Medicaid Expansion and Intensity of Treatment: A Case Study in the Emergency Department

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Abstract

While we know that acquiring insurance increases use of health care services, less is known about how medical providers respond to the expanding insurance coverage of the patient population. We study the impact of ACA Medicaid expansion on intensity of treatment in the emergency department in four states which chose to expand coverage, and two states which did not. Using the State Emergency Department Databases (SEDD) in 2013-2014, we estimate a difference-in-differences specification at the visit level to find up to 0.27 procedure increase (3.9%) in expanding states in 2014, and some evidence of a decline of 0.10 diagnoses per record. While we find no evidence of changing complexity of visits, some evidence of changing composition of visits with more non-preventable emergency and fewer primary care treatable visits. The effect is stronger in most common diagnostic categories, as well as most common non-preventable categories. The estimates are robust to exclusion of any states in the sample. We estimate that these changes translate into 1.5 million extra procedures performed in 2014 in expanding states, at an additional cost of $248 million for insurers and patients, of which $95.8 million additional cost to Medicaid programs. Our findings suggest that delivery of care changes with expanding insurance coverage, operating through changes to provider practice, billing, or patient expectations. We believe some of these changes are driven by the fee-for-service, suggesting that since insurance expansion remains policy goal, it should be paired with payment reform to slow expenditure growth.

1 Introduction

The Medicaid expansion by the Affordable Care Act (ACA) extended insurance to 6.7 million uninsured Americans in 2014. In that year, Medicaid was the primary payer for 62.0% of all ED visits (Sun et al. 2018). Total Medicaid expenditures grew 11.6% from $445.4 billion to $497.2 billion[1]. Prior to the expansion, many Americans turned to the emergency department (ED) for medical care due to lack of, or inadequate, insurance coverage. As millions of Americans have gained insurance coverage, often for the first time, lower out-of-pocket costs have changed the utilization of medical services. While some of the medical care may have moved into primary care settings, rising demand and increasing reimbursement may have changed the type and intensity of treatment provided in the ED.

In this paper we study the changes to treatment in the ED using a case study of six states - Arizona, Iowa, Kentucky, and Maryland which chose to expand Medicaid eligibility, and Florida and Wisconsin which did not. The analysis uses State Emergency Department Databases (SEDD) which include all discharges from the ED not resulting in admission. While the database provides most extensive information about each visit, its use restricts the analysis to a case-study of states, with limited generalizability. We define intensity of treatment in terms of procedures and diagnoses on record and type of visit.

The ED is an ideal setting for this study. First, the Emergency Medical Treatment and Active Labor Act (EMTALA) of 1986 requires they provide medical screening examinations to individuals seeking medical treatment regardless of ability to pay. While EDs face this constraint in case-mix adjustment of their patients, they are able to adjust the intensity of treatment in response to changes in insurance coverage and reimbursement rates. Second, ED medical providers do not engage in continuing patient care because subsequent care occurs elsewhere in the health care system. This allows us to focus on the treatment change for a single visit. Third, we argue that instead of re-

[1] National Health Expenditure Tables, 2015,Table 3

sponding to the specific insurance status of the patient, the medical provider adjusts practice to the changing insurance status of the general patient population, which is more plausible in the context of ED treatment, though the physician would be undoubtedly be aware that, overall, fewer patients would be uninsured post-Medicaid expansion. As a result, we expect the effect of the Medicaid expansion to spillover to patients unaffected by changing Medicaid eligibility.

Here, we examine the changes in treatment and billing in the ED setting following the ACA mandated Medicaid expansion. Expanding insurance coverage for patients can affect treatment and billing in two ways. First, if the physician acts as an agent for the patient, increasing insurance coverage relaxes the financial constraint. Thus, the physician may choose to perform a test or procedure previously deemed too costly. Second, as a larger share of patients become insured, the average reimbursement rate for tests and procedures increases, increasing the incentive for performing more and billing more carefully. Both of these effects should result in increased medical expenditure in the ED. The data used for the study do not allow us to draw any conclusions about the health outcomes of patient or the welfare implications of changing treatment in the ED.

Our results show that states that expanded their Medicaid program had increases of between 0.19 to 0.27 in the number of procedures performed at each ED visit. We find evidence of a parallel decline in the number of diagnoses on record. These findings are robust to specification and subsample. Categorizing visits by type according to the Billings et al. (2000) algorithm, we find an increase in visits with emergency non-preventable components. We also find an increase in visits with primary care treatable components. These findings are particularly strong with previously uninsured patients. A quarterly event study shows that the increase in procedures and the decrease in diagnoses persisted in every quarter of 2014. We estimate that 1,502,294 additional procedures were performed in Arizona, Iowa, Kentucky, and Maryland in 2014, at an additional cost of $248 million, as providers adjusted treatment and billing to insurance coverage of patients. This cost constitutes at least 3.1% of the total Medicaid cost associated with the expansion of coverage in these states.

Changes in demand for ED care resulting from changes in insurance have been studied extensively. Notably, the Oregon Health Insurance Experiment (OHIE) found significant and persistent increases in ED utilization (Finkelstein et al. 2016, Taubman et al. 2014). Other studies found no change in ED volume (Pines, et al., 2016; Gingold, et al., 2017) or even evidence of substitution towards primary care (Klein, et al., 2017; Miller, 2012). Much less is known, however, about the treatment received once a patient arrives in the ED after such an expansion of coverage.

The ACA Medicaid expansion was aimed at adults[2], and the percentage of individuals with Medicaid coverage for some months in a year increased by 11.4% from 2013 to 2014 (Smith and Medalia, 2015). Wherry and Miller (2016) find a 7.6 percentage point increase in health insurance coverage, and a 10.5 percentage point increase in Medicaid enrollment in expanding states. Evidence on ED utilization with insurance expansion is mixed. In the context of OHIE, Taubman et al. (2014) showed an increase in ED use not only within the first 15 months of qualifying for coverage, but Finkelstein et al. (2016) showed persistence in increased ED use two years after initial enrollment. Nikpay et al. (2017) found a 2.5 visit increase in ED visits per 1000 population in expanding states after 2014, with the injury-related visits driving the growth. Miller (2012) finds a 5 to 8% decline in ED utilization following the Massachusetts health reform in 2006, stemming mostly from a reduction in non-urgent visits that could be treated in outpatient settings. Using the same data, Ellimoottil et al. (2014) found a 9.3% increase in inpatient discretionary surgical procedures, but a 4.5% decrease in non-discretionary surgical procedures. Comparing California to Florida, Barakat et al. (2017) found no significant change in rate of ED visits, or diagnostic changes, but a significant change in payer composition. Focusing on Maryland, Klein et al. (2017) found a 1.2% decrease in ED visits in the six quarter following the ACA Medicaid expansion.

There is also some evidence of changing use of other medical services. Wherry and Miller (2016) find that the ACA Medicaid expansion was associated with increased physician office visits and overnight hospital stays in the initial year, but Wherry and Miller (2017) update these results two

[2]Coverage for children and Medicare eligible adults were not affected by the ACA Medicaid expansion

years after the expansion with no significant changes to medical utilization in the long-term. Estimating the effect of a Medicaid contraction in Tennessee in 2005, Ghosh and Simon (2015) find a 21% decrease in hospitalizations. The heterogeneity in ED use estimates as well as the parallel change in physician office use suggest that the compositional changes in patients have a large effect on estimated outcome.

Provider and physician response to changing insurance status and reimbursement rates has been studied in the context of Medicaid and Medicare. Gruber et al. (1999) find that differentials in the Medicaid fees explain one half to three-quarters of differences between Medicaid and private insurance Cesarean delivery rates. Clemens and Gottlieb (2014) estimate that a 2% increase in payments leads to a 3% increase in care supply in the context of Medicare, driven particularly by discretionary services. Buchmueller et al. (2016) estimate that Medicaid fee increase results in greater access to dental care and increased intensity of dental treatments. He et al. (2015) link business cycles to physician treatment of Medicare patients, showing a rise in both volume and intensity of treatments. They also find that the effects are more pronounced in areas with greater impact of insurance status on patient population. Similar results are also reported by Jacobson et al. (2013), and Brunt and Jensen (2014). We believe that ours is the first paper addressing provider response to the ACA Medicaid expansion, particularly in the ED setting.

We would also like to contrast our work from literature that identifies disparities in care and treatment of the uninsured and Medicaid insured (see, for example, Niedzwiecki et al. 2018). Rather, we assume the effect is operating through the general increase in insurance coverage for all patients in the ED in the spirit of Glied and Zivin (2002). Focusing on the ED allows us to assume that the physician does not have a long-standing relationship with the patient, and as such, is not plausibly aware of patient's insurance status. We assume that the physician, and the provider in general, respond to the insurance coverage of all patients arriving at the ED, not the specific patient insurance status.

The contribution of this paper is threefold. First, it studies the effect of the expansion in the ED. The ED has been, and will likely remain, the sole point of contact with a medical provider for many Americans. Medicaid was the primary payer for close to 62% of all visits to the ED in 2015 (Sun et al. 2018) and, therefore, changes to enrollment and reimbursements constitute a substantial financial change for hospitals.

Second, it focuses on working age adults. The Medicaid expansion affects primarily non-parental adults, a population whose medical utilization has been understudied due to scarcity of data. This study provides additional insight into how changes to insurance affect delivery of care to this population.

The third contribution relates to the intensity of medical treatment. While care has been studied in greater detail, less is known about the intensity of treatment and resulting billing. If expansion of health insurance remains a policy goal, whether through continued expansion of Medicaid eligibility or through a Medicare-4-All plan, our research suggests that changing incentives for providers will result in additional expenditure. While rationing care for patients is often unpractical, our research provides additional evidence to motivate payment reform.

While the case study of six states precludes easily generalizable conclusions, we present evidence that the states selected are not outliers in the health care market. As Kowalski (2014) notes, the treatment effect of ACA insurance expansion is heterogeneous across states. Thus, in the absence of a national sample, no subset of states will fully represent the range of treatment effects. Nor, one could argue, would the national average reflect this heterogeneity.

The paper will proceed in the following manner. The next section, the Medicaid expansion with particular attention on how each state used in this dataset responded to it. In the following section, we will present the methodology, including a discussion of the data and the estimation method. We will present our results and robustness checks in section 4. Section 5 will discuss our findings, in the context of implied costs attributable to supply side response to the expansion. Section 6 will conclude.

2 Medicaid Expansion

One of the mandates of the Affordable Care Act of 2010 was the expansion of Medicaid coverage to all adults earning below 138% of Federal Poverty Level starting in January 2014. Because Medicaid is a state-federal partnership, prior to 2014 each state set its own eligibility requirements. The ACA mandate set a uniform federal eligibility, in addition extending eligibility to non-parental adults, allocating additional funding for states to cover costs for those enrolled in line with the expansion. The mandate was challenged in the Supreme Court by National Association of Independent Business vs. Sibellius in 2012, resulting in a ruling allowing states to opt out of the expansion. In January 2014, 25 states including the District of Columbia adopted the expansion; Michigan and New Hampshire expanded coverage later in 2014; Pennsylvania, Indiana, and Alaska expanded in 2015; Montana and Louisiana expanded in 2016; Virginia and Maine in 2019; Idaho, Nebraska, and Utah have expressed intent to expand with date to be determined.

The decision to opt out of the Medicaid expansion has not been costless for states. The ACA aimed to reduce Disproportionate Share Hospital (DSH) payments to hospital for uncompensated care by $17.1 billion between 2014 and 2020. Thus, states which chose not to expand did not receive the additional Medicaid funding, but still saw declines in DSH payments. For those states, Price and Eibner (2013) estimate foregone benefits of federal payments in the amount of $3.6 billion and 3.6 million fewer uninsured.

In this paper, we focus on six states. Arizona, Iowa, Kentucky, and Maryland, chose to expand Medicaid, Florida and Wisconsin, which did not. While these states do not constitute a nationally representative sample, we selected these states because of three important factors. First, these states contribute ED data to SEDD, providing us with detailed information about diagnoses, procedures, and patient characteristics for the universe of all visits which resulted in a discharge from the ED. Second, on their own, these states span the distribution among all states in terms of socioeconomic, insurance, and medical characteristics, without being outliers in any dimension. Furthermore, when combined by their treatment status, these states are sufficiently similar prior to 2014 to justify the quasi-experimental design used in the analysis. We compare the six states to other states along these dimensions in the following section. Finally, these states contribute hospital and patient identifiers which allowing us greater flexibility in specification.

2.1 Expanders vs. Non-Expanders

Of the six states, four (Arizona, Iowa, Kentucky, Maryland) chose to expand their Medicaid eligibility to 138% of FPL. Of the two states that did not (Florida, Wisconsin), Florida eligibility remained unchanged, while Wisconsin made changes to eligibility. Table 1 summarizes the Medicaid eligibility rules and enrollment before and after the expansion. Among the expanders, Arizona experienced the smallest change in eligibility, in terms of both rule and enrollment. However, while Arizona had generous coverage for non-parental adults prior to 2013, enrollment was capped at 252,000 in 2011. In 2014, the cap was removed with 63,000 additional childless adults enrolled. Maryland had high eligibility threshold for parental adults prior to the expansion, but no coverage for non-parental adults

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Table 1 about here

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[2] Maryland implemented a change to its global payment system that was adopted at the beginning of 2014, though freestanding EDs were exempt from this policy (Sabatini et al. 2017). The differential application of this change would present an estimation problem if our sample included hospital unaffiliated freestanding facilities. The data used here only includes hospital affiliated EDs, circumventing this problem.

Among non-expanding states, Florida parental eligibility was at 19% for jobless and 56% for working adults in 2013, and was consolidated at 35% for parental adults in 2014. Wisconsin is another state with unusual non-expanding status. In 2009, Wisconsin created a new Medicaid program, BadgerCare Plus Core Plan, extending coverage to 200% of FPL for non-parental adults. Eligibility for parental adults remained at 200% of FPL during this period. However, budgetary constraints forced a cap on enrollment at 50,627 for non-parental adults in 2010, declining in the subsequent years to 17,791 by 2013 (Kaiser Family Foundation, 2015). Though rejecting the complete Medicaid expansion, in 2014 Wisconsin chose to expand coverage for all adults to 100% of FPL. While these changes in policy among non-expanding states appears to challenge the identification of analysis here, these changes were not unique to these two states.

Though Wisconsin opted to implement this "partial" expansion, it did not receive federal funding for any additional enrollment. While the composition of enrollees changed, this change in eligibility did not affect the adult enrollment number substantially. Enrollment of non-parental adults likely increased, as seen in Table 1, enrollment for parental adults declined due to changes in eligibility requirements affecting both groups. In the net, adult enrollment in Wisconsin increased from 440,000 to 457,000, constituting a 3.8% increase. Ideally, we should not observe a change in the number of enrolled in the control group, this increase in consistent with other non-expanding states[3]

Despite the heterogeneous Medicaid response among different states, we do not believe this invalidates our analysis. First, the effect we are estimating operates through provider's expectation about the changing coverage of their patient population. We argue that providers respond to policy changes associated with the ACA expansion, rather than by observing the insurance status among their patients. A 2010 survey conducted by the American College of Emergency Physicians, 66% of physicians anticipated increases in patient volumes, 43% expected to see fewer uninsured pa-

[3]Such an increase in adult enrollment in non-expanding states can be attributed to increased visibility of public health insurance programs. Enrollment in Florida increased 7.5%, North Carolina experienced a 5.7% increase, while South Carolina had a 25.3% increase in adult enrollment (Author's own calculations from MACStats, March 2014 and Kaiser Family Foundation, 2015).

tients following the health reforms, and only 22% expected to see more and 19% expected to see the same number of uninsured patients (Survey of Hospital Emergency Department Administrators, 2010). These results suggest providers were focusing and adjusting to the overall change in their patient population due to ACA.

To further explore the visibility of state level Medicaid changes, we used Google searches for terms "Medicaid" and "Patient Protection and Affordable Care Act" between September 2013 and May 2014 for each state in this sample. Though we do not have physician specific survey or data, we believe that Google searches reflect the relative awareness among physicians of changes resulting from each program. Figure A1 in the Appendix plots the number of Google search counts for "Medicaid" (black) and "PPACA" (grey) relative to the highest number of searches in that period for either term. The common feature of all these graphs is a surge in searches on the ACA around October 1, 2013, followed by sustained high interest through January 2014. Another notable feature of the results is that there is no comparable spike in Medicaid searches, even though eligibility rules for the program were being changed simultaneously. Finally, we also note that searches for Medicaid do not surpass those for ACA for most of this period, suggesting that medical providers were more likely to know whether their state complied with the ACA guidelines, and less likely to know the specific changes to Medicaid.

2.2 Comparison to Other States

As discussed in the previous section, the states used in this analysis are not necessarily representative of expanding and non-expanding states. The expansion of Medicaid coverage was heterogeneous among all states, as shown by Kowalski (2014), and the concept of representative experience may be ill-fitting in this context. However, the states selected here are not outliers nationally in any dimension relevant to socioeconomic make-up, insurance coverage, or medical expenditure.

To show this, Figure 2 depicts various indicators at state level for all states in grey compared to the expanding (solid black) and non-expanding (dashed black) states used in the analysis here. The data for each of the panels is drawn from the American Community Survey (ACS) (2008-2016), the Annual Social and Economic Supplement (ASEC) to the Current Population Survey (CPS) (2011-2015), and the Dartmouth Atlas of Healthcare (2008-2015). Panels (a)-(d) show socioeconomic indicators that are associated with Medicaid enrollment: unemployment, poverty, minority, and married rates. Panels (e) and (f) represent any insurance and Medicaid enrollment. Panels (g) and (h) reflect average state utilization, with average out-of-pocket medical expenditure and the total claims based Medicare reimbursements per enrollee.

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Figure 2 about here

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The states used in this sample, both expanding and non-expanding are generally within the middle of the range of values of other states for all indicators. For socioeconomic indicators, expanding and non-expanding states are also very similar – the dashed and solid lines are close close and parallel in most years. These states also in the middle range among other states in insurance coverage and Medicaid enrollment. However, expanding states consistently have a higher insurance rate than non-expanding states before and after 2014, though their trends are parallel. Expanding states also have a somewhat higher rate of Medicaid enrollment prior to 2012, and in 2012-2013 their rates are overlapping.

The last two panels include out-of-pocket medical expenditure and total Medicare reimbursements. The states used in our analysis, once again, trend in the middle of all states on these indicators. Expanding states differ substantially from non-expanding states in the pre-2014 period in out-of-pocket medical expenditure, with no clear evidence of parallel trends in this indicator.

Non-expanding states have consistently higher Medicare reimbursements compared to expanding states between 2008 and 2015, however the trends are parallel.

These indicators suggest that while the six states chosen for our analysis are not representative of the experience of all other states, they do not constitute outliers in any of the indicators that are likely predictors of medical utilization and expenditure, and health.

3 Methodology

3.1 Data

We use the State Emergency Department Databases (SEDD) compiled by the Health Care Utilization Project (HCUP) for Arizona, Florida, Iowa, Kentucky, Maryland, and Wisconsin for 2013 and 2014. The data include information of every discharge from hospital-affiliated EDs in the six states. Discharge records include list of diagnoses, procedures, primary and secondary payer by category, charges submitted, and limited patient demographic information. We supplement the data with demographic information from the American Community Survey (ACS) and unemployment data from the Bureau of Labor Statistics (BLS) using the patient zip code of residence.

One of the major challenges to identifying the effect of insurance is the change in the patient case-mix after the expansion. We address this shift in patient composition in three ways. First, we use a visit-linking feature provided by four of the six states to create longitudinal data of ED visits. When we limit the analysis to these states, in addition to hospital fixed effects, we are able to control for individual fixed effects removing variation attributable to sicker patients responding more readily to insurance access. Second, using the longitudinal data, we further limit the data to patients who were uninsured in 2013 without limiting their insurance status in 2014. This allows us to study the effect of the expansion on the target population. Third, using all six states we match visits in expanding states to those in non-expanding states based on the patient's level of visit complexity. Furthermore, we control for the primary diagnostic category in each specification to account for potential changes as newly insured patients seek primary care instead of using the ED.

We start with the universe of ED visits in six states over two years and drop observations missing identifiers to link visits and those with missing primary payer, leaving a sample of 34,221,138 visits. We limit the sample to working age adults, 19 to 64 years old, reducing the sample to 22,643,132 visits, of which 18,872,744 have non-missing values for all indicators of interest here. When analyzing longitudinal data, our sample is further reduced to 14,714,515 visits by 11,458,734 patients. For most of our analysis we do not restrict the sample by primary payer, which includes privately insured, Medicaid, and self-paying visits[4].

Table 2 summarizes the characteristics of the data for the expanding and non-expanding states before and after the expansion.

Table 2 about here

Expanding and non-expanding states differ in demographic features, such as proportion of black and Hispanic patients, though these differences remain constant after the expansion. The states also differ in primary payer distribution before the expansion, with substantial changes after the expansion. Expanding states have a greater share of privately insured patients, and much fewer self-paying patients before the expansions. After the expansion, non-expanding states saw an increase

[4]When tracking patients across time, many patients have multiple payers in the same year. This can be attributed to mid-year insurance switches associated with a new job, gaps in Medicaid coverage due to new eligibility or enrollment, or lack of patient knowledge about insurance status at time of intake. When multiple payers are present for the same patient across visits, we assign the primary payer status of the patient as the mode of the payers for the year.

of 4 percentage points in privately insured patients, with an equivalent decrease in self-paying patients, while expanding states had no change in privately insured patients. After the expansion, in 2014, the average share of Medicaid patients increases by 9 percentage points in expanding states, with no change in non-expanding states. Combined, these distribution suggest that after the expansion, non-expanding states directed patients towards private plans available through health insurance marketplaces, while Medicaid in expanding states absorbed the previously uninsured.

3.2 Estimation

We wish to disentangle the effect of health policy change from the underlying changes in the health care markets and the changes in the patient composition resulting from the policy. To address the changes in health care markets independent of policy we estimate a difference-in-differences (DD) model, comparing states which adopted the Medicaid expansion to those that opted out. The Medicaid expansion coincided with the introduction of health insurance marketplaces through the ACA. However, while the Medicaid expansion affected expanding and non-expanding states differently, all six states examined here had health insurance marketplaces [5].

The change in the composition of patients is more difficult to detect. Because all diagnostic information in the data may be endogenous to the insurance expansion (that is, physicians may diagnose patients differently because of perceived insurance change), we rely on the initial evaluation of patient complexity of presentation. These evaluations are coded as procedures, categorizing the visit according to the extent of physician intervention necessary. We compare expanding and non-expanding states in 2014, analyzing visits in all states for changing patient complexity. We believe these results justify the further adjustment for patient case-mix changes.

First, we will establish that the Medicaid expansion affects EDs in expanding states dispropor-

[5] The federal government operated all core exchange functions in Arizona, Florida, and Wisconsin, while in Iowa the state conducted the plan management and consumer assistance, while the federal government operated remaining core exchange functions. Kentucky and Maryland operated all core exchange functions. (Dash et al. 2013)

tionately from those in non-expanding states by estimating an ED level DD model specification:

$$Y_{ht} = \alpha + \gamma_1 After_t + \gamma_2 Exp_h * After_t + H_{ht}\Theta + \eta_h + \epsilon_{ht} \tag{1}$$

where the outcome variable, Y_{ht}, is share of visits by insurance type or share of total billable charges by insurance type for hospital h in year t. The DD structure is captured by coefficients γ_1 and γ_2, $After_t$ is an indicator for the year following expansion, and $Exp_h * After_t$ is an interaction of expansion states in the year after expansion. Hospital characteristics are captured by H_{ht}, and η_h are hospital fixed effects.

We will next estimate a general DD specification:

$$Y_{iht} = \alpha + \beta_1 After_t + \beta_2 Exp_h * After_t + \beta_3 Exp_h + X_{it}\Gamma + Z_{it}\Delta + \eta_h + \epsilon_{iht} \tag{2}$$

The DD structure is captured by coefficients β_1 and β_2 , where $After_t$ is an indicator for the year following expansion, and $Exp_h * After_t$ is an interaction of expansion states in the year after expansion. Patient characteristics are captured by the vector X_{it}, zip code characteristics by Z_{it}, and η_h are hospital fixed effects. The outcome variables of interest, Y_{iht} are number of procedures and diagnoses on the discharge record as well as, indicators for appropriateness of ED care by type of visit.

Next, we will present evidence on changing composition of patients in the ED after the expansion by estimating equation (2) with ED complexity level as outcome variable. ED complexity is aggregated from physician notes by the billing service reflecting the extent of physician intervention and urgency of visit. Thus, a Level (CPT 99281) visit involves an initial assessment, without any medication and treatment, such as prescription refill visits, work/school note, or follow up wound care; a Level 5 visit, on the other hand, within the constraints of urgency, involves extensive physician intervention, monitoring of multiple vital signs, and more than 3 diagnostic tests[6].

[6]Level 1 (CPT 99281) requires initial assessment, no medication or treatment, but follow up care such as prescrip-

We use two methods to address the changing composition of patients. First, limiting the analysis to visits in four states (Florida, Iowa, Maryland, and Wisconsin) whose data allow patient tracking across time, we will re-estimate the DD specification with additional patient fixed effects. That is, we will estimate

$$Y_{iht} = \alpha + \beta_1 After_t + \beta_2 Exp_h * After_t + X_{it}\Gamma + Z_{it}\Delta + \eta_h + \nu_i + \epsilon_{iht} \tag{3}$$

where in addition to previous terms, ν_i will capture time invariant patient characteristics. Controlling for time-invariant patient fixed effects, we believe, removes variation in outcome attributable to observable and unobservable patient characteristics such as underlying health conditions which might make them more frequent user of the ED.

Since fixed effects are time invariant, however, we supplement this analysis by matching patients in expanding states with those in non-expanding states. We use propensity score matching based on ED complexity level, gender, age, Charlson index of co-morbidities, and some zip code characteristics. Because of the size of the sample, computational constraints prevent us to match all visits; we draw 100 samples of 400,000 observations each, estimating equation (2). In our results we report the mean β_2 coefficient.

To check the robustness of our estimates, we test the parallel trends assumption of our DD model in the periods leading up to the expansion. Since the data used in the analysis here provide insight only for 2013 and 2014, we separate visits by quarter, and conduct an event study on a quarterly

tion refill, wound recheck and redressing, suture removal, or booster immunization; Level 2 (CPT 99282) requires expanded problem focused history, expanded problem focused examination, and medical decision making of low complexity; Level 3 (CPT 99283) requires expanded problem focused history, expanded problem focused examination, and medical decision making of moderate complexity; Level 4 (CPT 99284) requires a detailed history, a detailed examination, and medical decision making of moderate complexity; Level 5 (CPT 99285) within the constraints imposed by the urgency of the patient's clinical condition and/or mental status, requires a comprehensive history and examination, and medical decision making of high complexity.

basis estimating:

$$Y_{iht} = \alpha + \sum_{j=2013\,Q2}^{2014\,Q4} \beta_j Expand_h * Q_j + X_{it}\Gamma + Z_{jt}\Delta + \eta_h + \epsilon_{iht} \tag{4}$$

where Q_j is a dummy for each quarter, so that the coefficient β_j measures the difference in the outcome variable between expending and non-expanding states for each quarter leading up to and after the expansion.

Finally, we test the sensitivity of our estimates limiting the sample to individuals who were uninsured in 2013. We restrict the analysis to the four states which allow patient tracking, and estimate equation (3). Since this was the target population of the policy, this estimate will give us the average treatment effect on treated. Following Cameron and Miller (2015) standard errors are estimated using bootstrapped clustering at state level, where possible. Where such clustering is computationally unfeasible, we cluster at patient level.

4 Results

4.1 Hospital Level Effects

Table 3 presents the results for 692 hospital based EDs followed in 2013 and 2014. Each column represents a single regression estimate, with only the DD coefficients reported. The dependent variable in each regression is the share of visits and charges by payer category in ED, the column header specifying the payer. In addition to the listed coefficients, each model also controls for hospital level covariates, such as patient characteristics (gender ratio and average age) and patient zip code characteristics (poverty, median income, minority ratio, unemployment rate, etc.). All specifications include ED fixed effects, and errors are clustered at ED level. The first four columns present the estimates for visit shares, while the second set present the charges share of total by payer type.

Table 3 about here

Looking at row (a), the coefficient estimates for $After$ show that the number of visits and charges increased for all categories of payers in 2014 in both expanding and non-expanding states, with the notable exception of Medicare. This may reflect the impact of health insurance exchanges which increased enrollment in private plans across all states. In row (b), the coefficient for $Expand*After$ reflects exclusively the change in visits and charges for expanding states alone. As expected, we see a 7 percentage point increase in Medicaid visits and charges. This increase appears to come from a 4 percentage point decrease in self-paying visits, as expected. However, we also find a 2 percentage point decrease in privately insured visits and charges, which points towards crowding out effect of the expansion[7].

This analysis suggests that the Medicaid expansion did result in a noticeable shift in insurance coverage at the ED level in expanding states. As we proceed in our analysis, we rely on this shift to motivate medical provider response to the expansion.

4.2 Patient Level Effects

Patient level results are presented in Table 4. Columns (1) and (2) report estimates for number of procedures and diagnoses on discharge record, while columns (3)-(6) show effect on ED visit

[7] At the aggregate level it is unclear whether the change results from privately insured patients switching to Medicaid, or losing insurance coverage. A more in-depth analysis of the crowding out effect is forthcoming

type. As before, row (a) reports the coefficient for $After$ dummy, showing an rise in diagnoses, but not procedures, among both expanding and nonexpanding states. Row (b), however, reports the coefficient for expanding states only, with a 0.27 per visit rise in number of procedures. Compared to non-expanding states in our sample, expanding states experienced a 3.9% rise in procedures. In this sample, we estimate a 0.10 decline in number of diagnoses, though it is not precisely estimated.

Table 4 about here

Next, we classify visits by its emergent nature according to the algorithm developed by Billings et al. (2000) as Emergent / Not Preventable, Emergent / Preventable, Emergent / Primary Care treatable, Non-Emergent [8]. Each diagnostic code is proportionately assessed according to these categories [9]. Columns (3)-(6) of Table 4 presents the estimates of the DD coefficients. Focusing on the interactive coefficient in row (b), our estimates show a 0.0037 increase in the emergent / non-preventable component of visits, which constitutes a 2.8% effect increase. None of the other categories experience statistically significant changes, though estimates suggest an increase in primary care treatable component and a decrease in non-emergent component of visits.

These results, however, may not account for compositional changes as the Medicaid expansion brings new patients to the ED. To explore this possibility, Table 5 shows estimates for Equation (2)

[8] Emergent - ED Care Needed - Not Preventable / Avoidable if ED care was required and ambulatory care could not have prevented the condition.
Emergent - ED Care Needed - Preventable / Avoidable if ED care was required, but the emergent nature of the condition was potentially preventable by timely and/or effective ambulatory care.
Emergent - Primary Care Treatable if treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting.
Non-emergent if the patient's initial complaint, presenting symptoms, vital signs, medical history, and age indicate that immediate care was not required within 12 hours.

[9] For example, a diagnosis of unspecified abdominal pain is categorized as 33% emergent non-preventable and 66% emergent but primary care treatable. These percentages were based on an examination of 6,000 full ED records. For more information, see Billings et al. (2000)

with the ED level complexity as the outcome variable[10]. In row (a) we find significant changes in complexity level in 2014, as all states adjust to the new health insurance marketplaces. However, row (b) shows no significant changes in complexity level restricted to states that chose to expand Medicaid eligibility. Though statistically not significant at conventional levels, there may be evidence of substitution from Level 2 visits towards Level 1 visits, and from Level 4 towards Level 5 visits, suggesting some compositional changes after expansion.

To account for possible patient compositional changes, we estimate Equation (3) in Table 6, where the sample has been limited to the four states (Florida, Iowa, Maryland, and Wisconsin) whose data allow patient tracking within the state across time. All specifications in this table control for individual and hospital fixed effects. In this specification, in row (a) we see a significant decline in procedures and a rise in diagnoses across all states. In row (b), the interaction DD coefficient shows 0.19 unit increase in procedures performed (a 2.7% effect evaluated at the mean of dependent variable), and a 0.02 increase in diagnoses (0.6% effect). Our estimates do not show any significant changes in non-preventable or preventable emergent visits, nor in non-emergent visits. However, the estimates show a significant decline in primary care treatable component of visits.

Table 6 about here

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[10]Level 1 (CPT 99281) requires initial assessment, no medication or treatment, but follow up care such as prescription refill, wound recheck and redressing, suture removal, or booster immunization; Level 2 (CPT 99282) requires expanded problem focused history, expanded problem focused examination, and medical decision making of low complexity; Level 3 (CPT 99283) requires expanded problem focused history, expanded problem focused examination, and medical decision making of moderate complexity; Level 4 (CPT 99284) requires a detailed history, a detailed examination, and medical decision making of moderate complexity; Level 5 (CPT 99285) within the constraints imposed by the urgency of the patient's clinical condition and/or mental status, requires a comprehensive history and examination, and medical decision making of high complexity.

4.3 Robustness Analysis

To test the underlying assumptions of the DD model, we conduct additional robustness checks of our estimates. First, we present the average treatment effect on treated by limiting the sample to patients who were uninsured in 2013. These patients were the intended beneficiary of the ACA Medicaid expansion and, as such, should see a similar, if not larger, change in treatment intensity and type. Then, we extend the adjustment for compositional changes among patients by using propensity score matching to compare visits in expanding states to those in non-expanding states. Finally, we test the parallel trends assumption for our data by showing the results of a quarterly event study according to equation (4).

Table 7 about here

In Table 7 the sample consists of the four states which allow tracking of patients across time restricting the sample to patients who were self-paying in 2013. Table A2 in the Appendix presents the characteristics of visits for this subsample of patients. The DD coefficient is presented in row (b) of Table 7, showing a 0.26 increase in the number of procedures on the discharge record (4.2% effect), and a 0.03 decline in diagnoses (1.1% effect). These results are very similar to those of the entire sample. When looking at type of visit, however, we note a significant increase in non-preventable and primary care treatable components of visits, and an increase in preventable component of visits though the coefficient is not significant at conventional statistical levels. This result is substantially different from the total sample, suggesting that the newly insured increased ED utilization not only for types of primary care that are thought to be sensitive to insurance status, but also for care that is thought to be insensitive to it.

As previously argued, newly insured may engage in more frequent or first-time medical care, resulting in changing composition of patient populations in expanding states, compared to non-expanding states. While we believe the inclusion of individual fixed effects in the trackable sample addresses this changing composition, we test the stability of our estimates by matching patients in expanding states with those in non-expanding states on visit level complexity, gender, age, Charlson co-morbidity index, and zip code characteristics. Because of computational limitations, however, we draw 100 samples of 400,000 observations, yielding a distribution of the coefficients of interest. Table A3 in the Appendix reports the mean and 90% interval of the coefficient distribution for the six outcomes of interest. Though the confidence intervals are unusually large, the coefficient estimates for procedures and diagnoses match almost exactly those of the all states, all visits sample with 0.27 increase in procedures and 0.9 decrease in diagnoses. Coefficient estimates for visit types are also close to those of the entire sample as well as the subsample of previously uninsured patients, reflecting an increase in non-preventable and primary care treatable components of ED visits.

The DD model assumes that prior to change, the treatment and control groups were on parallel trends in the outcome. To test this hypothesis, we conduct an event study of the outcome variables prior to the switch. Our data are limited to 2013 and 2014, however, precluding an annual event study. To circumvent this limitation, we use two methods of evaluating the pre-trend. First, we use SEDD Summary Statistics to present unadjusted average number of procedures between 2010 and 2017. These results are presented in Figure 3, with the gray lines representing the averages for states not included in this sample, and the black lines (solid for expanding; dashed for non-expanding) representing the average number of procedures for states in our sample. This graph shows that the average number of procedures among the states used in the analysis is representative of other states. It also shows that expanding and non-expanding states did not have wildly divergent trends prior to 2013. While expanding states appear to have a steeper trajectory prior to the expansion, one must keep in mind that these trends are unadjusted. Furthermore, our specifications control for state fixed effects to absorb any state-specific pre-trends, as recommended by Ryan et al. (2018).

—————————————-

Figure 3 about here

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For adjusted analysis of pre-trends, we use the quarterly indicators of visits, to conduct a quarterly event study for outcomes. Figure 4 graphs quarterly coefficients β_j from equation (4) with two outcomes in each panel. Each point in the estimate of the difference between expanding and non-expanding states in that quarter compared to the first quarter of 2014 (2014 Q1), with a 95% confidence interval shown in a bar around the estimate.

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Figure 4 about here

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Panel (a) shows quarterly changes in procedures, with the 95% confidence interval around the estimates. The estimates show a clear rise in procedures in the first quarter of 2014, and a sustained rise in the following quarters. These estimates show a steady non-zero trend in the quarters leading up to the expansion. Panel (b) shows the same analysis for diagnoses. Here, again, we see a steady zero trend prior to the expansion, with a slight, but not statistically significant decline in all quarters of 2014.

—————————————-

Figure 5

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Because of the small number of states used in this sample, we want to test the sensitivity of our results to the inclusion of any one or two states. To do this, we re-estimate equation (2) leaving out one state at a time, and then combinations of two states at a time. The estimates for procedures and diagnoses are presented in Figure 5. In Panel (a), procedures remain very close to our original estimate, ranging from 0.2 to 0.42 increase in procedures per visit. Exclusion of Maryland impacts the standard error estimates most significantly, which could be due to the disproportionate number of visits in the state compared to other expanding states. The number of diagnoses in panel (b) also remains stable when states are excluded from the sample, with a similar increase in standard errors upon exclusion of Maryland.

5 Discussion

Our estimates show a consistent increase in the number of procedures and a decrease in diagnoses after the expansion of Medicaid coverage in 2014. In every specification and subsample, we estimated an increase of 0.19 - 0.27 number of procedures on the discharge record. We interpret this rise in the number of procedures as increased intensity of treatment. The estimate for diagnoses was not always significant, but it was consistently negative, ranging between 0.02-0.10 diagnoses.

The contrary directions of procedures and diagnoses may be explained by one of two factors. First, a greater number of tests and procedures may increase the clinical accuracy of evaluation, resulting in fewer diagnoses. Second, as physicians believe that more of their patients are insured, they may be less likely to treat co-morbidities and conditions peripheral to the visit, resulting in less breadth of diagnoses and greater depth of treatment. While exploring these two explanations is beyond the scope of this paper, we address physician driven effects in treatment following the Medicaid expansion in our other work.

These result suggest that medical providers in the ED are sensitive, consciously or unconsciously, to the patient's insurance status and increase the intensity of the treatment when the budget constraint slackens. We do not believe the increase is due to pent-up demand as we do not see a decline in procedures in the latter half of 2014 as shown by the quarterly event study.

Visit types also change after the expansion, though the results are less stable. Our preferred specification shows a decrease across all types of visits, with a significant decrease in primary care treatable components of visits. However, some specifications, as well as the subsample of uninsured, show increases in non-preventable emergency and primary care treatable components of visits. Focusing specifically on the subsample of those patients who were uninsured in 2013, we interpret the increase in non-preventable emergency care as a correction of previously sub-optimal use of medical services. As Table A2 in the Appendix shows, the sample of those who were uninsured in 2013 is predominantly male and younger than the average ED patient – a population substantially underrepresented in the ED census. In expanding states, Medicaid was single largest category of insurance switch for this subsample. Our results are also consistent with Taubman et al. (2014) who found an increase in primary care treatable and non-emergent visits following the Medicaid expansion in Oregon.

Furthermore, the NYU algorithm classification categories are not exclusive. Rather than ascribing a visit exclusively to one category, it assigns weights by category for each visits. Thus, an increase in non-preventable emergency visits in the subsample of previously uninsured is consistent with increased use of all ED care, with particular emphasis on conditions with a non-preventable emergent component which the patient would have previously ignored or treated elsewhere. Using the Medical Expenditure Panel Survey (MEPS) and National Hospital Ambulatory Medical Care Survey, Zhou et al. (2017) establish that the uninsured use the ED at the same rate as the insured, but use other type of care much less. Analyzing the utilization by type, the authors also find that the uninsured have a slightly lower composition of non-preventable ED visits compared to the insured.

We remain agnostic on the mechanism of the change in the intensity and billing of treatment. We cannot establish here that the increase is due to a change in physician practice. The increase may also be attributed to improved documentation of procedures and diagnoses, increases in hospital level billing for every procedure, and changes in organization and management in the ED. Some, though not all, of these effects should be captured by the hospital fixed effects.

The results presented here show that the Medicaid expansion affected not only the treatment of those who were uninsured in 2013, but also those who were not affected by the expansion. We explain this counter-intuitive result by observing that the ED setting precludes existing relationship between provider and patient, thus reducing the likelihood that the physician is aware of the specific insurance status of the patient. As such, the physician treats patients with expectation of changing coverage overall. This spillover effect has been studied in the context of health management organization (HMO) expansion by Glied and Zivin (2002) who found a change in treatment among all patients when a subgroup of patients changes insurance characteristics. Such spillovers have also been documented by Baicker et al. (2013) for Medicare Advantage plans, by Finkelstein (2007) for introduction of Medicare, among others.

While the magnitude of these changes appears small, they translate into significantly higher costs in the current system for Medicaid. Using the total sample results, 0.27 extra procedures per visit translate into one extra procedure for every 3.7 visits. Among the four states which expanded Medicaid in our sample, this translates into 1,502,294 extra procedures performed in 2014 attributable to the expansion. Using our most conservative estimate from the sample of tracked patients, a 0.19 increase in procedures translates into 1,057,169 extra procedures in expanding states. Applying this most conservative estimate of extra procedures and the average cost per procedure in each expanding state, we estimate an associated additional charge to insurers, including Medicaid, of approximately $520 million in these states. These charges do not necessarily reflect the underlying costs of the procedures. For an imperfect measure of the costs underlying these charges, we use the HCUP Hospital Cost-to-Charge Ratio for inpatient care for the expanding states, generating an estimate of $248 million additional costs and expenses for insurers in these states, of which $95.8 million was incurred by Medicaid. The Kaiser Family Foundation estimates that the combined federal and state costs for new enrollees were approximately $7.75 billion in 2015. The additional costs of the more intensive treatment in the ED of these patients amounted to 1.2% of 2015 costs. This is a conservative estimate of the 2014 shares of this spending as well since medical expenditure does not decline in the years after insurance expansion (Finkelstein et al. 2016).

Many studies estimate demand response to ACA Medicaid expansion, use of ED, preventive care, and primary care. Few studies look at the supply response to the expansion. While the demand side literature establishes that expanding insurance access will result in increased utilization of medical care and, therefore, increased expenditure, none focus on additional costs associated with the supply response to increased insurance coverage. Our study presents evidence of supply side response to expanding insurance coverage, with increased intensity of treatment. While we do not know whether these changes will improve the patient experience, they will certainly result in increased national health expenditure and, specifically, increased costs for Medicaid. Accordingly, projections of national health expenditure of increased access to health care from current and future insurance expansions do not take into account the additional costs associated with provider response. Our study is limited to the ED, but we show that the supply side response is substantial and should be taken into account when considering the impact of single payer or universal health insurance. We believe that the fee-for-service structure of provider reimbursement drives this effect. As such, any health policy pursuing expansion of insurance should involve a restructuring of the provider payment system.

The study data constitute a main limiting factor. The data include exclusively the discharges from the ED. Thus, any patients who were admitted to the hospital subsequent to their entry through the

ED are not seen in this dataset. Though comprising only 11.9% of all visits, this group constitutes a selection which may also be subject to insurance status. Our preliminary results using the State Inpatient Database show a modest increase in admission rate from the ED in the expanding states. This is likely to further affect the patient composition in our results, thus placing a further emphasis on the propensity score matched results. The quality of the propensity matching is closely linked to the covariates used in matching, as well as the sample size. In our analysis, the number of covariates and the sample size were limited by computational constrains.

Another confounding factor of this study is that the Medicaid expansion coincided with the launch of health insurance exchanges. While the exchanges were launched in all the states analyzed here, the state effort in administering and facilitating the exchanges varied among the states. Hospital fixed effects, as well as controlling for the insurance status of the patient, remove this common trend across patients, hospitals, and visits, but they do not affect the propensity of newly insured from making more frequent use of the ED, or on the contrary, moving some care to the primary care office.

The results presented here are based on the six states selected for analysis and, therefore, may not be generalizable to all states in the US. However, the microdata used here allows us to undertake much more detailed analysis of changes to visits resulting from the expansion. For a complete analysis, all visits from all reporting states would have to be combined, resulting in a dataset magnitudes larger than the one used in the current study. As cited repeatedly, our study faced computational constraints associated with the large number of observations. Though more easily generalizable, analysis of an even larger would be computationally unfeasible.

Finally, the data used here do not allow us to draw qualitative conclusions about the effect of the expansion. We are not able to observe or characterize the health outcomes for the patients seen in the ED during this period. Thus, while we detect an increased intensity of treatment, we cannot conclude whether this improves delivery of health care. Furthermore, while data provide information about the charges submitted by the provider for each episode of care, we do not have any information about the cost of care delivered, nor the associated reimbursement. Thus, while we believe that more procedures translate into more cost, the data do not allow us to conduct a more precise analysis.

6 Conclusion

Using detailed data on visits from six states, we estimate the impact of the ACA mandated Medicaid expansion on intensity of treatment in the ED. Taking advantage of state choice to expand or not expand Medicaid, we estimate a DD specification for the number of procedures, number of diagnoses, and visit type by appropriateness of ED care. We find consistent results that the number of procedures increased in expanding states after the expansion, with some evidence that it was coupled with a decrease in the number of diagnoses. We also estimate an increase in non-preventable and primary care sensitive visits, though the result varies depending on the specification. Focusing on previously uninsured patients, we find an even more pronounced increase in number of procedures, non-preventable visits, and primary care sensitive visits.

Our findings show that an expansion of health insurance like the ACA will result in increased supply side costs as providers respond to reimbursement of previously uncompensated or low-compensated care. We show that additional 0.27 procedures per visit associated with the ACA Medicaid expansion translate into more than 1.5 million extra procedures performed in the four expanding states studied here, or $248 million additional costs for insurers and patients in these states. Of these costs, we estimate $95.8 million are born by Medicaid programs in these states. These additional costs constitute a significant share of the total medical costs associated with the expansion, and must be incorporated in projections of future costs of insurance expansion. We believe these costs are driven by the fee-for-service structure of medical reimbursement and, therefore, a policy of increased access to health care through insurance expansion should be accompanied with a restructuring of provider payment.

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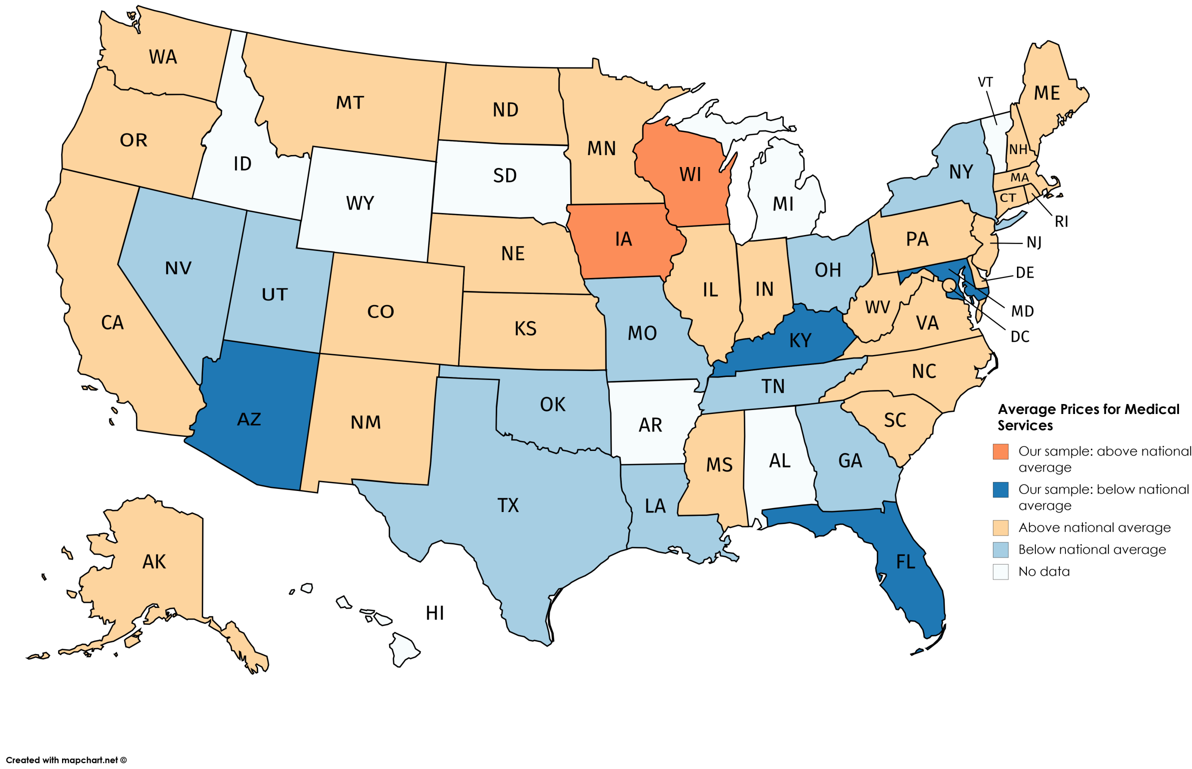


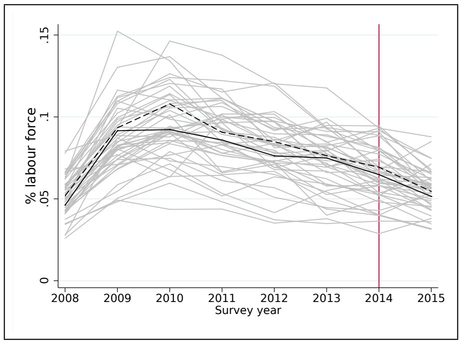
Figure 1: Average Prices for Medical Services

[10]Source: Newman et al. (2016). State average prices to national average price for 162 common medical services, 2015 prices. Peach colored states have average prices above and blue states have average prices below national average. Darker states correspond to those included in the analysis.

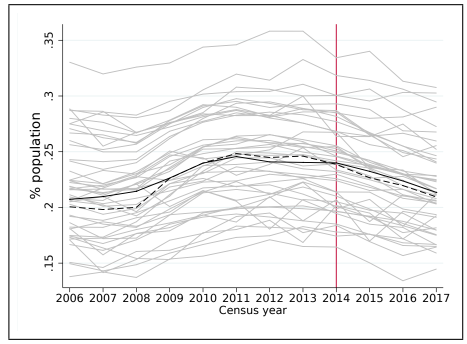
[11]Source: ACS 2008-2016, CPS-ASEC 2011-2015, Dartmouth Atlas 2008-2015. Solid line represents indicator average for expanding states (AZ, IA, KY, MD) and dashed line represents non-expanding states (FL, WI) used in this analysis.

[12]Source: SEDD 2013-2014. Each point is a coefficient estimate for β_{2j}, the difference between expanding and non-expanding states within the quarter, with 95% confidence interval indicated with bars. The omitted category is Q1 2014. Dependent variables are: number of procedures, number of diagnoses. Estimation for number of procedures controls for number of diagnoses. Each regression controls for demographic variables, Medicaid ratio at hospital level, and patient diagnostic category. All specifications include hospital fixed effects. Standard errors are clustered at hospital level.

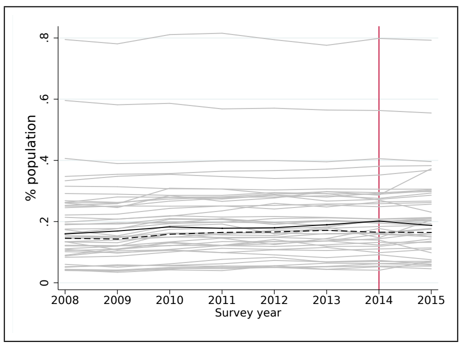
[13]Source: SEDD 2013-2014. Each point is a coefficient estimate for β_{2j} in a regression with sample excluding the state(s) indicated on the horizontal axis. Dependent variables are: number of procedures, number of diagnoses. Estimation for number of procedures controls for number of diagnoses. Each regression controls for demographic variables, Medicaid ratio at hospital level, and patient diagnostic category. All specifications include hospital fixed effects. Standard errors are clustered at hospital level.



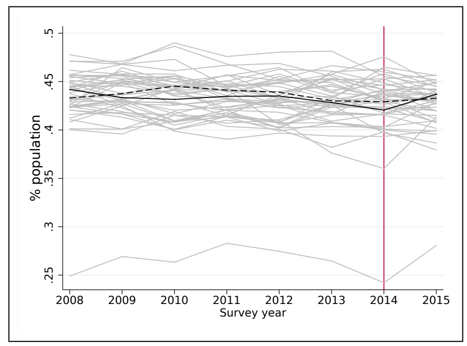
(a) Unemployment



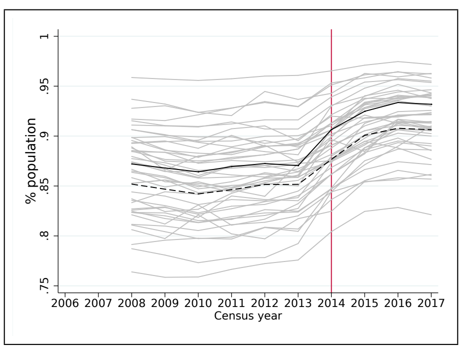
(b) Poverty



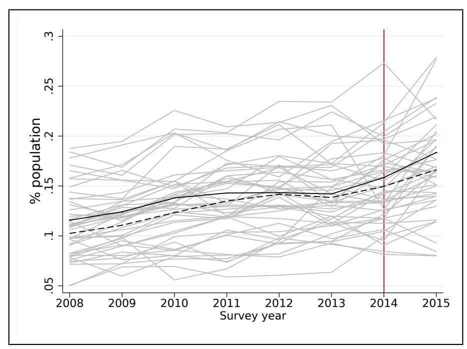
(c) Minority



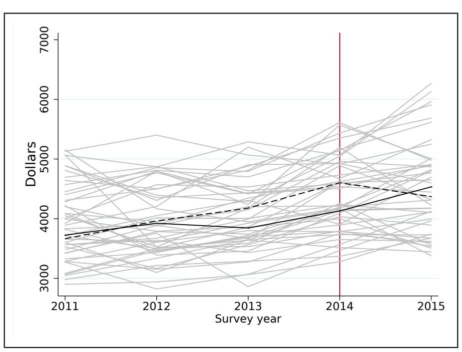
(d) Married



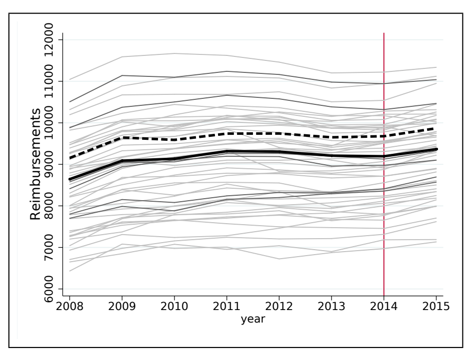
(e) Any Health Insurance



(f) Medicaid Enrollment



(g) Out of Pocket Medical Expenditure



(h) Total Claim Based Medicare Reimbursements

Figure 2: Expanding (solid) and Non-Expanding (dashed) states compared to other states.[11]

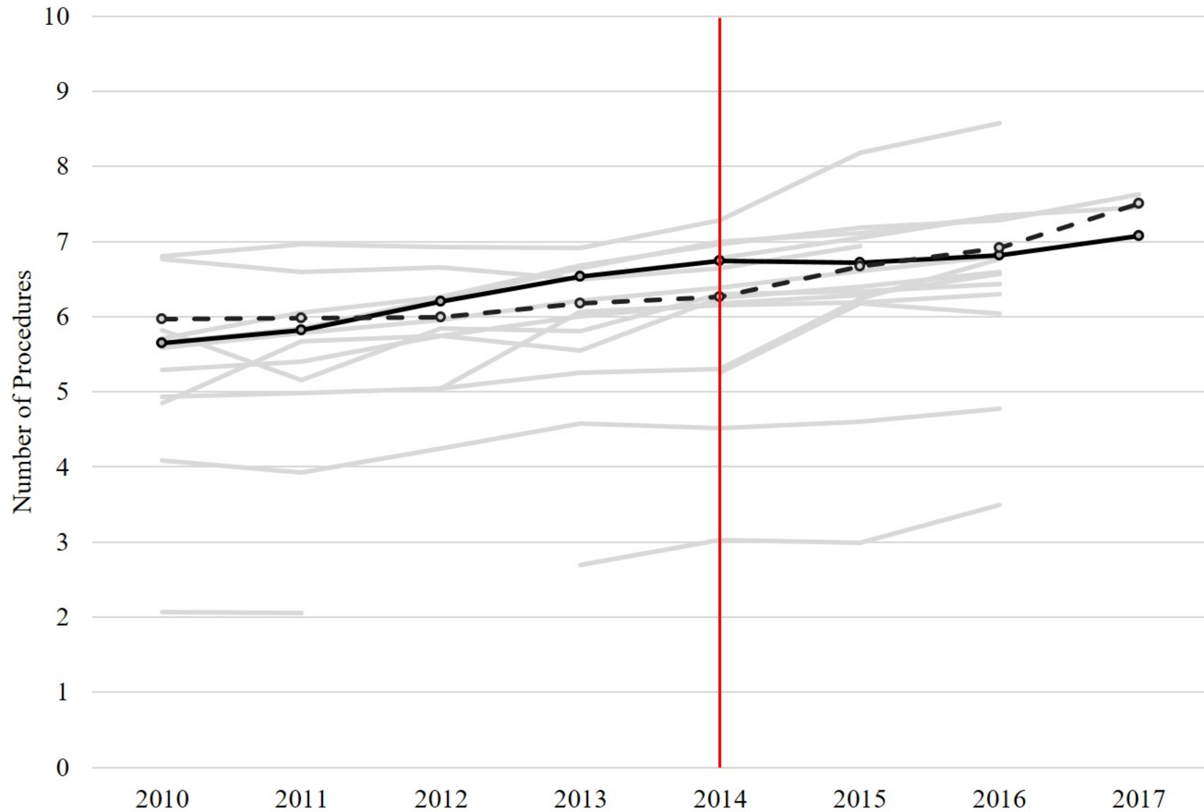
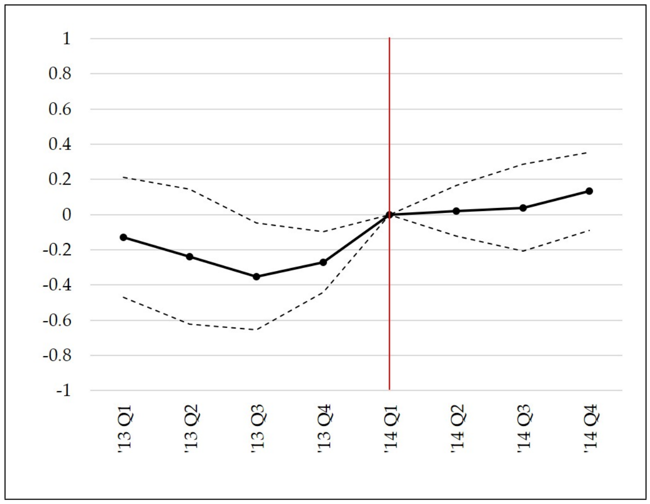


Figure 3: Procedures, Unadjusted, 2010-2017

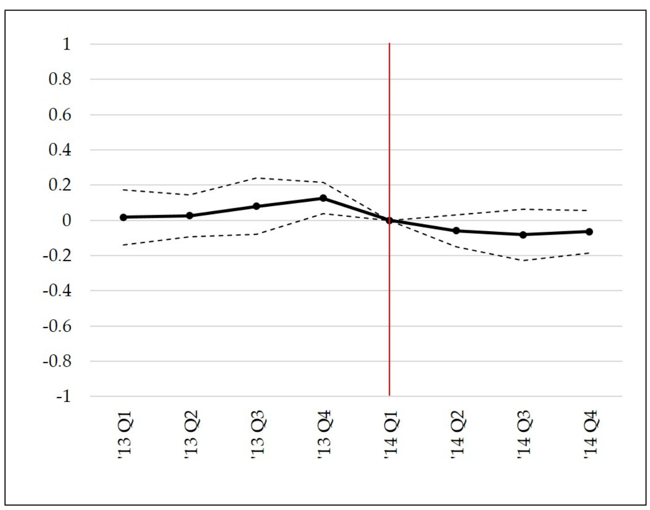
Table 1: Medicaid Adult Eligibility and Enrollment

	2013			**2014**		
	Eligibility Standard (% FPL)		**Enrollment**	**Eligibility Standard (% FPL)**		**Enrollment**
	Parents	Other Adults	(thousands)	Parents	Other Adults	(thousands)
Expanders						
Arizona	106%	100%*	579	138 %	138 %	541
Iowa	80%	0 %	212	138 %	138 %	261
Kentucky	57%	0 %	139	138 %	138 %	449
Maryland	122%	0%	389	138%	138%	503
Non-expanders						
Florida	56%	0%	943	36%	0%	1,014
Wisconsin	200%**	0%	440	100%	100%	457

Source: MACStats March 2014 and June 2015, and Kaiser Family Foundation, 2015.
* Arizona expanded coverage in 2000, but capped beginning in July 2011 to 252,000 childless adults. The expansion enrolled additional 63,000 childless adults. (Kaiser Family Foundation, 2015)
** Wisconsin expanded coverage 2009, but capped enrollment in 2010 at 50,627 adults, slowly decreasing enrollment to 17,791 by 2013. (Kaiser Family Foundation, 2014)

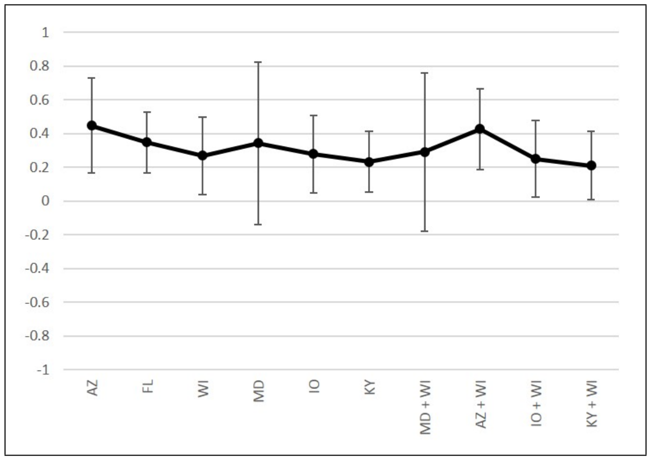


(a) Procedures

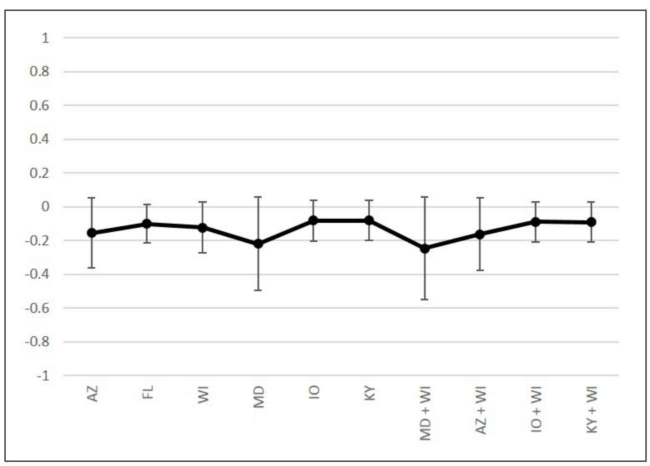


(b) Diagnoses

Figure 4: Event Study.[12]



(a) Procedures



(b) Diagnoses

Figure 5: Coefficient stability with leave-one-out state estimates.[13]

Table 2: Data characteristics by expansion status

	Before		After	
	Non-Expanding Mean (Std. Dev.)	Expanding Mean (Std. Dev.)	Non-Expanding Mean (Std. Dev.)	Expanding Mean (Std. Dev.)
Age	38.14 (12.87)	38.02 (9.16)	38.33 (12.89)	38.16 (9.34)
Female	.61 (.48)	.58 (.49)	.61 (.49)	.58 (.49)
Black	.25 (.43)	.27 (.45)	.26 (.43)	.25 (.43)
Hispanic	.17 (.37)	.11 (.31)	.17 (.37)	.11 (.31)
Primary Payer				
Medicaid	.27 (.44)	.28 (.45)	.28 (.44)	.37 (.48)
Private	.29 (.45)	.33 (.47)	.32 (.46)	.33 (.48)
Medicare	.08 (.28)	.12 (.33)	.09 (.28)	.13 (.33)
Self Pay	.27 (.45)	.19 (.40)	.24 (.42)	.12 (.32)
Procedures	6.86 (6.12)	6.83 (6.24)	6.96 (6.16)	7.01 (6.36)
Diagnoses	2.88 (2.17)	3.42 (2.92)	3.06 (2.26)	3.58 (3.11)
Charlson Index	.18 (.56)	.25 (.64)	.20 (.59)	.26 (.68)
ED Visit Complexity				
Level 1	.05 (.21)	.45 (.49)	.04 (.20)	.43 (.49)
Level 2	.10 (.30)	.12 (.32)	.10 (.29)	.11 (.31)
Level 3	.34 (.47)	.35 (.47)	.34 (.47)	.35 (.48)
Level 4	.33 (.47)	.31 (.46)	.34 (.47)	.32 (.46)
Level 5	.09 (.29)	.12 (.32)	.10 (.30)	.12 (.32)
Obs.	5,055,419	4,123,448	5,409,621	4,284,256

Source: SEDD 2013-2014.

ED visit level determined according to the following CPT codes: Level 2 (CPT 99282) requires expanded problem focused history, expanded problem focused examination, and medical decision making of low complexity; Level 3 (CPT 99283) requires expanded problem focused history, expanded problem focused examination, and medical decision making of moderate complexity; Level 4 (CPT 99284) requires a detailed history, a detailed examination, and medical decision making of moderate complexity; Level 5 (CPT 99285) within the constraints imposed by the urgency of the patient's clinical condition and/or mental status, requires a comprehensive history, a comprehensive examination, and medical decision making of high complexity.

ED Levels are not mutually exclusive in our data. While non-expanding states generally assign a single level of complexity to visits, expanding states, in particular, assign multiple complexity levels. Thus, the proportion of complexity levels does not sum to one for expanding states.

The Charlson Comorbidity Index predicts the risk of death within 1 year of hospitalization of patients with one of 22 comorbid conditions. Each condition is assigned a weight from 1 to 6 based on the estimated 1-year mortality hazard ratio from a Cox proportional hazards model. These weights are summed to produce the Charlson comorbidity score.

Table 3: Difference-in-Differences Estimation: ED Analysis

		Visits				Charges			
		Medicaid	Private	Medicare	Self-pay	Medicaid	Private	Medicare	Self-pay
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Marg./se	Marg./se	Marg./se	Marg./se	Marg./se	Marg./se	Marg./se	Marg./se
(a)	After	.014*	.016***	–.003	–.024***	.010*	.015***	.000	–.023***
		(.005)	(.004)	(.002)	(.005)	(.005)	(.004)	(.003)	(.004)
(b)	Expand*After	.069***	–.018***	–.004	–.036***	.071***	–.018***	–.007	–.036***
		(.005)	(.003)	(.002)	(.004)	(.005)	(.002)	(.004)	(.003)
	Dep. Var. Mean	.301	.281	.228	.139	.228	.290	.312	.123
	Hosp. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	N	1392	1392	1392	1392	1392	1392	1392	1392
	F-statistic	88.48	13.61	13.16	103.93	95.26	16.51	8.86	107.63

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$
Source: SEDD 2013-2014
Dependent variables are: share of ED visits by primary payer type; share of ED charges by primary payer type. Primary payer types are Medicaid, private, Medicare, and self-pay.
ED characteristics include gender ratio, average patient age, average rate of poverty in patient zip codes, average rate of minority in patient zip codes, average median income in patient zip codes, average unemployment in patient zip code.
Standard errors clustered at ED level.

Table 4: Difference-in-differences estimates: All states, all patients

		Procedures	Diagnoses	Em/Not Prev	Em/Prev.	Em/PC Treat.	Non-Emergent
		(1)	(2)	(3)	(4)	(5)	(6)
		Marg./se	Marg./se	Marg./se	Marg./se	Marg./se	Marg./se
(a)	After	–.056	.167***	.0012	–.0005	.0006	.0023*
		(.036)	(.023)	(.0007)	(.0006)	(.0014)	(.0011)
(b)	Expand*After	.275*	–.098	.0037*	.0003	.0015	–.0031
		(.129)	(.089)	(.0018)	(.0005)	(.0013)	(.0025)
	Indiv. FE	No	No	No	No	No	No
	Hosp. FE	Yes	Yes	Yes	Yes	Yes	Yes
	Indiv. and Zip Controls	Yes	Yes	Yes	Yes	Yes	Yes
	Dep. Var. Mean	6.923	3.212	.13	.05	.22	.23
	N	18872744	18872744	18872744	18872744	18872744	18872744
	R^2	.24	.23	.02	.04	.02	.05

*** p < 0.001, ** p< 0.01 , * p< 0.05

Source: SEDD 2013-2014

Dependent variables are: total number of procedures performed, total number of diagnoses on record, and visit classification by type. Estimation for number of procedures includes control for number of diagnoses. Using Billings et al. (2000) classification of ED visits, the categories are: Em/Not Prev. - Emergent/ED Care Needed/Not Preventable/Avoidable - Emergency department care was required and ambulatory care treatment could not have prevented the condition; Em/Prev. - Emergent/ED Care Needed/Preventable/Avoidable - Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness; Em/PC Treat. - Emergent/Primary Care Treatable - Based on information in the record, treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting; Non-Emergent - The patient's initial complain, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours.

Individual and zip controls include age, gender, race, characteristics of population in patient zip code of residence (share of Medicare population, share of female heads of household in poverty, share of poverty, median income, maximum unemployment rate over the previous 12 months), the diagnostic category, hospital level Medicaid ratio, hospital fixed effects.

Standard errors are bootstrapped clustered at state level.

Table 5: ED Visit Complexity: all states, all patients

		ED Level 1	ED Level 2	ED Level 3	ED Level 4	ED Level 5
		(1)	(2)	(3)	(4)	(5)
		Marg./se	Marg./se	Marg./se	Marg./se	Marg./se
(a)	After	–.0032	–.0059*	–.0015	.0103**	.0058**
		(.0022)	(.0023)	(.0037)	(.0030)	(.0020)
(b)	Expand*After	.0029	–.0081	–.0037	–.0036	.0032
		(.0030)	(.0057)	(.0081)	(.0087)	(.0039)
	Indiv. FE	No	No	No	No	No
	Hosp. FE	Yes	Yes	Yes	Yes	Yes
	Indiv. and Zip Controls	Yes	Yes	Yes	Yes	Yes
	Dep. Var. Mean	.20	.11	.36	.32	.11
	N	21589033	21589033	21589033	21589033	21589033
	R^2	.81	.07	.04	.05	.07

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$
Source: SEDD 2013-2014
ED visit level determined according to the following CPT codes: Level 2 (CPT 99282) requires expanded problem focused history, expanded problem focused examination, and medical decision making of low complexity; Level 3 (CPT 99283) requires expanded problem focused history, expanded problem focused examination, and medical decision making of moderate complexity; Level 4 (CPT 99284) requires a detailed history, a detailed examination, and medical decision making of moderate complexity; Level 5 (CPT 99285) within the constraints imposed by the urgency of the patient's clinical condition and/or mental status, requires a comprehensive history, a comprehensive examination, and medical decision making of high complexity.
Individual and zip controls include age, gender, race, characteristics of population in patient zip code of residence (share of Medicare population, share of female heads of household in poverty, share of poverty, median income, maximum unemployment rate over the previous 12 months), the diagnostic category, hospital level Medicaid ratio, hospital fixed effects.
Standard errors are bootstrapped clustered at state level.

Table 6: Difference-in-differences estimates: tracked visits in four states, all patients

		Procedures	Diagnoses	Em/Not Prev	Em/Prev.	Em/PC Treat.	Non-Emergent
		(1)	(2)	(3)	(4)	(5)	(6)
		Marg./se	Marg./se	Marg./se	Marg./se	Marg./se	Marg./se
(a)	After	–.076***	.146***	.0001	–.0001	.0009	.0020*
		(.013)	(.005)	(.0005)	(.0003)	(.0006)	(.0008)
(b)	Expand*After	.192***	.015**	–.0002	–.0002	–.0042***	–.0007
		(.013)	(.005)	(.0004)	(.0003)	(.0005)	(.0006)
	Indiv. FE	Yes	Yes	Yes	Yes	Yes	Yes
	Hosp. FE	Yes	Yes	Yes	Yes	Yes	Yes
	Indiv. and Zip Controls	Yes	Yes	Yes	Yes	Yes	Yes
	Dep. Var. Mean	6.960	3.051	.13	.05	.22	.23
	N	14714515	14714515	14714515	14714515	14714515	14714515
	Adj-R^2	.37	.39	.23	.16	.10	.09

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Source: SEDD 2013-2014

Sample limited to visits in four states which allowed tracking of patients across time within the state.

Dependent variables are: total number of procedures performed, total number of diagnoses on record, and visit classification by type. Estimation for number of procedures includes control for number of diagnoses. Using Billings et al. (2000) classification of ED visits, the categories are: Em/Not Prev. - Emergent/ED Care Needed/Not Preventable/Avoidable - Emergency department care was required and ambulatory care treatment could not have prevented the condition; Em/Prev. - Emergent/ED Care Needed/Preventable/Avoidable - Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness; Em/PC Treat. - Emergent/Primary Care Treatable - Based on information in the record, treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting; Non-Emergent - The patient's initial complain, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours.

Individual and zip controls include age, gender, race, characteristics of population in patient zip code of residence (share of Medicare population, share of female heads of household in poverty, share of poverty, median income, maximum unemployment rate over the previous 12 months), the diagnostic category, hospital level Medicaid ratio, individual and hospital fixed effects.

Standard errors clustered at patient level.

Table 7: Difference-in-differences estimates: tracked visits in four states, patients who were uninsured in 2013

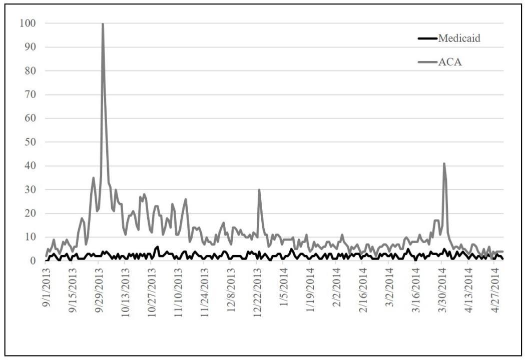
		Procedures	Diagnoses	Em/Not Prev	Em/Prev.	Em/PC Treat.	Non-Emergent
		(1)	(2)	(3)	(4)	(5)	(6)
		Marg./se	Marg./se	Marg./se	Marg./se	Marg./se	Marg./se
(a)	After	–.085**	.105***	.0020*	.0003	.0034*	.0016
		(.026)	(.008)	(.0010)	(.0007)	(.0014)	(.0017)
(b)	Expand*After	.261***	–.028**	.0045***	.0011	.0039**	.0000
		(.028)	(.009)	(.0004)	(.0008)	(.0014)	(.0006)
	Indiv. FE	Yes	Yes	Yes	Yes	Yes	Yes
	Hosp. FE	Yes	Yes	Yes	Yes	Yes	Yes
	Indiv. and Zip Controls	Yes	Yes	Yes	Yes	Yes	Yes
	Dep. Var. Mean	6.193	2.704	.11	.06	.23	.24
	N	2492849	2492849	2492849	2492849	2492849	2492849
	Adj-R^2	.32	.32	.19	.22	.11	.12

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$
Source: SEDD 2013-2014
Sample limited to visits in four states which allowed tracking of patients across time within the state and to patients who were self-paying in 2013.
Dependent variables are: total number of procedures performed, total number of diagnoses on record, and visit classification by type. Estimation for number of procedures includes control for number of diagnoses. Using Billings et al. (2000) classification of ED visits, the categories are: Em/Not Prev. - Emergent/ED Care Needed/Not Preventable/Avoidable - Emergency department care was required and ambulatory care treatment could not have prevented the condition; Em/Prev. - Emergent/ED Care Needed/Preventable/Avoidable - Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness; Em/PC Treat. - Emergent/Primary Care Treatable - Based on information in the record, treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting; Non-Emergent - The patient's initial complain, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours.
Individual and zip controls include age, gender, race, characteristics of population in patient zip code of residence (share of Medicare population, share of female heads of household in poverty, share of poverty, median income, maximum unemployment rate over the previous 12 months), the diagnostic category, hospital level Medicaid ratio, individual and hospital fixed effects.
Standard errors clustered at patient level.

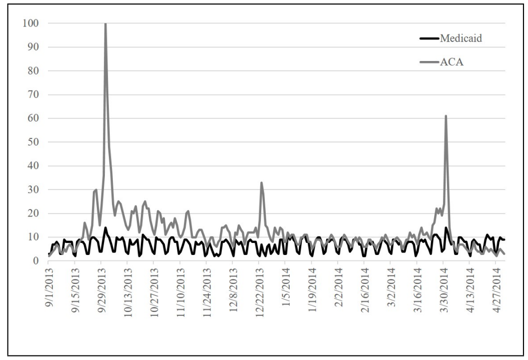
Appendices

A Google Searches

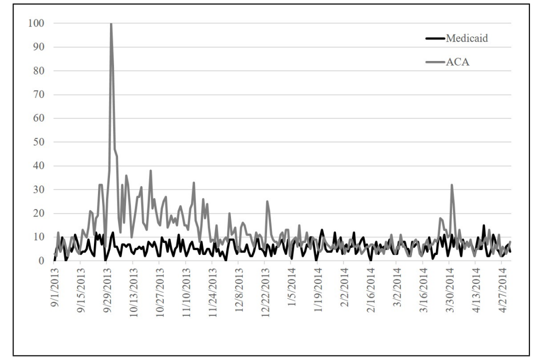
To understand the importance of changing state level Medicaid eligibility requirements compared to the state's decision to opt in or out of the ACA imposed eligibility rules, we explore the prevalence of knowledge about changing Medicaid rules by looking at Google searches for terms "Patient Protection and Affordable Care Act" and "Medicaid. Figure A1 shows the relative number of searches between September 2013 and May 2014 for these two terms. Because the number of searches for ACA is larger, the highest number of searches on that topic set the upper bound for the Google index. Thus, in each state, the largest number of searches for either of these terms occurred on October 1, 2013 for the terms relating to ACA. All other days, as well as all "Medicaid" searches, therefore, are represented relative to that number.



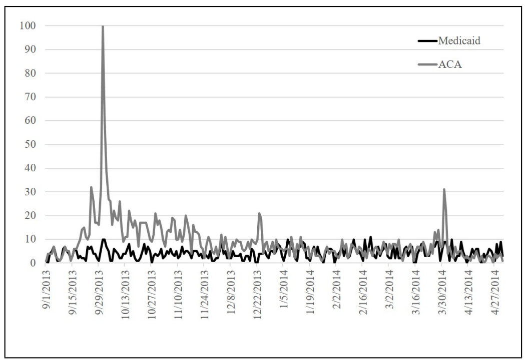
(a) Arizona



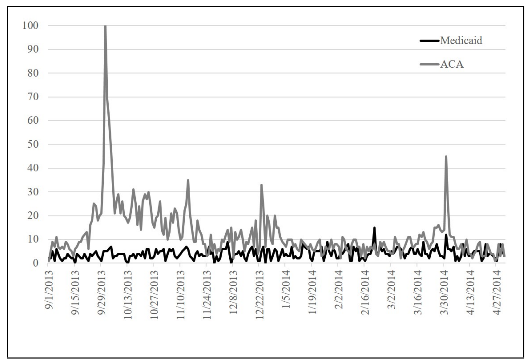
(b) Florida



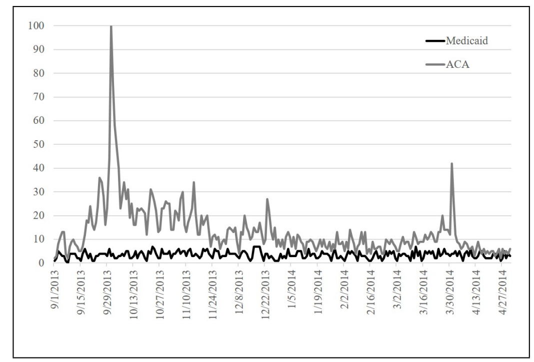
(c) Iowa



(d) Kentucky



(e) Maryland



(f) Wisconsin

Figure A1: Google Searches in Sample States Between September 2013 and May 2015[14]

[14]Source: Google Trends 2013-2014. The ACA line represents the number of searches in the geographic area relative to the highest daily number of searches during the specified time period. The Medicaid line represents the number of searches in the geographic area relative to the highest daily number of ACA searches during the specified time period.

B Sample Characteristics

In part of our analysis, we limit the sample to states which allow us to track patients across time within the state. Table A1 summarizes the characteristics of patients in the sample. Patients in these states are very similar to those in the entire sample. Women make up the majority of patients, more so in non-expanding states. Racial and ethnic differences among expanding and non-expanding states persist through 2013 and 2014. As before, expanding states see a large increase in Medicaid insured patients in 2014, while non-expanding states experience a modest increase in privately insured patients. Both expanding and non-expanding states see a 4 percentage point decrease in self-paying patients.

As noted in the main text, expanding states do not code visit complexity level exclusively, resulting in a substantial overlap between Level 1 and other levels. This is more pronounced in this current subsample. Over 76% of all visits are categorized as Level 1 visits in expanding states in addition to other levels. This practice, however, does not change in 2014 and, therefore, should not pose a challenge to our identification.

Table A2 describes sample characteristics for subsample of patients who were self-paying in 2013. This sample is predominantly male, and somewhat younger than other samples. In 2014, in expanding states 46% of these patients enrolled in Medicaid, while in non-expanding states only 20% enrolled in the program. 13% of these patients, in both expanding and non-expanding states enrolled in a private health insurance plan. The majority of these patients in non-expanding states remained self-paying.

Overall, these patients appear to be in better health, with a Charlson score lower than the overall sample in both expanding and non-expanding states. While these patients have fewer Level 5 visits, they have a greater share of Level 3 visits compared to the total sample.

Table A1: Sample characteristics: tracked patients

	Before		After	
	Non-Expanding Mean (Std. Dev.)	Expanding Mean (Std. Dev.)	Non-Expanding Mean (Std. Dev.)	Expanding Mean (Std. Dev.)
Age	38.22 (12.90)	37.76 (5.02)	38.41 (12.92)	37.79 (5.06)
Female	.61 (.48)	.57 (.49)	.61 (.48)	.57 (.49)
Black	.26 (.43)	.37 (.48)	.26 (.44)	.35 (.47)
Hispanic	.15 (.36)	.05 (.21)	.16 (.37)	.05 (.22)
Primary Payer				
Medicaid	.27 (.44)	.30 (.46)	.28 (.45)	.36 (.48)
Private	.29 (.45)	.35 (.47)	.32 (.46)	.37 (.47)
Medicare	.08 (.28)	.14 (.34)	.09 (.28)	.15 (.35)
Self Pay	.27 (.44)	.15 (.36)	.23 (.28)	.11 (.31)
Procedures	6.86 (6.12)	6.95 (6.74)	6.95 (6.16)	7.18 (6.96)
Diagnoses	2.88 (2.17)	3.12 (2.71)	3.07 (2.26)	3.24 (2.91)
Charlson Index	.18 (.56)	.23 (.63)	.20 (.59)	.25 (.66)
ED Visit Complexity				
Level 1	.05 (.21)	.76 (.42)	.04 (.20)	.76 (.42)
Level 2	.10 (.30)	.13 (.34)	.09 (.29)	.12 (.32)
Level 3	.34 (.47)	.37 (.48)	.34 (.47)	.37 (.48)
Level 4	.33 (.47)	.32 (.46)	.34 (.47)	.33 (.47)
Level 5	.09 (.29)	.13 (.34)	.10 (.30)	.14 (.34)
Obs.	4,851,442	2,338,051	5,161,213	2,363,809
Patients	2,780,838	1,417,014	2,896,432	1,423,921

Source: SEDD 2013-2014.

ED visit level determined according to the following CPT codes: Level 2 (CPT 99282) requires expanded problem focused history, expanded problem focused examination, and medical decision making of low complexity; Level 3 (CPT 99283) requires expanded problem focused history, expanded problem focused examination, and medical decision making of moderate complexity; Level 4 (CPT 99284) requires a detailed history, a detailed examination, and medical decision making of moderate complexity; Level 5 (CPT 99285) within the constraints imposed by the urgency of the patient's clinical condition and/or mental status, requires a comprehensive history, a comprehensive examination, and medical decision making of high complexity.

ED Levels are not mutually exclusive in our data. While non-expanding states generally assign a single level of complexity to visits, expanding states, in particular, assign multiple complexity levels. Thus, the proportion of complexity levels does not sum to one for expanding states.

The Charlson Comorbidity Index predicts the risk of death within 1 year of hospitalization of patients with one of 22 comorbid conditions. Each condition is assigned a weight from 1 to 6 based on the estimated 1-year mortality hazard ratio from a Cox proportional hazards model. These weights are summed to produce the Charlson comorbidity score.

Table A2: Sample characteristics: patients who were uninsured in 2013

	Before		After	
	Non-Expanding Mean (Std. Dev.)	Expanding Mean (Std. Dev.)	Non-Expanding Mean (Std. Dev.)	Expanding Mean (Std. Dev.)
Age	38.10 (12.00)	37.10 (5.04)	35.85 (11.63)	37.05 (5.15)
Female	.48 (.49)	.44 (.49)	.53 (.49)	.47 (.49)
Black	.28 (.45)	.39 (.48)	.31 (.46)	.39 (.48)
Hispanic	.16 (.37)	.10 (.30)	.14 (.34)	.06 (.23)
Primary Payer				
Medicaid	.02 (.13)	.03 (.16)	.20 (.40)	.46 (.49)
Private	.01 (.10)	.01 (.11)	.13 (.33)	.13 (.33)
Medicare	.00 (.02)	.00 (.03)	.01 (.09)	.02 (.13)
Self Pay	.93 (.25)	.94 (.24)	.57 (.49)	.36 (.48)
Procedures	6.07 (5.57)	6.13 (5.79)	6.34 (5.73)	6.51 (6.22)
Diagnoses	2.59 (1.85)	2.54 (1.88)	2.92 (2.06)	2.83 (2.22)
Charlson Index	.11 (.39)	.12 (.39)	.16 (.49)	.17 (.49)
ED Visit Complexity				
Level 1	.05 (.22)	.72 (.44)	.04 (.20)	.72 (.44)
Level 2	.12 (.32)	.14 (.34)	.10 (.30)	.12 (.32)
Level 3	.37 (.48)	.40 (.49)	.36 (.48)	.39 (.48)
Level 4	.31 (.46)	.31 (.46)	.33 (.47)	.32 (.47)
Level 5	.08 (.27)	.11 (.31)	.09 (.29)	.13 (.49)
Obs.	1,247,492	326,799	750,135	168,423
Patients	721,115	204,464	315,666	74,072

Source: SEDD 2013-2014.

ED visit level determined according to the following CPT codes: Level 2 (CPT 99282) requires expanded problem focused history, expanded problem focused examination, and medical decision making of low complexity; Level 3 (CPT 99283) requires expanded problem focused history, expanded problem focused examination, and medical decision making of moderate complexity; Level 4 (CPT 99284) requires a detailed history, a detailed examination, and medical decision making of moderate complexity; Level 5 (CPT 99285) within the constraints imposed by the urgency of the patient's clinical condition and/or mental status, requires a comprehensive history, a comprehensive examination, and medical decision making of high complexity.

ED Levels are not mutually exclusive in our data. While non-expanding states generally assign a single level of complexity to visits, expanding states, in particular, assign multiple complexity levels. Thus, the proportion of complexity levels does not sum to one for expanding states.

The Charlson Comorbidity Index predicts the risk of death within 1 year of hospitalization of patients with one of 22 comorbid conditions. Each condition is assigned a weight from 1 to 6 based on the estimated 1-year mortality hazard ratio from a Cox proportional hazards model. These weights are summed to produce the Charlson comorbidity score.

C Additional Robustness Tests

To test the robustness of our estimates, we used propensity score matching to select a sample of visits in non-expanding states comparable to those in expanding states. Computational constraints, however, did not allow us to match the entire sample. To circumvent this challenge, we drew 100 samples of 400,000 observations each, matched them using nearest neighbor matching with trimming on the basis of visit level complexity, gender, age, Charlson comorbidity index, and zip code characteristics in each year separately. Of the 400,000 observations in each sample, fewer than 200,000 observations remained in the matched sample because only two nearest matches were kept for each treated observation. We then used the weights generated by this matching process to estimate the DD model. The resulting coefficient distribution are presented in Table A3. Each column presents a separate specification. For each specification, the mean of the coefficient distribution is reported along with the 95% confidence interval of coefficient values.

Table A3: Difference-in-differences with propensity score matching: all states, all visits

	Procedures	Diagnoses	Em/Not Prev	Em/Prev.	Em/PC Treat.	Non-Emergent
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean Coeff.	Mean Coeff.	Mean Coeff.	Mean Coeff.	Mean Coeff.	Mean Coeff.
	[90% CI]	[90% CI]	[90% CI]	[90% CI]	[90% CI]	[90% CI]
Expand*After	.276	–.089	.0063	–.0016	.0018	–.0030
	[–.57 1.09]	[–.34 .14]	[–.02 .03]	[–.02 .01]	[–.03 .03]	[–.05 .03]
Indiv. FE	No	No	No	No	No	No
Hosp. FE	Yes	Yes	Yes	Yes	Yes	Yes
Indiv. and Zip Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	100x400K	100x400K	100x400K	100x400K	100x400K	100x400K

Source: SEDD 2013-2014

Propensity score matching of 100 samples of 400,000 observations on ED visit complexity level, age, gender, Charlson comorbidity index, and zip code characteristics using two nearest neighbor matching with 10% trim.

Dependent variables are: total number of procedures performed, total number of diagnoses on record, and visit classification by type. Estimation for number of procedures includes control for number of diagnoses. Using Billings et al. (2000) classification of ED visits, the categories are: Em/Not Prev. - Emergent/ED Care Needed/Not Preventable/Avoidable - Emergency department care was required and ambulatory care treatment could not have prevented the condition; Em/Prev. - Emergent/ED Care Needed/Preventable/Avoidable - Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness; Em/PC Treat. - Emergent/Primary Care Treatable - Based on information in the record, treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting; Non-Emergent - The patient's initial complain, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours.

DD specification estimated using matching weights generated by Stata psmatch2 command. All specifications include hospital fixed effects. Standard errors are clustered at hospital level.