Medicaid Expansion, Crowd-Out, and Emergency Department Utilization: Evidence from California's Bridge to Reform Medicaid*

Cameron M. Ellis† Meghan I. Esson‡

January 16, 2019

Abstract

A common policy proposal to address the over-use of emergency departments by the uninsured is expanding public insurance. However, these expansions are not limited to the previously uninsured; crowding-out of private health insurance also occurs. The effect on emergency department utilization following an expansion in public insurance will be largely determined by the makeup of the newly covered population. Consideration of only one avenue will lead to an inaccurate interpretation of how expanding public insurance to the uninsured impacts emergency department utilization by the previously uninsured. Yet, the two streams of current literature – the expansionary and crowding-out avenues – have yet to cross. This paper is an effort to fill that gap. Using the Low Income Health Program (LIHP) and subsequent Affordable Care Act (ACA) Medicaid expansions in California, we examine how the prior insurance status of the newly eligible Medicaid population impacts emergency department usage. Employing hospital-level data from 2006 through 2016, we estimate (1) a binary difference-in-difference model, (2) a continuous treatment difference-in-difference model where our treatment is the number of newly eligible and enrolled in Medicaid, and (3) a continuous difference-in-difference model with two treatment effects: the estimated number of newly enrolled who were previously uninsured vs. those previously privately insured. We find that emergency department visits increased and that this increase is driven entirely by those who crowded-out from their private insurance. The increase in emergency department usage increased healthcare expenditures in California by $429.3 million per year.

JEL Codes: **I13, I18, I38, G22**

Keywords: **Crowd Out, Emergency Departments, Medicaid, Public Insurance**

*The authors would like to thank David Bradford, Jim Carson, David Eckles, Paul Goldsmith-Pinkham, Kimberly Groover, Rong Luo, David Mustard, Sayeh Nikpay, Svetlana Pashchenko, Vincent Pohl, Thomas Quan, Amarendra Sharma, Meghan Skira, Rhet Smith, Justin Sydnor, John Turner, William Vogt, and seminar participants at The Southern Economic Association (Washington DC, November 2016), The International Health Economics Association (Boston, July 2017), The American Risk and Insurance Association (Toronto, August 2017), The Association for Public Policy Analysis and Management (Chicago, November 2017), The Southern Risk and Insurance Association (Nashville, November 2017), The PhD Student Insurance Symposium (Athens, February 2018), The Chinese Economist Society (Athens, April 2018), and The University of Georgia.

†Fox School of Business, Temple University, Cameron.Ellis@temple.edu

‡**Contact Author** Terry College of Business, University of Georgia, mie49386@uga.edu

"I mean, people have access to health care in America. After all, you just go to an emergency room."

– President George W. Bush - 2007

1 Introduction:

Lacking access to other forms of healthcare, the poor and uninsured rely on emergency departments for routine medical care. A common policy proposal to address this over-reliance is expanding public insurance, specifically Medicaid, to reduce the number of uninsured. The thought is the previously uninsured will seek more cost-effective and appropriate care after receiving public insurance.

However, this thought is incomplete. Medicaid expansions are usually not applicable to just the previously uninsured; "crowding-out" of private health insurance also occurs. There are two (potentially competing) effects of expanding the eligibility of public insurance. There is the intended expansionary effect – the change in behavior from consumers going from uninsured to covered by public insurance; but there is also a crowding-out effect – the change in behavior from consumers switching from private insurance to public insurance. To determine whether the expansionary effect works as policymakers intend (i.e. decreasing emergency department utilization), we disentangle the expansionary and crowding-out effects.

In this paper, we examine the impact of the prior insurance status of the newly publicly insured on emergency department usage. Our identification is based on the staggered roll-out of California's Low Income Health Program (LIHP) and subsequent Affordable Care Act Medicaid expansions. Using hospital-level data from 2006 through 2016, we estimate (1) a binary difference-in-difference model, (2) a continuous treatment difference-in-difference model where our treatment is the number of newly eligible and enrolled in Medicaid, and (3) a continuous difference-in-difference model with two treatment effects: the estimated number of newly enrolled who were uninsured vs. those who previously had private insurance. We find that, following the LIHP and ACA Medicaid expansions in California, total emergency department utilization increased. This increase was driven entirely by those who previously had private insurance. The increase in emergency department usage resulted in an increase in healthcare expenditures in California of $429.3 million per year.

A major provision of the ACA was the expansion of the federal minimum Medicaid eligibility from 100% to 138% of the federal poverty line (FPL) and the inclusion of non-disabled, childless adults. To prepare for the ACA Medicaid expansion, California submitted a section 1115 Medicaid Demonstration Waiver titled California's Low Income Health Program (LIHP) which was approved on November 2nd, 2010. Beginning in July 2011, California counties could choose to expand Medicaid ahead of the ACA Medicaid expansion. From 2011 to 2013, the LIHP Medicaid expansion provided health insurance to previously non-Medicaid eligible individuals living at or below 67%, 75%, 100%, 138%, or 200% of the FPL depending on the county of residence (Meng et al., 2012; Golberstein et al., 2015). Beginning in 2014, all counties in California expanded Medicaid to the ACA Medicaid expansion requirements.[1]

The ACA Medicaid expansion was partially intended to address the over-use of emergency departments by the uninsured.[2] However, not all of the new recipients of Medicaid were previously uninsured.[3] An individual's prior insurance status may impact their emergency department utilization after gaining Medicaid.

Specifically, those who crowd-out may increase their reliance on emergency departments for routine care. Many primary care physicians do not accept Medicaid, and those that do are often reluctant to schedule new patients (Kellermann and Weinick, 2012). Thus, consumers moving from private insurance to public insurance (i.e. crowding-out) may be more likely to use emergency departments for non-emergency care. Additionally, cost-sharing is much lower for Medicaid. The median cost of an emergency department visit with private insurance is $1,233, whereas the maximum co-pay for Medi-Cal patients going to the emergency department for non-emergency services is $15 (Caldwell et al., 2013; California Department of Healthcare Services, 2013a,b).[4] Individuals who crowd-out see a 98.8% price decrease for a non-emergency emergency department visit. The

[1]Expanding to the ACA Medicaid requirements of 100% to 138% of the FPL meant that the California counties that expanded only to 67% or 75% of the FPL under the LIHP saw an additional increase in Medicaid eligibility. The counties that expanded to 200% of the FPL under the LIHP saw individuals lose their Medicaid eligibility.

[2]President Obama mentioned this during a speech in 2010. For a full text of the speech, please refer to https://obamawhitehouse.archives.gov/the-press-office/2010/09/22/remarks-president-a-backyard-discussion-health-care-reform-and-patients-

[3]The Oregon Medicaid expansion is a special case as only the previously uninsured were eligible.

[4]Medi-Cal is California's name for Medicaid. Please refer to section 2.3.2 for more information on maximum out of pocket payments for non-emergency visits to the emergency department for Medicaid patients and how the maximum out of pocket payments have developed over time.

price decrease combined with the lower availability of primary care physicians leads us to expect that individuals who crowd-out will utilize the emergency department more.

Conversely, previously uninsured individuals in California actually see an increase in the price of an emergency department visit after receiving Medicaid. Every hospital in California is required to have in place and disclose to all patients their policies for charity care (i.e. free care) and discount payments (i.e. discounted cost of care) for uninsured patients with incomes at or below 350% of the FPL (California Department of Healthcare Services, 2010). In 2014, at least 53% of California emergency departments offered free care to uninsured individuals with incomes 100% to 138% of the FPL, while 100% of emergency departments in California offered some form of financial assistance for uninsured individuals with incomes 100% to 138% of the FPL.[5] The majority of patients who were uninsured and gained Medicaid in California went from free emergency department care to paying a $15 copay for a non-emergency emergency department visit (California Department of Healthcare Services, 2013b). We expect those who were previously uninsured and gained Medicaid to substitute away from emergency department visits (which become more expensive) towards primary care visits (which become cheaper).

Policymakers expand public insurance to the uninsured to decrease emergency department utilization by the uninsured but, in theory, the effect is ambiguous. The extensive margin, use of emergency department vs. other providers, predicts a reduction in emergency department over-usage as the newly insured will have more options for care available to them (Ayanian et al., 2000; Weissman et al., 1991). The intensive margin, quantity of use, predicts an increase in emergency department utilization as those newly insured will consume more healthcare in general (Finkelstein et al., 2012; Hadley and Holahan, 2003).

Empirically, the results are mixed. Anderson et al. (2012) analyze the effect of children becoming ineligible for their parents' health insurance at age 18 ("aging out") and find that the reduction in coverage reduces both hospital and emergency department usage, implying that insurance coverage increases emergency department usage. Nikpay et al. (2017) find the ACA Medicaid expansion

[5]While all hospitals in California are required to have in place and disclose their charity care policies, the historical data is limited in the data on the income thresholds for charity care and discount care. It is important to note that these charity care policies vary by state. California is one of twenty states that have passed such legislation. Oregon does not require emergency departments to offer charity care for the uninsured. Therefore, the previously uninsured who gained Medicaid in Oregon under the Oregon Health Insurance experiment did not see a price increase for an emergency department visit but rather saw a price decrease. For more information concerning California AB 774, please refer to Section 2.3.1.

increased emergency department use by 2.5 visits per 1,000 population in expansion states. Dresden et al. (2017) examine the ACA Medicaid expansion in Illinois and find emergency department visits by adults increased with the increase being driven by visits resulting in discharge from the emergency department. Wherry and Miller (2016) find an increase in overnight hospital stays, physician visits, and rates of diagnosis of diabetes in states that adopted the ACA's Medicaid expansion. Taubman et al. (2014) examine the Oregon Health Insurance Experiment and find that emergency department visits for the previously uninsured increased by 40%. This increase includes a broad range of types of visits including conditions that may be more efficiently treated by a primary care physician.

Miller (2012), who examines the 2006 Massachusetts Health Reform, comes to the opposite conclusion – finding that counties who previously had the highest uninsured levels saw the greatest decrease in emergency department visits. Similarly, Hernandez-Boussard et al. (2014) study emergency department usage in California, New York, and Florida between 2009-2011 and also find a decrease in emergency department usage for young adults following the implementation of the ACA. Similarly, McConville et al. (2018) examine the impact of the ACA Medicaid expansion in California and find that high utilizers of the emergency department (i.e. 4 or more visits annually) visited the emergency department less frequently. Other studies, such as Gingold et al. (2017) and Klein et al. (2017), find no statistically significant impact on emergency department utilization as a result of an insurance expansion.

A stream of literature examining the effect of public health insurance expansions on those already privately insured, coined "crowding-out" by Cutler and Gruber (1996), has developed in parallel to the purely expansionary literature. Cutler and Gruber (1996) use the Medicaid expansion for pregnant women and children from 1987-1992 and find evidence that a significant portion of the increase in Medicaid coverage was successively followed by a reduction in private insurance coverage. Ham and Shore-Sheppard (2005) criticize Cutler and Gruber (1996) for failing to consider insurance coverage as a family decision. When accounting for this, Ham and Shore-Sheppard (2005) find that, though overall take up increases, the crowding out effect was not significant. This indicates that the new insureds in a Medicaid expansion were not previously private market participants.[6] The

[6]For a detailed literature review of the crowding-out literature, please refer to Gruber and Simon (2008).

estimates of the crowding-out rate are consistently positive, but the magnitude varies wildly – ranging from 4% to 60% (Gruber and Simon, 2008).

The effect on emergency department utilization following an expansion in public insurance will be largely determined by the makeup of the newly covered population. Consideration of only one avenue will lead to an inaccurate interpretation of how expanding public insurance to the uninsured impacts emergency department utilization by the previously uninsured. Yet, the two streams of current literature – the expansionary and crowding-out avenues – have yet to cross. This paper is an effort to fill that gap.

This paper contributes to the literature as a connection between the crowd-out and the expansionary literature. Additionally, this paper contributes to the literature examining the efficacy of the Medicaid expansion of the ACA. If a goal of expanding public insurance is to limit emergency department over-utilization (thereby controlling healthcare costs), it is imperative to understand the interaction of expansionary and crowding-out effects.

2 Institutional Details:

2.1 Medicaid and the Affordable Care Act:

In 1965, President Johnson signed into law the Social Security Act Amendment, which established Medicare and Medicaid in the US. Developed as a federal-state partnership program, Medicaid provided public health insurance for low-income children, caretaker relatives, and individuals with disabilities. States that opted into the Medicaid program would receive federal funds for eligible citizens to access a defined set of medical benefits. Prior to the passage of the ACA, non-disabled, childless adults were ineligible for Medicaid, regardless of whether these adults met the income requirements. The ACA filled in this coverage and made the income requirements less restrictive. Specifically, the Medicaid expansion component of the ACA increased the federal minimum Medicaid eligibility from 100% to 138% of the FPL. Additionally, all non-elderly adults meeting this income requirement were Medicaid eligible. The federal government would provide 100% of the funding for these newly eligible adults from 2014 through 2016, 95% of the funding for 2017, 94% for 2018, 93% for 2019, and 90% for 2020 and onward. It is projected that the Medicaid expansion provision of the ACA would increase overall Medicaid enrollment by more

than 20 million. Besides expanding coverage to reduce the number of uninsured, the Medicaid expansion component directly impacted hospitals, and emergency departments in particular, by reducing disproportionate share hospital payments (DSH) by $22.1 billion over the course of five years (American Hospital Association, 2015).

While the Medicaid expansion component was set to take effect in 2014, California, Connecticut, Minnesota, New Jersey, Washington, and the District of Columbia immediately filed section 1115 Medicaid Demonstration waivers to implement the ACA Medicaid expansion early (The Henry J. Kaiser Family Foundation, 2012b; Golberstein et al., 2015). California submitted a section 1115 Medicaid Demonstration waiver titled California's Low Income Health Program (LIHP), also referred to as "California's Bridge to Reform", which was approved on November 2nd, 2010 (The Henry J. Kaiser Family Foundation, 2012a). California's LIHP was set to take effect in July 2011 and contained two components: (1) Health Care Coverage Inititave (HCCI) and (2) Medicaid Coverage Expansion (MCE).

The HHCI provided health insurance to previously non-Medicaid eligible individuals living above 138% through 200% of the FPL. The MCE provided health insurance to previously non-Medicaid eligible individuals living at or below 67%, 75%, 100%, 138%, or 200% of the FPL depending on the county of residence (Meng et al., 2012; Golberstein et al., 2015). At the end of the program, July 31, 2013, individuals enrolled in MCE were transitioned into the Medi-Cal program if they were at or below 138% of the FPL (consistent with Medicaid expansion), and individuals enrolled in HHCI or MCE with incomes above 138% of the FPL were transitioned into the California Health Benefit Exchange (consistent with the ACA individual marketplaces) (Meng et al., 2012; Golberstein et al., 2015). Unlike the ACA Medicaid expansion, counties that chose to participate in the LIHP were required to pay for half the cost of coverage for the newly eligible adults (Harbage and King, 2012). The other half of the cost of coverage was paid through federal funds (Harbage and King, 2012).

Of particular importance to this analysis, the LIHP was not a statewide program but was rolled-out at the county-level – California counties had the option of participating in this demonstration. Of the 58 counties in California, 10 chose to join the demonstration in 2011, 41 additional counties joined in 2012, and 2 additional counties joined in 2013 (Golberstein et al., 2015). The remaining 5 counties did not participate in the LIHP program but expanded Medicaid under the ACA Medicaid

expansion in 2014. Figure 1 has more specific information about the roll-out of the LIHP across California counties.[7]

2.2 Emergency Departments:

An emergency department is a medical treatment facility in a hospital designed for the treatment of acute medical conditions. In 1986, Congress enacted the Emergency Medical Treatment and Labor Act (EMTALA). EMTALA mandates that any Medicare participating hospital screen and stabilize any individual regardless of insurance status or ability to pay. This asymmetric (non-hospitals are unaffected) federal regulation prevents emergency departments from diverting the poor and uninsured to more appropriate – and cost efficient – healthcare providers.[8] Emergency department usage remained steady for two decades following initial implementation but, more recently, the U.S. has seen a striking increase in the use of emergency departments. From 2003-2010, the number of emergency department visits grew by 15.9%, from 113.9 million to 129.8 million, with the majority of the growth occurring between 2008 and 2010 (McCaig and Burt, 2005; NHAMCS, 2011). Unprepared for such a drastic increase in patient volume, emergency departments have become overcrowded with wait times increasing 25% between 2008 to 2010 (Hing and Bhuiya, 2012). Such increases in wait time adversely impact health outcomes, especially for emergency ailments.

Additionally, emergency departments are increasingly being used for non-urgent or semi-urgent care. Of the 136.2 million emergency department visits in 2011, 43.5% of these visits were classified as semi-urgent or non-urgent (NHAMCS, 2011). A stark increase from 2001, where only 25.4% of emergency department visits were classified as semi-urgent or non-urgent (McCaig and Burt, 2005). This increasing reliance on emergency departments for non-emergency care, often by patients who lack access to other medical care, has led to emergency departments becoming the safety-net provider of healthcare.

With the additional role of safety-net provider, emergency departments have enlarged their presence as a healthcare provider. Emergency department volume increased 11.2% between 2007-

[7]For more specific information concerning California's LIHP, please refer to Meng et al. (2012), Gelatt et al. (2014), Harbage and King (2012), and Golberstein et al. (2015).

[8]For more information see the American College of Emergency Physicians EMTALA information page at https://www.acep.org/News-Media-top-banner/EMTALA/.

2010 compared to 4.6% between 2003-2006 (McCaig and Burt, 2005; Pitts et al., 2008; Niska et al., 2010; NHAMCS, 2011). In response to this "crowding crisis," the American College of Emergency Physicians (ACEP) created a task force to identify the cause of emergency department overutilization (Asplin et al., 2008). The ACEP found cause of the crowding crisis to be the poor and uninsured, whose emergency department usage increased from 4.4% between 2003-2006 to 17.2% between 2007-2010.[9]

This overutilization of the emergency department by the uninsured for medical care has caused a financial burden for emergency departments. Unable to afford costly emergency department visits, the bills of the uninsured go unpaid, with uncompensated care costs growing from $24.9 billion in 2003 to $39.3 billion in 2010 (Garthwaite et al., 2015; American Hospital Association, 2014).

Policymakers hypothesize that the expansion of Medicaid will decrease the uninsured rate allowing emergency departments to shift back to the role of an acute medical care provider rather than a safety net. This is particularly true for the ACA. In a speech on September 22, 2010, President Obama highlighted this intention of the ACA stating

> What happens is, you don't have health insurance, you go to the emergency room... We're a lot better off if we are making sure that everybody is getting preventive care, we're encouraging wellness programs where people have access to doctors up front. And that's why we feel pretty confident that over the long term, as a consequence of the Affordable Care Act, premiums are going to be lower than they would be otherwise; health care costs overall are going to be lower than they would be otherwise."[10]

2.3 Price of an Emergency Department Visit:

2.3.1 Uninsured Patients: California Hospital Fair Pricing Policy (AB 774)

On September 29th, 2006, California passed AB 774, which added Hospital Fair Pricing Policies to the California Health and Safety Code for self-pay and underinsured, high cost patients (California Department of Healthcare Services, 2010). Effective January 1st, 2007, AB 774 requires that each licensed general acute care hospital, psychiatric acute hospital, and special hospital in

[9] From the NHAMCS 2003, 2006, 2007 and 2010 Emergency Department Summary Tables.

[10] For a full text of the speech, please refer to https://obamawhitehouse.archives.gov/the-press-office/2010/09/22/remarks-president-a-backyard-discussion-health-care-reform-and-patients-

California have in place written policies for charity care (i.e. free care) and discount payments (i.e. discounted cost of care) for individuals with income at or below 350% of the FPL who are either: (1) uninsured, or (2) underinsured with high medical costs (California Department of Healthcare Services, 2010). Additionally, AB 774 requires that each licensed general acute care hospital, psychiatric acute hospital, and special hospital in California provide written notice of their charity care and discount payments, eligibility information, and contact information where additional information concerning these policies may be acquired (California Department of Healthcare Services, 2010; Hilltop Institute, 2016). AB 774 specifies that the written notice of their charity care and discount payments must (1) be provided to patients who receive emergency or outpatient care (i.e. patients who may be billed but not admitted), and (2) posted in public locations including, the emergency department, billing office, admissions office, and other outpatient settings (California Department of Healthcare Services, 2010). [11]

Under AB 774, each hospital is allowed to determine their eligibility thresholds for charity care and discount payments for the uninsured or underinsured with high medical costs up to 350% of the FPL. Between 2007 to 2014, at least 24.8% to 53% of California emergency departments set their eligibility thresholds such that uninsured individuals between 100% to 138% of the FPL qualified for free care.[12] This means that for 24.8% to 53% of California emergency departments, emergency department visits by those who were uninsured and would become eligible for Medicaid under most of the LIHP expansions and the entirety of the ACA Medicaid expansion were free. For the emergency departments that did not offer full or partial charity care for those uninsured between 100% to 138% of the FPL, these individuals still qualified for discount payments. While the payment discounts vary by emergency department, these patients could expect to receive a 65% to 85% discount.[13] Therefore, all uninsured patients visiting an emergency department in California with incomes between 100% to 138% of the FPL received either free care or highly discounted care prior to becoming eligible for Medicaid. As of 2016, only 20 states had passed legislation similar to

[11] For more information regarding AB 774, please refer to the https://syfphr.oshpd.ca.gov/AboutFairPricingPolicy.aspx. The entire policy can be downloaded at https://oshpd.ca.gov/documents/hid/fairpricing/HSC127400_CharityCarePoliciesSB350.pdf.

[12] For each hospital's charity care and discount payment policy income requirements, please refer to the https://syfphr.oshpd.ca.gov/. Please refer to Figure 2 to see the breakdown of coverage range for individuals between 100% to 138% of the FPL between 2007 and 2014.

[13] These numbers come from the 2005 OSHPD data. For more information please refer to Hhttps://oshpd.ca.gov/HID/Hospital-Fair-Pricing-FAQs.html#Public.

the AB 774 requiring both financial assistance policies and financial assistance policy dissemination (Hilltop Institute, 2016).[14]

2.3.2 Medicaid Patients:

A Medicaid patient is only required to pay out of pocket for visiting an emergency department for non-emergency care if (1) the patient has already been screened to determine that no medical emergency is present; (2) the patient received a referral from the hospital for an appropriate medical provider; (3) the hospital ensured that the patient could be seen by an alternative provider in a timely manner with less cost-sharing; (4) the hospital coordinated scheduling and provided a referral for treatment; and (5) the hospital warned the patient that they may be required to pay a co-payment for services if they continue to be treated at the emergency department (Centers for Medicare & Medicaid Services, 2008). If the Medicaid patient still requests care after all five of those events occur, then the Medicaid patient will be charged cost-sharing (Centers for Medicare & Medicaid Services, 2008).

From 2005 to 2013, the federally restricted maximum out of pocket payments for Medicaid patients between 100% to 138% of the FPL for going to the emergency department for non-emergency services was either a $5.30 deductible, a $7.80 co-pay, or 10% coinsurance (not to exceed 5% of monthly/quarterly income) (The Henry J. Kaiser Family Foundation, 2013). As Figure 3 shows, after 2013 the federally restricted maximum amount a Medicaid patient could be charged for using the emergency department for non-emergency services was $8 (The Henry J. Kaiser Family Foundation, 2013). In California, where our analysis takes place, the maximum charge for a Medicaid patient with income 100% to 138% of the FPL was $5 prior to 2014 (California Department of Healthcare Services, 1991b,a). In 2014, California received a waiver from the Centers for Medicaid and Medicaid Services to charge a maximum $15 copay for non-emergency visits to the emergency department (California Department of Healthcare Services, 2013a,b).

[14] States with financial assistance policies and financial assistance policy dissemination requirements are CA, CO, IL, IN, ME, MD, MA, NH, NM, NY, PA, RI, TX, UT, VA, WA, WV, and WI. For a complete breakdown of state hospital financial assistance policies and financial assistance dissemination policies, please refer to https://hilltopinstitute.org/our-work/hospital-community-benefit/hospital-community-benefit-state-law-profiles/.

3 Data and Methods:

3.1 Data:

To measure emergency department utilization, we use the 2006 to 2016 California Office of Statewide Health Planning and Development (OSHPD) Hospital Utilization data. The OSHPD hospital data provide annual data for each hospital licensed in the state of California including hospital and emergency department location, associated emergency department utilization, and emergency department characteristics, such as number of beds, trauma designation, number of areas in the emergency department that can treat one patient at a time (i.e. EMS station), etc. To measure access to other healthcare providers (i.e. potential substitutes for non-emergency emergency department care), we use the OSHPD Primary Care Clinic Annual Utilization data. The OSHPD Primary Care Clinic Utilization data provide annual data on primary care clinics, including community and free clinics, and specialty clinics. Specifically, the OSHPD Primary Care Clinic Annual Utilization data include the clinic location, type of clinic, services provided, financial data, utilization, and full-time equivalent healthcare provider breakdowns. County unemployment rates come from the Bureau of Labor Statistics (BLS) local area unemployment statistics labor force data by county. The BLS local area labor force data include annual averages of the total labor force, total employed, total unemployed, and unemployment rate for each county in the United States. The county-level poverty rates come from the Small Area Income and Poverty Estimates (SAIPE) based on the American Community Survey (ACS). For a measure of insurance penetration, we use the number of Medicare Advantage beneficiaries, which comes from the Centers for Medicare and Medicaid Services.[15] We use Medicare Advantage beneficiaries as a measure of insurance penetration as Medicare Advantage is run through private insurance companies and the Medicare beneficiaries must opt into a Medicare Advantage Plan (i.e. enroll in Medicare Part C). Therefore, the number of Medicare Advantage beneficiaries provides a measure of private insurance penetration.

To measure insurance enrollment, which we use to estimate the level of crowd-out caused by the LIHP and ACA Medicaid expansion, and for demographic controls, we use the ACS one year

[15] Full Medicare enrollment was only available from 2007 onward, which is why we are restricted to the number of Medicare Advantage beneficiaries.

estimates from 2006 through 2016. The ACS provides annual estimates for insurance enrollment (beginning in 2008), educational attainment, demographic characteristics, etc. for every public use microdata area (PUMA) in the United States.[16] Because our treatment is at the county-level, we calculate values at the PUMA level and crosswalk these values to the county-level, which we can then match to the hospital-level OSHPD data.[17] We only include emergency departments in operation throughout our entire study period of 2006 to 2016. We also exclude emergency departments for which emergency department utilization was equal to zero. This leaves us with a balanced panel of 287 emergency departments from 2006 to 2016.[18]

Table 1 shows the summary statistics of the data pertaining to emergency departments and Table 2 shows the summary statistics for the county controls. Both Tables 1 and 2 contain summary statistics for the full sample, and then broken apart by those years prior to the Medicaid expansion and the years following the Medicaid expansion. Table 1 displays that for the entire sample, the average number of emergency department visits per capita was 0.067 and of these visits, the majority were visits that did not result in admission to the hospital. Additionally, Table 1 indicates that for the entire sample, 22% of emergency departments had some level of trauma designation, only 7.7% were identified as a teaching hospital, the average number of ICU beds was 18.89, and the average number of EMS stations was 21.80.[19] Table 2 shows that the counties in the sample had an average of 109.24 full-time equivalent medical professionals, an average population of 720,530, an average of 28.73% of the population was Hispanic or Latino, and an average of 15.65% of the population was in poverty.

Tables 3 and 4 show the summary statistics of the data pertaining to emergency departments and county controls for those counties that either expanded Medicaid under the LIHP to 100% to 138% of the FPL or only expanded Medicaid under the ACA, respectively.[20] This subsample of the data includes 80.8% of the emergency departments included in the full sample. Table 3 indicates

[16] PUMA is the most detailed geographical area included in the ACS 1-year estimates, which is why we use the PUMA area. For more information about PUMAs please refer to the US Census Bureau Geography.

[17] These data were downloaded from OSHPD Hospital, OSHPD Primary Care Clinic, Medicare Beneficiaries, BLS, SAIPE, ACS Race Tables, Crosswalks, and ACS 1 Year Estimates.

[18] Please note that six counties in California did not have emergency departments in operation from 2006 to 2016. These counties are Alpine, Colusa, Kings, Plumas, Sierra, and Sutter. Since these counties did not have a balanced panel of emergency departments, these counties were not included in this analysis.

[19] EMS station does not include the number of holding or observation beds.

[20] The counties excluded from this subsample are Alameda, Contra Costa, Orange, Ventura, Sacramento, and Tulare.

an average number of emergency department visits per capita of 0.076, and the majority of these emergency department visits did not result in admission to the hospital. Table 3 also shows that the sample of emergency departments operating in counties that only expanded Medicaid 100% to 138% of the FPL had average number of ICU beds of 18.46, an average number of trauma designated facilities of 22.6%, an average number of teaching hospitals of 8.2%, and an average number of EMS stations of 21.07. Table 4 shows that counties that only expanded Medicaid 100% to 138% of the FPL had an average of 99.07 full-time equivalent medical professionals, an average population of 632,030 where an average of 28.16% of that population was Hispanic or Latino, and an average of 15.84% of the population lived in poverty.

3.2 Crowd-out and Expansionary Effects Estimation:

The two variables of interest for this analysis are (1) the number of previously-insured individuals who enroll in Medicaid once they become eligible under the LIHP or ACA Medicaid expansion (i.e. crowding-out effect), and (2) the number of previously uninsured individuals who enroll in Medicaid after becoming eligible under the LIHP or ACA Medicaid expansion (i.e. expansionary effect). Because the ACS is not a panel, we cannot determine an individual's prior insurance status and therefore must estimate the expansionary and crowding-out effects.

Let $PrivCov_i$ be whether or not individual i had private health insurance in the period prior to Medicaid expansion in that county. What we are trying to estimate is $Pr(PrivCov_i = 1|X_i) \;\; i \in e$ for every individual e in the expansion county who is newly eligible for, and enrolled in, Medicaid. We model and estimate this probability through

$$Pr(PrivCov_i = 1|X_i) = F(X_i; \beta) + \epsilon_i, \;\; i \in n$$

Where $F()$ is a random forest classifier; n is the subset of our sample who live in non-expansion county-years and who would have been eligible for Medicaid if they lived in an expansion county-year; and X_n is a vector of control variables including race, education, income, year trends, and several more. The full list of variables is available in Table 5. For robustness, we also run and report all of our analysis using a more traditional probit functional form for $F()$ instead of a random forest.

We then use the estimated $\hat{\beta}$ to predict the probability that individuals in expansion county-years who are newly-eligible for, and enrolled in, Medicaid had private insurance in the most recent non-expansion year. That is, we estimate:

$$\widehat{PrivCov}_e = F(X_e; \hat{\beta})$$

Where e is the subset of our sample that is newly-eligible for, and enrolled in, Medicaid in the expansion county-years. We then use the person-weights for each observation to aggregate up to a county-level number of newly eligible and enrolled Medicaid recipients who would have had private insurance if not for their new found Medicaid eligibility (i.e. crowded-out).

To calculate the total number of newly eligible and enrolled in Medicaid who were previously uninsured (i.e. the expansionary effect) we use the ACS one-year estimates in county-expansion years and subset the data to include individuals who are newly eligible and enrolled in Medicaid.[21] Using the person-weights, we aggregate up to the total number of newly-eligible and enrolled in Medicaid in a county (i.e. the total effect of the expansion). We then subtract the crowding-out effect from the total effect which gives the expansionary effect.[22]

Popular in machine learning, random forests are an ensemble learning method most commonly used for classification problems. Developed to correct for the over-fitting inherent in single decision trees, random forests operate by constructing a multitude of decision trees via bootstrapping and then using the mean prediction.[23] The gap between econometrics and machine learning is largely one of predictive power vs. interpretability. The most popular methods in machine learning, such as random forests and neural networks, are often referred to as "black box" algorithms. This moniker references the difficulty in interpretation of the estimated parameters (when they exist) relative to the linear (in some way) methods pervasive in econometrics. However, the cost of opacity buys an increase in predictive power which, when leveraged properly, is extremely useful. For

[21] While there is no single variable in the ACS to identify an individual as newly eligible and enrolled in the Medicaid expansion, we are able to determine whether an individual is newly eligible and enrolled in Medicaid by examining (1) their income level, (2) their age, (3) whether or not they have children, and (4) whether they have Medicaid. For example, for the ACA expansion if we see a non-disabled childless adult living within 100% to 138% of the FPL who has Medicaid, we know that this individual is newly eligible for and enrolled in Medicaid.

[22] The ACS data is at the PUMA level and not the county-level. This would create difficulties for our estimates if multiple counties that are located in a single PUMA expanded Medicaid at different times. However, for the few PUMAs that cover multiple counties in California, all of the counties expanded Medicaid at the same time.

[23] See Breiman (2001) for a discussion of random forest predictors.

instance, Belloni et al. (2012) use the LASSO estimator to allow for non-linearity in the estimation of treatment effects in sparse models; Wager and Athey (2015) discuss the use of random forests to estimate models with heterogeneous treatment effects.

We choose the random forest method as our preferred specification, as opposed to a traditional probit, a neural net, or a LASSO, based on an out of sample cross validation test. For this test, we use the same method described above on the sample of consumers from 139% to 400% of the FPL. These individuals do not become eligible for Medicaid and thus we can use them to test each method's predictive power. The results are in Table 6. The random forest method has both the smallest mean squared error in prediction as well as the smallest bias.[24]

A good general rule, and one this paper follows, is to use more traditional econometric techniques when interpretability and an unbiased estimator are required, such as determining the effect of multiple continuous treatment variables, and to use machine learning techniques where prediction is the dominant requisite, such as in deriving estimated regressors.

Table 7 shows the random forest estimates of the average crowding-out and expansionary effects as (1) the average total number of individuals per county, and (2) the average percent of the total effect per county by year. The average crowding-out effect as a percent of the total effect is approximately 34.78% per county across the years, which is well within the ranges found in the literature. The average expansionary effect as a percent of the total effect is approximately 65.21% per county across the years. Figures 4 through 9 show the ranges and heterogeneity of the crowding-out and expansionary effects across counties and years of expansion.

Table 8 displays the probit estimates of the average crowding-out and expansionary effects as (1) the average total number of individuals per county, and (2) the average percent of the total effect per county by year. The average crowding-out effect as a percent of the total effect using the probit estimation is 38.16% per county across the years, which is a larger estimate than the random forest estimate but still within the ranges found in the literature. The average expansionary effect as a percent of the total effect per county from 2011 to 2016 is roughly 61.84%.

While high, our estimates of the crowding-out effect are well within the literature, with estimates ranging between 4% to 60%. Additionally, the ACS shows that prior to the Medicaid expansion in California, 64% of the individuals who would become eligible for Medicaid had private insurance.

[24] The constant negative bias across all methods is due to the implementation of the exchanges.

Following the Medicaid expansion, only 42% of those who were eligible for Medicaid had private insurance. These numbers imply a 34.37% decrease in private insurance coverage, which is very close to our average crowding-out effect per county between 2011 to 2016 using the random forest estimator.[25]

To compare our ACS estimates of those who were newly eligible and enrolled in the ACA Medicaid expansion in California to the enrollment numbers in California, we use the California Department of Health Care Services Statewide Medi-Cal Certified Eligible Individuals data from 2014 through 2016.[26] The California Statewide Medi-Cal Certified Eligible Individuals data detail the annual Medicaid enrollment numbers in California by aid code. The aid codes include a breakdown of codes for those enrolled through the ACA Medicaid expansion. Table 9 shows that we underestimate the number of newly eligible and enrolled in the ACA Medicaid expansion on average 22.79% from 2014 through 2016.[27]

3.3 Model:

Our first specification is a difference-in-difference estimation of emergency department volume per capita for emergency department i in county j in year t:

$$EDVisitsPerCap_{ijt} = \beta_0 + \beta_1 TreatmentEffect_{jt} + \beta_2 X_{ijt} + \alpha_i + \delta_t + C_j \times t + \epsilon_{ijt} \quad (1)$$

Where $TreatmentEffect_{jt}$ is a dummy variable equal to one if county j has expanded Medicaid by year t. X_{ijt} is a vector of demographic and emergency department controls including the percent of the population in poverty, the population that is Hispanic or Latino, the total population, the number full-time equivalent relevant healthcare providers, the number of Medicare Advantage

[25] The high crowd-out estimates shown in Tables 7 and 8 are also not surprising given the individuals targeted in the LIHP and ACA Medicaid expansion. Specifically, individuals eligible for the Medicaid expansion are childless adults. Given that children are not a factor in their insurance decisions, these individuals may be more likely to switch insurance.

[26] The Statewide Medi-Cal Certified Eligible Individuals by Aid Code can be downloaded at https://data.chhs.ca.gov/dataset/statewide-medi-cal-certified-eligible-individuals-by-aid-code-2013-2017. This data is only available for the ACA Medicaid expansion.

[27] Underestimating the number of Medicaid enrollees is one of the limitations of the ACS, which historically has underestimated the number of Medicaid recipients.

beneficiaries, the number of Intensive Care Unit (ICU) beds, number of EMS stations, a dummy indicating whether the hospital is a teaching hospital, and a dummy indicating whether the emergency department is a trauma designated facility of any level.[28] α_i is an emergency department fixed effect. δ_t is a year fixed effect. $C_j \times t$ are county specific linear time trends that absorb pre-existing county trends in emergency department utilization. The identification derives from the heterogeneity across California's counties for the roll-out of the LIHP and subsequent ACA Medicaid expansions. If the newly insured seek more appropriate care, as the policy intended, then counties that expanded Medicaid should see a decrease in emergency department utilization relative to counties that did not expand Medicaid (i.e. $\beta_1 < 0$). However, if it is difficult for new Medicaid patients to see healthcare providers or if consumers are sticky in their healthcare habits (i.e. patients like going to the emergency department), then counties that expanded Medicaid should see an increase in emergency department utilization relative to counties that did not expand Medicaid (i.e. $\beta_1 > 0$).

Given the heterogeneity in the roll-out LIHP Medicaid expansion and subsequent ACA Medicaid expansion in California, it is important to consider how the difference in the timing of the treatment impacts the interpretation of β_1 in equation 1. Under a traditional difference-in-difference framework, β_1 can be interpreted as the average treatment effect on the treated. When the timing of treatment varies, as it does with Medicaid expansion in California, β_1 represents the weighted average of all possible two by two difference-in-difference estimators, where the weight is determined by both the group size and the variance of the treatment dummy (Goodman-Bacon, 2018). Specifically, β_1 of equation 1 represents the variance-weighted average treatment effect on the treated, where the treatment variance is highest for groups treated in the middle of the roll-out and lowest for early and late adopters (Goodman-Bacon, 2018).

Utilizing the total number of newly eligible and enrolled, we then estimate a continuous treatment difference-in-difference for emergency department volume per capita for emergency department i in county j in year t:

[28] The number of relevant full-time healthcare providers means the number of full-time equivalent healthcare providers excluding dentists, dental assistants, social workers, and psychiatrists.

$$EDVisitsPerCap_{ijt} = \beta_0 + \beta_1 TotalEffect_{jt} + \beta_2 X_{ijt} + \alpha_i + \delta_t + C_j \times t + \epsilon_{ijt} \quad (2)$$

Where $TotalEffect_{jt}$ is the total number of individuals newly eligible and enrolled in the LIHP or ACA Medicaid expansion in county j at year t per capita. All other variables are identically defined as in equation 1. If the newly enrolled in Medicaid seek more appropriate care, as the ACA intended, then counties with a larger total number of newly eligible and enrolled in the LIHP or ACA Medicaid expansion should see a larger decrease in emergency department utilization (i.e. $\beta_1 < 0$). However, if other healthcare providers are not accepting new Medicaid patients or consumers are reluctant to change their healthcare habits, then counties with a larger number of individuals enrolled in the LIHP or ACA Medicaid expansion should see a larger increase in emergency department utilization (i.e. $\beta_1 > 0$).

To determine the true impact of expanding insurance to the uninsured on emergency department utilization, our main specification is a double treatment continuous difference-in-difference estimation of emergency department volume per capita for emergency department i in county j in year t:

$$\begin{aligned} EDVisitsPerCap_{ijt} = \beta_0 + \beta_1 ExpansionaryEffect_{jt} + \beta_2 X_{ijt} \\ + \beta_3 CrowdOutEffect_{jt} + \alpha_i + \delta_t + C_j \times t + \epsilon_{ijt} \end{aligned} \quad (3)$$

Where $ExpansionaryEffect_{jt}$ is the number of previously uninsured (measured using the random forest or probit estimation) per capita in county j who were eligible for and enrolled in the LIHP or ACA Medicaid expansion in year t. $CrowdOutEffect_{jt}$ is the number of previously privately insured (measured using the random forest or probit estimation) per capita in county j who were eligible for and enrolled in the LIHP or ACA Medicaid expansion in year t. All other variables are identically defined as in equation 1. Equation 3 is our main specification as it distinguishes between the expansionary and crowding-out effects. This specification allows us to identify the

two (potentially competing) effects of expanding public insurance to the uninsured and privately-insured. If the expansionary effect works as intended as a public policy (i.e. allows access to other healthcare providers), then the counties with a higher number of previously uninsured per capita who were eligible for and enrolled in Medicaid should see a decrease in emergency department volume (i.e. $\beta_1 < 0$). If healthcare providers do not accept new Medicaid patients or consumers are sticky in their healthcare habits, then counties with a higher number of previously uninsured per capita who were eligible for and enrolled in Medicaid should see an increase in emergency department volume (i.e. $\beta_1 > 0$).

An issue with this two-step model is we have a generated regressor in the second step which leads to problems estimating the standard errors. The solution is non-trivial. Traditionally, this is solved by either bootstrapping the data and running both steps of the estimation procedure (Wooldridge, 2010) or by using the Murphy-Topel correction (Murphy and Topel, 2002). Neither of these methods work in our case. The Murphy-Topel correction does not work because it relies on partial derivatives of the likelihood function from the first step which our preferred specification, the random forest, does not have. Direct bootstrapping does not work because we use different data sets in each step of our estimation procedure. If we were to bootstrap the ACS data in the first step and then run the entire model, then we would be unable to account for any clustering (at the county level, where our treatment is assigned) in our second stage. Instead, we develop a two-step bootstrap procedure. For the first step, we bootstrap the ACS and perform the first part of our estimation to create a distribution of predicted crowd-out and expansionary effects at the county-year level. For the second step, we block bootstrap the OSHPD at the county level and then, for each hospital-year observation, we randomly draw predicted crowd-out and expansionary effects from the county-year distribution created in the first step. This procedure accounts for both generated regressor issues as well as clustering issues.

The total impact on emergency department utilization will also depend on the change in emergency department utilization from those who forgo their private insurance and enroll in Medicaid when they become eligible (i.e. the crowd-out effect). The crowd-out effect can have a significant positive or negative effect on emergency department utilization, which could enhance or overshadow the expansionary effect. If individuals "crowded-out" because their private insurance was too expensive for preventative care, then by switching to Medicaid these individuals will not need to rely

as heavily on the emergency department. That is, if those who crowded-out have better access to other healthcare providers with Medicaid than their previous private insurance, then counties with a higher number of previously privately insured per capita who were eligible for and enrolled in Medicaid (i.e. a higher crowd-out effect) should see a decrease in emergency department volume (i.e. $\beta_3 < 0$). If healthcare providers do not accept new Medicaid patients, then individuals who drop their private insurance and enroll in Medicaid may lose access to their primary care physician. Unable to access their primary care physician, individuals who crowded-out may be forced to rely on the emergency department for care. This implies that counties with a higher level of crowd-out per capita should see an increase in emergency department volume (i.e. $\beta_3 > 0$).

Individuals who drop their private insurance and enroll in Medicaid when becoming eligible may visit the emergency department more frequently due to the price change of an emergency department visit. The median cost of an emergency room visit with private insurance is $1,233 (Caldwell et al., 2013). The maximum co-pay for Medi-Cal patients going to the emergency department for non-emergency services prior to 2014 was $5 and was $15 from 2014 onward (California Department of Healthcare Services, 1991b; The Henry J. Kaiser Family Foundation, 2013; California Department of Healthcare Services, 2013b). The law of demand tells us that as price decreases, quantity demanded increases. Thus, the drastic decrease in the price of an emergency department visit for those who switch from private insurance to Medicaid implies that an individual who crowded-out should visit the emergency department more frequently. If individuals who crowd-out respond to the price decrease of an emergency department visit according to classic demand theory, then counties with a higher level of crowd-out per capita should see an increase in emergency department volume (i.e. $\beta_3 > 0$).

Failing to separate out the expansionary and crowding-out effects will yield to inaccurate estimates for examining whether expanding public insurance to the uninsured works as policymakers intended by decreasing unnecessary emergency department utilization. If the crowd-out effect and expansionary effect impact emergency department utilization in the same direction, failing to separate out these effects will lead to policymakers overstating the harm or benefit to emergency departments of expanding public insurance to the uninsured. That is, if the crowd-out effect and the expansionary effect both increase emergency department utilization, failing to separate out these effects will result in estimates that overstate the harm to emergency departments of expand-

ing public insurance to the uninsured. Alternatively, if the expansionary and crowd-out effects both decrease emergency department utilization, failing to separate out these effects will result in estimates that overstate the benefit of expanding public insurance to the uninsured.

If the expansionary and crowd-out effects work in opposite directions, failing to separate out these effects will also lead to misleading estimates for examining whether expanding public insurance to the uninsured decreases emergency department utilization, as policymakers intended. For example, if the crowd-out effect increases emergency department utilization by more than the expansionary effect decreases emergency department utilization, failing to separate out the expansionary and crowd-out effects would lead policymakers to inaccurately conclude that expanding public insurance to the uninsured increases emergency department utilization. By separating out the expansionary and crowd-out effects, policymakers would accurately conclude that public insurance subsidizing private insurance increases emergency department utilization while expanding public insurance to the uninsured works as policymakers intended. Alternatively, if the crowd-out effect decreases emergency department utilization by more than the expansionary effect increases emergency department utilization, failing to separate out the expansionary and crowd-out effects would lead policymakers to inaccurately conclude that expanding public insurance to the uninsured decreases emergency department utilization.

Overstating the harm or benefit of expanding public insurance to the uninsured could lead to suboptimal policy decisions regarding expanding public insurance to the uninsured. To accurately determine how expanding public insurance to the uninsured, and consequentially how public insurance subsidizing private insurance, impacts emergency department utilization, equation 3 is our main specification.

4 Results:

Table 10 shows the results for the difference-in-difference estimations of equations 1 through 3. Column (1) of Table 10 shows the results of equation 1, Column (2) shows the results of equation 2, and Columns (3) and (4) show the results of equation 3 with the random forest and probit estimates of the crowding-out and expansionary effects, respectively. Columns (1) and (2) of Table 10 show that the LIHP and ACA Medicaid expansions increase emergency department visits per

capita. Specifically, Column (1) of Table 10 indicates that expanding Medicaid increased annual emergency department visits per capita by 0.003 relative to counties that did not expand Medicaid. This is roughly a 4.48% increase in emergency department utilization per capita relative to the average utilization. Column (2) of Table 10 shows that for each additional individual enrolled in the Medicaid expansion per capita increases annual emergency department visits per capita by 0.124, which is an increase of roughly 1.06 standard deviations. The positive results of Columns (1) and (2) of Table 10 are statistically significant at the 1% level. These results complement the findings of Nikpay et al. (2017), which found that the ACA Medicaid expansion increased use of the emergency department by 2.5 more visits per 1,000 of the population relative to non-expansion states. The positive results of Columns (1) and (2) of Table 10 indicate that the proposed solution of decreasing emergency department utilization by expanding public insurance to the uninsured is ineffective. Rather, the results of Columns (1) and (2) of Table 10 suggest that the expansion of public insurance exacerbates the crowding crisis by increasing emergency department volume per capita.

The results of Columns (1) and (2) of Table 10 are the incorrect estimates for determining how expanding public insurance to the uninsured alters emergency department utilization. To answer this, we must disentangle the effect on emergency department utilization of expanding public insurance to the previously uninsured and the previously privately insured. Columns (3) and (4) of Table 10 separate out the expansionary and crowding-out effects and provide insight on which type of new Medicaid recipient, the previously uninsured or privately insured, drives the increase in emergency department utilization. The coefficient estimates on the crowding-out effect in Columns (3) and (4) of Table 10 show that for each additional individual crowded-out per capita increases emergency department visits per capita by 0.739 or 1.288, respectively. These positive coefficients are statistically significant at the 5% and 1% levels, respectively. Comparatively, the coefficient estimates on the expansionary effect in Columns (3) and (4) of Table 10 indicate that for each additional individual who was uninsured and gains Medicaid per capita, emergency department visits per capita remain unchanged or decrease by 0.531.

Taken in conjunction, the results of Columns (3) and (4) of Table 10 divulge that while the expansion of public insurance increases emergency department volume per capita, this increase is driven entirely by expanding Medicaid to those who previously had private insurance. The

statistically insignificant estimate on the expansionary effect in Column (3) and the negative and statistically significant estimate on the expansionary effect in Column (4) of Table 10 imply that expanding public insurance to the uninsured does not exacerbate the crowding crisis but may even work as policymakers intended in California.

The results of Columns (3) and (4) of Table 10 suggest that changes in emergency department utilization after gaining public insurance are driven by the relative change in the price of an emergency department visit. Individuals who previously had private insurance could expect to pay the median value of $1,233 for a visit to the emergency department (Caldwell et al., 2013). After enrolling in Medicaid, that individual would be expected to pay a maximum of $5 prior to 2014 and $15 for 2014 onward as a copay for a visit to the emergency department that did not result in admission of the hospital (California Department of Healthcare Services, 1991b; The Henry J. Kaiser Family Foundation, 2013; California Department of Healthcare Services, 2013b).[29] Therefore, individuals who had private insurance and enrolled in Medicaid after becoming eligible saw a decrease in the price of an emergency department visit of 98.8%. Economic demand theory states that with a price decrease, quantity demanded increases. The coefficients on the crowding-out effect in Columns (3) and (4) of Table 10 show exactly this result, as the price of an emergency department visit decreases there are more visits to the emergency department.

We do not believe that the positive coefficients on the crowding-out effect in Columns (3) and (4) of Table 10 are driven by access to primary care physicians for two reasons. First, we control for the number of relevant full-time equivalent medical professionals, which includes primary care physicians, employed at health clinics in the county. These health clinics all accept Medicaid. Second, if our results were driven by access to primary care physicians, then we would expect the signs on the expansionary effect to also be positive, given that those who were previously uninsured and gained Medicaid would face the same restrictions in finding a primary care physician that accepts Medicaid as those who were previously privately insured. Given the statistically significant and negative estimate for the expansionary effect in Column (4), we do not believe that access to primary care physicians is the driving factor of the positive coefficients on the crowd-out effect in Columns (3) and (4) of Table 10.

[29] For specific information regarding the cost of a visit to an emergency department when on Medi-Cal, which is California's Medicaid, please refer to http://www.dhcs.ca.gov/services/medi-cal/eligibility/Pages/Medi-CalFAQs2014a.aspx.

While individuals who crowded-out saw a large price decrease for an emergency department visit after enrolling in Medicaid, individuals who were previously uninsured largely saw an increase in the price of an emergency department visit. As a result of California law AB 774, between 2007 to 2014, 24.8% to 53% of California emergency departments offered charity care (i.e. free care) to uninsured individuals between 100% to 138% of the FPL.[30] For 24.8% to 53% of California emergency departments, emergency department visits by those who were uninsured and became eligible for Medicaid under most of the LIHP expansions and the entirety of the ACA Medicaid expansion were free prior to receiving Medicaid. For the emergency departments that did not offer full or partial charity care for those uninsured between 100% to 138% of the FPL, these individuals still qualified for discount payments that generally offered a 65% to 85% discount.[31]

The majority of patients who were uninsured and gained Medicaid from the LIHP or ACA Medicaid expansions went from free emergency department care to paying a maximum copay of $5 or $15 for an emergency department visit that does not result in hospital admission (California Department of Healthcare Services, 1991b; The Henry J. Kaiser Family Foundation, 2013; California Department of Healthcare Services, 2013b). The law of demand tells us that as the price of a good increases, quantity demanded decreases. The coefficient on the expansionary effect in Column (4) of Table 10 shows exactly this, as the price of an emergency department visit increases there are fewer visits to the emergency department.[32]

We feel it is important to note that we do not believe that the negative coefficient on the expansionary effect in Table 10 contradicts the results of Taubman et al. (2014). Specifically, Taubman et al. (2014) found that those who were previously uninsured and gained Medicaid in Oregon increased their emergency department utilization. Given that Oregon did not have (and still does not have) legislation requiring hospitals to offer financial assistance to the uninsured, the uninsured who gained Medicaid as a result of the Oregon Health Insurance Experiment and the uninsured who gained Medicaid under the LIHP or ACA expansion in California saw different changes in price of an emergency department visit. That is, the previously uninsured in Oregon saw a price decrease of an emergency department visit after gaining Medicaid and the previously

[30] For more information concerning California AB 774, please refer to Section 2.3.1.

[31] These numbers come from the 2005 OSHPD data. For more information please refer to Hhttps://oshpd.ca.gov/HID/Hospital-Fair-Pricing-FAQs.html#Public.

[32] Given the slight increase in the price of an emergency department visit, the statistically insignificant coefficient on the expansionary effect in Column (3) of Table 10 is unsurprising.

uninsured in California saw a slight price increase of an emergency department visit after gaining Medicaid. The differences in charity care policies between Oregon and California, and thus the different changes in the price of an emergency department visit for the previously uninsured, is why we do not believe that our results contradict the results of Taubman et al. (2014).

The negative coefficient on the expansionary effect in Column (4) of Table 10 could also be driven by previously uninsured individuals substituting emergency department visits with visits to primary care physicians. The average cost of a primary care visit when uninsured is $160, whereas the copay for a primary care visit with Medi-Cal is $0 (Saloner et al., 2015; California Department of Healthcare Services, 1991b).[33] The law of demand tells us that individuals who were uninsured and gained Medicaid under the LIHP or ACA Medicaid expansions should visit a primary care physician more frequently. We would therefore expect those who were previously uninsured and gained Medicaid to substitute emergency department visits (which became more expensive) with primary care physician visits (which became cheaper).

To determine whether the increase in emergency department utilization was driven by necessary (i.e. severe) or unnecessary (i.e. primary care treatable) utilization, we estimate equations 1, 2, and 3 for emergency department visits that resulted in hospital admission and emergency department visits that did not result in admission to the hospital.[34] Table 11 shows the results of the difference-in-difference estimations of equations 1 through 3 for emergency department visits that resulted in hospital admission per capita. Column (1) of Table 11 shows the results of the standard difference-in-difference, Column (2) shows the results of the continuous treatment difference-in-difference, and Columns (3) and (4) show the results of the double treatment continuous difference-in-difference estimation with random forest and probit estimates of the effects, respectively. As Columns (1) through (4) of Table 11 show, we find no evidence that the LIHP or ACA Medicaid expansions impacted emergency department utilization that resulted in admission to the hospital. This result aligns with the intuition that true emergencies, which are likely to result in admission to the hospital, are inelastic and unaffected by insurance status. Since true emergencies are inelastic, it follows that visits that result in admission to the emergency department would be unaffected by

[33] For more recent information regarding Medi-Cal, please refer to Medi-Cal FAQs.

[34] The authors acknowledge that these distinctions between visits are imperfect measures of severity. However, the aggregated nature of the OSHPD data places restrictions on the measures of severity available.

the change in price of an emergency department visit moving from private insurance to Medicaid or moving from no insurance to Medicaid.

Table 12 shows the difference-in-difference estimations of equations 1 through 3 for emergency department visits that did not result in admission to the hospital per capita. Column (1) of Table 12 shows the results of equation 1, Column (2) shows the results of equation 2, and Columns (3) and (4) show the results of equation 3 with the random forest and probit estimates of the expansionary and crowding-out effects, respectively. The positive and statistically significant coefficients in Columns (1) and (2) indicate that the increase in emergency department usage per capita as a result of the LIHP or ACA Medicaid expansion is driven by visits that do not result in hospital admission. These results coincide with the results of Dresden et al. (2017), which finds that the increase in emergency department visits in Illinois from the ACA is driven by an increase in visits resulting in discharge from the emergency department. The results of Columns (1) and (2) of Table 12 imply that the expansion of public insurance increases unnecessary emergency department visits thereby exacerbating the crowding crisis.

By separating out the expansionary and crowding-out effects, Columns (3) and (4) of Table 12 illustrate that the increase in emergency department visits that do not result in hospital admission per capita is caused by those who previously had private insurance increasing their emergency department utilization. We find either no statistical significance or a decrease in emergency department utilization that does not result in hospital admission from expanding Medicaid to those who were previously uninsured. As with the results of Columns (3) and (4) of Table 10, the increase in less severe emergency department visits by those who were previously insured can be explained by the drastic decrease in the price of a visit to the emergency department after receiving Medicaid. The statistically insignificant or decrease in less severe emergency department visits by those who were previously uninsured can be explained by (1) the potential price increase of an emergency department visit, or (2) the relative price decrease of a primary care physician visit. The results of Columns (3) and (4) of Table 12 indicate that expanding public insurance to the uninsured may work as policymakers intended by decreasing emergency department utilization but public insurance subsidizing private insurance leads to an undesirable outcome of increasing emergency department utilization.

4.1 Economic Significance:

Using the estimates on the crowd-out and expansionary effects from Column (3) of Table 12 and the average number of individuals crowded-out by year from Table 7, we generate back of the envelope estimates of the increase in emergency department visits that do not result in admission to the hospital. These estimates are shown in Table 13. Table 13 illustrates that between 2011 to 2016, expanding Medicaid to those who had private insurance increased emergency department visits that did not result in hospital admission by an average of 3.08% per year. That is, an average of 3.08% of total emergency department visits that did not result in hospital admission were a result of the LIHP or ACA Medicaid expansion. Making the strong assumption that all of the visits were primary care treatable, using the median price of an emergency department visit of $1,233, and using the average cost of a primary care physician visit of $49 for the insured, this results in an average increase in unnecessary healthcare costs of $429,326,131 per year (Saloner et al., 2015; Caldwell et al., 2013). This increase in cost was driven entirely by public insurance subsidizing private insurance.[35]

5 Robustness Checks:

5.1 Medicaid Expansion 100%-138% of the FPL:

Given that the LIHP Medicaid expansion contained expansion ranges outside of the ACA Medicaid expansion range of 100% to 138% of the FPL, one may be concerned that the counties with alternative LIHP Medicaid expansion ranges are driving the results of Tables 10, 11, and 12. These counties could be driving the results as these counties contained individuals that would have time to plan their emergency department utilization based on the knowledge that they would either gain/lose Medicaid when the ACA Medicaid expansion took effect in 2014. More specifically, one may be concerned that in those counties that expanded Medicaid under the LIHP to 67% or 75% of the FPL, those individuals who would become eligible for Medicaid under the ACA might forgo

[35] Table 14 provides the back of the envelope calculations for the increase in emergency department visits that do not result in admission to the hospital using the crowd-out and expansionary effects from Column (4) of Table 12 and the average crowd-out and expansionary effect by year from Table 8. While smaller than the back of the envelope estimates shown in Table 13, Table 14 shows that expanding Medicaid to those who had private insurance increased emergency department visits that did not result in hospital admission by an average of 2.54% per year, leading to an average increase in unnecessary healthcare costs of $305,056,536 per year. Again, this increase in cost was driven entirely by those dropping their private insurance and enrolling in Medicaid.

medical care until after they become eligible for Medicaid. Those individuals who went without medical care in anticipation of receiving Medicaid may then utilize emergency departments more frequently, not because they gained Medicaid, but as a result of years of lack of medical attention. Additionally, one may be concerned that in those counties that expanded Medicaid under the LIHP to 200% of the FPL, individuals who would lose Medicaid in 2014 might utilize the emergency department more frequently in anticipation of losing Medicaid. Those individuals who anticipated becoming ineligible for Medicaid in 2014 might utilize the emergency department more frequently, not because they gained Medicaid, but because they were going to lose Medicaid. To examine whether counties with LIHP Medicaid expansion ranges that varied from the ACA Medicaid expansion range appear to drive the results of Tables 10, 11, 12, we estimate equation 2 interacting the total effect with the Medicaid expansion level. Specifically, we estimate:

$$\begin{aligned} EDVisitsPerCap_{ijt} =& \beta_0 + \beta_1 TotalEffect_{jt} \times ExpansionLevel_{jt} + \beta_2 X_{ijt} \\ &+ \alpha_i + \delta_t + C_j \times t + \epsilon_{ijt} \end{aligned} \tag{4}$$

where $ExpansionLevel_{jt}$ is a factor indicating whether the expansion level was 67%, 75%, 100%, 138%, or 200% for county j at time t, and all other variables are identically defined as in equation 2. Equation 4 allows us to identify which Medicaid expansion ranges are contributing to the results of Column (2) in Tables 10, 11, and 12.

Table 15 presents the results for the difference-in-difference estimations of equations 2 and 4 for emergency department visits per capita.[36] Column (1) of Table 15 displays the results of equation 2 and Column (2) displays the results of equation 4. Column (1) of Table 15 indicates that for each individual that gains Medicaid under the LIHP or ACA Medicaid expansion per capita, annual emergency department visits increase by 0.124 per capita, which is an increase of approximately 1.06 standard deviations. This result is statistically significant at the 1% level. Column (2) of Table 15 reveals that the positive and statistically significant increase in Column (1) is driven by those counties that expanded Medicaid up to 75%, 138%, and 200% of the FPL. That is, Table 15 demonstrates that counties that expanded Medicaid up to 75%, 138%, and 200% of the FPL, saw a

[36] Please refer to the online appendix for the full table including controls.

statistically significant increase in emergency department visits per capita following the LIHP and ACA Medicaid expansions.

Tables 16 and 17 display the results for the difference-in-difference estimations of equations 2 and 4 for emergency department visits that result in hospital admission per capita and for emergency department visits that do not result in hospital admission per capita, respectively.[37] Column (1) of Tables 16 and 17 display the results of equation 2 and Column (2) of Tables 16 and 17 display the results of equation 4 for emergency department visits that result in hospital admission per capita and for emergency department visits that do not result in hospital admission per capita, respectively. Columns (1) and (2) of Table 16 show that, regardless of the Medicaid expansion level, we find no evidence that the LIHP or ACA Medicaid expansions altered emergency department utilization that resulted in admission to the hospital. Conversely, Column (1) of Table 17 demonstrates that for each individual that gains Medicaid per capita, emergency department visits that do not result in admission to the hospital increase by 0.161 per capita, which is an increase of roughly 1.52 standard deviations. This result is statistically significant at the 1% level. As Column (2) shows, the positive and statistically significant result of Column (1) of Table 17 is driven by those counties that expanded Medicaid up to 67%, 75%, 138%, and 200% of the FPL.[38]

The statistically significant estimates in Column (2) of Tables 15 and 17 for those counties that expanded Medicaid up to 67%, 75%, or 200% of the FPL provide evidence that these alternative Medicaid expansion ranges counties could be driving the results of Tables 10 and 12. To address this concern, we estimate equations 1, 2, and 3 for just those counties that (1) expanded Medicaid under the LIHP expansion up to 100% or 138% of the FPL, or (2) did not expand Medicaid until the ACA Medicaid expansion (i.e. those counties that only expand Medicaid 100% to 138% of the FPL). That is, we re-estimate equations 1, 2, and 3 excluding those six counties that chose to expand Medicaid to 67%, 75%, or 200% of the FPL under the LIHP Medicaid expansion.

Table 18 displays the results for the difference-in-difference estimation of equations 1 through 3 for those counties that (1) expanded Medicaid to 100% to 138% of the FPL during the LIHP Medicaid expansion, or (2) did not expand Medicaid until the ACA Medicaid expansion in 2014. Column (1) of Table 18 corresponds to equation 1, Column (2) corresponds to 2, and Columns

[37] Please refer to the online appendix for the full table including controls.

[38] Please refer to the online appendix for tables showing the interaction of the treatment effect and the expansion level, as well as the interaction of the expansionary/crowd-out effect and the expansion level.

(3) and (4) correspond to equation 3 for the random forest and probit estimates of the crowd-out and expansionary effects, respectively. As with the results for the full sample, Columns (1) and (2) of Table 18 show that expanding Medicaid to 100% to 138% of the FPL increases emergency department visits per capita. Column (1) of Table 18 indicates that expanding Medicaid increased emergency department visits per capita by 0.003, which is the exact estimate for the full sample (i.e. the same result in Column (1) of Table 10). Similarly, Column (2) of Table 18 shows that for each additional individual that gains Medicaid per capita, emergency department visits per capita increase by 0.123, which is not statistically different from the estimate of 0.124 for the full sample.

Columns (3) and (4) of Table 18 disentangle the expansionary and crowd-out effects to provide insight on which type of newly eligible and enrolled Medicaid recipient, the previously uninsured or previously privately insured, causes the increase in emergency department utilization for those counties that only expanded Medicaid to 100% to 138% of the FPL. The coefficient estimates on the crowd-out effect in Columns (3) and (4) of the Table 18 suggest that for each additional individual who drops their private insurance coverage and enrolls in Medicaid per capita increases emergency department visits per capita by 0.764 or 1.337, respectively. These estimates, which are statistically significant at the 10% and 1% levels respectively, are not statistically different from the coefficient estimates for the crowd-out effect for the full sample (i.e. the estimates in Columns (3) and (4) of Table 10). The coefficient estimates on the expansionary effect in Columns (3) and (4) of Table 18 indicate that for each additional individual who was uninsured and gains Medicaid per capita, emergency department visits per capita do not change. The estimates for the expansionary effect in Columns (3) and (4) of Table 18 are not statistically different from the estimates for the expansionary effect for the full sample.

As with the full sample, the estimates on the crowd-out and expansionary effects in Columns (3) and (4) of Table 18 indicate that expanding Medicaid to 100% to 138% of the FPL for childless adults increases emergency department utilization per capita and that this increase is driven entirely by expanding Medicaid to those who previously had private insurance. Additionally, the results of Columns (3) and (4) of Table 18 imply that changes in emergency department visits following an expansion of Medicaid to 100% to 138% of the FPL are driven by the relative change in the price of a visit to the emergency department (i.e. decrease in price of emergency department visit if previously insured and slight increase in price of emergency department visit if previously uninsured).

To ascertain whether necessary (i.e. severe) or unnecessary (i.e. primary care treatable) emergency department utilization brought about the overall increase in emergency department utilization for those counties that only expanded Medicaid to 100% to 138% of the FPL for the LIHP and ACA Medicaid expansions, we estimate equations 1, 2, and 3 for emergency department visits that resulted in admission to the hospital and emergency department visits that did not result in admission to the hospital per capita. Table 19 displays the difference-in-difference estimations of equations 1 through 3 for emergency department visits that resulted in hospital admission per capita. As with the full sample, we find no evidence that the LIHP and ACA Medicaid expansions to 100% to 138% of the FPL altered emergency department utilization that resulted in hospital admission, as shown by the statistically insignificant results on the treatment effect, the total effect, and the crowd-out and expansionary effects in Columns (1) through (4) of Table 19.

Table 20 provides the difference-in-difference results of equations 1 through 3 for emergency department visits that did not result in hospital admission per capita. Columns (1) and (2), which correspond to equations 1 and 2, respectively, imply that expanding Medicaid to childless adults 100% to 138% of the FPL in California increased emergency department utilization that did not result in admission to the hospital per capita. Specifically, Column (1) of Table 20 shows that expanding Medicaid to childless adults 100% to 138% of the FPL increases emergency department utilization that does not result in hospital admission by 0.005 visits per capita, which is an increase of 7.35% relative to the average. The result in Column (1) of Table 20, which is statistically significant at the 1% level, is the same estimate for the impact of expanding not admitted emergency department utilization for the full sample (i.e. the same result as Column (1) of Table 12). The estimate in Column (2) of Table 20, which is statistically significant at the 1% level, indicates that each additional childless adult with income 100% to 138% of the FPL that enrolls in Medicaid per capita increases emergency department visits per capita by 0.156, which is not statistically different from the full sample estimate of 0.161 per capita.

To determine whether the previously insured or the previously uninsured cause the increase in not admitted emergency department visits per capita, we separate the crowd-out effect and expansionary effect, as shown in Columns (3) and (4) of Table 20. The coefficient estimates on the crowd-out effect in Columns (3) and (4), which are statistically significant at the 10% and 5% levels, respectively, indicate that for each additional childless adult living between 100% to 138% of the

FPL who crowds-out per capita increases not admitted emergency department visits by 0.725 or 1.365, respectively. Alternatively, the coefficient estimates on the expansionary effect in Columns (3) and (4) of Table 20 suggest that for each additional childless adult with income between 100% to 138% of the FPL that was uninsured and enrolls in Medicaid per capita, not admitted emergency department visits per capita either do not change, or decrease by 0.518.

The coefficient estimates on the crowd-out effect and expansionary effect in Columns (3) and (4), which are not statistically different from the estimates for the full sample, indicate that the previously insured cause the increase in emergency department visits that do not result in hospital admission per capita. The increase in emergency department visits that do not result in hospital admission per capita by the previously insured can be explained by the decrease in the price of a visit to the emergency department after receiving Medicaid.

As with the full sample, the results of Tables 18, 19, and 20 suggest that expanding Medicaid to childless adults with incomes 100% to 138% of the FPL increases emergency department visits per capita and that this increase is driven entirely by those who crowded-out. Additionally, the results from the full sample of emergency departments and the sample of emergency departments in counties that only expanded Medicaid to 100% to 138% of the FPL are not statistically different from each other. That these results for these two different samples are not statistically different from each other indicates that those counties with alternative expansion ranges are not driving our main results that the LIHP and subsequent ACA Medicaid expansion increased emergency department visits and that this increase was caused entirely by those who crowded-out.

5.2 Sensitivity of Estimates Based on Controls:

One concern is that our choice of controls could be driving the results of Tables 10, 11, and 12. Tables 21, 22, and 23 address this concern by showing how our estimates for emergency department visits per capita, emergency department visits that result in hospital admission per capita, and emergency department visits that do not result in hospital admission per capita, change with different controls, respectively.

Column (1) of Table 21 shows the results of Table 10 for the treatment effect, the total newly enrolled per capita, the crowd-out effect per capita, and the expansionary effect per capita using both random forest and probit estimates for emergency department visits per capita. Columns (2)

through (9) of Table 21 examine the impact of different controls on the estimates for the treatment effect, the total newly enrolled per capita, the crowd-out effect per capita, and the expansionary effect per capita using both random forest and probit estimates. Columns (2) through (9) of Table 21 are nearly identical to the estimates of Column (1) indicating that our estimates examining the impact of expanding Medicaid during the LIHP and subsequent ACA Medicaid expansion on emergency department visits per capita appear robust to various specifications.

Similarly, Column (1) of Tables 22 and 23 contains the results for equations 1, 2, and 3 of our main specification for emergency department visits that result in hospital admission per capita, and emergency department visits that do not result in hospital admission per capita, respectively. Columns (1) through (9) of Table 22 indicate that, regardless of the controls used, the LIHP and ACA Medicaid expansions did not impact emergency department utilization that resulted in hospital admission per capita. Columns (2) through (9) of Table 23 closely resemble the estimates of Column (1) demonstrating that our estimates examining the impact of the LIHP and ACA Medicaid expansion on emergency department visits that do not result in hospital admission per capita are robust to various specifications.[39] Tables 21 through 23 show that regardless of the specification, we find that the LIHP and ACA Medicaid expansion increased emergency department utilization per capita and this increase is driven entirely by those who crowded-out.[40]

5.3 Sensitivity of Estimates Based on Sample:

One may also be concerned that our choice to use only a balanced panel of emergency departments is driving the results of Tables 21, 22, and 23. To address this concern, we estimate the same regressions shown in Tables 21, 22, and 23 using the unbalanced panel of emergency departments in California between 2006 and 2016. Tables 24, 25, and 26 show these results for emergency department visits per capita, emergency department visits that result in hospital admission per capita, and emergency department visits that do not result in hospital admission per capita, respectively.[41]

While slightly higher, the results of Columns (1) through (9) of Table 24 are comparable to the estimates of Columns (1) through (9) of Table 21. That is, both the results of Columns (1) through

[39] For full tables of results using alternative controls, please refer to the online appendix.

[40] Additionally, we checked whether our choice of controls was driving our results for subsample of the data that only expanded Medicaid to 100% to 138% of the FPL. As with the full sample, we do not find evidence that our specification is sensitive to the controls utilized. The tables showing these results can be found in the online appendix.

[41] For full tables of results using the unbalanced panel, please refer to the online appendix.

(9) of Tables 21 and 24 indicate that the Medicaid expansion in California increased emergency department usage per capita, and that this increase was entirely driven by those that already had private insurance. The results of Table 24 provide further evidence that our results are robust to both the sample selection and various specifications.

As with Table 22, Columns (1) through (9) of Table 25 indicate that regardless of the sample selection or the controls used, the LIHP and ACA Medicaid expansions did not alter emergency department visits that result in hospital admission per capita. Columns (1) through (9) of Table 26 closely resemble the estimates in Columns (1) through (9) of Table 23 again demonstrating that our estimates examining how the LIHP and ACA Medicaid expansion on emergency department visits that do not result in hospital admission are robust to both various specifications and sample selection. Tables 24 through 26 show that regardless of sample choice, as well as the specification, we find that the LIHP and ACA Medicaid expansion increased emergency department utilization per capita and that this increase is driven entirely by those who crowded-out. However, the balanced panel remains our preferred specification as the results using the balanced panel are more conservative than the unbalanced panel.

6 Parallel Trends:

The difference-in-difference estimation strategy relies on the assumption that in absence of the treatment, all unobserved differences between the treatment and control groups are the same over time (i.e. treatment and control groups have parallel trends). To test the underlying parallel trends assumption of the difference-in-difference framework that non-expansion counties are a valid counter factual for Medicaid expansion counties, we employ an event study framework. That is, we indirectly test the internal validity of the difference-in-difference framework by examining whether emergency department utilization was similar across California counties prior to Medicaid expansion by examining the policy leads in the event study (Dave et al., 2017). Figures 10, 11, and 12 show the coefficient estimates on the policy leads and lags with corresponding 95% confidence intervals for emergency department visits per capita, emergency department visits that do not result in hospital admission per capita, and emergency department visits that result in hospital admission per capita, respectively. As Figures 10 to 12 show, there is no discernible trend and no statistically significant

effect in emergency department utilization for two years to seven years prior to Medicaid expansion using the event study framework. This provides support that the parallel trends assumption holds during our main analysis (i.e. the full sample of emergency departments in California).

We also indirectly test the internal validity of the difference-in-difference framework for those counties that either expanded Medicaid to 100% to 138% of the FPL during the LIHP expansion, or only expanded Medicaid under the ACA expansion by expanding the policy leads in an event study framework (Dave et al., 2017). Figures 13, 14, and 15 show the coefficient estimates with the corresponding 95% confidence intervals for the years prior and following Medicaid expansion on emergency department visits per capita, emergency department visits that do not result in hospital admission per capita, and emergency department visits that result in hospital admission per capita, respectively. Figures 13 through 15 exhibit no discernible trend and no statistically significant impact on emergency department utilization for the two year to seven years prior to Medicaid expansion using the event study framework. The statistically insignificant coefficient estimates for emergency department utilization, and the lack of a clear trend provides support that the parallel trends assumption also holds for the analysis using counties that only expanded Medicaid to 100% to 138% of the FPL.[42]

In addition to providing support that the parallel trends assumption holds, Figures 10 through 15 indicate (1) how long after treatment until an emergency department experiences a change in utilization, and (2) how long the change in utilization persists. For both the full sample and for counties that expanded Medicaid 100% to 138% of the FPL, Figures 10 and 13 indicate that increases for emergency department utilization per capita occurs three years following treatment. Figure 11 suggests that for the full sample increases in emergency department utilization that does not result in hospital admission per capita begins two years following the Medicaid expansion and persists for three years after the expansion. For counties that expanded Medicaid to 100% to 138% of the FPL, Figure 14 shows that increases for emergency department utilization that does not result in hospital admission per capita start slightly earlier than the full sample at the treatment year and persist for four or more years after treatment.

[42]Please refer to the online appendix for the Figures examining the internal validity of the difference-in-difference framework for all alternative specifications as well as the unbalanced panel. As shown in the online appendix, the parallel trends assumption appears to hold for these alternative specifications for the balanced panel and all expansion ranges, the balanced panel containing only counties that expanded Medicaid to 100% to 138% of the FPL, and the unbalanced panel containing all expansion ranges.

To ensure that our specification that includes county time trends is indeed the correct specification, we also indirectly test the parallel trends assumption for our specification excluding county time trends by examining the policy leads in an event study framework for our specification excluding time trends. Figures 16, 17, and 18 display the coefficient estimates with the 95% confidence intervals for the years prior and following Medicaid expansion on emergency department visits per capita, emergency department visits that do not result in hospital admission per capita, and emergency department visits that result in hospital admission per capita, respectively. As opposed to the Figures examining the policy leads when we include county time trends, Figures 16 and 17 show a clear linear trend prior to Medicaid expansion. Given that excluding county time trends results in a failure of the parallel trends assumption, we maintain that the specification including time trends is the proper specification.

7 Conclusions:

Often lacking access to other forms of healthcare, the poor and uninsured rely heavily on emergency departments for medical care. This is particularly true in California, where emergency department visits are free or heavily discounted for uninsured patients that meet certain income requirements. Due to an asymmetric federal regulation that requires an emergency department to treat an individual regardless of their ability to pay, emergency departments are prevented from diverting the poor and uninsured to more appropriate healthcare providers. One proposed solution to decrease emergency department utilization by the poor and uninsured is the expansion of Medicaid. Expansion of Medicaid to the poor and uninsured is projected to alleviate emergency department stress by giving these individuals access to other forms of healthcare. However, these expansions are not limited to the previously uninsured: crowding-out of private health insurance also occurs. In reality, there will be two (potentially competing) effects of expanding the eligibility of public insurance. In this paper, we examined how the expansionary and crowding-out effects of a public insurance expansion impact emergency department usage following the Low Income Health Program (LIHP) and Affordable Care Act (ACA) Medicaid expansions in California.

To prepare for the ACA expansion of Medicaid to childless adults with incomes 100% to 138% of the federal poverty line (FPL), California submitted a section 1115 Medicaid Demonstration waiver

titled California's Low Income Health Program, which was approved on November 2nd, 2010. Under California's LIHP, beginning in July 2011 California counties could choose to expand Medicaid to previously ineligible adults. From 2011 to 2013, the LIHP Medicaid expansion provided health insurance to previously non-Medicaid eligible individuals (i.e. non-disabled or childless) living at or below 67%, 75%, 100%, 138%, or 200% of the FPL depending on the county of residence (Meng et al., 2012; Golberstein et al., 2015). Beginning in 2014, all counties in California expanded Medicaid to childless adults with incomes 100% to 138% of the FPL under the ACA Medicaid expansion.

Exploiting the heterogeneity in the roll-out of the LIHP and ACA Medicaid expansions across counties in California, we utilize a two-way fixed effects difference-in-difference model to estimate the impact of expanding public insurance to the uninsured on emergency department utilization. By employing a standard difference-in-difference estimation and a continuous difference-in-difference estimation, we find that the LIHP and subsequent ACA Medicaid expansion increased emergency department utilization per capita, counter to the intended public policy. Specifically, taking into account only the total effect of expanding Medicaid (as is standard in the literature), we find that the LIHP and ACA Medicaid expansion increased emergency department visits per capita by 0.124 for each additional newly eligible and enrolled per capita. The increase in emergency department visits per capita following the LIHP and ACA Medicaid expansions implies that expanding public insurance to the uninsured fails to alleviate emergency department stress.

However, considering only the total effect of expanding Medicaid on emergency department utilization will yield inaccurate estimates for examining whether expanding public insurance to the uninsured works as policymakers intended. Medicaid expansions are usually not applicable to just the previously uninsured; crowding-out of private health insurance also occurs. When we separate out the effect of the LIHP and ACA Medicaid expansion on emergency department utilization by those who were previously privately insured and those that were previously uninsured, it is clear that the increase in emergency department usage is driven entirely by those who previously had private insurance. Specifically, we find that following the LIHP and ACA Medicaid expansions in California for each additional individual who crowds-out per capita, emergency department utilization per capita increases by 0.739 or 1.288. For each additional individual who was uninsured and gains Medicaid per capita, emergency department visits per capita remain unchanged or decrease by

0.531. The increase in emergency department usage, driven entirely by the previously insured, results in an increase in healthcare expenditures of approximately $429.3 million per year.

The increase in emergency department utilization by those who crowded-out is unsurprising given that those who crowded-out saw a decrease in the price of an emergency department visit of 98.8%. Comparatively, the previously uninsured largely had free emergency department care as a result of California law AB 774. The previously uninsured therefore either saw no change in the cost of an emergency department visit or a slight price increase following the LIHP and ACA Medicaid expansions. The increase in emergency department utilization by the previously insured and the lack of change in emergency department utilization by the previously uninsured after gaining public insurance are driven by the relative change in the price of an emergency department visit.

Our results indicate that the LIHP and ACA Medicaid expansions increased emergency department usage. Taking into account the total effect alone, policymakers would incorrectly conclude that expanding public insurance to the uninsured in California acts counter to the intended expansionary effect of decreasing emergency department utilization by the uninsured. To determine the true effect of expanding public insurance to the uninsured on emergency department utilization, we separate out the expansionary and crowding-out effects. When we separate out the expansionary and crowding-out effects, our results indicate that the increase in emergency department utilization following the LIHP and ACA Medicaid expansions is driven not by the uninsured gaining Medicaid, but the privately insured gaining Medicaid. Although the impact of the expansionary effect will depend on the presence of state mandated hospital charity care policies, our results indicate that expanding public insurance to the previously insured will increase emergency department utilization, as these individuals will always see a decrease in the price of an emergency department visit after receiving Medicaid. Therefore, while this analysis is restricted to California, it highlights the importance of considering both the expansionary and crowding-out effects of a public insurance expansion and the importance of limiting crowd-out in future Medicaid expansions.

Bibliography

American Hospital Association, "American Hospital Association: Uncompensated Hospital Care Cost Fact Sheet," *AHA Policy Research: Research & Trends*, 2014.

_ , "American Hospital Association: Medicare DSH Fact Sheet," *AHA Policy Research: Research & Trends*, 2015.

Anderson, Michael, Carlos Dobkin, and Tal Gross, "The Effect of Health Insurance Coverage on the Use of Medical Services," *American Economic Journal: Economic Policy*, 2012, *4* (1), 1–27.

Asplin, Brent, Frederick C. Blum, Robert I. Broida, W. Richard Bukata, Michael B. Hill, Sandra M. Schneider, Peter Viccellio, and Shari J. Welch, "Emergency Department Crowding: High-Impact Solutions," *American College of Emergency Physicians: Task Force*, 2008.

Ayanian, John Z., Joel S. Weissman, Eric C. Schneider, Jack A. Ginsburg, and Alan M. Zaslavsky, "Unmet health needs of uninsured adults in the United States," *JAMA*, 2000, *284* (16), 2061–2069.

Belloni, Alexandre, Daniel Chen, Victor Chernozhukov, and Christian Hansen, "Sparse models and methods for optimal instruments with an application to eminent domain," *Econometrica*, 2012, *80* (6), 2369–2429.

Breiman, Leo, "Random Forests," *Machine Learning*, 2001, *45* (1), 5–32.

Caldwell, Nolan, Tanja Srebotnjak, Tiffany Wang, and Renee Hsia, "How Much Will I Get Charged For This- Patient Charges for Top Ten Diagnoses in the Emergency Department," *PLOS ONE*, 02 2013, *8*, 1–6.

California Department of Healthcare Services, "California's Medicaid State Plan (Title XIX)- Section 4.18," 1991.

_ , "California's Medicaid State Plan (Title XIX)- Section 4.18 Attachments," 1991.

_ , "California Health and Safety Code- Chapter 2.5 of Division 107," 2010.

_ , "California's Medicaid State Plan (Title XIX)- Section 4.18 Attachment," 2013.

_ , "Medi-Cal Program Regular Policy Change Index-Copayment for Non-Emergency ER Visits," 11 2013.

Centers for Medicare & Medicaid Services, "Medicaid program; premiums and cost sharing. Final rule.," *Federal Register*, 2008, *73* (228), 71827–71855.

Cutler, David M. and Jonathan Gruber, "Does Public Insurance Crowd Out Private Insurance?," *Quarterly Journal of Economics*, 1996, *111* (2), 391 – 430.

Dave, Dhaval. M, Anca M. Grecu, and Henry Saffer, "Mandatory access prescription drug monitoring programs and prescription drug abuse," Technical Report, National Bureau of Economic Research 2017.

Dresden, Scott M., Emilie S. Powell, Raymond Kang, Megan McHugh, Andrew J. Cooper, and Joe Feinglass, "Increased Emergency Department Use in Illinois After Implementation of the Patient Protection and Affordable Care Act," *Annals of emergency medicine*, 2017, *69* (2), 172–180.

Finkelstein, Amy, Sarah Taubman, Bill Wright, Mira Bernstein, Jonathan Gruber, Joseph P Newhouse, Heidi Allen, and Katherine Baicker, "The Oregon Health Insurance Experiment: Evidence From The First Year," *Quarterly Journal of Economics*, 2012, *127* (3), 1057–1106.

Garthwaite, Craig, Tal Gross, and Matthew J. Notowidigdo, "Who Bears the Cost of the Uninsured? Nonprofit Hospitals.," *Kellogg Insight*, 2015.

Gelatt, Julia, Heather Koball, and Juan Manuel Pedroza, "California's Implementation of the Affordable Care Act," 2014.

Gingold, Daniel B., Rachelle Pierre-Mathieu, Brandon Cole, Andrew C. Miller, and Joneigh S. Khaldun, "Impact of the Affordable Care Act Medicaid Expansion on Emer-

gency Department High Utilizers with Ambulatory Care Sensitive Conditions: A Cross-Sectional Study," *The American Journal of Emergency Medicine*, 2017, *35* (5), 737–742.

Golberstein, Ezra, Gilbert Gonzales, and Benjamin D Sommers, "California's Early ACA Expansion Increased Coverage And Reduced Out-Of-Pocket Spending For The State's Low-Income Population," *Health Affairs*, 2015, *34* (10), 1688–1694.

Goodman-Bacon, Andrew, "Difference-in-Differences with Variation in Treatment Timing," Working Paper 25018, National Bureau of Economic Research September 2018.

Gruber, Jonathan and Kosali Simon, "Crowd-out 10 years later: Have recent public insurance expansions crowded out private health insurance?," *Journal of Health Economics*, 2008, *27* (2), 201–217.

Hadley, Jack and John Holahan, "How much medical care do the uninsured use, and who pays for it?," *Health Affairs*, 2003, *22* (3; SUPP), W3–66.

Ham, John C. and Lara Shore-Sheppard, "The effect of Medicaid expansions for low-income children on Medicaid participation and private insurance coverage: evidence from the SIPP," *Journal of Public Economics*, 2005, *89* (1), 57–83.

Harbage, Peter and Meredith L King, "A bridge to reform: California's Medicaid section 1115 waiver," *Prepared for California HealthCare Foundation*, 2012.

Hernandez-Boussard, Tina, Carson S. Burns, N. Ewen Wang, Laurence C. Baker, and Benjamin A. Goldstein, "The Affordable Care Act Reduces Emergency Department Use By Young Adults: Evidence From Three States," *Health Affairs*, 2014, *33* (9), 1648–1654.

Hilltop Institute, *Community benefit state law profiles*, UMBC, Baltimore, MD, 2016.

Hing, Esther and Farida Bhuiya, "Wait time for treatment in hospital emergency departments: 2009," *NCHS data brief*, 2012, *1* (102).

Kellermann, Arthur L and Robin M Weinick, "Emergency departments, Medicaid costs, and access to primary care – understanding the link," *New England Journal of Medicine*, 2012, *366* (23), 2141–2143.

Klein, Eili Y, Scott Levin, Matthew F Toerper, Michael D Makowsky, Tim Xu, Gai Cole, and Gabor D Kelen, "The effect of Medicaid expansion on utilization in Maryland emergency departments," *Annals of emergency medicine*, 2017, *70* (5), 607–614.

McCaig, Linda F. and Catharine W. Burt, "National hospital ambulatory medical care survey: 2003 emergency department summary," *Advanced Data: Vital and Health Statistics*, 2005, (358).

McConville, Shannon, Maria C Raven, Sarah H Sabbagh, and Renee Y Hsia, "Frequent Emergency Department Users: A Statewide Comparison Before And After Affordable Care Act Implementation," *Health Affairs*, 2018, *37* (6), 881–889.

Meng, Ying-Ying, Livier MPA Cabezas, Dylan H Roby, Naderah Pourat, and Gerald F Kominski, "Successful strategies for increasing enrollment in california's low income health program (LIHP)," 2012.

Miller, Sarah, "The Effect of Insurance on Emergency Room Visits: An Analysis of the 2006 Massachusetts Health Reform," *Journal of Public Economics*, 2012, *96* (11-12), 893–908.

Murphy, Kevin M and Robert H Topel, "Estimation and inference in two-step econometric models," *Journal of Business & Economic Statistics*, 2002, *20* (1), 88–97.

NHAMCS, "National hospital ambulatory medical care survey: 2011 emergency department summary tables," 2011, pp. 1–39.

Nikpay, Sayeh, Seth Freedman, Helen Levy, and Tom Buchmueller, "Effect of the Affordable Care Act Medicaid expansion on emergency department visits: evidence from state-level emergency department databases," *Annals of Emergency Medicine*, 2017, *70* (2), 215–225.

Niska, Richard, Farida Bhuiya, Jianmin Xu et al., "National hospital ambulatory medical care survey: 2007 emergency department summary," *National Health Stat Report*, 2010, *26*, 1–31.

Pitts, Stephen R., Richard W. Niska, Jianmin Xu, and Catharine W. Burt, "National hospital ambulatory medical care survey: 2006 emergency department summary," *National Health Stat Report*, 2008, *7*, 1–38.

Saloner, Brendan, Daniel Polsky, Genevieve M. Kenney, Katherine Hempstead, and Karin V. Rhodes, "Most Uninsured Adults Could Schedule Primary Care Appointments Before The ACA, But Average Price Was $160.," *Health Affairs*, 2015, *34* (5), 773 – 780.

Taubman, Sarah L., Heidi L. Allen, Bill J. Wright, Katherine Baicker, and Amy N. Finkelstein, "Medicaid Increases Emergency-Department Use: Evidence from Oregon's Health Insurance Experiment.," *Science*, 2014, *343* (6168), 263–268.

The Henry J. Kaiser Family Foundation, "California's "Bridge to Reform" Medicaid Demonstration Waiver," http://www.kff.org/health-reform/fact-sheet/californias-bridge-to-reform-medicaid-demonstration-waiver/ 2012. [Online; accessed 02-August-2017].

_ , "States Getting a Jump Start on Health Reform's Medicaid Expansion," http://www.kff.org/health-reform/issue-brief/states-getting-a-jump-start-on-health/ 2012. [Online; accessed 02-August-2017].

_ , "Premiums and Cost-Sharing in Medicaid," 02 2013.

Wager, Stefan and Susan Athey, "Estimation and inference of heterogeneous treatment effects using random forests," *arXiv preprint arXiv:1510.04342*, 2015.

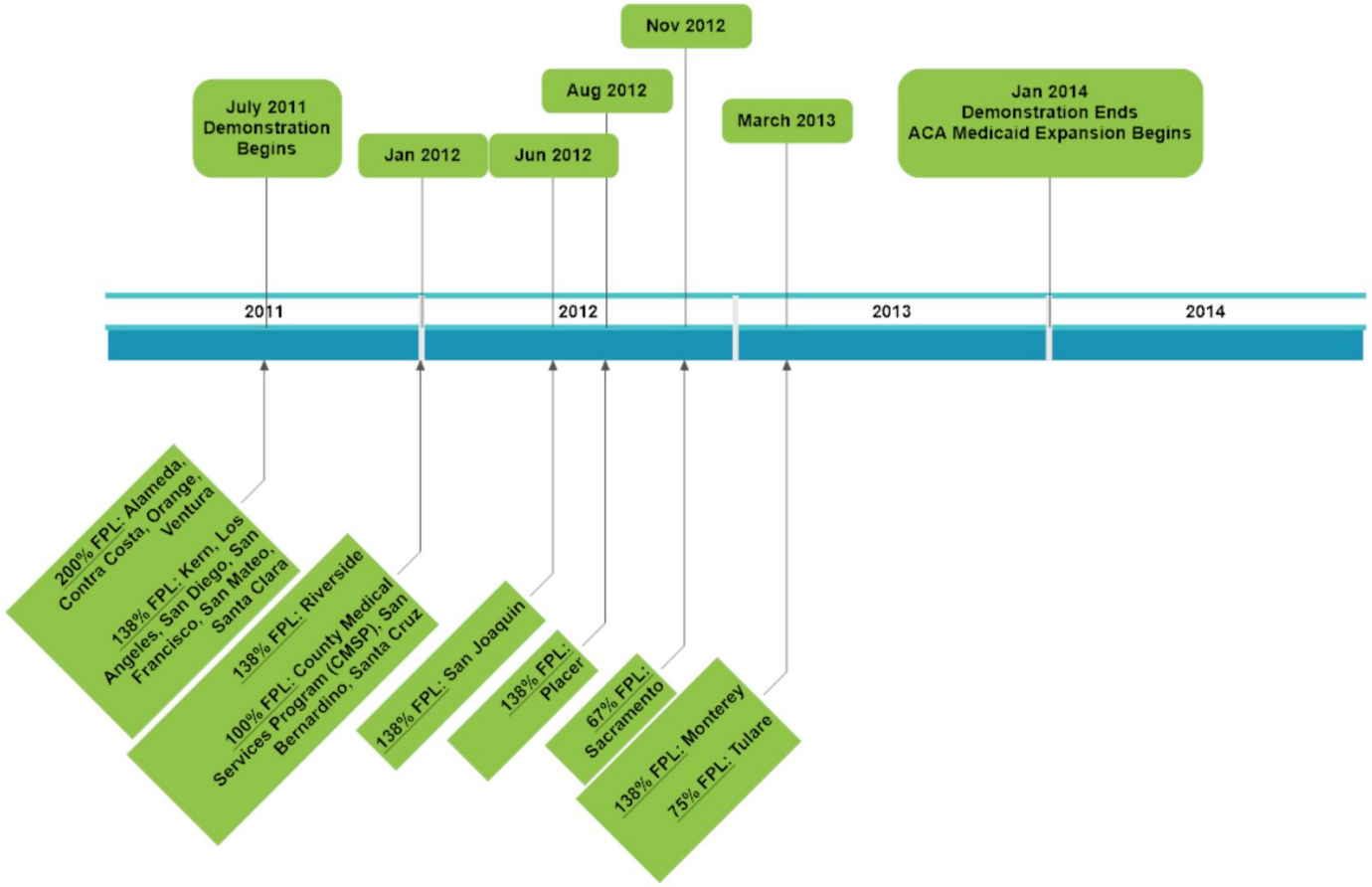
Weissman, Joel S., Robert Stern, Stephen L. Fielding, and Arnold M. Epstein, "Delayed Access to Health Care: Risk Factors, Reasons, and Consequences," *Annals of Internal Medicine*, 1991, *114* (4), 325–331.

Wherry, Laura R. and Sarah Miller, "Early coverage, access, utilization, and health effects associated with the affordable care act medicaid expansions: A quasi-experimental study," *Annals of Internal Medicine*, 2016, *164* (12), 795–803.

Wooldridge, Jeffrey M, *Econometric analysis of cross section and panel data*, MIT press, 2010.

8 Tables and Figures

Figure 1: Timeline of California's LIHP Expansion



Source: This figure is modified from Meng et al. (2012) and Golberstein et al. (2015).

Note: CMSP is a consortium of 35 rural counties. These counties are: Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Glenn, Humboldt, Imperial, Inyo, Kings, Lake, Lassen, Madera, Marin, Mariposa, Mendocino, Modoc, Mono, Napa, Nevada, Plumas, San Benito, Shasta, Sierra, Siskiyou, Solano, Sonoma, Sutter, Tehama, Trinity, Tuolumne, Yolo (joined July 1st, 2012), and Yuba.

Figure 2: Percent of Emergency Departments with Discount and Charity Care Policies 100% to 138% of FPL: 2007-2014

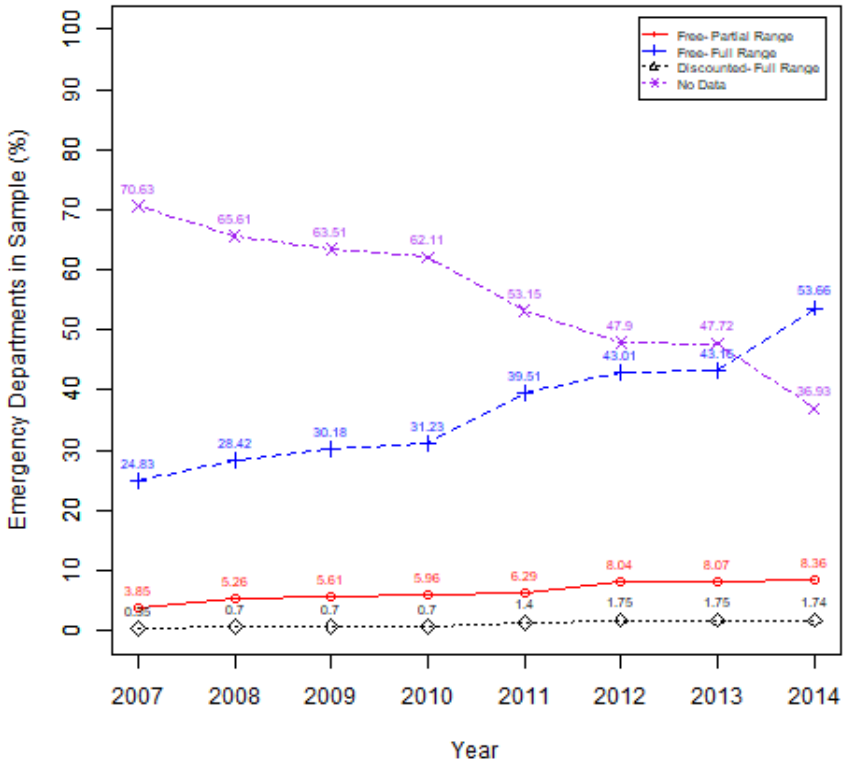


Figure 3: Federal Maximum Medicaid Copay:

FY 2013 Maximum Nominal Deductible and Managed Care Copayment Amounts

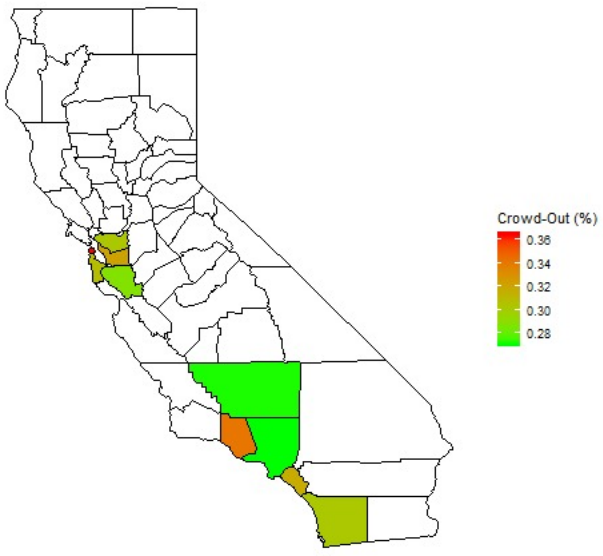
- Deductible $2.65
- Managed Care Copayment $4.00

Maximum Allowable Copayments for Eligible Populations by Family Income (FY 2013)

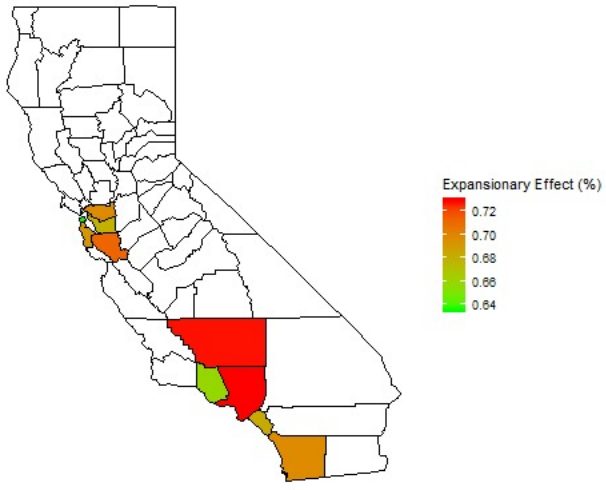
Services and Supplies	100% FPL	101-150% FPL	>150% FPL
Institutional Care (inpatient hospital care, rehab care, etc.)	$75	10% of the cost the agency pays for the entire state	20% of cost the agency pays for the entire state
Non-Institutional Care (physician visits, physical therapy, etc.)	$4.00	10% of costs the agency pays	20% of costs the agency pays
Non-emergency use of the ER	$8.00	$8.00	No limit *within 5% aggregate limit
Drugs Preferred drugs Non-preferred drugs	 $4.00 $8.00	 $4.00 $8.00	 $4.00 20% of cost the agency pays

Source: This figure was taken from
https://www.medicaid.gov/medicaid/cost-sharing/out-of-pocket-costs/index.html.

Figure 4: Random Forest Estimation for 2011 – Percent Total Newly Eligible Medicaid Enrollees

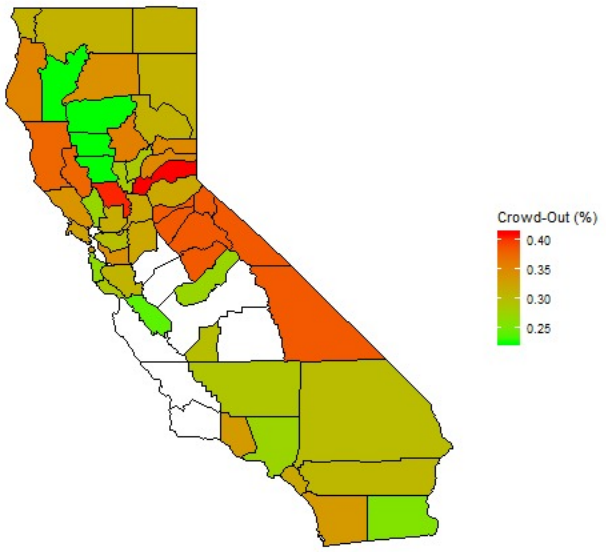


(a) Crowding-out Effect (%)

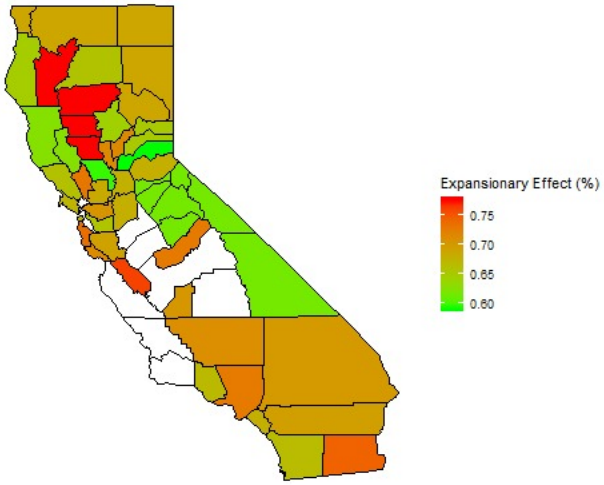


(b) Expansionary Effect (%)

Figure 5: Random Forest Estimation for 2012 – Percent Total Newly Eligible Medicaid Enrollees

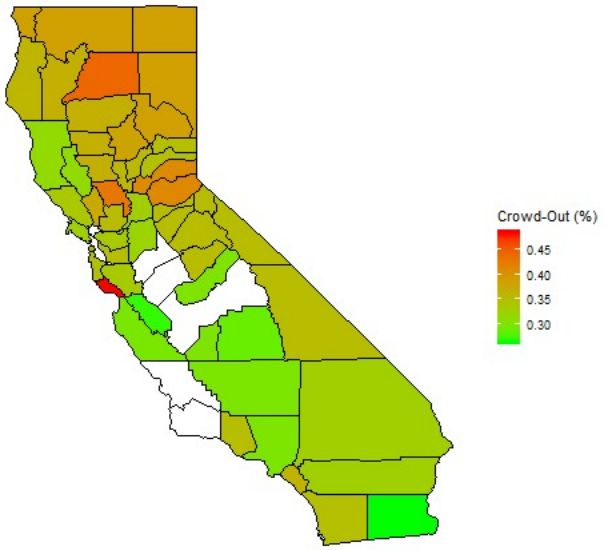


(a) Crowding-out Effect (%)

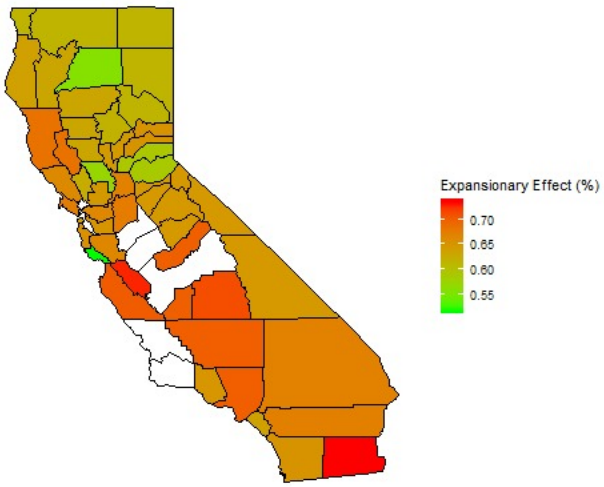


(b) Expansionary Effect (%)

Figure 6: Random Forest Estimation for 2013 – Percent Total Newly Eligible Medicaid Enrollees

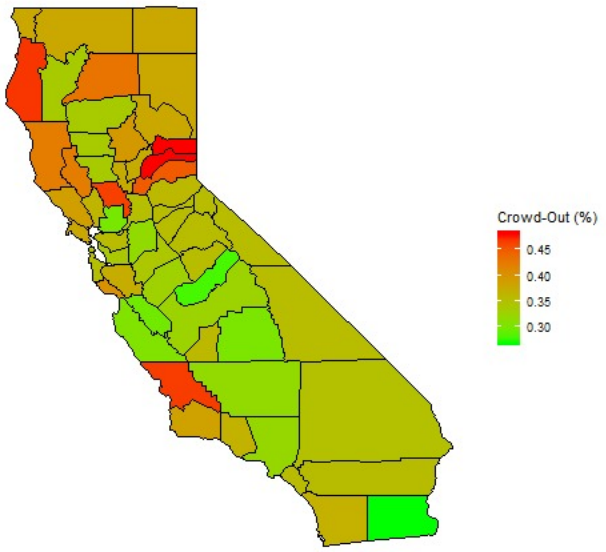


(a) Crowding-out Effect (%)

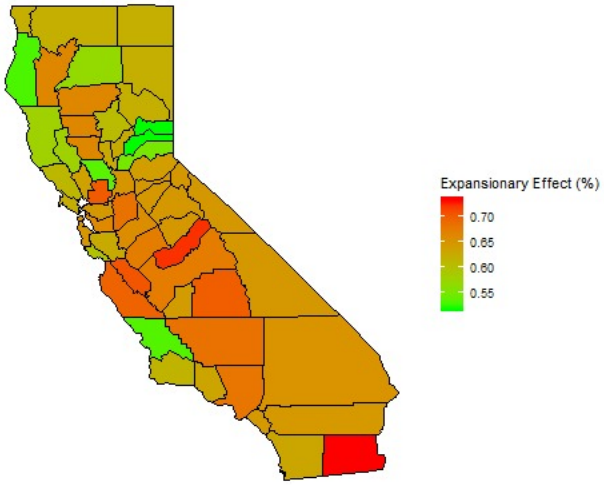


(b) Expansionary Effect (%)

Figure 7: Random Forest Estimation for 2014 – Percent Total Newly Eligible Medicaid Enrollees

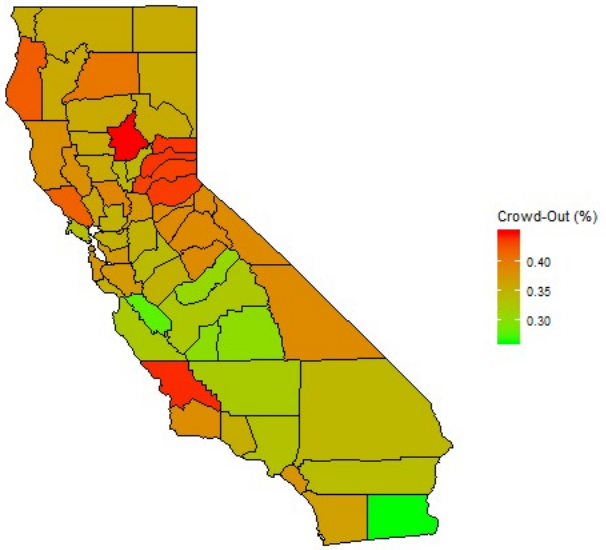


(a) Crowding-out Effect (%)

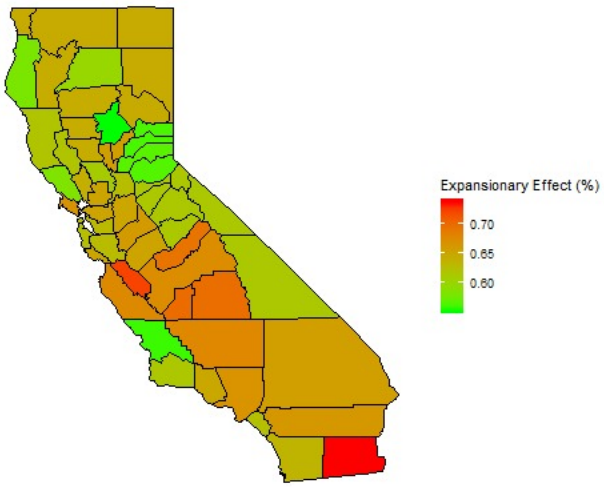


(b) Expansionary Effect (%)

Figure 8: Random Forest Estimation for 2015 – Percent Total Newly Eligible Medicaid Enrollees

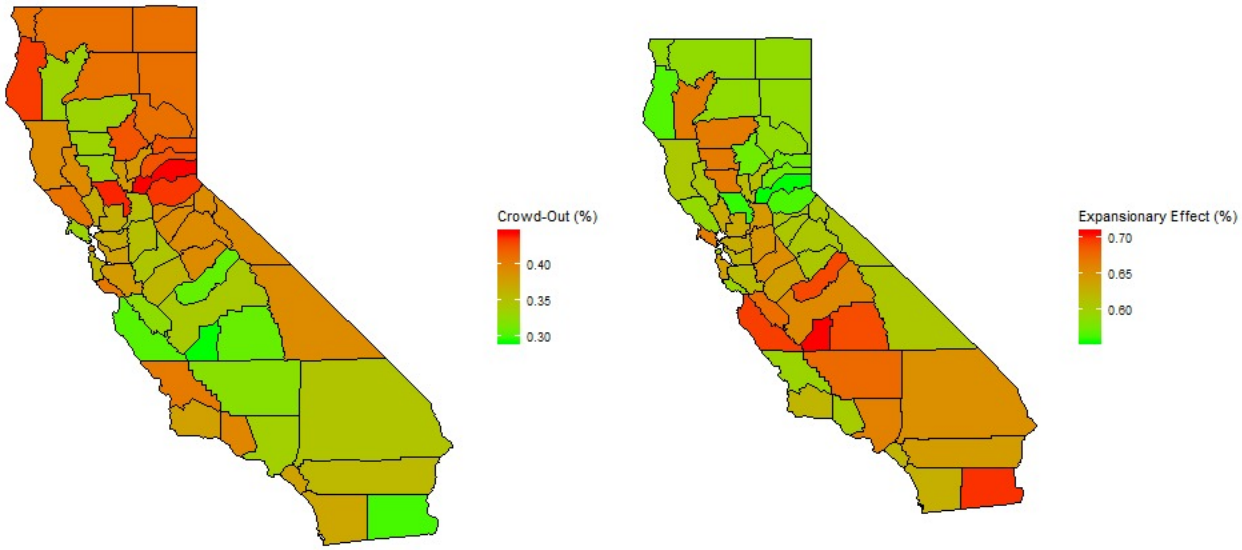


(a) Crowding-out Effect (%)



(b) Expansionary Effect (%)

Figure 9: Random Forest Estimation for 2016 – Percent Total Newly Eligible Medicaid Enrollees



(a) Crowding-out Effect (%)

(b) Expansionary Effect (%)

Figure 10: Test of Parallel Trends Assumption– Emergency Department Visits Per Capita

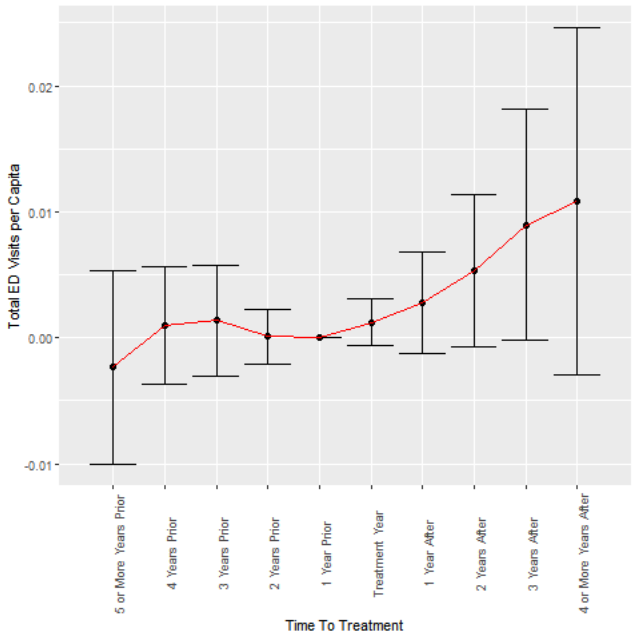


Figure 11: Test of Parallel Trends Assumption– Emergency Department Visits That Do Not Result in Admission Per Capita

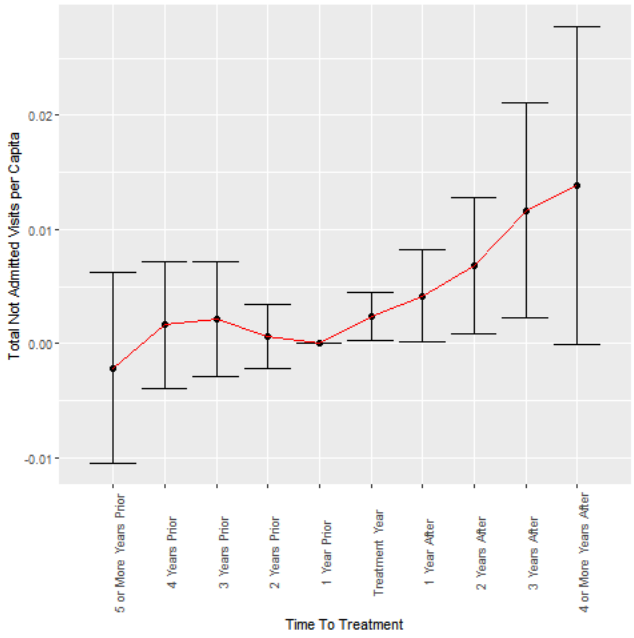


Figure 12: Test of Parallel Trends Assumption– Emergency Department Visits That Result in Admission Per Capita

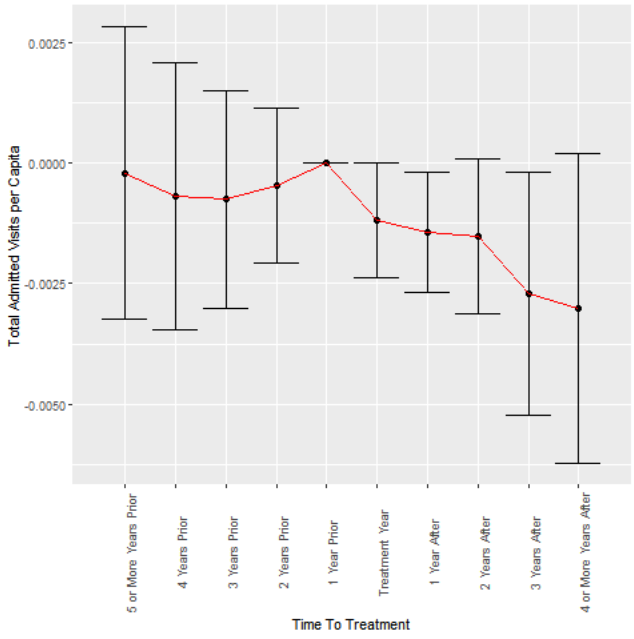


Figure 13: Test of Parallel Trends Assumption Medicaid Expansion Range 100% to 138% of the FPL– Emergency Department Visits Per Capita

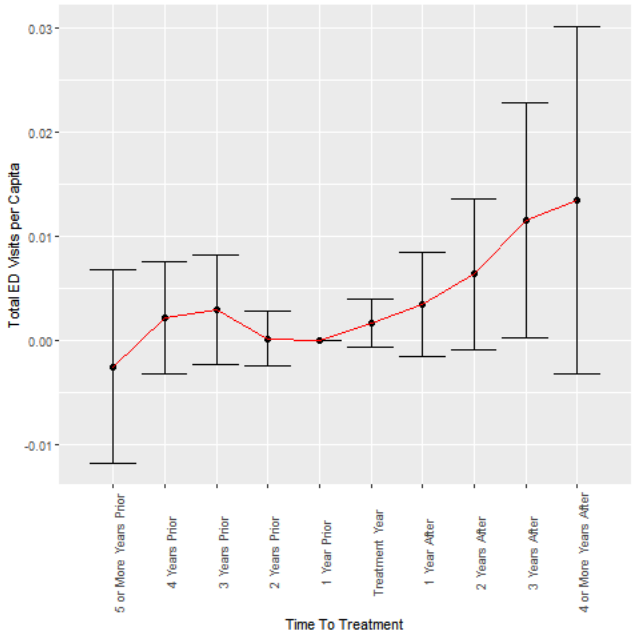


Figure 14: Test of Parallel Trends Assumption Medicaid Expansion Range 100% to 138% of the FPL– Emergency Department Visits That Do Not Result in Admission Per Capita

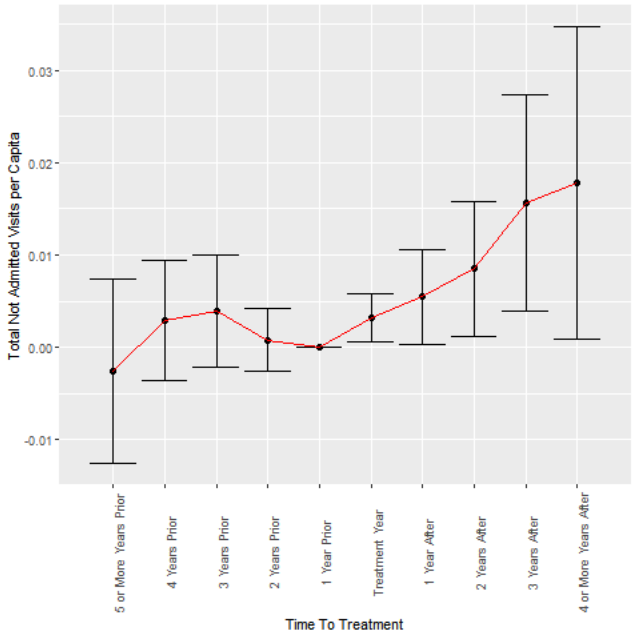


Figure 15: Test of Parallel Trends Assumption Medicaid Expansion Range 100% to 138% of the FPL– Emergency Department Visits That Result in Admission Per Capita

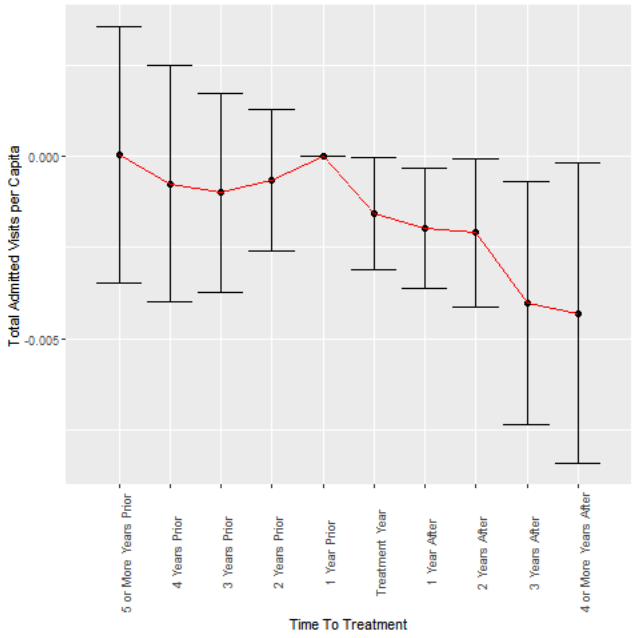


Figure 16: Test of Parallel Trends Assumption Excluding Time Trends– Emergency Department Visits Per Capita

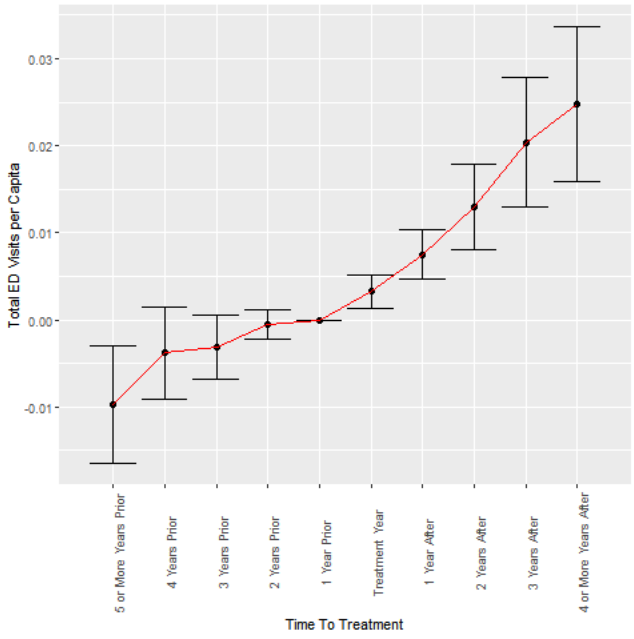


Figure 17: Test of Parallel Trends Assumption Excluding Time Trends– Emergency Department Visits That Do Not Result in Admission Per Capita

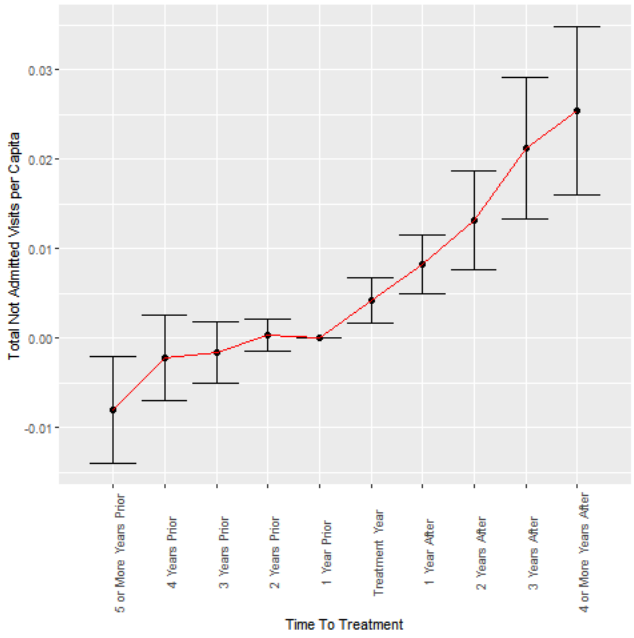


Figure 18: Test of Parallel Trends Assumption Excluding Time Trends– Emergency Department Visits That Result in Admission Per Capita

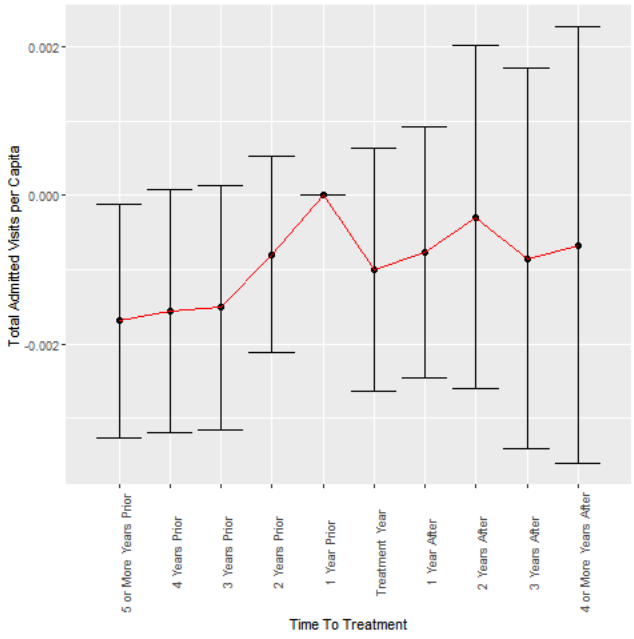


Table 1: Summary Statistics: Emergency Department Variables

Variable	Full Sample		Pre-Expansion		Post-Expansion	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
ED Visits (per capita)	0.067	0.117	0.069	0.114	0.066	0.121
Admitted Visits (per capita)	0.007	0.013	0.008	0.013	0.007	0.014
Non-Admitted Visits (per capita)	0.060	0.106	0.061	0.104	0.059	0.110
Hospital Total Licensed Beds	231.912	156.993	224.877	155.871	240.214	157.656
Hospital Total ICU Beds	18.894	21.177	17.363	20.123	20.722	21.995
Trauma Designation	0.220	0.414	0.207	0.406	0.233	0.423
Teaching Hospital Designation	0.077	0.266	0.065	0.246	0.090	0.286
Number EMS Stations	21.797	14.791	20.234	13.827	23.705	15.718
N	3145		1605		1254	

Note: This table shows summary statistics for our sample separated for hospitals in counties before and after expansion. Note that the sample sizes are not equal pre- and post-expansion as 10 counties chose to expand Medicaid in 2011, 41 in 2012, 2 in 2013, and 5 counties waited to expand Medicaid until the ACA in 2014. The roll-out of the LIHP Medicaid expansion and subsequent ACA Medicaid expansion means that there will be an uneven number of pre- and post-expansion observations.

Table 2: Summary Statistics: County Variables

Variable	Full Sample		Pre-Expansion		Post-Expansion	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Total Medical Professionals (FTE)	109.237	226.036	82.829	150.989	150.299	307.065
Total Relevant Medical Professionals (FTE)	84.601	183.808	64.199	123.881	115.709	249.051
Total Population (per 10k)	72.053	149.304	64.362	135.888	83.735	167.614
Population Hispanic Or Latino (%)	28.734	16.974	27.939	16.888	29.678	17.037
Population Hispanic Or Latino (per capita)	0.287	0.170	0.279	0.169	0.297	0.170
Population in Poverty (%)	15.646	5.056	15.221	5.031	15.910	4.956
Unemployment Rate (%)	9.388	4.059	9.972	4.325	7.934	3.274
Medicare Advantage Beneficiaries (per capita)	0.034	0.024	0.030	0.021	0.040	0.027
Rape Crime Rate (per 100k)	31.336	18.206	29.773	14.847	34.850	21.824
N	572		314		206	

Note: This table shows summary statistics for our sample separated for counties before and after expansion. Note that the sample sizes are not equal pre- and post-expansion as 10 counties chose to expand Medicaid in 2011, 41 in 2012, 2 in 2013, and 5 counties waited to expand Medicaid until the ACA in 2014. The roll-out of the LIHP Medicaid expansion and subsequent ACA Medicaid expansion means that there will be an uneven number of pre- and post-expansion observations.

Table 3: Summary Statistics Medicaid Expansion Range 100%-138% of the FPL: Emergency Department Variables

Variable	Full Sample		Pre-Expansion		Post-Expansion	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
ED Visits (per capita)	0.076	0.128	0.077	0.124	0.075	0.134
Admitted Visits (per capita)	0.008	0.015	0.009	0.014	0.008	0.015
Non-Admitted Visits (per capita)	0.068	0.116	0.068	0.113	0.067	0.122
Hospital Total Licensed Beds	228.612	163.247	221.086	161.833	237.721	164.112
Hospital Total ICU Beds	18.461	21.906	16.978	21.021	20.303	22.569
Trauma Designation	0.226	0.418	0.217	0.412	0.236	0.425
Teaching Hospital Designation	0.082	0.274	0.067	0.250	0.100	0.300
Number EMS Stations	21.070	14.980	19.448	13.891	23.142	16.098
N	2542		1318		993	

Note: This table shows summary statistics for our sample separated for hospitals in counties before and after expansion. Note that the sample sizes are not equal pre- and post-expansion as 10 counties chose to expand Medicaid in 2011, 41 in 2012, 2 in 2013, and 5 counties waited to expand Medicaid until the ACA in 2014. The roll-out of the LIHP Medicaid expansion and subsequent ACA Medicaid expansion means that there will be an uneven number of pre- and post-expansion observations. Only counties that (1) did not expand during the LIHP expansion, or (2) expanded during LIHP between 100-138% of the FPL were included. That is, counties that expanded during the LIHP expansion up to 200% of the FPL or below 100% of the FPL were excluded from this sample.

Table 4: Summary Statistics Medicaid Expansion Range 100%-138% of the FPL: County Variables

Variable	Full Sample		Pre-Expansion		Post-Expansion	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Total Medical Professionals (FTE)	99.069	231.989	75.073	152.769	137.621	320.012
Total Relevant Medical Professionals (FTE)	78.038	191.008	58.653	126.482	108.721	263.009
Total Population (per 10k)	63.203	153.664	56.578	138.884	73.551	174.516
Population Hispanic Or Latino (%)	28.157	17.196	27.375	16.943	29.120	17.512
Population Hispanic Or Latino (per capita)	0.281	0.172	0.274	0.169	0.291	0.175
Population in Poverty (%)	15.836	4.936	15.381	4.893	16.185	4.876
Unemployment Rate (%)	9.546	4.113	10.123	4.345	8.078	3.375
Medicare Advantage Beneficiaries (per capita)	0.032	0.024	0.029	0.021	0.037	0.027
Rape Crime Rate (per 100k)	32.378	18.907	30.433	15.313	36.580	22.746
N	506		281		179	

Note: This table shows summary statistics for our sample separated for counties before and after expansion. Note that the sample sizes are not equal pre- and post-expansion as 10 counties chose to expand Medicaid in 2011, 41 in 2012, 2 in 2013, and 5 counties waited to expand Medicaid until the ACA in 2014. The roll-out of the LIHP Medicaid expansion and subsequent ACA Medicaid expansion means that there will be an uneven number of pre- and post-expansion observations. Only counties that (1) did not expand during the LIHP expansion, or (2) expanded during LIHP between 100-138% of the FPL were included. That is, counties that expanded during the LIHP expansion up to 200% of the FPL or below 100% of the FPL were excluded from this sample.

Table 5: Controls Included When Calculating Random Forest/Probit Effects:

Demographic:	Family Structure:	Income Source:	Military:	Mobility:	Labor:	Education:	Language:
-Age	-Gave birth past year	-Interest,Dividends, Net rental	-Military Service	-Mobility status	-Class of Worker	-Educational attainment	-Ability to speak English
-Number of major race groups represented	-Grandparent living w/grandchild	-All other	-Veteran service disability number	-Means of transport to work	-Employment status	-School enrollment	-Lang. other than Eng. spoken at home
-Place of birth	-Grandparent responsible for grandchild	-Public assistance		-Travel time to work	-Industry recode		
-Race	-Divorced past year	-Retirement			-Temp absence from work		
-Sex	-Married past year	-Self-employment			-Available for work		
	-Widowed past year	-Supplemental security			-Occupation		
	-Number of times married	-Social security			-When last worked		
	-Year last married	-Wages			-Usual hours worked per week		
					-On layoff from work		
					-Looking for work		
					-Informed of recall		

Note: This table shows the controls used to calculate the crowding-out and expansionary effects. Specifically, these are the controls used from the ACS 1-year estimates after subsetting the ACS to those individuals that will become eligible for the Medicaid expansion. The exact variables used are AGEP, COW, DRAT, ENG, ESR, FER, GCL, GCR, INDP, INTP, JWTR, JWMNP, LANX, MARHD, MARHM, MARHT, MARHW, MARHYP, MIG, MIL, NWAB, NWAV, NWLA, NWLK, NWRE, OCCP, OIP, PAP, POBP, RACNUM, RAC1P, RETP, SCHL, SCH, SEMP, SEX, SSIP, SSP, WAGP, WKHP, and WKL.

Table 6: Cross Validation Test

	Mean Squared Error:				Mean Absolute Error:				Bias:			
	Total	2014	2015	2016	Total	2014	2015	2016	Total	2014	2015	2016
Probit	0.151	0.161	0.147	0.151	0.328	0.340	0.323	0.333	−0.093	−0.065	−0.106	−0.137
Random Forest	0.143	0.151	0.139	0.140	0.310	0.318	0.305	0.312	−0.084	−0.051	−0.096	−0.116
Lasso	0.147	0.157	0.143	0.144	0.316	0.327	0.311	0.312	−0.087	−0.058	−0.099	−0.115
Neural Network	0.163	0.175	0.159	0.156	0.355	0.367	0.350	0.346	−0.093	−0.061	−0.107	−0.115

Note: This table shows the estimated Mean Squared Error, Mean Absolute Error, and Bias for different prediction methods. These predictions are calculated using people outside the expansion range (from 139% to 400% of the poverty line) as a cross validation sample. All methods use the same covariates, but the Lasso includes all possible squared and interaction terms.

Table 7: Summary Statistics: Average Effects per Year- Random Forest Estimation

Year:	Crowd-Out Effect:		Expansionary Effect:		Crowd-Out Effect (%):		Expansionary Effect (%):		Number Counties:
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Total
2011	18,745.641	23,392.962	45,494.659	64,108.229	30.895	2.927	69.105	2.927	10
2012	5,601.838	13,406.094	12,991.900	34,582.810	31.960	4.865	68.040	4.865	51
2013	6,394.253	15,379.370	13,153.040	35,008.367	35.220	4.071	64.780	4.071	53
2014	10,182.280	23,565.858	19,611.964	49,009.162	36.531	4.772	63.469	4.772	58
2015	13,352.864	30,394.502	24,822.450	59,914.990	36.555	3.891	63.445	3.891	58
2016	13,744.764	31,894.562	25,023.617	61,810.056	37.547	3.854	62.453	3.854	58

Note: This table shows summary statistics for the random forest estimates of the crowd-out effect and the expansionary effect per county by year. Note that the summary statistics for 2011 are larger than the subsequent years as Los Angeles county and San Francisco county, two of the largest counties in California, make up 20% of the expansion counties.

Table 8: Summary Statistics: Average Effects per Year- Probit Estimation

Year:	Crowd-Out Effect:		Expansionary Effect:		Crowd-Out Effect (%):		Expansionary Effect (%):		Number Counties:
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Total
2011	20,929.240	27,527.429	43,311.060	59,952.365	33.209	1.602	66.791	1.602	10
2012	6,289.981	15,636.901	12,303.757	32,320.870	36.302	3.502	63.698	3.502	51
2013	6,839.747	16,676.165	12,707.546	33,700.164	37.759	3.530	62.241	3.530	53
2014	11,040.867	25,774.895	18,753.377	46,792.651	40.223	4.875	59.777	4.875	58
2015	14,596.040	33,540.904	23,579.273	56,747.331	40.527	3.668	59.473	3.668	58
2016	14,914.770	35,131.586	23,853.611	58,557.223	40.916	3.581	59.084	3.581	58

Note: This table shows summary statistics for the probit estimates of the crowd-out effect and the expansionary effect per county by year. Note that the summary statistics for 2011 are larger than the subsequent years as Los Angeles county and San Francisco county, two of the largest counties in California, make up 20% of the expansion counties.

Table 9: Comparing Estimates of ACA Medicaid Expansion Enrollees:

Year:	Total Enrollees: California Provided	Total Enrollees: ACS Calculated	Difference (%):
2014	1,999,549.36	1,728,066.16	13.58
2015	2,831,894.75	2,214,168.18	21.81
2016	3,355,268.42	2,248,566.09	32.98

Note: This table shows the comparison between the California provided estimates of those eligible for and enrolled in the ACA/LIHP Medicaid expansion and our ACS estimates.

Table 10: Difference-in-Differences Estimation with Time Trends: ED Visits Per Capita

	Dependent variable: ED Visits per Capita			
	(1)	(2)	(3)	(4)
Treatment Effect	0.003***			
	(0.001)			
Total Newly Enrolled (per capita)		0.124***		
		(0.040)		
Crowd-Out R.F. (per capita)			0.739**	
			(0.371)	
Expansionary R.F. (per capita)			−0.165	
			(0.185)	
Crowd-Out Probit (per capita)				1.288***
				(0.399)
Expansionary Probit (per capita)				−0.531**
				(0.231)
Total FTE Relevant Medical Professionals (000s)	0.000	−0.004	−0.003	−0.002
	(0.011)	(0.010)	(0.011)	(0.010)
Total ICU Beds (000s)	0.114*	0.114*	0.114*	0.113*
	(0.066)	(0.066)	(0.065)	(0.065)
Teaching Facility	0.012***	0.012***	0.012***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)
Trauma Facility	0.018***	0.018***	0.018***	0.018***
	(0.006)	(0.006)	(0.007)	(0.007)
Population Hispanic or Latino (%)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Advantage Beneficiaries (per capita)	−0.108	−0.104	−0.067	−0.003
	(0.220)	(0.214)	(0.197)	(0.194)
Number EMS Stations	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Population in Poverty (%)	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.001)
Total Population (per 10k)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Trends?	Yes	Yes	Yes	Yes
Hospital Effects?	Yes	Yes	Yes	Yes
Year Effects?	Yes	Yes	Yes	Yes
Within R-squared	0.378	0.379	0.38	0.381
Observations	3,145	3,145	3,145	3,145
Residual Std. Error	0.015	0.015	0.015	0.015

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization per capita. Block bootstrapped SEs at the county level are reported in parentheses. Column (1) shows the results of a traditional difference-in-difference. Column (2) shows a varying treatment effect difference-in-difference for the total newly eligible and enrolled Medicaid population. Column (3) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a random forest to estimate the effects. Column (4) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a probit to estimate the effects. Controls included are the total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 11: Difference-in-Differences Estimation with Time Trends: ED Visits That Result In Admission Per Capita

	Dependent variable: Admitted ED Visits per Capita			
	(1)	(2)	(3)	(4)
Treatment Effect	−0.002			
	(0.001)			
Total Newly Enrolled (per capita)		−0.036		
		(0.029)		
Crowd-Out R.F. (per capita)			0.007	
			(0.188)	
Expansionary R.F. (per capita)			−0.057	
			(0.060)	
Crowd-Out Probit (per capita)				−0.063
				(0.234)
Expansionary Probit (per capita)				−0.022
				(0.104)
Total FTE Relevant Medical Professionals (000s)	−0.004	−0.004	−0.003	−0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Total ICU Beds (000s)	0.041	0.040	0.040	0.040
	(0.026)	(0.026)	(0.026)	(0.026)
Teaching Facility	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Trauma Facility	0.002***	0.002**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Population Hispanic or Latino (%)	−0.000*	−0.000*	−0.000*	−0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Advantage Beneficiaries (per capita)	0.269	0.269	0.272*	0.267*
	(0.171)	(0.169)	(0.164)	(0.160)
Number EMS Stations	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Population in Poverty (%)	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Total Population (per 10k)	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Trends?	Yes	Yes	Yes	Yes
Hospital Effects?	Yes	Yes	Yes	Yes
Year Effects?	Yes	Yes	Yes	Yes
Within R-squared	0.104	0.104	0.104	0.104
Observations	3,145	3,145	3,145	3,145
Residual Std. Error	0.005	0.005	0.005	0.005

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that resulted in hospital admission per capita. Block bootstrapped SEs at the county level are reported in parentheses. Column (1) shows the results of a traditional difference-in-difference. Column (2) shows a varying treatment effect difference-in-difference for the total newly eligible and enrolled Medicaid population. Column (3) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a random forest to estimate the effects. Column (4) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a probit to estimate the effects. Controls included are the total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 12: Difference-in-Differences Estimation with Time Trends: ED Visits That Do Not Result In Admission Per Capita

	Dependent variable: Not Admitted ED Visits per Capita			
	(1)	(2)	(3)	(4)
Treatment Effect	0.005***			
	(0.001)			
Total Newly Enrolled (per capita)		0.161***		
		(0.050)		
Crowd-Out R.F. (per capita)			0.731*	
			(0.419)	
Expansionary R.F. (per capita)			−0.108	
			(0.198)	
Crowd-Out Probit (per capita)				1.351***
				(0.524)
Expansionary Probit (per capita)				−0.509*
				(0.289)
Total FTE Relevant Medical Professionals (000s)	0.004	−0.000	0.001	0.002
	(0.012)	(0.012)	(0.012)	(0.012)
Total ICU Beds (000s)	0.074	0.074	0.074	0.072
	(0.058)	(0.058)	(0.058)	(0.058)
Teaching Facility	0.011***	0.011***	0.011***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)
Trauma Facility	0.016**	0.016***	0.017***	0.017***
	(0.006)	(0.006)	(0.006)	(0.006)
Population Hispanic or Latino (%)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Advantage Beneficiaries (per capita)	−0.378	−0.373	−0.339	−0.270
	(0.292)	(0.285)	(0.265)	(0.254)
Number EMS Stations	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Population in Poverty (%)	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Total Population (per 10k)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Trends?	Yes	Yes	Yes	Yes
Hospital Effects?	Yes	Yes	Yes	Yes
Year Effects?	Yes	Yes	Yes	Yes
Within R-squared	0.328	0.33	0.33	0.332
Observations	3,145	3,145	3,145	3,145
Residual Std. Error	0.016	0.016	0.016	0.016

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that did not result in hospital admission per capita. Block bootstrapped SEs at the county level are reported in parentheses. Column (1) shows the results of a traditional difference-in-difference. Column (2) shows a varying treatment effect difference-in-difference for the total newly eligible and enrolled Medicaid population. Column (3) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a random forest to estimate the effects. Column (4) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a probit to estimate the effects. Controls included are the total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 13: Back of the Envelope Calculations Random Forest Estimates: Visits That Do Not Result in Admission

Year:	Total Increase:	Increase % Total:	Increase Cost:
2011	137,121.415	1.350	$162,351,755.62
2012	208,980.495	1.950	$247,432,906.64
2013	247,896.652	2.262	$293,509,636.13
2014	431,994.297	3.706	$511,481,248.10
2015	566,509.771	4.591	$670,747,568.99
2016	583,136.548	4.610	$690,433,672.51

Note: This table shows the back of the envelope calculations using the random forest estimates of the impact of the Medicaid expansion in California emergency departments. The increase in cost is from assuming all visits were primary care treatable and using the average cost of a primary care visit of $49 for the insured and the median cost of an ED visit of $1233 (Saloner et al., 2015; Caldwell et al., 2013).

Table 14: Back of the Envelope Calculations Probit Estimates: Visits That Do Not Result in Admission

Year:	Total Increase:	Increase % Total:	Increase Cost:
2011	62,229.834	0.612	$73,680,124.04
2012	113,889.412	1.121	$134,845,063.44
2013	146,823.441	1.445	$173,838,953.63
2014	311,321.062	3.064	$368,604,137.51
2015	447,378.876	4.403	$529,696,589.71
2016	464,251.982	4.569	$549,674,346.69

Note: This table shows the back of the envelope calculations using the probit estimates of the impact of the Medicaid expansion in California emergency departments. The increase in cost is from assuming all visits were primary care treatable and using the average cost of a primary care visit of $49 for the insured and the median cost of an ED visit of $1233 (Saloner et al., 2015; Caldwell et al., 2013).

Table 15: Difference-in-Differences Estimation with Time Trends: ED Visits Per Capita Interacted With Expansion Level

	Dependent variable: ED Visits per Capita	
	(1)	(2)
Total Newly Enrolled (per capita)	0.124^{***}	
Total Newly Enrolled (per capita)- Up to 67% FPL		0.123
Total Newly Enrolled (per capita)- Up to 75% FPL		0.172^{**}
Total Newly Enrolled (per capita)- Up to 100% FPL		-0.073
Total Newly Enrolled (per capita)- Up to 138% FPL		0.144^{***}
Total Newly Enrolled (per capita)- Up to 200% FPL		0.141^{***}
Controls?	Yes	Yes
Time Trends?	Yes	Yes
Hospital Effects?	Yes	Yes
Year Effects?	Yes	Yes
Within R-squared	0.379	0.383
Observations	3145	3145

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization per capita. Block bootstrapped standard errors at the county level are used. Column (1) denotes the results from our main specification and column (2) shows which Medicaid expansion ranges are driving the results in column (1). Controls included are total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 16: Difference-in-Differences Estimation with Time Trends: ED Visits That Result In Admission Per Capita Interacted With Expansion Level

	Dependent variable: Admitted Visits per Capita	
	(1)	(2)
Total Newly Enrolled (per capita)	-0.036	
Total Newly Enrolled (per capita)- Up to 67% FPL		-0.064
Total Newly Enrolled (per capita)- Up to 75% FPL		-0.057
Total Newly Enrolled (per capita)- Up to 100% FPL		-0.04
Total Newly Enrolled (per capita)- Up to 138% FPL		-0.032
Total Newly Enrolled (per capita)- Up to 200% FPL		-0.058
Controls?	Yes	Yes
Time Trends?	Yes	Yes
Hospital Effects?	Yes	Yes
Year Effects?	Yes	Yes
Within R-squared	0.104	0.104
Observations	3145	3145

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on emergency department utilization that resulted in admission to the hospital per capita. Block bootstrapped standard errors at the county level are used. Column (1) denotes the results from our main specification and column (2) shows which Medicaid expansion ranges are driving the results in column (1). Controls included are total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 17: Difference-in-Differences Estimation with Time Trends: ED Visits That Do Not Result In Admission Per Capita Interacted With Expansion Level

	Dependent variable: Not Admitted Visits per Capita	
	(1)	(2)
Total Newly Enrolled (per capita)	0.161^{***}	
Total Newly Enrolled (per capita)- Up to 67% FPL		0.188^{*}
Total Newly Enrolled (per capita)- Up to 75% FPL		0.229^{***}
Total Newly Enrolled (per capita)- Up to 100% FPL		-0.033
Total Newly Enrolled (per capita)- Up to 138% FPL		0.176^{***}
Total Newly Enrolled (per capita)- Up to 200% FPL		0.198^{***}
Controls?	Yes	Yes
Time Trends?	Yes	Yes
Hospital Effects?	Yes	Yes
Year Effects?	Yes	Yes
Within R-squared	0.33	0.334
Observations	3145	3145

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on emergency department utilization that does not result in hospital admission per capita. Block bootstrapped standard errors at the county level are used. Column (1) denotes the results from our main specification and column (2) shows which Medicaid expansion ranges are driving the results in column (1). Controls included are total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 18: Difference-in-Differences Estimation with Time Trends for Medicaid Expansion 100%-138% of the FPL: ED Visits Per Capita

	Dependent variable: ED Visits per Capita			
	(1)	(2)	(3)	(4)
Treatment Effect	0.003***			
	(0.001)			
Total Newly Enrolled (per capita)		0.123***		
		(0.046)		
Crowd-Out R.F. (per capita)			0.764*	
			(0.393)	
Expansionary R.F. (per capita)			−0.176	
			(0.202)	
Crowd-Out Probit (per capita)				1.337***
				(0.430)
Expansionary Probit (per capita)				−0.555**
				(0.254)
Total FTE Relevant Medical Professionals (000s)	−0.005	−0.007	−0.005	−0.003
	(0.011)	(0.012)	(0.012)	(0.012)
Total ICU Beds (000s)	0.146	0.147	0.147	0.146
	(0.092)	(0.092)	(0.091)	(0.091)
Teaching Facility	0.011***	0.012***	0.011***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)
Trauma Facility	0.021**	0.021**	0.021**	0.021**
	(0.008)	(0.008)	(0.008)	(0.008)
Population Hispanic or Latino (%)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Advantage Beneficiaries (per capita)	−0.153	−0.143	−0.095	−0.020
	(0.235)	(0.229)	(0.209)	(0.206)
Number EMS Stations	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Population in Poverty (%)	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Total Population (per 10k)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Trends?	Yes	Yes	Yes	Yes
Hospital Effects?	Yes	Yes	Yes	Yes
Year Effects?	Yes	Yes	Yes	Yes
Within R-squared	0.379	0.38	0.38	0.382
Observations	2,542	2,542	2,542	2,542
Residual Std. Error	0.017	0.017	0.017	0.017

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion between 100%-138% of the FPL on total emergency department utilization per capita. Block bootstrapped SEs at the county level are reported in parentheses. Column (1) shows the results of a traditional difference-in-difference. Column (2) shows a varying treatment effect difference-in-difference for the total newly eligible and enrolled Medicaid population. Column (3) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a random forest to estimate the effects. Column (4) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a probit to estimate the effects. Controls included are the total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 19: Difference-in-Differences Estimation with Time Trends for Medicaid Expansion 100%-138% of the FPL: ED Visits That Result In Admission Per Capita

	Dependent variable: Admitted ED Visits per Capita			
	(1)	(2)	(3)	(4)
Treatment Effect	−0.001			
	(0.001)			
Total Newly Enrolled (per capita)		−0.034		
		(0.031)		
Crowd-Out R.F. (per capita)			0.039	
			(0.193)	
Expansionary R.F. (per capita)			−0.067	
			(0.061)	
Crowd-Out Probit (per capita)				−0.028
				(0.243)
Expansionary Probit (per capita)				−0.037
				(0.109)
Total FTE Relevant Medical Professionals (000s)	−0.003	−0.002	−0.002	−0.002
	(0.004)	(0.004)	(0.004)	(0.004)
Total ICU Beds (000s)	0.041	0.041	0.041	0.041
	(0.031)	(0.031)	(0.031)	(0.031)
Teaching Facility	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Trauma Facility	0.001**	0.001**	0.001**	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)
Population Hispanic or Latino (%)	−0.000*	−0.000*	−0.000*	−0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Advantage Beneficiaries (per capita)	0.276	0.275	0.280	0.276
	(0.182)	(0.180)	(0.173)	(0.169)
Number EMS Stations	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Population in Poverty (%)	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Total Population (per 10k)	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Trends?	Yes	Yes	Yes	Yes
Hospital Effects?	Yes	Yes	Yes	Yes
Year Effects?	Yes	Yes	Yes	Yes
Within R-squared	0.104	0.103	0.104	0.103
Observations	2,542	2,542	2,542	2,542
Residual Std. Error	0.006	0.006	0.006	0.006

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion between 100%-138% of the FPL on total emergency department utilization that resulted in hospital admission per capita. Block bootstrapped SEs at the county level are reported in parentheses. Column (1) shows the results of a traditional difference-in-difference. Column (2) shows a varying treatment effect difference-in-difference for the total newly eligible and enrolled Medicaid population. Column (3) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a random forest to estimate the effects. Column (4) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a probit to estimate the effects. Controls included are the total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 20: Difference-in-Differences Estimation with Time Trends for Medicaid Expansion 100%-138% of the FPL: ED Visits That Do Not Result In Admission Per Capita

	Dependent variable: Not Admitted ED Visits per Capita			
	(1)	(2)	(3)	(4)
Treatment Effect	0.005***			
	(0.002)			
Total Newly Enrolled (per capita)		0.156***		
		(0.057)		
Crowd-Out R.F. (per capita)			0.725*	
			(0.433)	
Expansionary R.F. (per capita)			−0.108	
			(0.214)	
Crowd-Out Probit (per capita)				1.365**
				(0.554)
Expansionary Probit (per capita)				−0.518*
				(0.313)
Total FTE Relevant Medical Professionals (000s)	−0.002	−0.005	−0.003	−0.000
	(0.013)	(0.014)	(0.014)	(0.014)
Total ICU Beds (000s)	0.105	0.106	0.106	0.105
	(0.080)	(0.079)	(0.079)	(0.078)
Teaching Facility	0.011***	0.011***	0.011***	0.011***
	(0.004)	(0.004)	(0.004)	(0.004)
Trauma Facility	0.019**	0.019**	0.020**	0.020**
	(0.008)	(0.008)	(0.008)	(0.008)
Population Hispanic or Latino (%)	0.000	0.000	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Advantage Beneficiaries (per capita)	−0.429	−0.418	−0.376	−0.295
	(0.313)	(0.303)	(0.281)	(0.268)
Number EMS Stations	0.000*	0.000*	0.000*	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Population in Poverty (%)	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Total Population (per 10k)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Time Trends?	Yes	Yes	Yes	Yes
Hospital Effects?	Yes	Yes	Yes	Yes
Year Effects?	Yes	Yes	Yes	Yes
Within R-squared	0.329	0.331	0.331	0.333
Observations	2,542	2,542	2,542	2,542
Residual Std. Error	0.018	0.018	0.018	0.018

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion between 100%-138% of the FPL on total emergency department utilization that did not result in hospital admission per capita. Block bootstrapped SEs at the county level are reported in parentheses. Column (1) shows the results of a traditional difference-in-difference. Column (2) shows a varying treatment effect difference-in-difference for the total newly eligible and enrolled Medicaid population. Column (3) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a random forest to estimate the effects. Column (4) shows the results of a difference-in-difference separating out the crowding-out effect and expansionary effect from the total effect using a probit to estimate the effects. Controls included are the total FTE medical professionals excluding those in dentistry, psychology, and social works, total ICU beds, whether the ED is a teaching hospital, whether the ED is a trauma designated facility, percent of the population that is Hispanic or Latino, the number of Medicare Advantage beneficiaries per capita, the number of EMS stations, the percent of the population that is in poverty, and the total population.

Table 21: Difference-in-Differences Estimation: ED Visits per Capita Alternative Specifications Summary Table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Effect	0.003^{***}	0.003^{***}	0.003^{***}	0.003^{***}	0.003^{***}	0.003^{***}	0.003^{***}	0.002^{**}	0.003^{***}
Total Newly Enrolled (per capita)	0.124^{***}	0.124^{***}	0.125^{***}	0.124^{***}	0.125^{***}	0.125^{***}	0.122^{***}	0.094^{*}	0.23^{***}
Crowd-Out R.F. (per capita)	0.739^{**}	0.739^{**}	0.738^{**}	0.738^{**}	0.753^{*}	0.763^{**}	0.718^{*}	0.716^{*}	0.83
Expansionary R.F. (per capita)	-0.165	-0.167	-0.165	-0.165	-0.172	-0.176	-0.16	-0.199	-0.046
Crowd-Out Probit (per capita)	1.288^{***}	1.29^{***}	1.287^{***}	1.288^{***}	1.29^{***}	1.307^{***}	1.289^{***}	1.28^{***}	1.757^{**}
Expansionary Probit (per capita)	-0.531^{**}	-0.532^{**}	-0.53^{**}	-0.53^{**}	-0.532^{**}	-0.541^{**}	-0.536^{**}	-0.574^{**}	-0.625
Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hospital Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Relevant Medical Professionals (000s)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Medical Professionals (000s)	No	Yes	No	No	No	No	No	No	No
Total ICU Beds (000s)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Total Hospital Beds (000s)	No	No	Yes	No	No	No	No	No	No
Teaching Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trauma Designated Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (%)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (per capita)	No	No	No	Yes	No	No	No	No	No
Medicare Advantage Beneficiaries (per capita)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number EMS Stations	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Population in Poverty (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Unemployment Rate (%)	No	No	No	No	No	No	No	No	No
Rape Crime Rate per 100k	No	No	No	No	No	No	Yes	No	No
Total Population (per 10k)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that did not result in hospital admission per capita for various specifications. Block bootstrapped standard errors at the county level are used. Column (1) denotes the primary specification and columns (2) through (9) show alterations to the base specification. Complete tables for specifications shown in columns (2) through (9) can be found in the online appendix.

Table 22: Difference-in-Differences Estimation: ED Visits That Result In Hospital Admission per Capita Alternative Specifications Summary Table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Effect	−0.002	−0.002	−0.002	−0.002	−0.002	−0.002	−0.001	−0.001	−0.002
Total Newly Enrolled (per capita)	−0.036	−0.037	−0.036	−0.036	−0.038	−0.036	−0.036	−0.029	−0.015
Crowd-Out R.F. (per capita)	0.007	0.008	0.007	0.007	−0.053	0.007	0.012	0.012	0.103
Expansionary R.F. (per capita)	−0.057	−0.058	−0.057	−0.057	−0.031	−0.057	−0.058	−0.048	−0.07
Crowd-Out Probit (per capita)	−0.063	−0.061	−0.062	−0.062	−0.156	−0.063	−0.063	−0.062	0.074
Expansionary Probit (per capita)	−0.022	−0.024	−0.022	−0.022	0.029	−0.022	−0.021	−0.01	−0.065
Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hospital Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Relevant Medical Professionals (000s)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Medical Professionals (000s)	No	Yes	No	No	No	No	No	No	No
Total ICU Beds (000s)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Total Hospital Beds (000s)	No	No	Yes	No	No	No	No	No	No
Teaching Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trauma Designated Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (%)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (per capita)	No	No	No	Yes	No	No	No	No	No
Medicare Advantage Beneficiaries (per capita)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number EMS Stations	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Population in Poverty (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Unemployment Rate (%)	No	No	No	No	No	No	No	No	No
Rape Crime Rate per 100k	No	No	No	No	No	No	Yes	No	No
Total Population (per 10k)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that results in hospital admission per capita for various specifications. Block bootstrapped standard errors at the county level are used. Column (1) denotes the primary specification and columns (2) through (9) show alterations to the base specification. Complete tables for specifications shown in columns (2) through (9) can be found in the online appendix.

Table 23: Difference-in-Differences Estimation: ED Visits That Do Not Result In Hospital Admission per Capita Alternative Specifications Summary Table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Effect	0.005^{***}	0.005^{***}	0.005^{***}	0.005^{***}	0.005^{***}	0.005^{***}	0.005^{***}	0.004^{**}	0.004^{***}
Total Newly Enrolled (per capita)	0.161^{***}	0.161^{***}	0.161^{***}	0.161^{***}	0.163^{***}	0.161^{***}	0.157^{***}	0.123^{*}	0.246^{***}
Crowd-Out R.F. (per capita)	0.731^{*}	0.732^{*}	0.731^{*}	0.73^{*}	0.806^{*}	0.757^{*}	0.706^{*}	0.704^{*}	0.726
Expansionary R.F. (per capita)	-0.108	-0.109	-0.108	-0.108	-0.141	-0.12	-0.101	-0.15	0.024
Crowd-Out Probit (per capita)	1.351^{***}	1.35^{***}	1.349^{***}	1.35^{***}	1.446^{**}	1.37^{***}	1.352^{***}	1.343^{***}	1.683^{**}
Expansionary Probit (per capita)	-0.509^{*}	-0.509^{*}	-0.508^{*}	-0.509^{*}	-0.56^{*}	-0.519^{*}	-0.515^{*}	-0.564^{*}	-0.559
Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hospital Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Relevant Medical Professionals (000s)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Medical Professionals (000s)	No	Yes	No	No	No	No	No	No	No
Total ICU Beds (000s)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Total Hospital Beds (000s)	No	No	Yes	No	No	No	No	No	No
Teaching Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trauma Designated Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (%)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (per capita)	No	No	No	Yes	No	No	No	No	No
Medicare Advantage Beneficiaries (per capita)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number EMS Stations	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Population in Poverty (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Unemployment Rate (%)	No	No	No	No	No	No	No	No	No
Rape Crime Rate per 100k	No	No	No	No	No	No	Yes	No	No
Total Population (per 10k)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that did not result in hospital admission per capita for various specifications. Block bootstrapped standard errors at the county level are used. Column (1) denotes the primary specification and columns (2) through (9) show alterations to the base specification. Complete tables for specifications shown in columns (2) through (9) can be found in the online appendix.

Table 24: Difference-in-Differences Estimation using Unbalanced Panel: ED Visits per Capita Alternative Specifications Summary Table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Effect	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***	0.003**	0.003***
Total Newly Enrolled (per capita)	0.133***	0.133***	0.133***	0.133***	0.134***	0.131***	0.132***	0.099*	0.214***
Crowd-Out R.F. (per capita)	0.671*	0.672*	0.673*	0.67*	0.688*	0.694*	0.652*	0.642*	0.683
Expansionary R.F. (per capita)	−0.12	−0.121	−0.122	−0.119	−0.127	−0.134	−0.113	−0.156	−0.002
Crowd-Out Probit (per capita)	1.066**	1.067**	1.068**	1.066**	1.08**	1.087**	1.071***	1.062**	1.501**
Expansionary Probit (per capita)	−0.392*	−0.393*	−0.394*	−0.391*	−0.399	−0.407*	−0.397*	−0.442*	−0.508
Unbalanced Panel?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hospital Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Relevant Medical Professionals (000s)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Medical Professionals (000s)	No	Yes	No	No	No	No	No	No	No
Total ICU Beds (000s)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Total Hospital Beds (000s)	No	No	Yes	No	No	No	No	No	No
Teaching Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trauma Designated Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (%)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (per capita)	No	No	No	Yes	No	No	No	No	No
Medicare Advantage Beneficiaries (per capita)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number EMS Stations	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Population in Poverty (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Unemployment Rate (%)	No	No	No	No	No	No	No	No	No
Rape Crime Rate per 100k	No	No	No	No	No	No	Yes	No	No
Total Population (per 10k)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that did not result in hospital admission per capita for various specifications using an unbalanced panel of emergency departments. Block bootstrapped standard errors at the county level are used. Column (1) denotes the primary specification and columns (2) through (9) show alterations to the base specification. Complete tables for specifications shown in columns (2) through (9) can be found in the online appendix.

Table 25: Difference-in-Differences Estimation using Unbalanced Panel: ED Visits That Result In Hospital Admission per Capita Alternative Specifications Summary Table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Effect	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001
Total Newly Enrolled (per capita)	−0.008	−0.008	−0.009	−0.008	−0.009	−0.008	−0.008	−0.001	0.007
Crowd-Out R.F. (per capita)	−0.011	−0.011	−0.01	−0.011	−0.059	−0.011	−0.01	−0.003	0.099
Expansionary R.F. (per capita)	−0.007	−0.007	−0.008	−0.007	0.014	−0.007	−0.008	0	−0.035
Crowd-Out Probit (per capita)	0.018	0.019	0.018	0.018	−0.065	0.017	0.017	0.021	0.137
Expansionary Probit (per capita)	−0.023	−0.024	−0.024	−0.023	0.022	−0.023	−0.023	−0.013	−0.066
Unbalanced Panel?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hospital Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Relevant Medical Professionals (000s)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Medical Professionals (000s)	No	Yes	No	No	No	No	No	No	No
Total ICU Beds (000s)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Total Hospital Beds (000s)	No	No	Yes	No	No	No	No	No	No
Teaching Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trauma Designated Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (%)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (per capita)	No	No	No	Yes	No	No	No	No	No
Medicare Advantage Beneficiaries (per capita)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number EMS Stations	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Population in Poverty (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Unemployment Rate (%)	No	No	No	No	No	No	No	No	No
Rape Crime Rate per 100k	No	No	No	No	No	No	Yes	No	No
Total Population (per 10k)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that results in hospital admission per capita for various specifications using an unbalanced panel of emergency departments. Block bootstrapped standard errors at the county level are used. Column (1) denotes the primary specification and columns (2) through (9) show alterations to the base specification. Complete tables for specifications shown in columns (2) through (9) can be found in the online appendix.

Table 26: Difference-in-Differences Estimation using Unbalanced Panel: ED Visits That Do Not Result In Hospital Admission per Capita Alternative Specifications Summary Table

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Effect	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.005***	0.003**	0.004***
Total Newly Enrolled (per capita)	0.142***	0.141***	0.141***	0.142***	0.143***	0.139***	0.14***	0.1	0.207***
Crowd-Out R.F. (per capita)	0.682*	0.683*	0.683*	0.681*	0.747*	0.705*	0.662	0.645	0.584
Expansionary R.F. (per capita)	−0.112	−0.114	−0.114	−0.112	−0.141	−0.127	−0.106	−0.156	0.033
Crowd-Out Probit (per capita)	1.049*	1.048*	1.049*	1.048*	1.145**	1.07*	1.053**	1.042*	1.364**
Expansionary Probit (per capita)	−0.369	−0.369	−0.37	−0.368	−0.422	−0.384	−0.374	−0.43	−0.442
Unbalanced Panel?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Hospital Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Relevant Medical Professionals (000s)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total FTE Medical Professionals (000s)	No	Yes	No	No	No	No	No	No	No
Total ICU Beds (000s)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Total Hospital Beds (000s)	No	No	Yes	No	No	No	No	No	No
Teaching Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trauma Designated Facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (%)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Population Hispanic or Latino (per capita)	No	No	No	Yes	No	No	No	No	No
Medicare Advantage Beneficiaries (per capita)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Number EMS Stations	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Population in Poverty (%)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Unemployment Rate (%)	No	No	No	No	No	No	No	No	No
Rape Crime Rate per 100k	No	No	No	No	No	No	Yes	No	No
Total Population (per 10k)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: *p<0.1; **p<0.05; ***p<0.01

This table represents difference-in-difference regressions for the impact of Medicaid expansion on total emergency department utilization that did not result in hospital admission per capita for various specifications using an unbalanced panel of emergency departments. Block bootstrapped standard errors at the county level are used. Column (1) denotes the primary specification and columns (2) through (9) show alterations to the base specification. Complete tables for specifications shown in columns (2) through (9) can be found in the online appendix.