricketts (1992) compared the characteristics between the NHSC and non-NHSC physicians and find that NHSC physicians are at least 1.56 times more

likely to leave in all specifications. Pathman et al. (2006) found that counties staffed by NHSC clinicians experienced a mean increase of 1.4 non-NHSC primary care physicians per 10,000 population, compared to a smaller, 0.57 mean increase in counties without NHSC clinicians. The result shows that NHSC contributed positively to the non-NHSC primary care physician workforce in the rural underserved counties during the 1980s and 1990s. According to previous studies, it is possible to expect that the increases in NHSC-approved sites in a county will increase the number of dentists in short term.

The second stream of literature focuses on the competition among physicians and labor supply outcomes. Some studies examine how physicians respond to competition. Staiger et al. (2011) suggest that health providers may work shorter hours as competition goes up because their financial incentive will decrease. The financial incentive is one of the key factors that determine the individual's labor supply decisions. Financial incentives for physicians might decrease as competition goes up (Austin and Baker, 2015) Thus, it is possible that the NHSC-programs might decrease working hours of physicians by changing the market structure. However, Rizzo and Blumenthal (1994) found the opposite result. They estimate the impact of wage change on labor supply. For male physicians, the income effect of wage change decreases labor supply. However, female physicians increase labor supply when wage increases.

In addition, several papers suggest a positive relationship between competition and business hours in retail industries. Kugler and Weiss (2016) study competition and business hours in the gasoline market. They find that firms tend to have longer opening hours in more competitive areas. Shy and Stenbacka (2008) also find that competition created incentives to expand their hours. Thus, physicians' working hours might increase if the market became more competitive.

Most of the literature evaluates the performance of the NHSC on retention of health professionals in NHCS-assigned areas. However, earlier papers do not examine how the NHSC program affect the intensive margin of labor supply. In my paper, I study how the NHSC programs affects not only the number of provider (extensive margin) but also working hours (intensive margin). In addition, my paper first examines how the competition among dentists change their working hours.

3.4 Data

I use the several different main data sources. Information on the NHSC-approved sites comes from the Health Resource and Services Administration (HRSA) Data Warehouse, which provides a name of the site, location, type of the site and NHSC approved date. Although NHSC programs started in the1980s, the HRSA Data Warehouse only provides information on the NHSC-approved sites that were approved after December 2005. [34] Using the Federal Information Processing Standard (FIPS) state and county codes, I calculate the number of NHSC-approved sites in each county from 2006 to 2010.

Then I obtain the number of dentist in each county and county-level covariates from the Area Health Resources Files (AHRF) which is managed by the HRSA Data Warehouse. It includes county-, state-, and national-level files which are obtained from more than 50 sources. For the county-level covariates, I used the population size of race, age, people living in poverty, and people without health insurance, population change, per capita income, number of Federal Qualified Health Centers (FQHCs), number of hospitals, and HPSA code. For the number of dentist in each county, I use professionally active dentist.[35]

I use the usual working hours and demographic characteristics of dentists from the Integrated Public Use Microdata Series (IPUMS-USA). The IPUMS-USA includes more than fifty high-precision samples of the American population drawn from the American Community Surveys (ACS) of 2006 to 2013. To get usual working hours of dentists, I first identify whether individuals' occupation is a dentist by using the occupation code (3010). The demographic variables of interest are age, race, gender, marital status, number of children, and migration status.

In addition, at the state level I use the minimum wage rate from University of Kentucky Center for Poverty Research (UKCPR) National Welfare Data 2017.

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[34] The list includes name, HPSA scores and geographic information of sites. However, it does not provide whether a site is primary, dental, or mental NHSC-approved site. Therefore, I exclude sites if their name contains 'mental' or 'behavior'.

[35] Dentists are from the American Dental Association Masterfile. They include dentist whose primary occupation is dental related, so the total number of dentist is sum of primary care dentists and specialties. NHSC programs are eligible for primary care providers, so I calculate how many dentists are eligible among total dentists. Using the NPI file from the Centers from Medicare and Medicaid Services (CMS), I manually calculate the primary care dentist by using taxonomy codes which are administrative codes that help to identify the provider type and area of specialization for health care providers. About 87% of total dentist are primary care physicians.

To measure a competition among dentists, I use a dentist concentration at county-level which is the finest geographic level in my data sets. To get a dentist concentration, I divide the number of dentist in county *j* with the number of population in county *j* and multiply it with 1,000. This will show how many dentists are in county *j* in time *t* per 1,000 population.

Table 3.1 provides a county-level summary statistics of outcome variable and covariates for counties that are metropolitans and counties that are non-metropolitans during 2006-2010. On average, demographic characteristics and education level are similar across the two groups. However, metropolitan counties have a larger population, more dentist, higher dentist concentration, and more hospitals. Population-to-dentist ratio is lower in non-metropolitan counties. Therefore, the NHSC programs may help rural areas to improve the supply of dentists.

Table 3.1 Summary statistics: Difference in Means between Non-Metropolitan Counties and Metropolitan Counties, 2006-2010

	Non-Metropolitan	Metropolitan
Number of active dentist	8.85	149.42
Dentist per 1000 population	0.32	0.45
Population	24,465	232,881
White	0.84	0.81
Black	0.06	0.09
Other	0.10	0.10
Child (age<19)	0.24	0.25
Old (age>65)	0.29	0.27
Per capita personal income	30,002	34,670
Minimum wage (state level)	6.42	6.58
Live in poverty (%)	0.28	0.11
Non HPSA	0.36	0.37
Whole HPSA	0.22	0.14
Partial HPSA	0.42	0.49
Number of Federal Qualified Health Centers	0.66	2.53
Number of Hospital	1.08	3.72
N (number of county)	2,058	1,090

Note: The table shows summary statistics separately for Non-metropolitan and Metropolitan counites during 2006-2010.
Source: Area Health Resource Files, 2006-2010. I exclude AA, AE, GU, PR, MS, and VI.

Table 3.2 provides summary statistics of working hours and demographic characteristics of dentists in counties with NHSC-approved sites and counties without NHSC-approved sites. Overall, individual, county and state characteristics are similar in both groups. Dentists located in the counties without NHSC-approved sites earns higher wage and have fewer hospitals and FQHCs in their areas compare to those in the counties with NHSC-approved sites.

Table 3.2 Summary Statistics of Dentists in Counties with NHSC-approved Sites and Counties without NHSC-approved Sites

	Dentist	
	NHSC=0	NHSC>0
Usual working hours	37.69	37.95
Wage or Salary	150,501	144,538
NHSC-approved sites	0	10.15
Individual characteristics		
Age	49.9	49.94
Male	0.77	0.73
Number of children	1.00	0.95
Married	0.84	0.81
Single	0.08	0.10
Widowed	0.02	0.01
Divorced	0.07	0.08
Single	0.07	0.10
White	0.83	0.75
Black	0.03	0.03
County characteristics		
White	0.73	0.67
Black	0.12	0.13
Other	0.15	0.20
Child (age<19)	0.26	0.25
Old (age>65)	0.18	0.32
Live in poverty (%)	0.11	0.13
Per capita personal income	44,632	45,498
Non HPSA	0.36	0.03
Whole HPSA	0.04	0.26
Partial HPSA	0.59	0.71
Number of Federal Qualified Health Centers	6.58	18.75
Number of Hospital	15.43	24.63
State characteristic		
Minimum wage (state level)	6.56	7.38
N	2,611	3,758

Note: The table shows summary statistics separately for dentists in counites that have NHSC-approved sites and in counties that do not have NHSC-approved sites during 2006-2010.
Source: Area Health Resource Files and American Community Survey 2006-2010

3.5 Empirical Method

To examine the effect of physician concentration on dentists' labor supply outcomes, I do the estimation proceeds in two steps. In the first step, I examine whether the number of NHSC-approved dental sites increased the number of dentists and the level of dentist concentration. In the second step, I estimate the relationship between the number of NHSC-approved dental sites and working hours of dentists.

First, I examined if the increase in the NHSC-approved sites in a county has a positive effect on the number of dentists in that county and further on the level of dentist concentration. According to previous literature, the number of physicians increased for the NHSC-approved sites. Therefore, I expect to see a positive relationship between the number of NHSC-approved sites and the number of dentists. I use the fixed effects panel regression model to control the unobserved state-fixed and time-fixed variables at county-level. Specifically, I estimate the following equation:

$$\mathrm{Y_{jt}} = \beta_0 + \beta_1 \mathrm{Num\_NHSC_{jt}} + \Gamma_1 X_{jt} + \gamma_2 \mathrm{z_{st}} + \delta_j + \delta_t + \epsilon_{jt} \quad (3.1)$$

The outcome variable is the number of physicians and the level of physician concentration in county *j* in year *t*. The regressor $\mathrm{Num\_NHSC_{jt}}$ is the number of NHSC-approved sites in county *j* in year *t*. I control for time-varying county level variables X_{jt}; population size of race (white, black, and other; other is omitted), percent of the population aged 0-19, 20-64, and over 65 (aged 20-64 is omitted), percent of the population without health insurance, population change, per capita income, number of Federal Qualified Health Center (FQHC), number of hospital, and whether county is fully or partly designated as HPSA. Include time-varying state level variable $\mathrm{z_{st}}$ which is the state's minimum wage rate. Standard errors are clustered by state.

In the second step, I examine the impact of the number of NHSC-approved sites on working hours of dentists. If there is a positive relation between the number of NHSC-sites and number of dentist in the first step, it would change the market structure that influences a labor supply decision. I estimate a linear model of the following form;

$$\mathrm{Y_{ijt}} = \beta_0 + \beta_1 Num\_NHSC_{jt} + \Gamma_1 V_{it} + \Gamma_2 X_{jt} + \gamma_3 \mathrm{z_{st}} + \delta_j + \delta_t + \epsilon_{ijt} \quad (3.2)$$

where the outcome variable is usual working hours per week for dentist *i* in county *j* in year *t*. The variables are defined as in equation (3.1). The model controls for a vector of physician-level characteristics (V_{it}), county-level characteristics (X_{jt}) and state minimum wage (z_{st}). V_{it} includes age, race (white, black, and other; other is omitted), marital status (married, single, divorced, and widowed), education level, number of children and migration status.

In the analysis, I am interested in whether the existing dentists would be affected by the influx of new dentists because of the NSHC-program. However, ACS data does not provide information whether a dentist is participating in the NHSC-program or not. Therefore, I used a migration status to determine whether a dentist is an incumbent or not. If an individual stayed at the same home in the previous year, then I consider the dentist to be working in the same location.

3.6 Results

In this section, I present results based on the empirical strategy laid out in section 5. Table 3 reports results of first regression. Column (1) and (2) of the table shows the impact of increasing one NHSC-approved sites on the number of dentist. The result shows that the new NHSC-approved site has a statistically significant effect on the number of dentist. One additional NHSC-approved sites in a county increase about 6.72 additional dentist in a county. On average, total NHSC-approved sites increased by 0.56 in a year. Therefore, the number of dentists might increase by about 4 because of the NHSC-program. Column (2) presents the elasticity of dentists with respect to NHSC-approved sites. One percent changes in the number of NHSC-approved sites changes about 5.4 % in the number of dentists in county j. Column (3) and (4) of the table present the impact on physician concentration. The result suggests that having one additional NHSC-approved site will increase the competition among dentist. There will be about 0.003 more physicians per 1,000 population because of an NHSC-approved site. Column (4) suggests that 1 percent increase in the number of NHSC will increase 0.2% in dentist concentration. This preliminary analysis suggests that NHSC-approved sites have a positive impact on the extensive margin of dentists' labor supply and level of competition.

Table 3.3 Impact of the Total Number of NHSC on the Extensive Margin of Labor Supply

	Number of dentist			
	(1) Dentist	(2) Ln(dentist)	(3) Concentration	(4) Ln(concentration)
Total number of NHSC	6.72**		0.003**	
	(3.17)		(0.001)	
Ln (Total number of NHSC)		0.054***		0.002***
		(0.012)		(0.003)
N	3,146	3,146	3,146	3,146
$N \times T$	12,246	12,246	12,246	12,246

Note: This table shows the linear regression estimates from equation (1) using the Area Health Resource Files (AHRF) for 2006-2010, Each column corresponds to a separate regression. The sample includes 3,146 counites. Standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1

I next conduct the main analysis by examining the impact of NHSC-approved sites on dentists' working hours. Column (1) and (2) of table 4 show the relationship between the number of NHSC-approved sites and working hours of dentists. One additional NHSC-approved site in a county increases dentists' working hours about 0.068 hours per week. Then I include lagged variable of the total number of NHSC-approved sites in column (2). The result suggests that the total number of NHSC-approved sites in a particular time *t* increase dentist' working hours about 0.262. In other words, when the competition among dentists goes up, dentists in shortage areas, tend to increase their working hours. However, the total number of NHSC-approved sites in a time *t-1* does have a negative impact and decreases working hours about 0.204 hours per week. In addition, migration status does not have the statistically significant impact on working hours. However, the incumbent dentists tend to work longer hours compared to the dentist who moved to the new place.

Table 3.4 Impact of the Total Number of NHSC on Intensive Margin of Labor Supply

	Working hours	
	(1)	(2)
	Working hours	Working hours with lagged variable
Total number of NHSC	0.068*	0.262**
	(0.036)	(0.108)
Total number of $NHSC_{t-1}$		-0.204*
		(0.118)
N	4,820	3,595

Note: This table presents the linear regression estimates from equation (2) by using Area Health Resource Files and American Community Study from 2006-2010. Each column corresponds to a separate regression. Standard errors are clustered by state. *** p<0.01, ** p<0.05, * p<0.1

Using the results from models (3.1) and (3.2), I estimate the relationship between the physician concentration and working hours. By dividing the coefficient of model (3.2) (0.068) with the coefficient of model (3.1) (0.003), dentists' working hours increase about 22.67 hours per week if there is an additional dentist per 1,000 population. Average dentist concentration in counties that obtained NHSC-approved sites during 2006 and 2010 is 0.17 at the beginning and average dentist concentration is 0.44 in 2010. Increases in NHSC-approved sites increase about 0.27 dentist per 1,000 and further it would increase dentists' working hours by about 6.12 hours per week. My result suggests that competition among dentists has a positive impact on physicians' working hours.

3.7 Conclusion

This paper provides the first empirical evidence for the relationship between competition among dentists and working hours of dentists. Existing papers have not examined whether and to what extent working hours of providers may change as competition increases among dentists. Moreover, this paper presents the impact of NHSC program on both intensive and extensive margin of labor supply outcome. I found that

NHSC programs do increase the number of dentists and the competition among dentists significantly. If a county sees a 1% increase in NHSC-approved sites, the number of dentists increases by 5.4% in the county. Further, the concentration of dentists increases about 0.2%. This result is consistent with existing literature that studies the short-term effect of NHSC on physicians' extensive margin of labor. Thus, NHSC programs have a positive impact on dentist supply in HPSAs.

In addition, I found that if a county has more NHSC-approved sites then incumbent dentists tend to work longer hours. There are few studies examined how competition affects working hours of providers. However, the previous studies suggest that more competition might decrease the financial incentives of providers. Lower financial incentives would discourage providers to work longer hours. My results, however, shows the opposite result. This can be explained that dental providers might expand their business hours to compete with others (Shy and Stenbacka, 2008; Steinhaeuser et al.,2011).

My paper can help policymakers understand how providers respond to financial incentives and make labor supply decisions in general. In addition, my paper finds that NHSC-program might increase not only the extensive but also the intensive margin of labor supply. These results suggest that NHSC program would increase access to medical services in shortage areas greatly.

There are a few potential limitations on this work. One category is generalizability. ACS data does not provide information whether a dentist is working at an NHSC-approved site or not. Therefore, the impact of NHSC program on working hours of provider might smaller than expected. The other category of limitation is measurement errors. I used survey data to identify working hours, so there is a passivity that individuals report inaccurate hours. Further study is needed to explore to compare between working hours of physicians who participate in NHSC program and who do not participate in NHSC.

APPENDIX A : COMPARATIVE STATISTICS
APPENDIX TO CHAPTER 1

This appendix provides background for the statements in Table 1 and provide additional details on the comparative statics.

Following is the second-order conditions when solved for the endogenous variable *e* and *t*.

(A1)
$$\frac{\partial e}{\partial p^m} = -\frac{u_{tt}u_{ep^m} - u_{et}u_{tp^m}}{\Delta}$$

(A2)
$$\frac{\partial e}{\partial \theta^{PI}} = -\frac{u_{tt}u_{e\theta^{PI}}}{\Delta}$$

(A3)
$$\frac{\partial e}{\partial \theta^{M}} = -\frac{u_{tt}u_{e\theta^{M}} - u_{et}u_{t\theta^{M}}}{\Delta}$$

(A4)
$$\frac{\partial t}{\partial p^m} = -\frac{-u_{te}u_{ep^m} + u_{ee}u_{tp^m}}{\Delta}$$

(A5)
$$\frac{\partial t}{\partial \theta^{PI}} = -\frac{-u_{te}u_{e\theta^{PI}}}{\Delta}$$

(A6)
$$\frac{\partial t}{\partial \theta^{M}} = -\frac{-u_{te}u_{e\theta^{M}} + u_{ee}u_{t\theta^{M}}}{\Delta}$$

where Δ is a Hessian determinant,

$$\Delta = \begin{vmatrix} U_{ee} & U_{et} \\ U_{te} & U_{tt} \end{vmatrix} > 0.$$

The second order condition U_{ee} and U_{tt} are both negative and Δ is positive, according to the second-order conditions for a maximum. The signs of other second order conditions are following,

(A7)

$u_{tt} < 0,$	$u_{te} > 0\,,$	$u_{tp^m} > 0\,,$	$u_{t\theta^{PI}} = 0\,,$	$u_{t\theta^m} > 0\,,$	$u_{t\theta^{UI}} < 0$
$u_{et} > 0,$	$u_{ee} < 0\,,$	$u_{ep^m} < 0\,,$	$u_{e\theta^{PI}} > 0\,,$	$u_{e\theta^m} < 0\,,$	$u_{e\theta^{UI}} > 0.$

The details for (A7) are

(A8)

$U_{ee} = (M\theta^{PI}s_{ee}g_e^2 + M\theta^{PI}s_e g_{ee})\left(p^{PI} - (\beta p^m + (1-\beta)p^{UI})\right) + (f_{ee}(t-e) - 2f_e)(\beta p^m + (1-\beta)p^{UI} - c)$
$U_{et} = f_e(\beta p^m + (1-\beta)p^{UI} - c + \lambda) > 0$
$U_{ep^m} = Q_e^{np}\beta < 0$
$U_{e\theta^{PI}} = Ms_e g_e(p^{PI} - (\beta p^m + (1-\beta)p^{UI}) > 0$
$U_{e\theta^m} = Q_e^{np}\beta_{\theta^m}(p^m - p^{UI}) < 0$

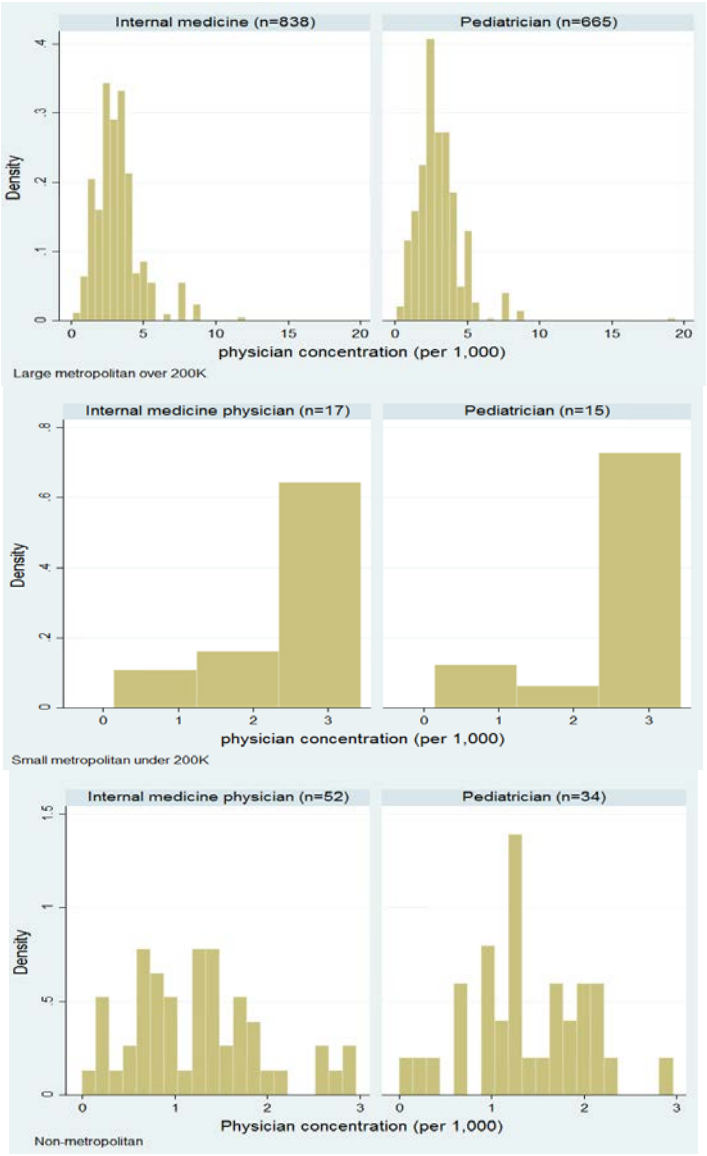
$U_{tt} = v_{\ell\ell} < 0$
$U_{te} = f_e(\beta p^m + (1-\beta)p^{UI} - c + \lambda) > 0$
$U_{tp^m} = f\beta > 0$
$U_{t\theta^{PI}} = 0$
$U_{t\theta^m} = f\beta_{\theta^m}(p^m - p^{UI}) > 0$

From the first order conditions (1a) and (1b), I can get $Q_e^{np} = f_e(t-e) - f - M\theta^{PI}s_e g_e < 0$. This means that physicians will treat less number of non-privately insured patients when they increase hours on non-direct patient care hours. By using equation (1b), the sign of U_{et} determined.

APPENDIX B : FIGURES AND TABLES

APPENDIX TO CHAPTER 1

Figure B.1 Physician Concentration by Specialties and Sites



Notes: The graph shows the distribution of physician concentration of counties where internal medicine physicians and pediatric physicians are practicing medicine in 1996 by the size of sites; large metropolitan over 200,000 population, small metropolitan under 200,000 population, and non-metropolitan areas.

Source: Area Health Resources Files, 1996 and Community Tracking Survey Physician Study, 1996-1997, 1998-1999, and 2000-2001

Table B.1 Simulated Eligibility Measure of SCHIP and Medicaid Eligibility

Year	Mean	Min	Max
1996	0.264	0.220	0.504
1999	0.454	0.321	0.641
2001	0.479	0.321	0.758
1996-2001	0.215	0.073	0.530

Source: Current Population Survey March Supplement, 1996

Table B.2 Physician Concentration Level in 1996

Year 1996	Average	25%	75%
All counties	2.82	1.79	3.55
Counties included in the CTS	1.04	0.38	1.27

Source: Area Health Resources Files, 1996 and Community Tracking Survey Physician Study, 1996-1997, 1998-1999, and 2000-2001

Table B.3 Chances of Changing Practice Styles

PRACTICE TYPE 1996	PRACTICE TYPE 1998					
	Solo or 2	Group>=3	HMO	Medical School	Hospital Based	Other
SOLO OR 2	72.73	13.17	2.08	2.23	5.13	4.67
GROUP>=3	19.49	57.89	2.85	3.88	7.76	8.14
HMO	15.84	17.03	45.05	3.48	8.52	10.07
MEDICAL SCHOOL	14.82	12.31	2.88	53.19	10.78	6.02
HOSPITAL BASED	16.20	13.78	2.36	5.88	50.52	11.26
OTHER	21.09	20.94	4.64	4.75	13.41	35.14
TOTAL	38.68	26.43	5.64	7.09	12.57	9.59

PRACTICE TYPE 1998	PRACTICE TYPE 2000					
	Solo or 2	Group>=3	HMO	Medical School	Hospital Based	Other
SOLO OR 2	73.82	13.79	1.64	2.32	4.26	4.17
GROUP>=3	19.90	63.70	1.93	2.54	6.01	5.92
HMO	13.75	24.63	41.81	4.93	7.10	7.79
MEDICAL SCHOOL	16.85	12.57	1.28	53.46	8.20	7.65
HOSPITAL BASED	18.39	19.36	1.34	6.01	45.97	8.94
OTHER	21.21	24.38	2.42	5.05	12.12	34.81
TOTAL	40.13	29.22	3.99	6.88	11.16	8.62

Source: Area Health Resources Files, 1996 and Community Tracking Survey Physician Study, 1996-1997, 1998-1999, and 2000-2001

Table B.4 Simulated Eligibility Measure of Medicaid Eligibility and of Potential Size of Marketplace

	Medicaid Simulated Eligibility			Marketplace Simulated Eligibility		
Year	Mean	Min	Max	Mean	Min	Max
2012	10.61	4.29	32.85	0	-	-
2013	10.37	4.26	32.85	0	-	-
2014	14.69	4.26	34.59	11.98	8.67	14.17
2015	15.22	4.32	34.59	11.96	8.67	14.17
Δ2013-2014	4.32	-	-	9.64	-	-

Source: Current Population Survey March Supplement 2014.

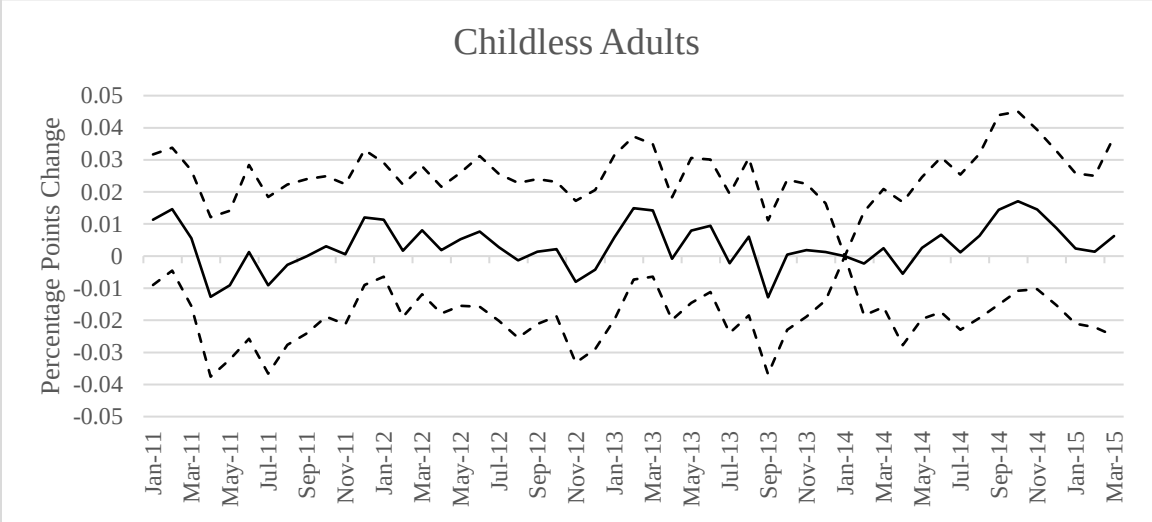
Table B.5 Physician Concentration Level in 2013

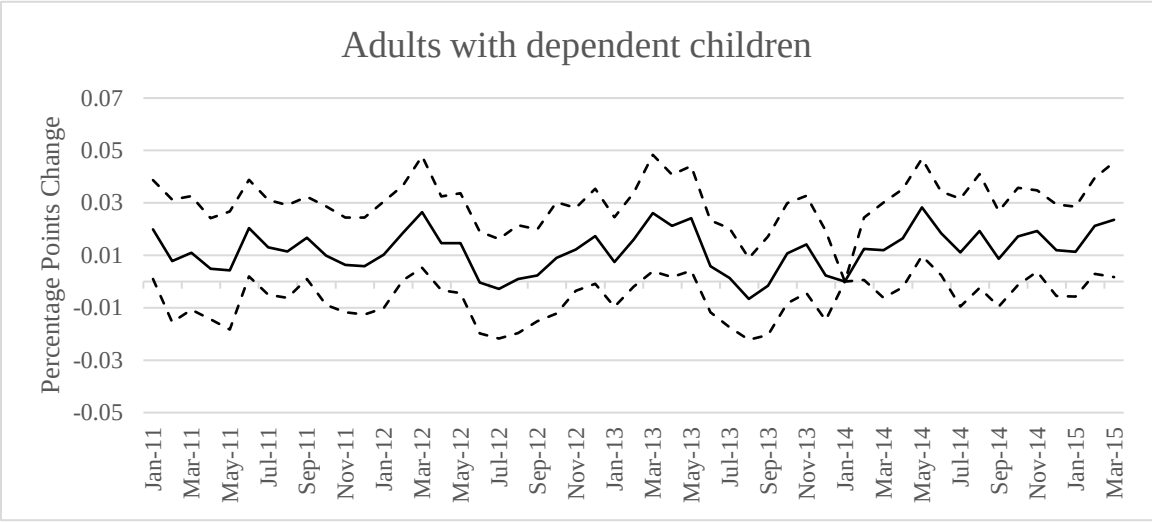
Year 2013	Average	25%	75%
All counties	0.53	0.31	0.71
Counties included in the IPUMS-ACS	0.84	0.66	0.99

Source: Area Health Resources Files, 2013 and IPUMS-ACS 2012-2015

APPENDIX C : FIGURES AND TABLES
APPENDIX TO CHAPTER 2

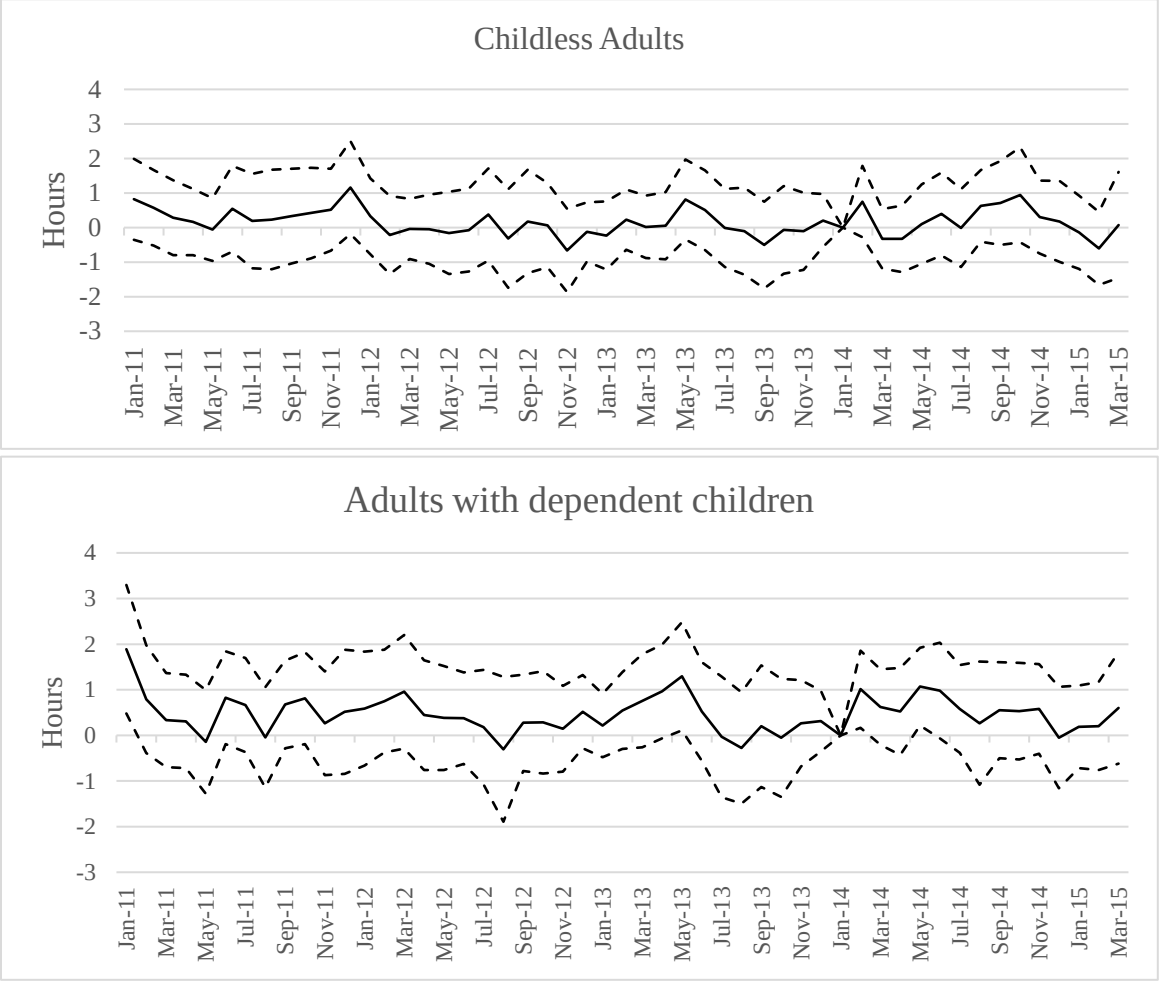
Figure C.1 Estimates of the Impact of Medicaid Expansion on Labor Force Participation Using CPS Monthly Data





Notes: The graph shows the percentage point change in labor force participation relative to December 2013, which is the month prior to expansion, for childless adults and adults with dependent children. The sample excludes individuals in states that expanded Medicaid after January 2014 (Indiana, Michigan, New Hampshire, and Pennsylvania), Hawaii, and Wisconsin.
Source: Basic Monthly CPS data, January 2011 – March 2015.

Figure C.2 Estimates of the Impact of Medicaid Expansion on Hours Worked Using CPS Monthly Data



Notes: The graph shows the change in hours worked during the previous week relative to December 2013, which is the month prior to expansion, for childless adults and adults with dependent children. The sample excludes individuals in states that expanded Medicaid after January 2014 (Indiana, Michigan, New Hampshire, and Pennsylvania), Hawaii, and Wisconsin.
Source: Basic Monthly CPS data, January 2011 – March 2015.

Table C.1 Medicaid Eligibility Thresholds for Childless Adults

State	Expand Medicaid	2011	2012	2013	2014	2015	Date of Expansion
Alabama	N	0	0	0	0	0	
Alaska	N	0	0	0	0	138	9/1/2015
Arizona	Y	0	100	100	138	138	1/1/2014
Arkansas	Y	0	0	0	138	138	1/1/2014
California	Y	0	0	0	138	138	1/1/2014
Colorado	Y	0	10	10	138	138	1/1/2014
Connecticut	Y	56	56	55	138	138	1/1/2014
Delaware	Y	0	100	100	138	138	1/1/2014
District of Columbia	Y	133	200	200	215	215	1/1/2014
Florida	N	0	0	0	0	0	
Georgia	N	0	0	0	0	0	
Hawaii	Y	0	100	133	138	138	1/1/2014
Idaho	N	0	0	0	0	0	
Illinois	Y	0	0	0	138	138	1/1/2014
Indiana	N	0	0	0	0	138	2/1/2015
Iowa	Y	0	0	0	138	138	1/1/2014
Kansas	N	0	0	0	0	0	
Kentucky	Y	0	0	0	138	138	1/1/2014
Louisiana	N	0	0	0	0	0	
Maine	N	0	0	0	0	0	
Maryland	Y	0	0	0	138	138	1/1/2014
Massachusetts	Y	0	0	0	138	138	1/1/2014
Michigan	Y	0	0	0	138	138	4/1/2014
Minnesota	Y	0	75	75	205	138	1/1/2014
Mississippi	N	0	0	0	0	0	
Missouri	N	0	0	0	0	0	
Montana	N	0	0	0	0	0	pending
Nebraska	N	0	0	0	0	0	
Nevada	Y	0	0	0	138	138	1/1/2014
New Hampshire	N	0	0	0	0	138	8/15/2014
New Jersey	Y	0	0	0	138	138	1/1/2014
New Mexico	Y	0	0	0	138	138	1/1/2014
New York	Y	0	100	100	138	138	1/1/2014
North Carolina	N	0	0	0	0	0	
North Dakota	Y	0	0	0	138	138	1/1/2014
Ohio	Y	0	0	0	138	138	1/1/2014
Oklahoma	N	0	0	0	0	0	
Oregon	Y	0	0	0	138	138	1/1/2014
Pennsylvania	N	0	0	0	0	138	1/1/2015
Rhode Island	Y	0	0	0	138	138	1/1/2014
South Carolina	N	0	0	0	0	0	
South Dakota	N	0	0	0	0	0	
Tennessee	N	0	0	0	0	0	
Texas	N	0	0	0	0	0	
Utah	N	0	0	0	0	0	
Vermont	Y	0	150	150	138	138	1/1/2014
Virginia	N	0	0	0	0	0	
Washington	Y	0	0	0	138	138	1/1/2014
West Virginia	Y	0	0	0	138	138	1/1/2014
Wisconsin	N	0	0	0	0	100	
Wyoming	N	0	0	0	0	0	

Notes: The income threshold shown applies to jobless adults. A value of zero denotes that childless adults are not eligible for Medicaid.
Sources: CMS and the Kaiser Family Foundation.

Table C.2 Medicaid Eligibility Thresholds for Adults with Dependent Children

State	Expand Medicaid	2011	2012	2013	2014	2015	Date of Expansion
Alabama	N	11	11	10	16	18	
Alaska	Y	77	76	74	128	143	9/1/2015
Arizona	Y	100	100	100	138	138	1/1/2014
Arkansas	Y	13	13	13	138	138	1/1/2014
California	Y	100	100	100	138	138	1/1/2014
Colorado	Y	100	100	100	138	138	1/1/2014
Connecticut	Y	185	185	185	201	201	1/1/2014
Delaware	Y	75	100	100	138	138	1/1/2014
District of Columbia	Y	200	200	200	220	221	1/1/2014
Florida	N	20	20	19	35	34	
Georgia	N	28	27	27	39	37	
Hawaii	Y	100	100	133	138	138	1/1/2014
Idaho	N	21	21	20	27	26	
Illinois	Y	185	133	133	138	138	1/1/2014
Indiana	N	19	19	18	24	138	2/1/2015
Iowa	Y	28	28	27	138	138	1/1/2014
Kansas	N	26	26	25	28	38	
Kentucky	Y	36	34	33	138	138	1/1/2014
Louisiana	N	11	11	11	24	24	
Maine	N	200	200	133	105	105	
Maryland	Y	116	116	116	138	138	1/1/2014
Massachusetts	Y	133	133	133	138	138	1/1/2014
Michigan	Y	37	37	37	138	138	4/1/2014
Minnesota	Y	100	215	215	205	138	1/1/2014
Mississippi	N	24	24	23	29	27	
Missouri	N	19	19	18	24	22	
Montana	N	32	32	31	52	50	pending
Nebraska	N	47	46	47	55	54	
Nevada	Y	25	25	24	138	138	1/1/2014
New Hampshire	N	39	39	38	75	138	8/15/2014
New Jersey	Y	29	200	200	138	138	1/1/2014
New Mexico	Y	29	29	28	138	138	1/1/2014
New York	Y	69	150	150	138	138	1/1/2014
North Carolina	N	36	35	34	45	44	
North Dakota	Y	34	34	33	138	138	1/1/2014
Ohio	Y	90	90	90	138	138	1/1/2014
Oklahoma	N	37	37	36	48	44	
Oregon	Y	32	31	30	138	138	1/1/2014
Pennsylvania	N	26	26	25	38	138	1/1/2015
Rhode Island	Y	110	175	175	138	138	1/1/2014
South Carolina	N	50	50	50	67	67	
South Dakota	N	52	52	50	54	52	
Tennessee	N	70	69	67	111	101	
Texas	N	12	12	12	19	18	
Utah	N	38	38	37	47	45	
Vermont	Y	77	185	185	138	138	1/1/2014
Virginia	N	25	25	25	52	44	
Washington	Y	37	36	35	138	138	1/1/2014
West Virginia	Y	17	13	16	138	138	1/1/2014
Wisconsin	N	200	200	200	100	100	
Wyoming	N	39	38	37	59	57	

Notes: The income threshold shown applies to jobless adults.
Sources: CMS and the Kaiser Family Foundation.

Table C.3 Estimates of the Impact of Medicaid Expansion on Health Insurance Coverage from the American Community Survey

	Childless Adults		Adults with Dependent Children	
	High School Degree or Less	Less than a High School Education	High School Degree or Less	Less than a High School Education
Medicaid	0.0319***	0.0393***	0.0319***	0.0383***
	(0.0059)	(0.0083)	(0.0081)	(0.000116)
	[0.0440]	[0.0542]	[0.0148]	[0.0178]
ESI	-0.0022	-0.0024	-0.0061*	-0.0104*
	(0.0026)	(0.0036)	(0.0032)	(0.0056)
	[0.0030]	[-0.0033]	[-0.0028]	[-0.0048]
Private (non-ESI)	-0.0070**	-0.0057**	-0.0052	-0.0027
	(0.0034)	(0.0024)	(0.0032)	(0.0036)
	[-0.0097]	[-0.0079]	[0.0024]	[-0.0013]
Uninsured	-0.0218***	-0.0318***	-0.0185**	-0.0235**
	(0.0053)	(0.0068)	(0.0078)	(0.0107)
	[-0.0301]	[-0.0439]	[-0.0086]	[-0.0109]
Observations	1,616,760	473,928	1,205,158	395,581

Notes: Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. The figures in brackets represent the marginal effect for the average change in the eligibility threshold for Medicaid from 2013 to 2014 for states that expanded Medicaid. Thus, this estimate shows the impact of Medicaid expansion for the average state expansion. These estimates are comparable to those shown in specification (2.3) of Table 2.2. For additional notes, see Table 2.2.
Source: American Community Survey 2011-2015.

Table C.4 Estimates of the Impact of Medicaid Expansion on Health Insurance Coverage using Different Functional Forms for Eligibility

	Childless Adults			Adults with Dependent Children		
	(1)	(2)	(3)	(1)	(2)	(3)
Medicaid						
Threshold	0.0307***	0.0073	0.0122	0.0308**	0.0225	-0.0223
	(0.0061)	(0.0127)	(0.0480)	(0.0124)	(0.0587)	(0.1640)
Threshold^2		0.0176**	0.0112		0.0038	0.0497
		(0.0086)	(0.0616)		(0.0246)	(0.1500)
Threshold^3			0.0020			-0.0133
			(0.0190)			(0.0408)
Impact	[0.0424]	[0.0436]	[0.0434]	[0.0143]	[0.0113]	[-0.0010]
AIC	71902.2	71900.7	71902.6	61804.3	61806.1	61807.5
ESI						
Threshold	-0.0074	0.0215	0.0876	-0.0047	-0.0301	0.0173
	(0.0074)	(0.0164)	(0.1100)	(0.0075)	(0.0263)	(0.0667)
Threshold^2		-0.0218*	-0.1080		0.0116	-0.0369
		(0.0126)	(0.1370)		(0.0109)	(0.0658)
Threshold^3			0.0271			0.0141
			(0.0407)			(0.0194)
Impact	[-0.0103]	[-0.0118]	[-0.0136]	[-0.0022]	[-0.0115]	[0.0015]
AIC	144021.9	144021.1	144022	100134	100135.1	100136.7
Private (non-ESI)						
Threshold	0.0045	0.0254***	0.0178	-0.0026	0.0065	0.0307
	(0.0050)	(0.0082)	(0.0400)	(0.0051)	(0.0266)	(0.0776)
Threshold^2		-0.0157***	-0.0058		-0.0042	-0.0289
		(0.0056)	(0.0518)		(0.0107)	(0.0746)
Threshold^3			-0.0031			0.0072
			(0.0162)			(0.0212)
Impact	[0.0063]	[0.0052]	[0.0053]	[-0.0012]	[0.0021]	[0.0088]
AIC	2043.5	2040.2	2042.2	-15242.9	-15241.4	-15239.9
Uninsured						
Threshold	-0.0197***	-0.0228**	-0.0171	-0.0170*	-0.0092	-0.0602
	(0.0069)	(0.0105)	(0.0665)	(0.0093)	(0.0405)	(0.1350)
Threshold^2		0.0024	-0.0051		-0.0036	0.0486
		(0.0074)	(0.0890)		(0.0182)	(0.1330)
Threshold^3			0.0024			-0.0152
			(0.0278)			(0.0377)
Impact	[-0.0272]	[-0.0270]	[-0.0272]	[-0.0079]	[-0.0050]	[-0.0190]
AIC	120254.5	120256.4	120258.4	85961.7	85963.6	85964.9
Observations	111,190	111,190	111,190	77,064	77,064	77,064

Notes: This table displays the estimates and AIC values for specifications with different functional forms for the eligibility threshold variable. Standard errors that allow for clustering within states are shown in parentheses. The figures in brackets represent the marginal effect for the average change in the eligibility threshold for Medicaid from 2013 to 2014 for states that expanded Medicaid. Thus, this estimate shows the impact of Medicaid expansion for the average state expansion. These estimates are comparable to those shown in specification (2.3) of Table 2.2.
Source: Current Population Survey March Supplement 2011-2015.

Table C.5 Estimates of the Impact of Medicaid Expansion on Labor Market Outcomes using Different Functional Forms for Eligibility

	Childless Adults			Adults with Dependent Children		
	(1)	(2)	(3)	(1)	(2)	(3)
Labor Force Participation						
Threshold	-0.0011	0.0144	0.0171	0.0030	0.0259	0.0769
	(0.0050)	(0.0088)	(0.0555)	(0.0059)	(0.0254)	(0.0683)
Threshold^2		-0.0114**	-0.0149		-0.0107	-0.0633
		(0.0052)	(0.0713)		(0.0108)	(0.0672)
Threshold^3			0.0011			0.0154
			(0.0214)			(0.0193)
Impact	[-0.0015]	[-0.0018]	[-0.0019]	[0.0014]	[0.0097]	[0.0236]
AIC	117524.5	117525.3	117527.3	70983.5	70984.3	70985.3
Employed						
Threshold	-0.0006	0.0173	-0.0194	-0.0015	0.0098	0.0066
	(0.0057)	(0.0105)	(0.0677)	(0.0058)	(0.0240)	(0.0630)
Threshold^2		-0.0132**	0.0343		-0.0053	-0.0020
		(0.0055)	(0.0847)		(0.0105)	(0.0599)
Threshold^3			-0.0148			-0.0010
			(0.0252)			(0.0173)
Impact	[-0.0008]	[-0.0013]	[-0.0003]	[-0.0007]	[0.0034]	[0.0025]
AIC	132721.3	132721.8	132723.4	85334.2	85335.9	85337.9
Usual Hours Worked						
Threshold	-0.1240	0.9960	-2.5060	-0.4420	-0.2310	-2.6910
	(0.2730)	(0.6230)	(3.1100)	(0.2960)	(0.8900)	(2.5180)
Threshold^2		-0.824**	3.7010		-0.0989	2.4360
		(0.3530)	(3.8590)		(0.4140)	(2.6320)
Threshold^3			-1.4140			-0.7430
			(1.1480)			(0.8110)
Impact	[-0.1711]	[-0.1947]	[-0.1262]	[-0.2055]	[-0.1288]	[-0.7993]
AIC	971229.7	971228.7	971228.6	670032.5	670034.4	670035.5
Actual Hours Worked						
Threshold	-0.1660	1.266**	-1.7530	-0.4200	0.4070	-1.8870
	(0.2330)	(0.5390)	(2.9700)	(0.2850)	(0.9360)	(2.2450)
Threshold^2		-1.053***	2.8470		-0.3870	1.9770
		(0.3050)	(3.6870)		(0.4380)	(2.2720)
Threshold^3			-1.2190			-0.6930
			(1.1210)			(0.6970)
Impact	[-0.2291]	[-0.2583]	[-0.2009]	[-0.1953]	[0.1056]	[-0.5197]
AIC	973673.4	973670.4	973671	670414.7	670416	670417.3
Self- Employed						
Threshold	0.0004	0.0051	-0.0435	0.0020	0.0039	-0.0474
	(0.0029)	(0.0075)	(0.0342)	(0.0036)	(0.0142)	(0.0378)
Threshold^2		-0.0035	0.0593		-0.0009	0.0519
		(0.0052)	(0.0429)		(0.0065)	(0.0373)
Threshold^3			-0.0196			-0.0155
			(0.0131)			(0.0111)
Impact	[0.0006]	[0.0005]	[0.0014]	[0.0009]	[0.0016]	[-0.0124]

Table C.5 ─ continued

AIC	7405.3	7406.9	7406.7	18983.0	18985	18985.2
Observations	111,190	111,190	111,190	77,064	77,064	77,064

Notes: For additional notes, see Appendix Table C.3.
Source: Current Population Survey March Supplement 2011-2015.

Table C.6 Estimates of the Impact of Medicaid Expansion on Health Insurance Coverage Using the Changes in the Medicaid Eligibility Thresholds for Childless Adults

	Childless Adults			
Δ 2014-2013 eligibility (%)	Medicaid	ESI	Private	Uninsured
-12 <= Change < 38	0.0069	0.0003	-0.0030	-0.0118
	(0.0324)	(0.0246)	(0.0251)	(0.0160)
38 <= Change < 138	0.0517***	-0.0311	-0.0039	-0.0150
	(0.0129)	(0.0226)	(0.0087)	(0.0159)
138 <= Change	0.0506***	0.0040	0.0000	-0.0375***
	(0.0088)	(0.0115)	(0.0080)	(0.0121)
Observations	111,190	111,190	111,190	111,190

Notes: Each column shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. We divide the change in the Medicaid eligibility thresholds for childless adults for all states from 2013 to 2014 into thirds instead of using the value of the eligibility threshold. The categories include states that increased the threshold by 138 percentage points, at least 38 percentage points and less than 138 percentage points, and less than 38 percentage points. These estimates can be interpreted as changes relative to states that did not expand Medicaid in 2014. The additional variables included, but not shown, are the same as Table 2.2, specification (2.3).
Source: Current Population Survey March Supplement 2011-2015.

Table C.7 Estimates of the Impact of Medicaid Expansion on Health Insurance Coverage Using the Changes in the Medicaid Eligibility Thresholds for Adults with Dependent Children

	Adults with dependent children			
Δ 2014-2013 eligibility (%)	Medicaid	ESI	Private	Uninsured
-100<=Change < 5	-0.0042	-0.0439**	0.0219	0.0217
	(0.0346)	(0.0206)	(0.0164)	(0.0164)
12<= Change < 22	0.0207	-0.0107	0.0022	-0.0072
	(0.0168)	(0.0126)	(0.0115)	(0.0232)
22<= Change < 54	0.0416**	-0.0214	0.0119	-0.0259
	(0.0191)	(0.0136)	(0.0109)	(0.0161)
54<= Change < 125	0.0754***	-0.0152	-0.0058	-0.0412**
	(0.0211)	(0.0160)	(0.0113)	(0.0164)
Observations	77,064	77,064	77,064	77,064

Notes: Each column shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. We use the change in the Medicaid eligibility thresholds for adults with dependent children for states that expanded Medicaid and states that did not from 2013 to 2014. We divide the change in the Medicaid eligibility thresholds for adults with dependent children for all states from 2013 to 2014 into quintiles instead of using the value of the eligibility threshold. The categories include states that increased the threshold at least 54 percentage points, at least 22 percentage points and less than 54 percentage points, at least 12 percentage points and less than 22 percentage points, at least 5 percentage points and less than 12 percentage points, and less than 5 percentage points, and state that did expand Medicaid eligibility. These estimates can be interpreted as changes relative to states that increased the eligibility threshold by at least 5 percentage points and less than 12 percentage points in 2014. The additional variables included, but not shown, are the same as Table 2.2, specification (2.3).
Source: Current Population Survey March Supplement 2011-2015.

Table C.8 Estimates of the Impact of Medicaid Expansion on Labor Market Outcomes Using the Changes in the Medicaid Eligibility Thresholds for Childless Adults

	Childless Adults				
Δ 2014-2013 eligibility (%)	Labor Force Participation	Employed	Usual work hour	Last week work hour	Self-Employed
-12<= Change < 38	-0.0193	-0.0281	-1.3870	-1.797*	-0.0125
	(0.0262)	(0.0281)	(1.3880)	(0.9810)	(0.0122)
38<= Change < 138	0.0030	0.0054	0.3090	-0.2530	0.0036
	(0.0139)	(0.0215)	(0.7940)	(0.8180)	(0.0065)
138<= Change	-0.0061	-0.0078	-0.3730	-0.3930	-0.0079
	(0.0077)	(0.0079)	(0.3900)	(0.3240)	(0.0050)
Observations	111,190	111,190	111,190	111,190	111,190

Notes: Each column shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. For additional notes, see Table 2.3 and Table C.6.
Source: Current Population Survey March Supplement 2011-2015.

Table C.9 Estimates of the Impact of Medicaid Expansion on Labor Market Outcomes Using the Changes in the Medicaid Eligibility Thresholds for Adults with Dependent Children

	Adults with Dependent Children				
Δ 2014-2013 eligibility (%)	Labor Force Participation	Employment	Usual work hour	Last week work hour	Self-Employment
-100 <= Change < 5	-0.0026	-0.0083	-0.1330	-0.2150	-0.0047
	(0.0122)	(0.0126)	(0.4870)	(0.4880)	(0.0104)
12<= Change < 22	-0.0077	-0.0132	-0.2790	-0.757*	-0.0122*
	(0.0105)	(0.0092)	(0.5020)	(0.3970)	(0.0065)
22<= Change < 54	-0.0095	-0.0176**	-0.5550	-0.980**	0.0039
	(0.0069)	(0.0073)	(0.3950)	(0.4330)	(0.0055)
54<= Change < 125	-0.0062	-0.0116	-1.119***	-0.782*	0.0010
	(0.0104)	(0.0089)	(0.3830)	(0.4330)	(0.0063)
Observations	77,064	77,064	77,064	77,064	77,064

Notes: Each column shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. For additional notes, see Table 2.3 and Table C.7.
Source: Current Population Survey March Supplement 2011-2015.

Table C.10 Estimates of the Impact of Medicaid Expansion on Labor Market Outcomes using a Placebo Date of Expansion

	Childless Adults			Adults with Dependent Children		
	High School Degree or Less	Less than a High School Education	Income Below Poverty	High School Degree or Less	Less than a High School Education	Income Below Poverty
Labor Force Participation	0.0019	0.0107	0.0119	-0.0004	-0.0135	0.0056
	(0.0037)	(0.0082)	(0.0072)	(0.0051)	(0.0124)	(0.0076)
	[0.0026]	[0.0148]	[0.0164]	[-0.0002]	[-0.0063]	[0.0026]
Employed	0.0034	0.0136	0.0056	-0.0032	-0.0183	0.0015
	(0.0052)	(0.0091)	(0.0071)	(0.0066)	(0.0143)	(0.0081)
	[0.0047]	[0.0188]	[0.0078]	[-0.0015]	[-0.0085]	[0.0007]
Usual Hours Worked	0.0364	0.4100	0.1330	-0.3640	-0.7770	-0.0072
	(0.2270)	(0.4510)	(0.2690)	(0.2860)	(0.5580)	(0.2780)
	[0.0502]	[0.5658]	[0.1835]	[-0.1693]	[-0.3613]	[-0.0033]
Actual Hours Worked	0.0464	0.5110	0.1750	-0.1380	-0.6830	-0.0375
	(0.2270)	(0.4230)	(0.2750)	(0.2930)	(0.5900)	(0.3860)
	[0.0640]	[0.7052]	[0.2415]	[-0.0642]	[-0.3176]	[-0.0174]
Self employed	-0.0004	-0.0027	-0.0030	-0.0005	-0.0012	-0.0027
	(0.0028)	(0.0043)	(0.0047)	(0.0042)	(0.0107)	(0.0076)
	[-0.0005]	[-0.0037]	[-0.0042]	[-0.0002]	[-0.0006]	[-0.0012]
Observations	111,190	28,701	32,066	77,064	23,315	26,976

Notes: These estimates are constructed by assuming that each state expanded Medicaid by one year earlier than the actual expansion date. Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. These estimates are comparable to those shown in specification (2.3) of Table 2.3. For additional notes, see Table 2.2.
*p<0.10, **p<0.05, ***p<0.01
Source: Current Population Survey March Supplement 2011-2015.

Table C.11 Estimates of the Impact of Medicaid Expansion on Labor Market Outcomes from the Basic Monthly Current Population Survey

	Childless Adults		Adults with Dependent Children	
	Actual Thresholds	Placebo Thresholds	Actual Thresholds	Placebo Thresholds
Labor Force Participation	0.0028	0.0025	0.0053	0.0003
	(0.0035)	(0.0030)	(0.0041	(0.0027)
	[0.0039]	[0.0034]	[0.0025]	[0.0001]
Employed	0.0035	0.0031	0.0035	0.0008
	(0.0043)	(0.0034)	(0.0034)	(0.0030)
	[0.0048]	[0.0043]	[0.0016]	[0.0004]
Usual Hours Worked	0.2940*	0.1410	0.0587	-0.2070
	(0.2140)	(0.1620)	(0.4580)	(0.1790)
	[0.4057]	[0.1946]	[0.0273]	[-0.0963]
Actual Hours Worked	0.2360	0.1060	-0.0448	-0.1930
	(0.1870)	(0.1500)	(0.2040)	(0.1630)
	[0.3257]	[0.1463]	[-0.0208]	[-0.0897]
Self employed	0.0004	0.0001	-0.0025	-0.0026
	(0.0022)	(0.0021)	(0.0025)	(0.0025)
	[0.0006]	[0.0002]	[-0.0012]	[-0.0012]
Observations	471,090	108,906	464,613	132,778

Notes: The first column for each demographic group is constructed using the actual Medicaid eligibility thresholds. The second column for each demographic group is constructed using the one-year lead of the Medicaid eligibility thresholds, assuming that each state expanded Medicaid by one year earlier than the actual expansion date. Each cell shows the estimates from separate regressions. Standard errors that allow for clustering within states are shown in parentheses. The figures in brackets represent the marginal effect for the average change in the eligibility threshold for Medicaid from 2013 to 2014 for states that expanded Medicaid. Thus, this estimate shows the impact of Medicaid expansion for the average state expansion. These estimates are comparable to those shown in specification (2.3) of Table 2.3. For additional notes, see Table 2.2.

*p<0.10, **p<0.05, ***p<0.01

Source: Current Population Survey Basic Monthly January, 2011 - March, 2015.

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