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The Medicaid Expansion and its Effects on Hospital Revenue

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a thesis submitted to the Faculty of Emory College of Arts and Sciences  
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## Abstract

### The Medicaid Expansion and its Effects on Hospital Revenue By Timothy Anders Olsen

This paper investigates the effect of the ACA's voluntary Medicaid Expansion policy on hospital revenue streams. In 2010, The Patient Protection and Affordable Care Act was signed into law. However, the court determined that it was unconstitutional to force states to participate in the Medicaid Expansion, allowing states to opt out of the policy. In 2014, the Medicaid Expansion took effect. By the end of 2016, 31 states had accepted the expansion. With significant research studying specific revenue streams for hospitals, this study aims to determine whether overall hospital revenues have increased in expansion states compared to non-expansion states. The findings of this study show that expansion appears to have a negative impact on the overall revenues of hospitals in expansion states, relative to their non-expansion state counterparts.

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## **I. Introduction**

In 2010, under the Obama administration, the Patient Protection and Affordable Care Act (ACA) was signed into law, and it stands as one of the major historical reforms to the US healthcare system. The bill contains numerous provisions that effect both providers and consumers alike. The Medicaid Expansion is one of these main provisions, and it aimed to increase insurance coverage for low-income Americans by expanding the eligibility requirements to Medicaid. The compulsory Medicaid Expansion was ruled unconstitutional, allowing states to decide whether to expand their Medicaid systems, or leave them unchanged (Musumeci, Mary-Beth, 2012).

There has been significant research examining the effects of the expansion on several aspects of patient health and the US healthcare system. In terms of hospitals, the majority of research has compared differences in revenues from Medicaid, costs from uncompensated/unreimbursed care, and frequencies of uninsured patient visits. The general findings show improvements to these hospital financials through increased Medicaid revenues, reduced instances of uncompensated/unreimbursed care and a lowered frequency of uninsured patient visits (Antonisse, Larisa, 2017). However, despite these positive research findings, there is limited literature examining whether the expansion has increased the general revenue of expansion hospitals compared to non-expansion state hospitals.

In general, it is unclear how reductions in uncompensated and unreimbursed care costs affect overall hospital revenues. It is sensible to presume that increases in Medicaid revenues would have a positive effect on net revenues. Furthermore, if Medicaid reimbursements from the expansion are replacing previously uninsured patient visits, it would be reasonable to assume these factors have an upward force on overall revenues. However, it is also possible that the



opposite effect can occur on total revenue. For example, the increase of Medicaid admissions in expansion state hospitals could effectively replace admissions by the privately insured. This change in the payer mix would replace commercial insurance compensation with the less generous reimbursements of Medicaid (Bowling, Brandon, 2017). If this were the case, the net financial effect could be negative, despite the reduction in instances of uncompensated care.

In addition to these effects, the expansion impacts the Disproportionate Share of low-income patient Hospital (DSH) payment system. DSH payments are allotted by the federal government for hospitals that take on a large proportion of Medicaid and Medicare patients, to supplement hospitals for the low reimbursements from public insurance. The expansion called for reductions in this DSH payment system,<sup>1</sup> which is another factor that could put negative pressure on overall hospital revenues.

In this study, I used the National Bureau of Economic Research's (NBER) Hospital Cost Report Information System (HCRIS) data, drawn from the CMS HCRIS database. I used data collected from the CMS-2552-10 Forms, which can be viewed in Figure 1 below.

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<sup>1</sup> Reductions to the DSH payments from Medicare covered services were set to take effect in the fiscal year 2014, while the reductions in DSH payments for Medicaid covered services was delayed until 2018  
<https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/dsh.html>

09-13		FORM CMS-2552-10				4090 (Cont.)			
COST ALLOCATION - GENERAL SERVICE COSTS				PROVIDER CCN:		PERIOD: FROM _____ TO _____		WORKSHEET B, PART I	
COST CENTER DESCRIPTIONS	NET EXPENSES FOR COST ALLOCATION (from Wkst. A col. 7)	CAPITAL RELATED COSTS		EMPLOYEE BENEFITS DEPARTMENT	SUBTOTAL (cols. 0-4)	ADMINIS- TRATIVE & GENERAL	MAIN- TENANCE & REPAIRS	OPERATION OF PLANT	
		BLDGS. & FIXTURES	MOVABLE EQUIPMENT						0
GENERAL SERVICE COST CENTERS									
1	Capital Related Costs-Buildings and Fixtures								1
2	Capital Related Costs-Movable Equipment								2
4	Employee Benefits Department								3
5	Administrative and General								4

Fig 1. CMS-2552-10 Hospital Cost Report Form taken from The National Bureau of Economic Research's Healthcare Cost Report Information System Database (HCRIS). Digital image displaying a snapshot of the cost center portion of the CMS-2552-10 form.

This study will analyze whether net revenues have increased for hospitals in expansion states versus non-expansion states. The current Medicaid expansion research has thoroughly studied specific revenue streams, such as those from Medicaid and federal hospital payments. The results of this study, regarding the expansion's effect on net hospital revenue, will contribute to a relatively un-investigated field of the Medicaid Expansion literature. The revenue streams of hospitals have a strong impact on hospital behavior and spending. The impact of the expansion on the overall revenue of hospitals, be it positive or negative, effects how hospitals decide to spend money, allocate resources and administer care. These factors play an important role in the lives of patients because these decisions determine the types of services offered by the hospital and the prices set on of these services.

It is crucial that researchers study the repercussions of the expansion, and its effects on the US healthcare system at large. The results of this study are important for the current research field because they add a new perspective to how the expansion has effected hospital financials and how these financial impacts may inform future hospital behaviors.

The expansion has greatly increased insurance coverage for American citizens. In fact, 1 in 5 Americans, or 74 million people, have coverage through Medicaid as of July 2017 (Rudowitz, Robin, 2017). However, this increase in coverage has been met with a surge in government

spending.<sup>2</sup> By fiscal year 2016, Medicaid spending totaled \$553 billion, with 63% coming from federal sources and 37% coming from the states. Medicaid accounted for 1 in every 6 dollars spent in the US healthcare system (Rudowitz, Robin, 2017). Additionally, the federal match rate is set to continue covering 100% of the ACA's expanded population cost until 2020, when the match rate drops to 90% (Rudowitz, Robin, 2016). The Medicaid expansion has had major impacts on the lives and wallets of a significant number of Americans. As one of the primary provisions to the ACA, the expansion has greatly increased the number Americans who have access to care. However, in doing so, the expansion has also increased the number of federal dollars spent on healthcare. Considering the number of Americans effected and amount of money invested in this program, the costs and benefits of the ACA must be fully appreciated to understand the impacts of maintaining the reform, and the repercussions of potential revisions or a repeal.

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<sup>2</sup> Overall Medicaid spending for states increased by an exceptional 13.5% in 2015 and 3.5% in 2016, with continued increases projected in the future. (Rudowitz, Robin, 2017)

## II. Policy Background

### The ACA

The ACA is a major reform that has had impacts on several aspects of the US healthcare system. Despite encountering scrutiny from politicians, the ACA passed through Congress. In order to survive the legislative process, the bill encountered numerous political obstacles and faced legal action, including a Supreme Court ruling on the constitutionality of the ACA's mandate and provisions.

Despite the bill's overall survival, many important provisions and programs faced significant revisions. One of these programs was the Medicaid expansion. The major caveat of the mandate's constitutional ruling, was the verdict on the compulsory Medicaid expansion as unconstitutional (Musumeci, Mary-Beth, 2012). This resolution allowed states to decide whether or not to expand their current Medicaid programs to the ACA's guidelines. Today, 33 states, including Washington DC, have accepted the Medicaid expansion as seen in Figure 2 below (The Kaiser Commission on Medicaid and the Uninsured, 2017). The 18 states who decided against the expansion denied the policy decision for numerous reasons including the state's current Medicaid system, demographics, future healthcare costs and political standing.

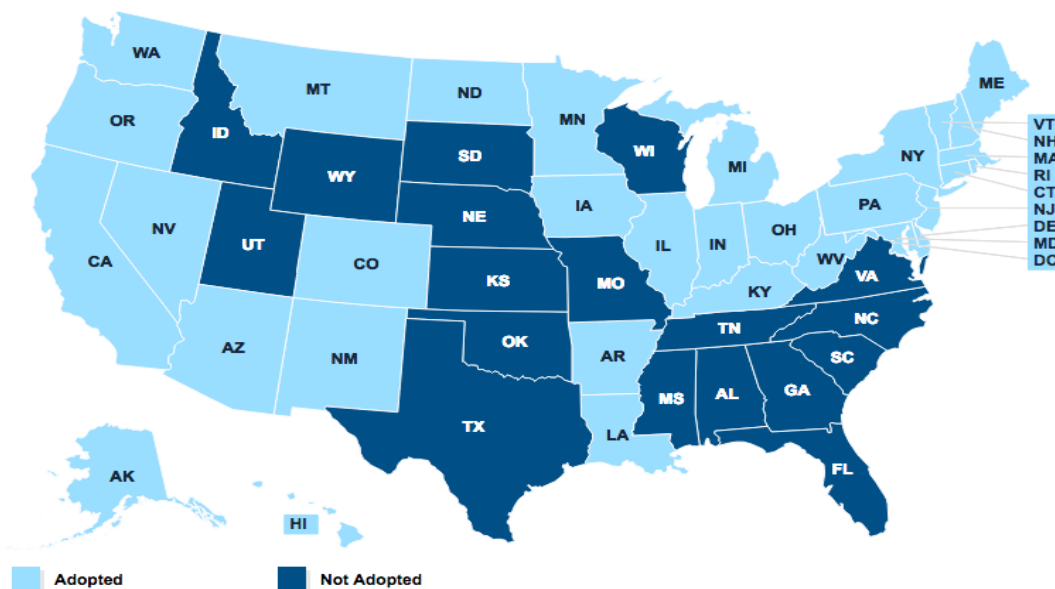


Fig. 2. The Kaiser Commission on Medicaid and the Uninsured, “Status of State Action on the Medicaid Expansion Decision (as of November 8<sup>th</sup>, 2017).”

The ACA has increased the complexity of an already complex healthcare system, and it has shifted many factors in the hospital provider market. American hospitals now exist under the legislation of expansion states or non-expansion states. Despite healthcare being a heated political issue, the expansion was accepted by states across the political spectrum. Although most expansion states were “blue” states prior to the ACA, a few of the expansion states that accepted are “conservative” in their political standing. Nevertheless, almost all the non-expansion states are “red” states that denied the expansion for various reasons related to political ideology and spending projections. Despite the political divide on the issue, there are a few states with comparable demographics and healthcare industries that differ merely on the policy decision to expand Medicaid (Dobson, Allen, 2017). This factor has opened the door to numerous studies that have attempted to analyze the impact of the Medicaid expansion on public health, consumer behavior, the healthcare industry and the US economy at large.

## The Medicaid Expansion

Although the Patient Protection and Affordable Care Act was passed in 2010, many of its key provisions were set to take effect in 2014 (Haislmaier, Edmund, 2015). The Medicaid expansion was one of these integral provisions. The number of states that accepted the expansion, either initially (as of Jan. 1<sup>st</sup>, 2014) or after its implementation, can be found in Table 1 below.

**Table 1. Number of States Accepting Medicaid Expansion by Year (2014-2016)**

Year	Number of Expanded States	States Accepting Post-Policy Introduction: (01/01/2014)
2014	25	Michigan (04/01/14) ; New Hampshire (08/15/14)
2015	28	Pennsylvania (01/01/15) ; Indiana (02/01/15) ; Alaska (09/91/15)
2016	30	Montana (01/01/16) ; Louisiana (07/01/16)

- Maine has been the most recent state to accept the expansion.

- Kentucky accepted the expansion in 2014, however, their expansion policy takes effect in April 2018 and will be in full effect by July 2018<sup>3</sup>

<sup>3</sup> <https://www.kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/?activeTab=map&currentTimeframe=0&selectedDistributions=current-status-of-medicaid-expansion-decision&sortModel=%7B%22collId%22:%22Location%22,%22sort%22:%22asc%22%7D>

The expansion's purpose was to help cover low-wage individuals in the "coverage gap." The coverage gap was the socioeconomic gap that included individuals who could not qualify for traditional Medicaid, for income or demographic reasons, but also were unable to afford health insurance (Garfield, Rachel, 2017). This meant that, in the event of a healthcare incident, these people were uninsured and had to pay their medical expenses out-of-pocket or rely on charity care. The people in the "coverage gap" are low-income earners and are particularly vulnerable to accruing medical debt that is unaffordable, given their stringent budgets. The Medicaid expansion was included in the ACA to remedy this issue. Its main purpose was to expand healthcare access to the uninsured and provide financial support for low-income Americans.

On the producer side, safety-net hospitals/clinics, who provide for all patients regardless of ability to pay, often take these lower-income patients and receive little to no compensation for the care they provide. To compensate, the government allots supplemental payments, mostly in the form of DSH payments, to these safety-net hospitals. However, this DSH payment system has become increasingly unsustainable for safety-net hospitals, as demand for care has outpaced supplier resources in recent years (Garfield, Rachel, 2017). The expansion provides a potential solution to this growing problem in the pre-reform US healthcare system. The expansion is supposed to supply safety-net hospitals with a more stable source of revenue from a newly insured Medicaid patient population.

Today, the DSH payment system is currently in a state of flux. The Center for Medicare & Medicaid services reduced DSH payments in 2014 with plans to cut DSH funding by \$2 billion in the fiscal year of 2018 (Rudowitz, Robin, 2016) and undertake future cuts in the years following 2018 (Rudowitz, Robin, 2017). However, the methodology of this process is unclear

and will be determined by the secretary of Human Health Services (HHS). The HHS will address DSH funding reductions with respect to each state, taking issues such as expansion status and the proportion of uninsured citizens into account (Rudowitz, Robin, 2016). It is unclear if these policies will have overall benefits to hospital financials. There has been no guarantee that the reductions in DSH payments will be made up by the Medicaid reimbursements under the ACA. Although this was an important goal of the expansion, many hospitals are skeptical if this claim will hold true as the overall effects of these payment reductions on hospital revenue streams have yet to take full effect (Rudowitz, Robin, 2016). This is a major concern of safety-net hospitals that serve mostly low-income patient populations. These types of hospitals have recently taken up strategies to recruit a more diverse payer mix to retain steady revenue streams in the face of the impending DSH reforms.<sup>4</sup> These, and many other factors, will drive behavior in the provider market. US hospitals will continue to adapt to the ever-changing health policy landscape in order to best compete and succeed financially. This paper will aim to study how one such policy, the Medicaid Expansion, has effected hospitals in the US, and the costs or benefits this reform brings to the overall revenues of hospitals.

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<sup>4</sup> Safety-net hospitals and those that serve mostly low-income publically insured patients are aiming to gain more privately insured patients to “diversify” their payer mix (Rudowitz, Robin, 2016).



### III. Related Literature

There has been a large influx of research studying this unique policy decision in the healthcare market. Comparing expansion and non-expansion states, researchers have looked at differences in consumer behavior by examining individual spending habits, healthcare usage, self-reported health markers, drug use, addiction, emergency department (ED) visits and length of hospital stays. On the producer side, researchers have also examined provider unreimbursed care costs, Medicaid costs, additional government (both federal and state) spending, estimated profit margins in hospitals and numerous other measurable outcomes effected by the expansion.

On a general scale, the Medicaid expansion has shifted the payer mix for expansion state hospitals. This mix includes significantly more Medicaid patients, especially for hospitals that serve lower income communities (Antonisse, Larisa, 2017). Expansion state hospitals have experienced reduced instances of uncompensated care (Camilleri, Susan, 2017), uninsured patient visits (Freaan, Molly, 2016), increased revenues from Medicaid (Antonisse, Larisa, 2017) and, in a few instances, improved hospital operating margins (Garfield, Rachel, 2015). The findings of this study align with the results of some of the studies listed. My results display similar impacts from the Medicaid expansion as the Camilleri (2017) and Larisa (2017) articles find with regards to reduced uncompensated care costs and increased Medicaid revenues.

More specific studies have analyzed the expansion's effect on specialized facilities within the hospital entity. For example, hospital EDs have experienced a lower proportion of uninsured visits and, therefore, a smaller proportion of unreimbursed care instances (Antonisse, Larisa, 2017). With EDs being perceived as a significant source of inflated healthcare costs, these positive research findings have importance in understanding the potential value of the expansion (Sommers, Benjamin, 2017). However, mixed results have been produced by studies considering

changes in total patient volume of ED's. A Maryland study found a reduction in ED usage by high utilizer patients (Antonisse, Larisa, 2017), whilst other studies have found no significant difference in ED usage since the expansion. However, some studies, like the popularly cited Oregon Health Experiment, have found increases in ED usage in reaction to insurance expansions. With such varied results, the research does not give a clear answer to how the expansion has effected ED's and the patients who use them (Sommers, Benjamin, 2017).

DSH Hospitals experienced significantly large reductions in cases of uncompensated and uninsured patient visits. Similarly, Safety-net hospitals showed significantly reduced cases of uncompensated care and had improved financial margins compared to safety-net hospitals in non-expansion states (Dobson, Allen, 2017). In expansion states, hospitals that were smaller in size, for-profit, non-government run and in non-metropolitan areas, experienced the greatest increases in hospital margins from the increased Medicaid revenue (Antonisse, Larisa, 2017).

On the other hand, non-expansion state hospitals have had less extreme outcomes since the reform. Non-expansion hospitals have had relatively unchanged uncompensated care costs over the course of the expansion. They have shown lower uninsured rates, however, these gains in coverage are exceeded significantly in expansion states (Rudowitz, Robin, 2016).

Additionally, coverage gains in the following vulnerable groups showed the largest coverage gains in expansion versus non-expansion states: low-income workers, low-educated adults, HIV patients and childless adults with incomes under the 100% Federal Poverty Line (Antonisse, Larisa, 2017).

The research has thoroughly analyzed many factors related to the Medicaid expansion. However, there has been no studies analyzing if hospital net revenues have increased in states that expanded their Medicaid, relative to states that did not expand. If expansion state hospitals

are indeed performing financially stronger on metrics of Medicaid revenue and uncompensated care costs, then it would seem probable that similar financial improvements are found within overall revenues. This paper will aim to re-affirm the findings present in the current Medicaid expansion literature and investigate if total hospital revenues have been effected by the expansion policy.

## **IV. Data**

The following data were assembled from the National Bureau of Economic Research's (NBER's) Hospital Cost Report Information System (HCRIS) Database. The NBER HCRIS database includes hospital cost report information that dates back to 1996. For this study, I am using data reported on the Center for Medicare & Medicaid's (CMS) 2552-10 Form, filled out by all registered hospitals in the US. This data is compiled from a 186-page form that includes various information on hospital financials and spending.

### **A. Variable Selection**

For this study, I focused on the revenues and costs within the hospital, ignoring the financial mechanisms of specialized healthcare facilities outside the main hospital entity. Dependent variables consist of key financial markers in the CMS-2552-10 Form that measure financial performance and re-investment strategies. Measurable variables include values from the revenue center, cost center and Medicaid/uncompensated cost center within the form.

The main dependent variables used to measure financial performance include: (1) net revenue from Medicaid; (2) total hospital inpatient revenue<sup>5</sup>; (3) total unreimbursed/uncompensated care costs; (4) and total patient revenue.<sup>6</sup> The summary statistics for these dependent variables are included in Table 2 below. Additionally, I selected independent variables that were of importance to the study. The hospital and state characteristics of interest include: (1) hospital county; (2) teaching status; (3) bed size; (4) and, most importantly, the hospital's state expansion status. In addition, I needed the hospitals' CMS certification number (CCNs) as a unique identifiers for each hospital over time. Teaching hospital status is a characteristic that determines whether a hospital is affiliated with a medical school, and bed size is a useful metric for hospital size. Summary statistics on teaching status and bed size can also be found in Table 2 below. For the summary statistics, hospitals were split into two groups: the treatment group (Exp=expansion state) and the control group (Non=non-expansion state). For the purposes of the summary statistics, all hospitals that eventually expanded from 2014-2016, were included in the expansion group.

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<sup>5</sup> Total revenues accrued from inpatient discharges within the sole hospital entity.

<sup>6</sup> Total revenues accrued from inpatient discharges from all specialized healthcare facilities in addition to the hospital.

**Table 2. Summary Statistics for Expansion versus Non-Expansion Hospitals from 2011-2016**

Year Expansion Status (Exp, Non)	2011		2012		2013		2014		2015		2016		Total
	Exp~	Non	Exp~	Non	Exp~	Non	Exp	Non	Exp	Non	Exp	Non	
Net Revenue Medicaid [in millions]	39.8 (129)	22.6 (39.2)	39.3 (80.4)	23.7 (38.9)	39.1 (67)	23.9 (40.1)	44.7 (66.2)	25.9 (43.7)	48.6 (67.3)	25.2 (38.9)	47.0 (91.9)	21.8 (34.8)	
Hospital Revenue [in millions]	140 (223)	63.2 (85.0)	144 (239)	68.1 (89.3)	146 (240)	73.2 (97.3)	147 (263)	80.0 (113)	167 (285)	97.6 (151)	169 (335)	98.5 (214)	
Total Unreimbursed and Uncompensated care costs [in millions]	24.3 (117)	16.4 (34.7)	23.6 (56.6)	18.4 (36.7)	23.3 (53.4)	19.1 (38.7)	19.3 (26.4)	21.9 (42.8)	20.0 (32.7)	20.6 (40.2)	19.0 (35.4)	20.6 (45.0)	
Total Patient Revenue [in millions]	963 (1200)	782 (853)	1020 (1170)	873 (924)	1080 (1250)	952 (1030)	1040 (1150)	967 (1010)	1250 (1440)	1230 (1260)	1190 (1280)	1150 (1130)	
Teaching Hospitals [Proportion per year]	0.51	0.33	0.51	0.34	0.5	0.34	0.5	0.37	0.53	0.39	0.51	0.35	
Bed Size	252 (183)	236 (214)	253 (188)	245 (218)	256 (274)	245 (222)	205 (150)	205 (173)	208 (151)	215 (179)	204 (152)	201 (164)	
# of Reports by Exp Status	1150	916	1149	870	1150	832	891	498	1258	819	730	457	10720
# of Reports	2066		2019		1982		1389		2077		1187		10720
Cumulative Frequency	19.27		38.11		56.6		69.55		88.93		100		100

Exp= Expansion accepted, Non= Expansion not accepted

~ Expansion policy does not take effect until 2014, the "Exp~" category for years 2011-2013 includes all hospitals that would eventually expand from 2014-2016

Mean reported on top [in millions if specified]

(Standard Deviation) reported on bottom in parentheses [in millions if specified]

## **B. Dataset Construction**

I organized and analyzed the dataset in Stata, refining the mass of data compiled in the HCRIS database to the values that would be important for my research question. The data consist of HCRIS reports starting in 2011. In 2011, all hospitals switched to the CMS-2552-10 form rather than the CMS-2552-96 form, which is formatted differently.

After identifying important values from the CMS-2552-10 report, I pulled values from each year's set of data that I believed was relevant to this study. In addition to important hospital data, I also used report specific information to help remove any duplicate reports by the same hospital. It is uncommon, but occasionally hospitals will complete multiple reports in one year. Using the CCN as a unique identifier, I kept the hospital report information submitted latest in the given fiscal year, dropping any duplicates submitted earlier that year by the same hospital. Merging the information from the HCRIS database, I obtained a comprehensive dataset for each year that contained hospital characteristics and information on hospital cash flows. The final dataset was created by appending the data from 2011 to 2016.

Final adjustments were made to a handful of variables to create a sample of hospitals that was relevant to our study. The expansion status variable was modified for certain states that accepted the expansion after 2014, but before 2016. These states include: Michigan and New Hampshire (expanded in 2014); Pennsylvania, Indiana and Alaska (expanded in 2015); Montana and Louisiana (expanded in 2016).

Our analysis attempts to examine the financial information of hospitals where the "average" American is most likely to receive care. Therefore, many cost reports for non-conventional hospitals were removed. To achieve this, the sample of hospitals was refined using the following

methods. We removed all reports from hospitals that did not qualify as “urban.” This removed unnecessary variation from the sample that could arise from the unique situations faced by rural hospitals (O’Neill, Stephen, 2016). Extremely small hospitals, hospitals with a bed size < 35, were removed from the study. This includes the removal of Critical Access hospitals (CAH), since hospitals that qualify as a CAH have bed sizes of 25 or less. All reports that contained negative revenue or negative cost values were also removed. Additionally, all reports that were missing values and identifiers of importance to our study were dropped from the dataset. The final sample contained information from 10,720 reports across 6 years of study. Summary statistics on the reports for each year can be found in Table 2 above.

The research base has thoroughly examined specific revenue streams related to Medicaid and uncompensated care, citing positive effects on these metrics due to expansion status. My goal is to reaffirm these findings present in the literature and identify if expansion status has effected the overall revenues of hospitals in expansion states relative to non-expansion states.

## **V. Effects of the Medicaid Expansion**

### **V.I. Empirical Model Regression Methods**

Our empirical model considers the effects of the Medicaid expansion and other hospital characteristics (teaching status and bed size) on overall hospital financial performance.

We estimated the effect of the response variables through a series of linear fixed effects regression models:

### Equation: Linear Fixed Effects Regression

$$\ln(Y_{ht}) = \beta_i X_{it} + \eta_h + \lambda_m + \delta_t + \beta_3 \text{expand}_{ht} + \varepsilon_{it}$$

$Y_{ht}$  represents a dependent variable of interest, which stands for a specified financial metric for hospital  $h$  in year  $t$ .  $X_{it}$  represents each independent variable  $i$  that contains a hospital characteristic of importance: teaching status and bed size.  $\eta_h$  contains hospital fixed effects that are time-invariant and would remain unchanged over the course of this study for each hospital.  $\delta_t$  includes year fixed effects for all reports made in the given year (valued as 1-6, 1=2011 and 6=2016).  $\lambda_m$  contains market fixed effects, which is represented by the hospital's county of operation.  $\beta_3 \text{expand}_{ht}$  is a time-varying and binary treatment indicator (0=non-expansion or 1=expansion), which is dependent on the given year ( $t$ ) and displays the impact of expansion on the estimator of interest through the  $\beta_3$  coefficient value.  $\varepsilon_{it}$  is the error term and represents the residuals from the regression.

## V.II. Results

The results of the regression, on hospital financial metrics, can be found in Table 3 below. Holding for the fixed effects (CCN, county and report year), the linear fixed effects regression model estimates the impact of the effectors (teaching status, bed size and expansion status) on the estimator of interest ( $\ln[Y]$ ). Keep in mind, the variable "Expansion Status" is a binary regressor and only takes on the values 0 or 1.



**Table 3. Linear Fixed Effects Regression Model Results on Hospital Financials**

Estimator:		Regressors:		
$Y_{it}$ :	$X_1$ : Teaching Status	$X_2$ : Bed Size	$X_3$ : Expansion Status	$R^2$
Ln(Hospital Revenue)	0.58 (0.03) [2.26]*	1.53E-05 (8.41E-06) [1.82]	-0.0443 (0.0117) [-3.78]*	0.96
Ln(Net Revenue Medicaid)	0.118 (0.042) [2.78]*	1.78E-05 (1.38E-05) [1.29]	0.311 (0.019) [16.13]*	0.90
Ln(Total Unreimbursed/ Uncompensated Care Costs)	0.052 (0.039) [1.33]	2.04E-06 (1.28E-05) [0.16]	-0.198 (0.018) [-11.06]*	0.88
Ln(Total Patient Revenue)	0.0478 (0.015) [3.19]*	1.17E-05 (4.91E-06) [2.38]*	-0.056 (0.0069) [-8.12]*	0.98

\*Denotes Statistical Significance at 95% Confidence Interval

Coefficient reported on top

(Standard Error) reported in the middle in parentheses

[T-statistic] reported on the bottom in brackets

n=10,720

Results from Table 3 indicate significant values that align with current findings in the Medicaid expansion literature. With logarithmic transformations of the Y variable, the effect of the binary regressor changing from 0 to 1 is the coefficient on the regressor measured as a percentile change in Y:  $100\% * \beta_3 = \Delta\% Y_{it}$ .<sup>7</sup> For example, the effect of the expansion on the variable “Net Revenue Medicaid” is measured as  $100\% * (\beta_3 = 0.311)$ , which is a 31.1% increase. Using the equation above, this means that hospitals in expansion accepting states can expect a

<sup>7</sup> [https://www3.nd.edu/~wevans1/econ30331/interpreting\\_coefficients.pdf](https://www3.nd.edu/~wevans1/econ30331/interpreting_coefficients.pdf)

31.1% increase in their net revenues from Medicaid. Supporting previous research, the regression shows that expansion status has a positive and statistically significant effect on hospital revenue accrued from Medicaid [T-value: 16.13\*]. Furthermore, the results of the regression find that expansion status has a negative and statistically significant impact on the cost of unreimbursed and uncompensated care [T-value: -11.06\*]. The interpretation of the coefficient is  $100\% * (\beta_3 = -0.1980) = -19.8\%$ . Expansion state hospitals can expect a 19.8% decrease in total costs accrued from uncompensated and unreimbursed care as a result of accepting the expansion. The data used in this study presents findings that are supported by the current Medicaid expansion literature. As highlighted in the meta-analysis by Larisa Antonisse, the Medicaid expansion has had positive effects on specific hospital cash flows, resulting in increased Medicaid revenues and decreased uncompensated and unreimbursed care costs.

### **V.III. Regression Results: Expansion's Effect on Overall Revenue**

This model has also found that expansion status has a negative and statistically significant effect on overall hospital inpatient revenues and total patient revenues [Respective T-values: -3.78\*, -8.12\*]. Drawing from Table 3, expansion state hospitals can expect a 4.43% decrease in total hospital inpatient revenues presented by the variable "Hospital Revenue." Additionally, for "Total Patient Revenue," expansion state healthcare facilities can anticipate a 5.6% reduction in revenues from their total patient population (this metric includes specialized care facilities outside the main hospital entity). The data would seem to suggest that the decision to expand Medicaid has a negative impact on overall revenues gained by hospitals. These results present a new perspective on how the Medicaid expansion effects the overall financial performance of hospitals in expansion states. It would seem likely that overall revenues would

rise as a result of increased Medicaid revenues and decreased instances of uncompensated/unreimbursed care. However, the data presents the opposite result. These findings suggest that more complicated mechanisms are at play in the overall revenue streams of hospitals than the impacts of Medicaid revenues and uncompensated/unreimbursed care instances alone.

## **VI. Robustness and Sensitivity Tests**

### **VI.I. Parallel Trend Analysis**

The linear fixed effects regression model provides a useful tool when working with longitudinal data and examining the differences caused by a given treatment. The structure of the regression equation used in this paper is based on a Difference-in-differences (DiD) estimation model. This type of model allows for the control of certain factors for the hospital over the study period, whilst studying the differences in outcomes for the treatment, expansion status, on the estimators of interest.

However, one major assumption in this type of model is “parallel trends.” The parallel trends assumption states that the treatment group and the control group would follow similar paths if the treatment was absent. Put simply, had the expansion not occurred, both expansion and non-expansion state hospitals would follow similar financial outcomes throughout the study duration. If this assumption is not upheld, there is a concern that confounders are affecting the outcomes and significance of the regression.

To examine this assumption, I constructed parallel trend graphs, using the revenue data from the years pre-dating the expansion (2011-2013). The results can be observed in Figure 3

and Figure 4 below. The sample of hospitals from 2011-2013 were split into two groups: (1) hospitals that were in states that would eventually expand and (2) hospitals that were in non-expansion states throughout the duration of the study. If parallel trends are observed between the two groups prior to treatment, this finding would strengthen the perceived effect of the expansion variable, and the overall findings from the regression.

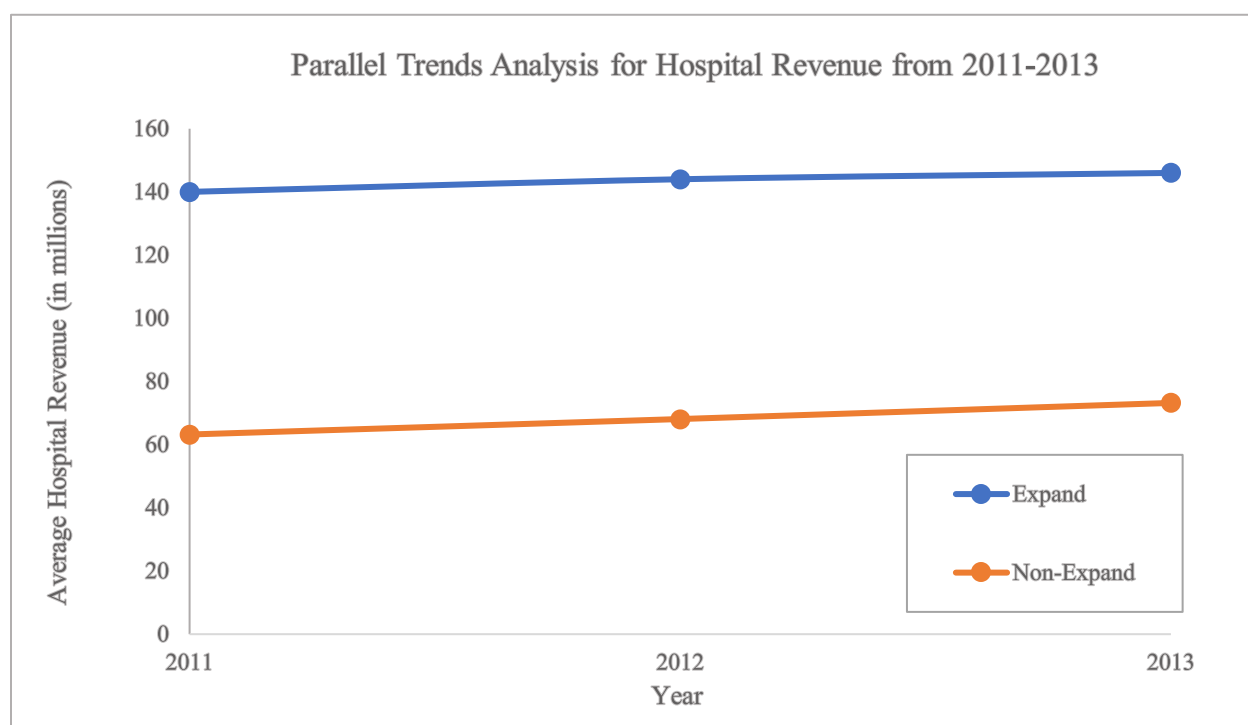


Fig 3. Graph displays trends of “Average net Hospital Inpatient Revenues” from 2011-2013 for expansion and non-expansion state hospitals. Revenue values are reported in millions.

Figure 3 displays lines that support our assumption of parallel trends. Both expansion and non-expansion hospitals show similar upward sloping trends in their average net hospital inpatient revenues from 2011-2013. This graph shows that the treated and control groups were following comparable paths prior to the treatment. These results suggest limited effects from unobserved confounders on hospital inpatient revenue. Judging by the magnitude of the difference in inpatient revenues experienced by expansion state hospitals [T-value= -3.78\*\*], it

is fair to conclude that the expansion had a significant effect on the treatment group relative to the control group. As a result, Figure 3 supports the findings found in the regression above.

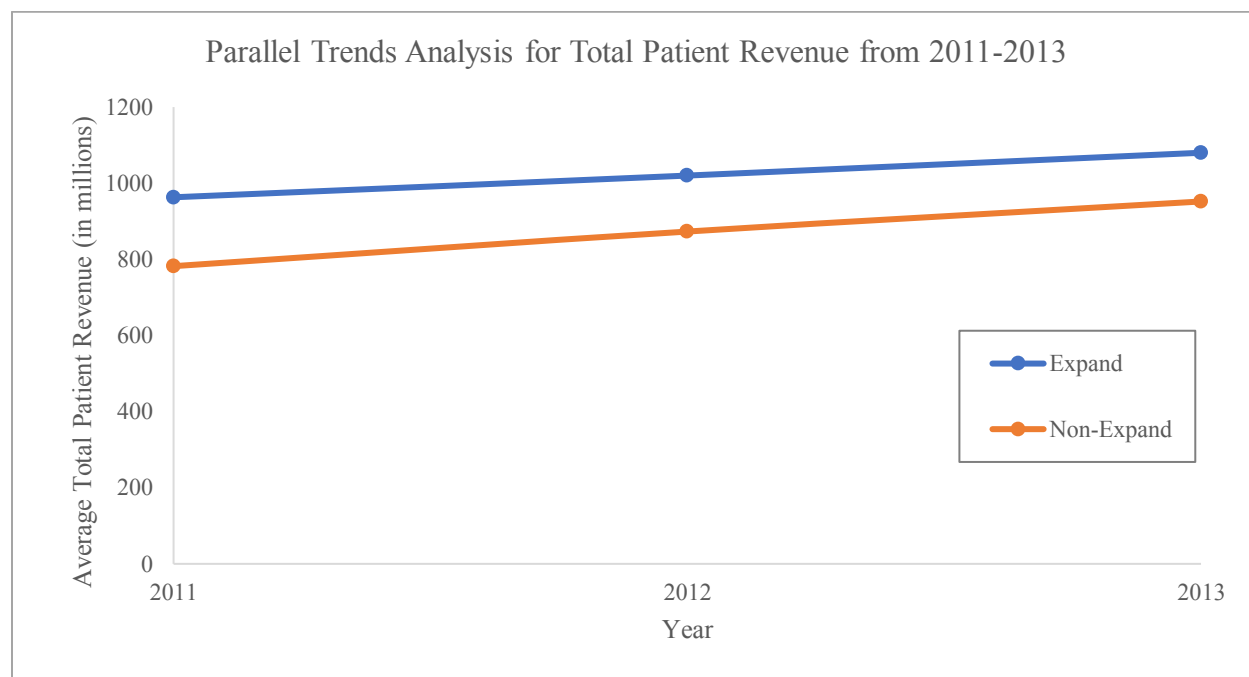


Fig 4. Graph displays trends of “Average Total Patient Revenue” from 2011-2013 for expansion and non-expansion state hospitals. Revenue values are reported in millions.

Similar to Figure 3, Figure 4 displays comparable upward sloping trends for total patient revenue between the treated and control groups prior to treatment introduction. The slopes appear to support our assumption of parallel trends as they do in Figure 3. It is important to note that the values of total patient revenue have a much greater magnitude and variance than the values drawn from overall hospital inpatient revenue (see Table 3). Total patient revenue combines the revenues from the hospital and specialized facilities. This, undoubtedly, introduces additional variability to the data and unobserved confounders to the regression equation. However, despite the greater variability, Figure 4 presents trends on the treatment and control groups that are highly comparable. In addition, the results of the regression, shown in Table 3, display highly statistically significant differences between the two groups for total patient

revenue post-expansion [T-value=-8.12\*\*]. Figure 4 shows that the two groups were following similar paths prior to treatment. However, after the expansion occurred in 2014, the groups experienced significantly different outcomes. Taking the high variability of total patient revenues into account, the comparable nature of the two trends supports the assumption of parallel trends from our regression. Figure 4 strengthens the results of the regression, reinforcing the notion that expansion status has a significant and negative impact on the total patient revenue of hospitals.

## **VI.II. Balanced Panel**

Hospitals are assumed to submit a fully completed CMS-2552-10 form once per fiscal year to allow for researchers to study hospital behaviors, revenues and costs. However, this is often not the case, as numerous hospitals produce cost reports with missing values. This factor creates inconsistencies when studying the HCRIS data because certain variable values will be missing for a given hospital depending on the year.<sup>8</sup> This could generate confounding factors to the regression, as results could be driven by missing information in given years, rather than the treatment effect. Keep in mind, I dropped all reports that were missing values of importance to our study. It is possible that, in doing so, I removed reports for a given hospital causing an unbalanced panel. In Table 2 above, judging by the inconsistent report count for each year, hospital specific data seem to come and go depending on the fiscal year selected.

To mitigate this issue, I used the same regression as before, but only for hospitals that completed reports for the 6 years of interest (2011-2016). I sorted the dataset by the unique CCN identifier and created a variable “hosp\_count” that measured the number reports made under each CCN. Over this six year study, hospitals that successfully made six reports would have a

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<sup>8</sup> This resulting dataset, with missing values for given years, is called an unbalanced panel.

hosp\_count=6. I dropped all reports with a hosp\_count lower than 6, leaving me with a final sample size of 3,768 (compared to the original 10,720 reports). 628 hospitals successfully completed 6 reports during the years 2011-2016 (see Table 4 below).

**Table 4. Sample Counts for Balanced Panel Regression from 2011-2016**

Year	2011		2012		2013		2014		2015		2016		Total
Expansion Status (Exp, Non)	Exp~	Non	Exp~	Non	Exp~	Non	Exp	Non	Exp	Non	Exp	Non	
Count	414	214	414	214	414	214	414	214	414	214	414	214	3768
Cumulative Count	628		628		628		628		628		628		3768

**Table 5. Balanced Panel Linear Fixed Effects Regression Model Results from 2011-2016**

Estimator:	Regressors:			R <sup>2</sup>
Y <sub>it</sub> :	X <sub>1</sub> : Teaching Status	X <sub>2</sub> : Bed Size	X <sub>3</sub> : Expansion Status	
Ln(Hospital Revenue)	0.30 (0.04) [0.69]	1.42E-05 (8.42E-06) [1.68]	-0.056 (0.019) [-2.99]*	0.96
Ln(Net Revenue Medicaid)	0.15 (0.071) [2.15]*	1.45E-05 (1.38E-05) [1.05]	0.24 (0.031) [7.93]*	0.89
Ln(Total Unreimbursed/ Uncompensated Care Costs)	0.0037 (0.067) [0.06]	-1.03E-06 (1.28E-05) [-0.08]	-0.17 (0.029) [-6.05]*	0.88
Ln(Total Patient Revenue)	0.048 (0.024) [1.94]	1.02E-05 (4.81E-06) [2.11]*	-0.071 (0.011) [-6.64]*	0.98

<sup>1</sup>\*Denotes Statistical Significance at 95% Confidence Interval  
Coefficient reported on top  
(Standard Error) reported in the middle in parentheses  
[T-statistic] reported on the bottom in brackets  
n=3,768

The results of the second linear fixed effects regression model can be found in Table 5 above. Similar to the outcomes in Table 3, the balanced panel regression presents comparable significance values for the treatment and its effect on the estimators of interest. When controlling for hospitals that submitted completed annual reports from 2011-2016, the expansion had a positive and statistically significant effect on net revenue from Medicaid [T-value= 2.15\*]. Additionally, the expansion also had a negative and statistically significant impact on total patient revenue, hospital inpatient revenue and total unreimbursed/uncompensated care costs [Respective T-values: -6.64\*, -2.99\*, -6.05\*]. The expansion's effect on these key financial estimators, even when controlling for inconsistent hospital reports, results in the same conclusions as those found in Table 3.

Table 5 displays significant improvements on hospital cash flows related to revenues drawn from Medicaid and costs from unreimbursed/uncompensated care. According to Table 5, expansion state hospitals can expect net revenue from Medicaid to increase by 24% (as opposed to +31.1% from Table 3) and uncompensated care costs to decrease by 17% (as opposed to -19.8% from Table 3). These predicted effects are very similar to the findings in Table 3 presented in the parenthesis. Further comparing the results of Table 5 to Table 3, expansion state hospitals can anticipate a 5.6% reduction in hospital inpatient revenues (opposed to -4.33%) and a 7.1% reduction in total patient revenues (opposed to -5.6%). The impact of expansion has similar results in the balanced panel regression compared to the regression used before. As seen in Table 5, hospitals could expect negative impacts to net hospital inpatient revenue and total patient revenue as a result of expanding Medicaid.



Mitigating a potential concern with the NBER HCRIS dataset, the 628 hospitals that successfully completed 6 reports from 2011-2016 experienced similar impacts from the expansion. The outcomes of the test provide additional support to the findings drawn from the regression and suggest that the treatment, indeed, had a significant impact on overall hospital financials.

## **VII. Discussion**

This study suggests that, relative to non-expansion state hospitals, hospitals in expansion states have faced a decreased net revenue stream after accepting the Medicaid expansion policy. The goal of this study was to understand how the Medicaid expansion affected the aggregate revenue of US hospitals. The findings of this paper indicate that the expansion is having a complicated effect on the revenue streams of hospitals. Many studies have focused on the expansion's impact on specific hospital financials related to Medicaid and insurance coverage. The literature has found that the expansion has made improvements on these specific factors. However, there is limited research analyzing the impact of the reform on overall revenues. The findings of this study show that there are other revenue streams, outside of those related to Medicaid coverage, that are affected by the expansion. These results are important because they suggest that the expansion is ultimately having a negative effect on these other sources of revenue. Future research should consider the expansion's effect on other significant revenue streams in the hospital cash flow, to better appreciate the impacts of the expansion on overall hospital performance.

The Medicaid expansion has influenced hospitals' payer mix, reimbursement schedules, consumer behaviors and supplemental payments from federal programs.<sup>9</sup> Changes in any of these factors will have repercussions in a hospital's revenue streams and overall financial performance. The current literature has found improvements on specific financial metrics through Medicaid revenues and reductions in the costs accrued from uncompensated care.

As seen in Table 3, the regression produced statistically significant results that align with these literature findings. In light of these financial improvements, it would seem sensible to believe net revenues would also be enhanced by the Medicaid expansion. However, the results of this paper display a negative and statistically significant impact on net hospital inpatient revenues and total patient revenues for expansion state hospitals versus non-expansion ones.

In light of these findings, the expansion appears to negatively impact some or multiple aspects of the hospital's revenue sources. If revenue from Medicaid is increasing, yet overall revenues are decreasing, there must be major revenue streams that are shrinking and putting downward pressure on overall hospital revenue. A potential explanation for this finding could be in the hospital's shifting payer mix. As stated earlier in the introduction, the reimbursement rates of Medicaid, relative to Medicare and private insurance, have become significantly less generous to providers in recent years (Bowling, Brandon, 2017). Furthermore, the expansion's impact on Medicaid enrollment could shift the payer mix of expansion state hospitals to contain a greater proportion of Medicaid patients relative to private. In fact, the current literature has found that the growth in enrollment far exceeded the projected increases predicted for the "expanded" Medicaid population (Antonisse, Larisa, 2017). If Medicaid patients are taking up a greater proportion of the hospital's patient population, the reimbursements could be seeing similar shifts

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<sup>9</sup> Most prominently through DSH and Upper Payment Limit (UPL) payments (Rudowitz, Robin, 2016).

towards Medicaid compensation relative to private. Moreover, this increase in Medicaid patients could be replacing the private patients in the payer mix, substituting private reimbursements with Medicaid reimbursements. On a large scale, this shift in the payer mix could cause the hospital revenue per patient to go down, as they accept proportionally more patients with less generous compensation.

The ramifications of lower net revenues for expansion state hospitals should be a focus of future studies. If expansion state hospitals are earning lower overall revenues, perhaps through a less generous payer mix, the spending habits between expansion and non-expansion state hospitals could begin to differ. The downstream effects of these spending changes could have major impacts on Americans who use the healthcare system. Hospitals that are earning less overall may decide to stop offering certain services because the lower reimbursements no longer justify the costs. In addition, prices on certain services may rise to cover the smaller margins, or negative margins, earned on care provided. The expansion has benefited certain aspects of hospital costs and revenue streams. However, weighing these benefits against the costs to other revenue streams, the resulting hospital behaviors may be unfavorable to the US healthcare consumer.

The CMS-2552-10 form has a metric that estimates how much Medicaid patients use hospital services relative to total patient usage. This metric evaluates the number of Medicaid patient days as a percentage of total patient days. Running a regression on this estimator, I found a positive and statistically significant effect on this variable due to expansion status [T-value= 34.11\*]. The results of the regression, and a payer mix comparison between the two groups over time, can be found in Table 6 and Figure 5 below. These findings are not a conclusive

explanation for the negative pressure on overall hospital revenues, yet they offer a future direction for research to study.

**Table 6. Linear Fixed Effects Regression Model Results on %Medicaid Patient Days from 2011-2016**

Estimator	Regressors:			R <sup>2</sup>
	Y	X1:Teaching Status	X2: Bed Size	
% Medicaid Patient Days of Total Patient Days	0.009 (0.0026) [3.46]*	-1.56E-07 (8.56E-07) [-0.18]	0.041 (0.0012) [34.11]*	0.97

\*Denotes Statistical Significance at 95% Confidence Interval

Coefficient reported on top

(Standard Error) reported in the middle in parentheses

[T-statistic] reported on the bottom in brackets

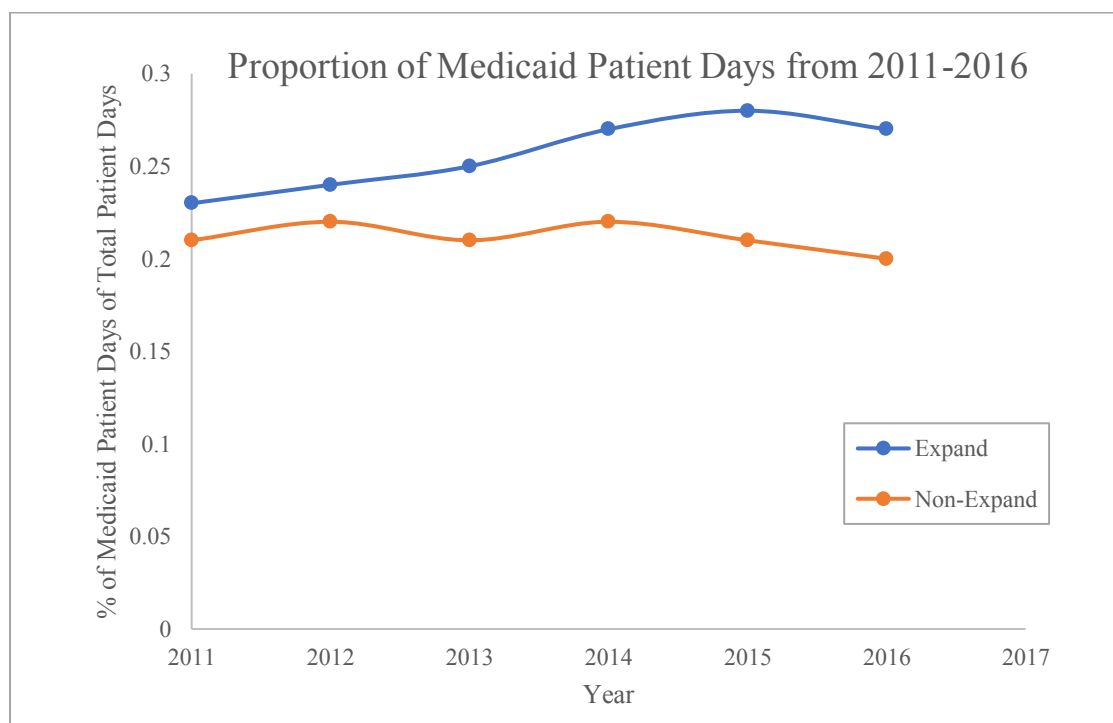


Fig 5. Graph displays trends of the average “Proportion of Total Patient Days taken by Medicaid Patient Days” from 2011-2016 for expansion and non-expansion state hospitals.

Further research should examine the payer mix in greater detail to provide a more conclusive explanation for the expansion's negative effects on overall hospital revenue. The results of Figure 5 and Table 6 show that Medicaid patients in expansion states are using significantly more hospital services relative to Medicaid patients in non-expansion states. This factor suggests that the Medicaid payer mix may be a key contributor to this downward pressure on revenues. If hospitals are exposed to a greater proportion of Medicaid patients, researchers should study how these newly insured patients use the healthcare system, and how this consumer behavior may impact hospital financials. Furthermore, future research should compare the revenue streams drawn from private patient populations, to measure how the expansion has impacted the privately insured payer mix. Finally, especially as the 2018 DSH payment reductions take effect, researchers should continue to examine hospital cash flows to study the long-term impacts of the reform on the provider market. Keep in mind, this study only examines hospital revenues, rather than profits, as a metric of hospital performance. Although difficult given the data resources available, researchers should continue to study how these changes in revenues impact the estimated profits of hospitals. There has been research attempting this endeavor, finding positive effects as a result of expansion (Antonisse, Larisa, 2017). However, as the reform continues to take full effect, researchers should continue to study the impacts caused by the ACA, and the benefits and costs it brings to the hospital market.

This study was limited mainly by its duration, but also by access to data. The Medicaid expansion took effect only 4 years ago in 2014. This allowed for a limited data set of 3 years (2014-2016) to examine the expansion's effects on hospital financials. Taking the complexity and magnitude of the reform into account, it is possible that the findings from this short study are a result of "hospital growing pains" rather than conclusive results caused by the expansion. In

addition, 2017's data was unfinished by the completion of this study. With so few years of data, any additional information could greatly contribute to the findings. In addition, the CMS forms transitioned mostly to the 2552-10 form from the 2552-96 form in 2011. Because of the difference in formatting, I only used the data produced from the 2552-10 forms, which restricted the sample size to 2011 or later. I was also limited to using the data constructed by the NBER HCRIS database, which is drawn from the CMS database. I did not have access the CMS database, which means the data I used had been refined prior to my research. Although minute, this factor could present errors in the study as well. Despite these limitations, research on hospital net revenues must continue as time goes on. Longitudinal studies will be crucial for examining the long-term effects of the expansion and how hospitals adapt to the policies imposed on them.

## **VIII. Conclusion**

In this paper, I aimed to find a relationship between overall hospital revenues and the voluntary Medicaid expansion. The linear fixed effects regression model presented results that aligned with previous findings related to Medicaid revenue and uncompensated care costs. In light of these results, I believed that the expansion's improvements to specific revenue streams would show through positive effects on the overall revenues of hospitals. However, the model showed a negative and statistically significant impact from expansion status on hospital inpatient revenue and total patient revenue. Essentially, the expansion improved certain revenue and cost metrics, but reduced the overall revenue of hospitals in expansion states. With additional robustness and sensitivity testing, the results of this study faced limited distortion from unobserved confounders, further supporting the negative relationship between expansion status

and overall hospital revenue. The findings of this study present an interesting outcome for future research to study. Most importantly, the fact that expansion has different effects on specific hospital revenue streams. The Medicaid expansion appears to increase certain revenue streams and diminish others. The mechanism through which these impacts occur is unknown. However, the data may present potential explanations through the hospital payer mix, consumer behavior and public/private reimbursement policies. Future researchers should examine these factors, in addition to others, to better understand the expansion's effect on hospital revenue and hospital behavior.

It is important to note that the Medicaid expansion is still a new reform, occurring as recently as 2014. With so few years since its implementation, my results, and the results of other literature findings, are limited most by the lack of data available for study. However, researchers must continue longitudinal studies comparing hospital cash flows in expansion states versus non-expansion states. The more years of data, the more conclusively the research can determine the long-term impacts of the Medicaid expansion on hospitals. With a reform as large as the ACA, it is important to understand the impacts such a policy brings to society. Especially with provisions as ambitious as the Medicaid expansion, researchers have a duty to inform policy makers and citizens alike, of the costs and benefits such policies bring to the healthcare system.

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