HOW DID MEDICAID EXPANSION AFFECT THE PROVIDER LABOR MARKET?

by

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ABSTRACT

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One provision of the Affordable Care Act was to expand Medicaid eligibility for a greater number of low-income patients. The resulting increase in demand for care was largely explored, but the effect of the 2014 Medicaid expansion on the physician and advanced practitioner labor market has not been well researched by economists. Using pooled cross-sectional data from the 2010 – 2018 American Community Surveys, this paper examines whether the Medicaid expansion has caused notable changes in physician, physician assistant, and nurse practitioner hours, compensation, and overall employment. The literature shows that practices that employ nurse practitioners are far more likely to accept Medicaid patients due to the lower wage rates of nurse practitioners that offset lower reimbursement rates for Medicaid patients. This study finds that the weekly hours worked by nurse practitioners increased significantly in states that have implemented Medicaid expansion, whereas physicians and physician assistants saw no change in their hours or earnings. Further, Medicaid expansion led to no significant change in the overall employment of each type of provider in states. Thus, the response of the health care system to the Medicaid expansion is in line with the profit maximizing input allocation.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

A. History of Medicaid

Medicaid and Medicare were established in 1965 as a part of President Lyndon B. Johnson's Social Security Amendments. While both programs existed to grant insurance coverage to groups of uninsured people, the programs derived funding from different sources. Presently, the federal government fully funds and administers health insurance for Medicare eligible citizens – those over the age of 65, with certain disabilities, or end-stage renal disease (Office of the Assistant Secretary of Planning and Evaluation, 2017). In contrast, Medicaid is a joint federal-state program in which states receive financial assistance from the federal government to fund their own programs that insure low-income families and individuals. In the five decades following the program's initiation, Medicaid has undergone several changes in its structure such as expansions of eligibility and requirements for state participation. The core of the program, however, remains intact; Medicaid expands access to health services for low-income citizens.

B. Medicaid and Public Health Insurance Expansion

In the 1980s and 1990s, Congress voted to include low-income children with families outside of the eligibility requirements and pregnant women in Medicaid (Medicaid and CHIP Payment and Access Commission, 2017). Considered the largest expansion prior to the ACA, the State Children's Health Insurance Program (CHIP) enrolled an additional 2 million children in Medicaid and authorized nearly $40 billion in funding over the following decade (Klemm, 2000). Other historical Medicaid expansions

stemmed from calls for coverage of the mentally ill, disabled, and other indigent groups. Early amendments to Medicaid granted coverage to these demographics, increasing enrollment by nearly 5% from 1972 to 1976 while also growing overall annual expenditure by 18%. In more recent years, enrollment increases have been largely driven by external factors. Due to the economic downturn in the early 2000s, enrollment in Medicaid grew tremendously; overall Medicaid spending increased commensurately by approximately one-third of its previous total (Holahan and Ghosh, 2005).

C. Providers in the Health Care System

Physicians – and increasingly, advanced practitioners such as physician assistants and nurse practitioners – are integral to the function of the healthcare system; they are the ultimate decision makers and leaders in health care delivery. As such, the current and future supply of physicians is of great concern to economists. Recently, studies have focused on the shortage of physicians in the United States, particularly that of primary care clinicians. The 2019 American Association of Medical Colleges (AAMC) projection estimates that the supply of physicians will experience a shortfall of 46,900 to 121,900 physicians by 2032 (American Association of Medical Colleges, 2019). This projected shortage operates under certain assumptions, one being that the average hours worked by physicians are experiencing a gradual decline. From 2000 to 2016, the overall hours worked by doctors has decreased due to several reasons including more stringent labor laws, physician pushback against employers, and integration of electronic medical records. Physicians and healthcare workers work some of the highest hours per week amongst all professional occupations. Between rising administrative work and more

complex care delivery systems, health professionals have sought to decrease their burdens. The downward trend in physician hours, however, reduces the supply of full-time equivalent (FTE) physicians. If the decline in hours continues, the AAMC estimates an additional 20,900 physician shortfall by 2032 than if the hours remain the same.

Concurrently, advanced practitioners such as physician assistants and nurse practitioners have been expanding in number and scope of practice. Physician assistants are providers that typically serve on teams with physicians or surgeons and other healthcare workers (Bureau of Labor Statistics, 2018). Under the supervision of a physician, physician assistants conduct physicals, provide treatment, and in certain states, prescribe medication. To become a PA, a two-year master's program is required after completion of a bachelor's degree. The median annual wage for physician assistants is $108,610, significantly lower than that of a physician (Bureau of Labor Statistics, 2018).

Nurse practitioners also play a vital role in the delivery of care. To be certified as a nurse practitioner, students must graduate from a registered nurse (RN) degree program before completing a master's or doctoral degree (American Association of Nurse Practitioners). The additional NP degree typically takes 2-4 years to complete after being certified as an RN. Once licensed, nurse practitioners may diagnose disease and prescribe medication within the scope of practice defined by their state of employment. Although the scope of practice varies from state to state, nurse practitioners have mostly filled roles in primary care in hospitals and private practices (Naylor and Kurtzman, 2010). Due to state variation in scope of practice laws, net migration has been observed in regions where policy is less restrictive on NPs. In terms of Medicare and Medicaid reimbursement, nurse practitioners typically receive around 75-85 percent of the payment

that physicians receive from providing the same services. Nurse practitioners earn a median wage of $107,030, significantly lower than that of the physician (Bureau of Labor Statistics, 2018). The observed disparities in payment and scope of practice between advanced providers and physicians have raised debate about the nurse practitioner's role in the future of health care delivery.

The projections of labor supply shortage raise concerns about the long-term sustainability of physicians as the drivers of the American health care system. Economists and industry experts have proposed that nurse practitioners and physician assistants continue to supplement care delivery. Of the several labor supply scenarios described in the 2019 AAMC report, the outcome with the greatest offset of the physician shortage is "APRN/PA high", in which the number of NPs and PAs trained each year continue to grow at high rates. With a greater reliance – and emphasis – on primary care services as a solution to the nation's huge healthcare expenditure and relatively poor outcomes, it remains to be seen if NPs and PAs can fill the shortage in the healthcare labor market. Preliminary research supports the ability of NPs and PAs to provide quality care services comparable with that of a primary care physician (Kurtzman and Barnow, 2017). However, while the services may be similar, the current healthcare infrastructure does not necessarily support new NPs and PAs substituting for physicians in every circumstance.

D. Contribution and Organization of this Paper

The literature does not extensively cover the effects of the Medicaid expansion on the supply of providers in their respective states, much less the changes in hours that

these providers tend to work as a result. Medicaid expansion has been studied primarily from the utilization side and financial ramifications of implementation on the state and hospitals. Meanwhile, the change in the supply – specifically the hours, earnings, and number of workers – has not been studied. Using 2010-2018 annual data from the American Community Survey, this paper evaluates if these core measures of the provider labor supply have changed for the providers in the states that opted into ACA Medicaid expansion. My answer adds to the existing literature in that it draws from a nationally representative dataset and examines the specific effect of expansion in the health care provider labor market. I find that the weekly hours worked for nurse practitioners increase by ~1.5 hours in states that have opted into Medicaid expansion. Furthermore, I determine that Medicaid expansion has no significant effect on the annual earnings, weekly earnings, or state level employment of providers.

This paper will first review the existing literature on the effect of Medicaid and public health expansions on health care utilization, health care supply, and provider work hours. The subsequent section describes the data sample used for analysis. Next, the econometric model of difference-in-difference analysis will be reviewed. Following an explanation of the model will be presentation of the analysis of the results and discussion on the findings in relation to the literature. Finally, the paper will finish with conclusions.

CHAPTER TWO

REVIEW OF MEDICAID EXPANSION AND PROVIDER LABOR MARKET

In 2009, President Obama assigned a team of physician leaders, healthcare economists, and policymakers to draft the Patient Protection and Affordable Care Act. Under the Affordable Care Act, the government intended to grant Medicaid eligibility to a greater number of low-income patients. The primary provision for Medicaid expansion was extended eligibility to all adults with incomes below 138% of the federal poverty line. However, following a June 2012 Supreme Court ruling in *National Federation of Independent Business (NFIB) v. Sebelius*, the Medicaid expansion provision was rendered an opt-in policy by state. As of July 2019, 37 states (including the District of Columbia) have adopted Medicaid expansion while 14 states have not (Medicaid.gov, 2019). The ACA also stipulated that the federal government would pay the full expenses of state Medicaid costs for newly enrolled patients up to 2016 and thereafter would only cover 90% of the costs. Many states and hospitals also possess certain Medicaid exceptions to the standard rules, such as disproportionate share hospitals that receive lump-sum payments for accepting a greater proportion of Medicaid patients in their payer mix or the District of Columbia only receiving a 70% cost coverage.

A. Impact on Health Care Utilization

As of April 2019, CMS reports that 72.9 million individuals are enrolled in Medicaid or CHIP in 49 reporting states, a 26.1% increase over the baseline set in July-September 2013 (Center for Medicare and Medicaid Services, 2019). This additional 26.1% of Medicaid enrollees consists of both previously ineligible individuals and

eligible individuals (Medicaid and CHIP Payment and Access Commission, 2019). The Medicaid and CHIP Payment and Access Commission suggest that a "welcome-mat" effect that stems from increased public knowledge of eligibility requirements may have boosted enrollment for previously eligible individuals. As a whole, enrollment has increased in both expansion and non-expansion states, although the growth is proportionally larger in the expansion states. Courtmanche et al. (2017) use a difference-in-differences model to evaluate American Community Survey data and found that expansion states experienced a 5.9% increase in Medicaid enrollees to non-expansion states' 2.8%. More recently, however, enrollment has actually started to decline; the Kaiser Family Foundation (2019) estimates a 1.6 million net decline in Medicaid or CHIP enrollment from December 2017 to December 2018. It remains to be seen whether this decline is a reflection of a resurging uninsured population or a transition from public to private insurance.

By increasing the number of Medicaid-enrolled patients, the ACA expansion has driven higher rates of patient utilization. Sommers et al. (2016) survey over 1,000 individuals in both Medicaid expansion and non-Medicaid expansion states and find that, on average, patients utilized a greater volume of primary care. Specifically, an increase in Medicaid eligibility was associated with an increase in utilization of preventative care and annual checkups as well as an improvement in self-reported health and health outcomes. However, in their comparison between Arkansas, a private insurance expansion state, and Kentucky, a Medicaid expansion state, Sommers et al. (2016) find many of the same effects on health utilization that are driven by expansion of the insurance pool not specific to Medicaid. When compared to Texas, a non-expansion state,

both Arkansas and Kentucky demonstrate greater health care access and outcomes. Generally, research supports that utilization will increase with any rise in enrollment, particularly in primary care services. This aligns with the temporary 2013 and 2014 Medicaid policy that specifically increased payment for primary care reimbursement relative to coverage for other services (Medicaid and CHIP Payment and Access Commission, 2019).

B. Impact on Health Care Supply

Beyond the effects on the utilization and demand side, ACA Medicaid expansion has profoundly affected the business of physician practice. Physicians have been notoriously selective about their payer mix due to the detrimental impact of accepting publicly insured or uninsured patients on their bottom line. Lower levels of reimbursement, higher volume of paperwork, and other factors cause providers to favor private insurance over public as well as standard Medicaid over capitated Medicaid payments (Berman et al., 2002). The ACA sought to combat these barriers to health care delivery by increasing the payments from CMS to providers. However, advanced practitioners continue to remain reimbursed at a rate lower than that of their physician counterparts.

Recent studies show a correlation between greater eligibility for Medicaid and increased supply of care for low-income patients (Chen, 2014). Analysis of medical expenditure panel data before and after expansion showed that when Medicaid enrollment is held constant, an increase in Medicaid reimbursement is associated with a commensurate increase in access to care by Medicaid patients. However, Chen (2014)

and Berman et al. (2002) find that the supply of physicians only rises when the level of reimbursement increases; when enrollment of Medicaid patients rises, physicians simply increase their work hours. These phenomena are further substantiated by Buchmueller et al. (2014) who investigate the response of providers to public health insurance expansions, specifically adult dental Medicaid benefits. In their study, Buchmueller et al. (2014) find that dentists see more publicly insured patients while maintaining their current number of privately insured patients in response to expansion of benefits. Empirically, they find that a 10% increase in dental coverage in the state corresponds with a 0.6 hour per week increase in time treating patients. To compensate for additional labor hours, dental practices hire more hygienists, which are the dental equivalent of physician assistants. Similarly, DiNardi (2017) identifies the effect of the Medicaid expansion on nurse hours. Using a difference-in-differences model to analyze data from the American Community Survey, Dinardi determines that both LPNs and RNs in expansion states raises hours worked per week by 1.6% overall (30-50 minutes per week), with the nurses in rural areas experiencing significantly greater increases.

Making changes to the hours of health care workers can exert significant financial pressure on hospitals and private practices. Employers must address the costs associated with these changes in labor. For instance, an increase in nurse hours translates to the marginal cost of overtime wages in addition to the potential charges incurred by medical error due to fatigue (Dinardi, 2017). Alternatively, hiring a new nurse or clinician includes the marginal cost of wages and adjustment costs of hiring. To maximize profit, individual hospitals or practices must ensure that the composition of their staff optimizes the ratio of marginal revenue produced by one type of provider to their wages. Since

advanced practitioners are not always able to provide care independently of a physician, their marginal products of labor remain ambiguous. While studies have not specifically examined this economic model in provider supply, work has been done to determine if advanced practitioners produce the adequate FTEs and care outcomes to substitute for physicians. Laurant et al. (2018) conduct a review on 18 randomized trials to determine whether nurses and nurse practitioners can substitute for primary care doctors. Although patient outcomes and satisfaction were found to be similar or equal in most of these studies, the effect of nurse practitioner substitution on cost was unclear. With varying levels of reimbursement provided to advanced practitioners by Medicaid, assessing the marginal revenue product generated by hiring additional advanced practitioners is complicated. Consequently, the effect of Medicaid expansion on these markets remains unclear.

C. Provider Labor Variables

Anecdotally, physicians – as well as other advanced practitioners – are known to work some of the longest hours and shifts amongst professionals. However, with recent concern for work-hours restrictions for newly trained residents and physician burnout, medicine has experienced a downtrend in hours regulated by healthcare agencies and government policy. Staiger et al. (2010) analyzes Current Population Survey (CPS) data and find that mean hours worked per week for all physicians decreased by 7.2% between 1996 and 2008 (from 54.9 hours per week in 1996-98 to 51.0 hours per week in 2006-2008). They determine that these decreases are also associated with lower physician fees, which suggests that a similar trend could occur in the presence of a public insurance

expansion. However, Staiger et al. could not conclusively link physician work hours to reimbursement levels. Liu (2019) substantiates this claim with a focus on the 2003 work-limit regulation as the primary exogenous variable. Liu (2019) contends that the 2003 Accreditation Council for Graduate Medical Education (ACGME) reform in resident work-hours limits decreased hours for all physicians and set a new working standard. Furthermore, Liu (2019) asserts that the reduction in work hours is inversely correlated with female physicians' propensity to marry or have children, that is, female physicians are more likely to do so. It remains to be seen what kind of constantly changing, endogenous factors will cause fluctuations in provider work hours and how Medicaid expansion alters these factors.

This paper uniquely evaluates the effect that Medicaid expansion has on the work hours, weekly earnings, and annual earnings of physicians, physician assistants, and nurse practitioners. Whereas the literature has provided context for the trends over time in nationally representative samples, this study shows how Medicaid expansion specifically has impacted these variables in the provider labor market.

CHAPTER THREE

ESTIMATING EFFECTS ON THE PROVIDER LABOR MARKET

A. *Econometric Model*

To determine the effect of the Medicaid expansion on physician work hours in expansion states, this study employs a difference-in-differences regression model. This technique mimics experimental design by studying the differential effect of an intervention, creating a quasi- "treatment" group and a "control" group. The model makes use of the cross-sectional data collected annually in the timeframe that is comprised of observations before and after the Medicaid expansion. In this case, the states that opted into Medicaid expansion are considered a treatment group and the states that did not opt in are considered the control. Thus, the model allows for causal inference of the policy intervention's effect. The following econometric model is employed:

Model I: $Y_{ist} = \beta_0 + \beta_1 \text{EXPANSION}_{st} + \beta_2 \text{INSURANCE}_{st} + \beta_3 \text{SELFEMPLOYED}_{ist} + \beta_4 \text{AGEGROUP}_{ist} + \beta_5 \text{FEMALE}_{ist} + \beta_6 \text{HISPANIC}_{ist} + \beta_7 \text{BLACK}_{ist} + \beta_8 \text{ASIAN}_{st} + \beta_9 \text{OTHER}_{ist} + \beta_{10} \text{MARRIED}_{ist} + \alpha_s + \lambda_t + \varepsilon_{ist}$

Model II: $Y_{st} = \beta_0 + \beta_1 \text{EXPANSION}_{st} + \beta_2 \text{UNEMPLOYMENT}_{st} + \beta_3 \text{LOG65}_{st} + \beta_4 \text{LOG5}_{st} + \beta_5 \text{INSURANCE}_{st} + \beta_6 \text{FEMALE}_{st} + \beta_7 \text{HISPANIC}_{st} + \beta_8 \text{BLACK}_{st} + \beta_9 \text{ASIAN}_{st} + \beta_{10} \text{OTHER}_{st} + \alpha_s + \lambda_t + \varepsilon_{st}$

Where α_s represents state fixed effects that control for differences between states,

λ_t represents year fixed effects that control for yearly differences that affect the labor market,

and ε is an error term.

The coefficient of interest in the equation is β_1, which will estimate the effect of the Medicaid expansion in the expansion state on the provider dependent variables.

Dependent Variables*

Model I

Hours worked per week	Individual level variable -- the average number of hours worked by a provider on a weekly basis in last 12 months.
Log of Annual Earnings	Individual level variable – log of annual earnings for the provider for the year, including self-employed and employed income
Log of Hourly Earnings	Individual level variable – log of the hourly earnings for the provider, including self-employed and employed income

Model II

Log of employment	State level outcome variable – log of number of providers working in the state

Independent Variables – Model I*

EXPANSION	1 - if the provider works in a Medicaid expansion state
INSURANCE	Share of individuals covered under health insurance other than Medicaid in state
SELFEMPLOYED	1 – if the provider receives self-employment income
AGEGROUP	
25-30	1 – if the provider is aged 25-30
31-35	1 – if the provider is aged 31-35
36-40	1 – if the provider is aged 36-40
41-45	1 – if the provider is aged 41-45
46-50	1 – if the provider is aged 46-50
51-55	1 – if the provider is aged 51-55
56-60	1 – if the provider is aged 56-60
61-65	1 – if the provider is aged 61-65
66-70	1 – if the provider is aged 66-70
70+	1 – if the provider is aged over 70

FEMALE	1 – if the provider is female
HISPANIC	1 – if the provider is Hispanic
BLACK	1 – if the provider is married
ASIAN	1 – if the provider is Asian
OTHER	1 – if the provider is another race/ethnicity
MARRIED	1 – if the provider is married

Independent Variables – Model II*

EXPANSION	1 - if the provider works in a Medicaid expansion state
UNEMPLOYMENT	Unemployment rate of the state
LOG65	Log of the number of individuals in the state aged over 65 years old
LOG5	Log of the number of individuals in the state aged under 5 years old
INSURANCE	Proportion of individuals covered under health insurance other than Medicaid in state
FEMALE	Proportion of population in the state that are female
HISPANIC	Proportion of population in the state that are Hispanic
BLACK	Proportion of population in the state that are black
ASIAN	Proportion of population in the state that are Asian
OTHER	Proportion of population in the state that are another race/ethnicity

*Variables are assessed in separate regressions by provider type: physicians, physician assistants, and nurse practitioners

B. Explanation of variables

The EXPANSION dummy variable serves as the variable of interest that demarcates whether an individual provider works in an ACA Medicaid expansion state. For a majority of the Medicaid expansion states, 2013 serves as the year prior to the Medicaid expansion, and the beginning of 2014 onwards exhibits the difference after the Medicaid expansion intervention. A select few states that implemented Medicaid

expansion after January 2014 are coded such that the number of months after January 2014 are counted as a proportion of a full year for Medicaid expansion. For example, since Michigan implemented Medicaid expansion in April 2014, the value of the EXPANSION for Michigan in the 2014 is 0.75, as the policy was only in effect for 75% of the year. While many of the providers who do reside in expansion states may not accept Medicaid patients and would ostensibly not be affected by the expansion, there are indirect effects of an increase in insured patients on extraneous practices. Thus, this study considers the broad effect of Medicaid expansion on the provider hours, not specifically the effect of changes in health insurance coverage of their patients. This variable will approximate the effect of Medicaid expansion on the physician work hours in expansion states as compared to the non-expansion states.

There are a limited number of proven independent variables that predict for provider work hours and earnings; I selected controls for Model I based on findings in literature. As discussed by Staiger et al. (2010), physician fees and reimbursement are somewhat associated with the number of hours they work. Thus, the variable INSURANCE - the data of which I acquire from the United States Census Bureau - will control for the different insurance rates in the physician's respective state. Furthermore, the control variable SELFEMPLOYED differentiates whether a provider receives self-employed income versus solely salaried income. Given that a high number of providers generate equity in group practices, this measure will control for the inherent differences in patient-mix between self-employed providers and employed providers. Next, the age group variables control for the age of the provider. The five-year increment is selected based on the general hierarchical structure of the medical profession. Younger providers

(25-30, 31-35) tend to be interns or residents, a status that directly impacts the number of hours and compensation a provider receives. Middle aged providers (46-50, 51-55) tend to work standard hours and receive greater compensation than their younger counterparts. Finally, older providers (66-70, 70+) may be heading towards retirement and slowly decreasing their hours – and consequently, their compensation. Liu (2019) finds strong differences between the sexes, as female physicians have different career and familial trajectories that can lead them to reduce their hours, hence the FEMALE dummy variable. HISPANIC, BLACK, ASIAN, and OTHER dummy variables are included to round out the demographics of the individual provider. The literature asserts that race and ethnicity have strong socioeconomic effects, and these are accounted for with these dummy variables.

I selected the state-level controls in Model II based on precedent set in literature. Dinardi (2017) uses the unemployment rate (UNEMPLOYED), log of the share of the state population over 65 years old (LOG65), and log of the share of the state population under 5 years old (LOG5) to control for state-level employment. The exact selection of these controls are not specifically justified by Dinardi, but it appears that they help to differentiate the composition of the potential patient population in each state. I also include FEMALE, HISPANIC, BLACK, ASIAN, and OTHER variables as shares of the demographic in each state. These serve to control the socioeconomic differences between state through sex and ethnic composition over time.

CHAPTER FOUR

SELECTING THE SAMPLE FROM THE 2010 – 2018 AMERICAN COMMUNITY SURVEY

A. Overview of the American Community Survey

This study uses annual data from the 2010 – 2018 American Community Survey 1-Year Data to determine the relationship between the onset of Medicaid expansion in 2014 and the change in physician work hours. The American Community Survey (ACS) is conducted by the United States Census Bureau on a yearly basis to provide data for distribution of federal and state funds.

The survey is administered to over 3.5 million Americans every year and asks about social, economic, housing, and demographic characteristics. The United States Census Bureau mails the survey forms to approximately 295,000 random addresses every month; if the forms are not completed after the first month, the Bureau sends surveyors to interview the addresses personally through telephone or in-person. Employment and labor information are collected from individuals who are a part of the labor force.

The United States Census Bureau also administers the Current Population Survey (CPS), which is another national, comprehensive household survey. The Annual Social and Economic Supplement (ASEC) portion of the CPS has several similarities to the ACS, with a few key differences that drove the selection of the ACS as the data source for this study. First, the CPS ASEC sample is much smaller than that of the ACS. Whereas the CPS ASEC surveys around 75,000 households annually, the ACS surveys over 3.5 million. Since this study looks at variables from specific occupations, the larger sample of the ACS serves to increase the power of this study. Moreover, the top coding

for the income question is higher in the ACS than on the CPS ASEC, which provides more detailed information for the earnings variable in this paper.

B. Selection of the Sample and Descriptive Statistics

The individual-level sample used in this study is comprised of 87,196 physicians, 9,816 physician assistants, and 13,367 nurse practitioners over the 9-year period. This sample was produced by using the American Community Survey occupation codes specific to "physicians and surgeons", "physician assistants", and "nurse practitioners". Notably, the occupation coding changed in the 2018 data, separating "physicians" and "surgeons". I categorize all individuals with these occupation codes into the physician sample. Given the ACS survey methodology of randomly sampling every year, I assume that each of the observations corresponds to a unique individual in any given year as opposed to a single individual providing multiple observations over multiple years.

Table 1 presents the descriptive statistics for the sample of physicians. On average, the physicians in this sample work about 50 hours per week. The average age of the physician in this sample is slightly above 48 years. The proportion of physicians in this sample who are female is 0.351.

Table 2 presents the descriptive statistics for the sample of physician assistants. On average, the physician assistants in this sample work about 41 hours per week. The average age for the physician assistants in this sample is around 41 years old. The proportion of physician assistants in this sample who are female is 0.671.

Table 3 presents the descriptive statistics for the sample of nurse practitioners. On average, the nurse practitioners in this sample work slightly less than 40 hours per week.

The average age of nurse practitioners in this sample is about 46.5 years old. The proportion of nurse practitioners in this sample who are female is 0.912.

C. Limitations of the Data

I filtered out unemployed individuals who reported occupation codes or those who were not active in the labor force in the given year. I dropped 489 individuals in the study who were under the age of 25 to avoid mischaracterizations in occupation. I also dropped 68 individuals who reported no employed or self-employed income, as this generated a missing value in the log of wages variable. This may have caused the data to be less representative of the actual provider population, as missing variables were disproportionately distributed among the states.

Notably, the state level data was missing several observations in the physician assistant and nurse practitioner sample. For certain states in certain years, the ACS simply did not collect individuals with these occupations. This causes the data to be not fully representative of the employment in every state over time for physician assistants and nurse practitioners.

CHAPTER FIVE

ESTIMATION RESULTS: QUANTIFYING THE EFFECT OF MEDICAID EXPANSION ON THE PROVIDER LABOR MARKET

A. *Effect of Medicaid Expansion on Individual Providers*

For each of the three types of providers in our data, I estimate the effect of Medicaid expansion on their hours, log annual earnings, and log of weekly wages. I employ models with and without state-specific linear trends that control for secular changes by state and year.

Estimates of the difference-in-differences regression effects at the individual level for physicians are presented in Table 4. Column 1 contains the regression model that does not include state-specific linear trend. Column 2 contains the model that does include state-specific linear trend. Both models include the same control variables as described previously in Chapter III. Furthermore, standard errors in both models are clustered by state. All else held equal, the physicians in Medicaid expansion states did not experience any significant changes in their weekly hour, annual salaries, or hourly wages as a result of working in a Medicaid expansion state following the policy implementation.

Estimates of the difference-in-differences regression effects at the individual level for physician assistants are presented in Table 5. Column 1 contains the regression model that does not include state-specific linear trend. Column 2 contains the model that does include state-specific linear trend. Both models include the same control variables as previously described. Standard error in both models are clustered by state. Without controlling for state-specific linear trend, the weekly hours worked by physician assistants significantly increased in states that expanded Medicaid. On average, these

physician assistants worked 1.099 hours longer per week than their counterparts that did not reside in states with Medicaid expansion. However, when including the state-specific linear trend, the regression model fails to identify a significant increase in weekly hours worked by physician assistants. Physician assistants in Medicaid expansion states do not experience any significant changes in their annual salary or hourly wages following the policy implementation.

Estimates of the difference-in-differences regression effects at the individual level for nurse practitioners are presented in Table 6. Column 1 contains the regression model that does not include state-specific linear trend. Column 2 contains the model that does include state-specific linear trend. Both models include the same control variables as previously described. Standard error in both models are clustered by state. Controlling for other factors, nurse practitioners in Medicaid expansion states after implementation of the policy experienced significant increases in hours ($p < 0.05$). Both models estimate a rise in nurse practitioner's hours, with the regression that includes state-specific linear trend presenting a 1.522 hour increase in weekly hours worked. Furthermore, nurse practitioners in Medicaid expansion states saw a significant decrease in their hourly wages when the regression controlled for state-specific linear trend. The log of hourly wages declined by 0.0638 for nurse practitioners in Medicaid expansion states, which equates to a $1.06 decrease in hourly wages. However, nurse practitioners that experienced Medicaid expansion saw no significant change in their annual salaries.

My findings mostly align with that of the study conducted by Dinardi (2017). Dinardi investigates the hours worked by LPNs and RNs and finds that those who work in states with Medicaid expansion experienced a 30 to 50-minute increase in hours

worked per week. Similarly, my results show an increase in nurse practitioner hours of 1.522 hours per week. However, the comparison between LPNs/RNs and nurse practitioners cannot be taken without considering the difference in the professions. While LPNs/RNs and nurse practitioners share similar educational background in nursing, their scope of practice and work environment differ substantially. LPNs and RNs are not licensed to diagnose disease or prescribe medication, and they typically work irregular shifts in the hospital setting. In contrast, nurse practitioners are mid-level practitioners that are able to diagnose and prescribe medication; they typically work in private practices that schedule more standard hours. Thus, the conclusions made by Dinardi about the increase in demand of the nurse labor market do not entirely translate to that of the NP labor market. Nurse practitioners fulfill clinician and primary care needs in private practice settings that standard nurses cannot, and vice versa. Barnes et al. (2016) finds that the practices that employ nurse practitioners are more likely to accept Medicaid patients than those that do not employ nurse practitioners. This may explain Medicaid expansion's unique effect on the nurse practitioner market; greater demand from Medicaid patients is funneled to the practices that employ nurse practitioners, thereby causing an increase in hours worked. However, the results of my study were incongruent with Chen's findings that saw physician increase hours in response to greater enrollment (Chen, 2014).

The differing results for nurse practitioners and physician assistants pose the question of why the effects of Medicaid expansion vary between the two. Although both providers are defined as "advanced practitioners", the practice environment of the average nurse practitioner differs from that of a physician assistant. Barnes et al. (2016)

examine the practice characteristics of NPs and PAs in medical practices using the 2012 SK&A physician and NP/PA files. 47.0% of NPs reported to working in primary care practices, whereas only 39.3% of PAs and 30.2% of physicians reported the same. In states that reimbursed nurse practitioners at 100% of the physician Medicaid fee-for-service rate, practices with NPs had 23% higher odds of accepting Medicaid patients than those that did not employ NPs (Barnes et al., 2016). Thus, in Medicaid expansion states where utilization of primary care increased, nurse practitioners experienced greater demand than their physician assistant counterparts.

B. Effect of Medicaid Expansion on State Employment

I estimate the effect of Medicaid expansion on the aggregate provider employment of each state by year. I employ models with and without state-level controls as well as models with and without state-specific linear trends.

Estimates of the difference-in-differences regression effects of Medicaid expansion at the aggregate state level on employment for all providers, physicians, physician assistants, and nurse practitioners are presented in Table 7. Column 1 contains the regression model that does not include state controls or state-specific linear trend. Column 2 contains the model that includes state controls but does not include state-specific linear trend. Column 3 contains the model that includes state-specific linear trend but does not include state controls. Column 4 contains the model that includes both state controls and state-specific linear trend. Medicaid expansion was associated with a significant increase in physician assistant employment in the two models that did not include state-specific linear trend. The log of physician assistant employment in states

with Medicaid expansion rose by 0.226 and 0.247 in models with and without state controls, respectively.

My findings differ slightly from the results of the studies conducted by Chen (2014) and Berman et al. (2002), who determine that the supply of physicians – and other providers – increase in response to increases in reimbursement. In contrast, my results show that the employment of physicians in each state did not significantly increase due to Medicaid expansion, despite evidence pointing to reimbursement increasing for certain specialties, such as ED physicians (Lynch et al., 2019). However, my study did not specifically investigate the reimbursement changes for all providers in Medicaid expansion states. The lack of significant change in physician hours may be due to a lack of specificity; different specialties may have experienced different effects in employment as a result of Medicaid expansion.

CHAPTER SIX

CONCLUSIONS

A. Summary of Findings

Using annual, cross-sectional data from the American Community Survey, this paper evaluates the effects of the ACA Medicaid expansion on the provider labor market. My study adds to the literature on the effect of public health expansions on the health care supply, particularly with the growing employment of advanced practitioners.

The results of the analysis show that the nurse practitioners in the states with Medicaid expansion are more likely to work a greater number of hours than their counterparts in non-Medicaid expansion states. I speculate that this occurrence could be due to the composition of practices that do accept Medicaid patients; these practices are more likely to employ nurse practitioners and therefore must accommodate for increased health care demand by increasing hours worked.

B. Policy Implications

My analysis would be improved with the addition of information about the type of area the provider resides in, either rural or urban. With a policy as tied to socioeconomics as Medicaid expansion, obtaining this private information from the American Community Survey would have been highly valuable. Nonetheless, the findings of this study should be used to help guide economists and policymakers in their decisions about health care labor. Nurse practitioners appear to be filling the demand for health care, and the increase in their hours in expansion states elucidates how hospitals and practices are profit maximizing input of labor. In areas where the Medicaid reimbursement for nurse

practitioners is equal to that of a physician, the marginal revenue of labor generated may be enough to justify increasing the hours worked by the NP. Given that nurse practitioners in states with greater scope of practice have higher odds of working in primary care, Medicaid expansion states should consider enacting less restrictive scope of practice laws for NPs and reimburse at an equivalent rate as that of physicians (Barnes et al., 2016). This may enable practices and hospitals to hire more advanced practitioners without losing out on profit. With a growing shortage of physicians and ever-increasing demand for affordable primary care, nurse practitioners are uniquely positioned to fulfill the needs in the labor supply.

C. Suggestions for Future Research

Given the differences in patient populations among specialties in medicine, a study into the effect of Medicaid expansion with data on the provider specialty could uncover the more nuanced effects of the policy. Determining which fields of medicine are most affected by public health expansions for low-income patients would help policymakers to target areas with inefficiencies and with the greatest potential to fill the gap in the labor market. Further, research can be done to look at how the advanced practitioner market responds to changes in the labor market of the other providers, i.e. how does supply of physician assistants change in response to an expansion in scope of practice for nurse practitioners? This research can direct health care policy to be enacted in ways that will most effectively address the overall shortage in providers that is facing the nation.

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TABLES

Table 1. Descriptive statistics for physicians

	Mean	Standard deviation	Minimum	Maximum
Dependent Variables				
Weekly hours	50.37	16.34	1.00	99.00
Annual earnings (2018 constant dollars)	207,010.40	153,735.60	1.00	1,256,177
Hourly earnings (2018 constant dollars)	101.04	144.83	1.00	14,687.81
Independent Variables				
Age (years)	48.55	13.31	25	96
Female	0.351	0.477	0	1
Married	0.793	0.405	0	1
Black	0.0395	0.195	0	1
Asian	0.187	0.390	0	1
Hispanic	0.0589	0.235	0	1
Other race/ethnicity	0.0204	0.141	0	1
Number of Observations: 87,196				

Notes: Providers with $0 in earnings were excluded from the dataset.

Table 2. Descriptive statistics for physician assistants

	Mean	Standard deviation	Minimum	Maximum
Dependent Variables				
Weekly hours	41.21	11.24	1.00	99.00
Annual earnings (2018 constant dollars)	80,891.69	60,708.20	1.00	1,057,673
Hourly earnings (2018 constant dollars)	44.84	32.66	1.00	1,045.85
Independent Variables				
Age (years)	41.33	11.82	25	94
Female	0.671	0.469	0	1
Married	0.684	0.465	0	1
Black	0.0525	0.223	0	1
Asian	0.0659	0.248	0	1
Hispanic	0.0772	0.267	0	1
Other race/ethnicity	0.0204	0.141	0	1
Number of Observations: 9,816				

Notes: Nominal dollars for each physician are converted to 2018 real dollars using adjusted income provided by the American Community Survey and the 2018 Consumer Price Index. Independent variables are weighted according to the annual weights provided by each of the years in the 2010-2018 American Community Survey Public Use Micro Datasets. Providers with $0 in earnings were excluded from the dataset.

Table 3. Descriptive statistics for nurse practitioners

	Mean	Standard deviation	Minimum	Maximum
Dependent Variables				
Weekly hours	39.80	11.01	1.00	99.00
Annual earnings (2018 constant dollars)	84,926.04	44,765.03	92.36	619,240
Hourly earnings (2018 constant dollars)	48.74	79.80	1.00	8,751
Independent Variables				
Age (years)	46.51	11.70	25	95
Female	0.912	0.282	0	1
Married	0.731	0.443	0	1
Black	0.0493	0.216	0	1
Asian	0.0481	0.213	0	1
Hispanic	0.0414	0.199	0	1
Other race/ethnicity	0.0127	0.316	0	1
Number of Observations: 13,367				

Notes: Nominal dollars for each physician are converted to 2018 real dollars using adjusted income provided by the American Community Survey and the 2018 Consumer Price Index. Independent variables are weighted according to the annual weights provided by each of the years in the 2010-2018 American Community Survey Public Use Micro Datasets. Providers with $0 in earnings were excluded from the dataset.

Table 4: Effect of Medicaid expansion on physician hours, annual earnings, and hourly earnings

	(1)	(2)
Hours		
	-0.271	-0.594
$EXPANSION_{st}$	(0.301)	(0.439)
	$R^2 = 0.097$	$R^2 = 0.098$
Log Annual Earnings		
	-0.0191	-0.0374
$EXPANSION_{st}$	(0.0162)	(0.0279)
	$R^2 = 0.210$	$R^2 = 0.211$
Log Hourly Earnings		
	-0.0137	-0.0248
$EXPANSION_{st}$	(0.0131)	(0.0255)
	$R^2 = 0.254$	$R^2 = 0.255$
State Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
State-specific Linear Trends	No	Yes
Observations	87,196	

Notes: The standard errors are presented in parentheses. Each coefficient is generated by a separate regression. Standard errors are clustered by state. Column (1) includes state and year fixed effects. Column (2) additionally includes a state-specific linear trend. Both columns include individual controls for if the provider receives self-employed earnings, the provider's age group, sex, ethnicity (Hispanic, black, Asian, other), and marriage status. Both columns also include a state control for the share of the population in their state covered under insurance that is not Medicaid.
*Statistically significant at the 0.10 level.
**Statistically significant at the 0.05 level.
***Statistically significant at the 0.01 level.

Table 5: Effect of Medicaid expansion on physician assistant hours, annual earnings, and hourly wages

	(1)	(2)
Hours		
	1.099**	0.552
$EXPANSION_{st}$	(0.412)	(0.997)
	$R^2 = 0.076$	$R^2 = 0.080$
Log Annual Earnings		
	0.0788*	.0642
$EXPANSION_{st}$	(0.0437)	(0.0693)
	$R^2 = 0.139$	$R^2 = 0.146$
Log Hourly Wages		
	0.0200	0.0319
$EXPANSION_{st}$	(0.0301)	(0.0382)
	$R^2 = 0.114$	$R^2 = 0.120$
State Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
State-specific Linear Trends	No	Yes
Observations	9,816	

Notes: The standard errors are presented in parentheses. Each coefficient is generated by a separate regression. Standard errors are clustered by state. Column (1) includes state and year fixed effects. Column (2) additionally includes a state-specific linear trend. Both columns include individual controls for if the provider receives self-employed earnings, the provider's age group, sex, ethnicity (Hispanic, black, Asian, other), and marriage status. Both columns also include a state control for the share of the population in their state covered under health insurance that is not Medicaid.
*Statistically significant at the 0.10 level.
**Statistically significant at the 0.05 level.
***Statistically significant at the 0.01 level.

Table 6: Effect of Medicaid expansion on nurse practitioner hours, annual earnings, and hourly wages

	(1)	(2)
Hours		
	0.961**	1.522**
$EXPANSION_{st}$	(0.405)	(0.667)
	$R^2 = 0.061$	$R^2 = 0.065$
Log Annual Earnings		
	-0.0142	-0.0474
$EXPANSION_{st}$	(0.0246)	(0.0491)
	$R^2 = 0.082$	$R^2 = 0.085$
Log Hourly Wages		
	-0.0313*	-0.0638**
$EXPANSION_{st}$	(0.0178)	(0.0285)
	$R^2 = 0.042$	$R^2 = 0.047$
State Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
State-specific Linear Trends	No	Yes
Observations	13,367	

Notes: The standard errors are presented in parentheses. The values in the table represent the regression coefficients for each dependent variable. Standard error is clustered by state. Column (1) includes state and year fixed effects. Column (2) adds a state-specific linear trend. Both columns include individual controls for if the provider receives self-employed earnings, the provider's age group, sex, ethnicity (Hispanic, black, Asian, other), and marriage status. Both columns also include a state control for the share of the population in their state covered under insurance that is not Medicaid.
*Statistically significant at the 0.10 level.
**Statistically significant at the 0.05 level.
***Statistically significant at the 0.01 level.

Table 7: Effect of Medicaid expansion on log of employment

	(1)	(2)	(3)	(4)
Total Providers (N = 459)				
$EXPANSION_{st}$	-0.0102	0.0224	0.0352	0.0776
	(0.0231)	(0.0343)	(0.0472)	(0.0489)
Physicians (N = 459)				
$EXPANSION_{st}$	-0.0144	0.0239	0.0241	0.0861
	(0.0266)	(0.0435)	(0.0503)	(0.0639)
Physician Assistants (N = 453)				
$EXPANSION_{st}$	0.247**	0.226***	0.228	0.213
	(0.0839)	(0.0823)	(0.155)	(0.180)
Nurse Practitioners (N = 455)				
$EXPANSION_{st}$	-0.118	-0.0820	-0.133	-0.0925
	(0.0829)	(0.102)	(0.151)	(0.146)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
State Controls	No	Yes	No	Yes
State-specific Linear Trends	No	No	Yes	Yes

Note: The standard errors are presented in parentheses. The values in the table represent the regression coefficients for each dependent variable. Standard error is clustered by state. Column (1) includes state and year fixed effects. Columns (3) and (4) additionally include state-specific linear trends. Columns (2) and (4) additionally include state controls for the unemployment rate, proportion of population covered under insurance other than Medicaid, population shares (female, Hispanic, black, Asian, other), log of the population age 65 and over, and log of the population age 5 and under. These controls are weighted according to the person weights provided by American Community Survey. Observation counts for physician assistants and nurse practitioners are less than 459 due to lack of observations of these occupations by the American Community Survey in certain states by year.

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.