HEALTH INSURANCE EXPANSIONS AND PROVIDER BEHAVIOR:
EVIDENCE FROM SUBSTANCE USE DISORDER PROVIDERS

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ABSTRACT

We examine how substance use disorder (SUD) treatment providers respond to private insurance
expansions induced by state equal coverage ('parity') laws for SUD treatment vis-à-vis general
healthcare services. Economic theory suggests that such laws will lead to changes in provider
behaviors. We use data on licensed specialty SUD treatment providers in the United States
between 1997 and 2010 in a differences-in-differences analysis. During this period, 12 states
implemented laws that require equality in coverage for SUD treatment. Following the passage of
a state parity law we find that providers are less likely to participate in public markets, are less
likely to offer price discounts to patients, and increase the quantity of healthcare provided.
Further we find evidence that treatment intensity declines following passage of a parity law and
heterogeneity in effects across ownership status.

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I. Introduction

State-level equal coverage ('parity') laws for substance use disorder (SUD) treatment in private insurance plans prohibit discriminatory coverage of SUD treatment services vis-à-vis general healthcare services. Standard economic models (Sloan, Mitchell et al. 1978, Mcguire and Pauly 1991) suggest that parity laws can induce changes in the insurance markets in which providers participate as well as the quantity and intensity of treatment provided. In this study we test these predictions using data on specialty SUD treatment providers between 1997 and 2010.

There are several reasons why understanding factors that affect SUD treatment provision is important beyond simply testing the predictive power of economic models in real-world healthcare markets. These reasons relate to the financial and non-financial costs SUDs impose on individuals and society. In terms of direct financial costs, the U.S. spends nearly $28B per year on SUD treatment, [1] the majority (69%) of which is financed by public payers (Substance Abuse and Mental Health Services Administration 2013) with specialty SUD treatment representing roughly 70% of treatment received in the past year (Center for Behavioral Health Statistics and Quality 2016). [2] The full costs of SUDs extend beyond financial costs of addiction treatment, however. For example, SUDs are linked with morbidity and mortality (Carpenter and Dobkin 2009, Carpenter and Dobkin 2011), increased use of general healthcare services (Balsa, French et al. 2009), employment problems (Terza 2002), crime (Carpenter 2007), violence (Markowitz and Grossman 2000), and traffic accidents (Adams, Blackburn et al. 2012).

Not surprisingly, the total annual economic costs of SUDs in the U.S. are large: $519B (Caulkins, Kasunic et al. 2014). [3] In addition, the U.S. is the midst of an alarming and

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[1] The authors used the Consumer Price Index to inflate the original estimate ($24B in 2009 dollars) to 2017 dollars.
[2] Data are based on Table 5.30A. We compared treatment for alcohol and/or illicit drugs received in specialty settings and specialty setting to all treatment to construct this estimate. More details available on request.
[3] The authors used the Consumer Price Index to inflate the original estimate ($481B in 2011 dollars) to 2017 dollars.

unprecedented rise in opioid use disorders (OUDs) with 115 overdose deaths per day attributable to this drug. Indeed, both the Centers for Disease Control and Prevention and Department of Health and Human Services have classified this rise in OUDs as an epidemic (Centers for Disease Control and Prevention 2017). The economic burden of non-medical prescription opioid use to the U.S. economy is estimated to be $63B per year (Birnbaum, White et al. 2011).[4] Moreover, the emergence of synthetic opioids such as fentanyl and the re-emergence of heroin as substances of abuse are deeply concerning to healthcare providers, advocates, and policymakers.

Although SUDs place a great burden on both the affected individual and society, treatment has been shown to reduce SUDs and their associated harms among treated patients (Rajkumar and French 1997, Lu and McGuire 2002, Stewart, Gossop et al. 2002, Kunz, French et al. 2004, Reuter and Pollack 2006, Popovici and French 2013, Volkow, Frieden et al. 2014, Swensen 2015, Bondurant, Lindo et al. 2016). Thus, understanding how SUD providers respond to changes in treatment coverage, such as those induced by insurance expansions, is important for promoting public health and minimizing social costs.

To study this question, we use data on the near universe of licensed specialty SUD treatment providers in the U.S. between 1997 and 2010. Over this time period, 12 states implemented laws that compel private insurers to provide equal coverage for SUD treatment services vis-à-vis general healthcare services, offering a quasi-experiment with which to study parity impacts on the supply side of treatment. Using a differences-in-differences design, we examine provider response along several margins: participation in specific insurance markets, use of price discounts, charity care provision, treatment quantity, and treatment setting.

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[4] This estimate is inflated by the authors from 2009 dollars to 2017 dollars using the Consumer Price Index.

Our findings suggest that SUD providers alter their care practices following the implementation of a state SUD treatment parity law. Following passage of parity laws, providers are less likely to participate in public insurance markets, are less likely to offer price discounts to patients, increase the quantity of healthcare provided, and are more likely to offer less intensive treatment – measured by setting (outpatient vs. inpatient). We observe heterogeneity in effects by ownership status (for-profits vs. non-profits).

This manuscript proceeds as follows: Section 2 describes state-level SUD treatment parity laws and related literature. Section 3 outlines the conceptual framework that guides our empirical analysis. Data, variables, and methods are outlined in Section 4. In Section 5 we present our main findings and Section 6 reports robustness checks. Section 7 concludes.

2. Background and related literature

2.1 Government efforts to expand SUD treatment coverage in private insurance markets

Historically SUD treatment benefits have been covered less favorably than general healthcare benefits in private insurance plans (Starr 2002).[5] Federal and state governments have attempted to address this coverage disparity.

The federal government has implemented two key coverage changes. The 2008 Mental Health Parity and Addiction Equity Act (MHPAEA) became effective in 2010. MHPAEA prohibits differences in treatment limits and cost-sharing, and extends coverage requirements to SUD treatment services in a range of public and private health insurance plans (Medicaid, Medicare, group and individual private plans). However, the Act does not mandate that plans provide SUD coverage; rather it regulates coverage generosity within plans that cover SUD services. The ACA, effective January 1st 2014, lists coverage for SUD treatment as one of ten

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[5] Public insurance coverage has historically been less generous as well.

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required benefits for private insurance offered for sale on online health insurance exchange marketplaces and individuals newly insured through expanded Medicaid programs. This Act extends MHPAEA by mandating equal coverage for SUD treatment in all affected plans rather than requiring parity only for plans that offer SUD benefits.

States have also attempted to address less generous coverage for SUD treatment in private markets by mandating coverage for such services ('parity laws'). There is substantial heterogeneity in terms of how states choose to regulate SUD coverage. Some states simply require insurers to offer a set of benefits to beneficiaries ('mandated offer'), place few limits on what benefits must be covered, and allow for substantial disparity between SUD treatment and general healthcare services in terms of cost-sharing and service limits. On the other hand, 'full parity' laws require insurers to cover SUD treatment and prohibit any discriminatory coverage for SUD treatment vis-à-vis general healthcare treatment in terms of cost-sharing and service limits. Hence these laws are designed to ensure equal coverage across the two groups of services. Finally, some states opt for a compromise: insurers are required to cover a specified set of benefits with restrictions on cost-sharing and service limits but differential treatment between SUD and general healthcare service coverage is permitted ('mandated benefits').

We examine the effects of full parity for both alcohol and illicit drug treatment. We choose to study full parity laws offering coverage for both alcohol and illicit drug treatment as these laws are likely to have the most impact on provider behavior as the majority of providers treat both alcohol use and illicit drug disorders. In our data, the shares of patients in treatment for alcohol, illicit drugs, and both are 23%, 23%, and 53%.

2.2 Evidence on private insurance expansion effects

Recent studies have relied on several regulatory changes to study the effect of private insurance expansions on SUD treatment use:[6] the 2006 Massachusetts healthcare reform that increased both public and private insurance coverage, the ACA 2010 dependent coverage provision (which requires that many private insurers offer coverage to dependent children of beneficiaries through the child's 26th birthday), MHPAEA, and state parity laws.

Meara, Golberstein et al. (2014) examine changes in inpatient hospital care among young adults after the 2006 healthcare reform law in Massachusetts. The authors find declines in SUD-related emergency department use and inpatient hospitalizations, which could be attributable to expanded access to SUD treatment services in other settings (e.g. outpatient). Maclean and Saloner (2018) find some evidence that admissions to specialty SUD treatment increase post-reform, but the finding is not entirely stable across different specifications.

Golberstein, Busch et al. (2015) document that the ACA dependent coverage provision leads to an increase in SUD admissions to hospitals. However, Saloner and Cook (2014) find that the provision has no effect on SUD treatment use in the National Survey of Drug Use and Health (NSDUH). Akosa Antwi, Moriya et al. (2015) document that SUD hospital admissions among young adults, relative to a sample of slightly older adults, are not appreciably affected by this provision. Finally, Saloner, Akosa Antwi et al. (2018), using a national database of admissions to specialty SUD treatment, find that the provision decreases admissions, which could suggest that the provision allows patients to receive care in other settings.

Busch, Epstein et al. (2014), McGinty, Busch et al. (2015), and Ettner, Harwood et al. (2016) use insurance claims to examine the effect of MHPAEA. Findings from these studies

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[6] There are numerous studies that examine individual decisions to obtain insurance, but we focus our attention here on studies that examine changes in Federal or state laws as they are most comparable to our analysis. There is also a literature that examines the effect of public insurance (e.g., Medicaid) expansions. See for a review Maclean and Saloner (2017) of these studies.

suggest a modest impact of MHPAEA on SUD treatment use overall, but increases in the use of out-of-network services (McGinty, Busch et al. 2015). Access to out-of-network services is important in the context of SUD treatment, as many networks do not offer adequate access to specialist addiction treatment providers.

Dave and Mukerjee (2011) show that parity laws increase the number of admissions to SUD treatment using a national database of admissions to specialty treatment. Wen, Cummings et al. (2013) and Wen, Hockenberry et al. (2017) find that state parity laws increase admissions using the National Survey of Substance Abuse Treatment Services, the same dataset we employ.

3. Conceptual framework

The starting point for our empirical analysis is the Sloan, Mitchell et al. (1978) mixed economy model. Although the Sloan model was developed in the context, and has been primarily applied to analyses, of state Medicaid programs (Sloan, Mitchell et al. 1978, Baker and Royalty 2000, Garthwaite 2012, Buchmueller, Miller et al. 2016), the model offers predictions for private insurance market changes; see Table 1 in Sloan, Mitchell et al. (1978).

In the Sloan model healthcare providers are hypothesized to operate in a healthcare market with two types of insured patients – the privately insured and the publicly insured – and uninsured patients. In our context, this third patient group includes patients who self-pay (either because they do not have insurance or their insurance does not cover SUD treatment services), and poor uninsured patients who do not pay for treatment and instead receive free care (`charity care'). The assumed order of reimbursement rates in the Sloan model is as follows: privately insured, publically insured, and charity care. Providers prefer to treat patients in this order and will only treat lower reimbursement rate patients when there are no higher reimbursement rate

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patients remaining in the market. Of course, provider j will only treat patients within group i if

$MR_i \geq MC_j$; where $i \in \{private\ insurance, public\ insurance, uninsured\}$.

Figure 1 graphically depicts our conceptual model adopted from Sloan, Mitchell et al. (1978). The marginal revenue curve faced by the provider is kinked; in particular there are three segments which capture patient groups that offer different levels of reimbursement. The leftmost downward sloping segment of the marginal revenue curve, MR_p, captures the privately insured market. The horizontal segment, MR_m, captures the public market; e.g., Medicaid, Medicare, state-financed, and other public insurance programs. Finally, the rightmost downward sloping segment of the marginal revenue curve (MR_c) reflects the market segment that offers the lowest reimbursement rate to providers, the charity care market. Where a provider chooses to operate – that is his mix of privately insured, publicly insured, and uninsured patients – is determined by his marginal cost curve. In Figure 1 providers with marginal cost curves MC_1 will treat only privately insured patients while providers with marginal cost curves MC_2 and MC_3 will treat a mix of privately and publicly insured patients. Finally, providers operating with marginal cost curve MC_4 will treat patients in all three markets (private, public, and uninsured).

In our study, we explore how, all else equal, providers respond to changes in the share of the private insurance market that covers SUD treatment services. In the context of the Sloan model, a state parity law in the private insurance market can be depicted as an outward rotation in the MR_p segment of the marginal revenue curve to MR_p'. That is, a larger share of the privately insured now has access to SUD treatment benefits.[7] We assume for simplicity that individuals who gain private insurance coverage for SUD treatment services through the

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[7] Basic demand theory implies that a decrease in price should increase the quantity demanded, while changes in the market size should lead to a change in demand. We focus on the latter change here: an increase in the market size.

expansion have, on average, comparable SUDs and preferences as those individuals who held

private coverage for these services prior to the expansion.[8] Relatedly, as the private insurance

market expands, the uninsured market declines (those individuals who gain private coverage for

SUD treatment services in our context held private insurance that did not cover these services

prior to the expansion). Thus, the uninsured portion of the marginal revenue curve (MR_u) should

rotate inward to MR_u'. There is no change in the size of the public market (MR_m).

The impact of this expansion on the providers' mix of patients and quantity of healthcare

services is predicated on where the marginal cost curves of providers are located prior to the

expansion of private coverage for SUD treatment services. Specifically, providers with marginal

cost curve MC_1 who treated only privately insured patients in the pre-expansion period will

continue to participate in the private market only, but will increase the quantity of services they

provide (Q_1 to Q_2). Providers with marginal costs curves MC_2 will increase the share of

privately insured patients; indeed they will leave the public market entirely, and increase the

quantity of services provided (Q_3 to Q_4). Providers with marginal cost curves MC_3 – participate

in the private and public market in the pre-expansion period – will shift their patient mix toward

privately insured patients, but will continue to participate in both the private and public market

and provide the same quantity of healthcare post-expansion. Finally, providers with marginal

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[8] It may be that individuals who hold private insurance coverage contracts that are compelled to provide SUD treatment services through state mandates are different, particularly in terms of the prevalence or severity of SUDs, than comparable individuals who had private coverage for these services prior to the expansion. To the best of our knowledge, there is no evidence on this question. However, Busch, Meara et al. (2013) show that individuals who gain access to Medicaid insurance through the ACA-related expansions have somewhat higher SUD prevalence rates than individuals holding Medicaid insurance prior to these expansions. These findings suggest that there may be differences in SUD treatment needs, and therefore in marginal cost of treatment, between those individuals gaining insurance through state parity laws and those individuals previously holding private insurance. If the newly insured were more costly than the previously insured, this higher marginal cost would offset a part of the benefit in terms of their higher reimbursement rate (i.e., marginal revenue).

cost curve MC_4, who participate in all three markets pre-expansion, exit the uninsured market, and increase quantity (Q_6 to Q_7).

Thus, the Sloan model leads to several market-level predictions regarding the impact of a private insurance expansion for SUD treatment services.

Prediction 1: Patient mix will shift toward the privately insured.

Prediction 2: Patient mix will shift away from the uninsured.

Prediction 3: The quantity of healthcare services will increase.

The effect of parity laws on provider participation in the public market is ambiguous as the effect will be determined by the responses of providers with marginal cost curves MC_2 and MC_4. While the Sloan model does not offer predictions for treatment setting or services offered, we can turn to additional theories. For instance, provider-induced-demand (PID) theory suggests that, while providers may induce excess treatment pre-expansion, there may be more scope for inducement as the share of patients with private coverage for SUD treatment increases (McGuire 2000). Moreover, models that allow heterogeneity across the types of patients providers treat open the door to the possibility that inducement may vary across patients of different types (Mcguire and Pauly 1991, Howard, Hockenberry et al. 2017). This pathway implies that treatment intensity will increase post-expansion.[9] We note the possibility raised by Chen (2014)

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[9] The discussion thus far has assumed that the populations covered by specific insurance plans and the uninsured will remain stable following the passage of the parity law. If instead individuals previously insured through Medicaid substitute private for public insurance then the MR_p will rotate farther outward and the MR_m segment of the marginal revenue curve will shrink. Similarly, if previously uninsured individuals take up private insurance to gain access to the newly covered benefits, this behavior will lead to an additional outward rotation of the MR_p segment and the MR_u segment will rotate farther inward. We test the hypothesis that passage of a parity law induces individuals to take up private insurance or substitute private for public insurance by regressing the proportion of the state with any insurance, private insurance, and public insurance using Equation (1), outlined later in the manuscript, and data from the Annual Social and Economic Supplement to the Current Population Survey over our study period (1997 to 2010; dropping 1999 and 2001 to align with our study period which is discussed later). We find no evidence that passage of a parity law leads to changes in overall insurance coverage or private coverage. Surprisingly, we find some evidence that public insurance coverage increases post-expansion. It is

that charity care may be a normal good. If charity care is a normal good and parity laws increase

provider income overall, we may find that, post-expansion, charity care provision increases.

In the canonical Sloan model all uninsured patients are assumed to offer lower

reimbursement rates to providers than either the privately insured or the publicly insured.

However, numerous studies within health economics show that the uninsured self-paying

patients pay higher prices for services than the privately insured. In particular, physicians charge

uninsured self-paying patients on average 2.5 times the amount most insurers are charged

(Tompkins, Altman et al. 2006, Anderson 2007, Melnick and Fonkych 2013, Bai 2015,

Dusetzina, Basch et al. 2015).[10] Given this disconnect between the patient groups outlined in the

Sloan model and reimbursement rates offered by self-paying patients, we separately consider the

self-pay market and the charity care market. Because self-pay patients plausibly offer higher

reimbursement rates to providers than other patients, we expect no change in provider

participation in the self-pay market post-expansion.

4. Data and methods

4.1 National Survey of Substance Abuse Treatment Services (N-SSATS)

We use the N-SSATS as our primary source of data. These data provide information on

all licensed providers known to the Substance Abuse and Mental Health Services Administration

(SAMHSA) that offered specialty SUD treatment between 1997 and 2016.[11] SAMHSA defines

a specialty SUD treatment facility as a hospital, a residential facility, an outpatient treatment

facility, or other facility with an SUD treatment program that offers the following services:

outpatient, inpatient, or residential/rehabilitation treatment; detoxification; opioid treatment; and

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possible that this increase could reflect well-established reporting error in the CPS (Lo Sasso and Buchmueller 2004). See Supplementary Table 1.

[10] Insurers arguably have a stronger bargaining position vis-à-vis providers than a single patient.

[11] Due to survey re-designs there are no data for 1999 or 2001.

halfway-house services. This care reflects roughly 70% of SUD treatment received in 2015 (Center for Behavioral Health Statistics and Quality 2016). We focus on years 1997 to 2010. We truncate the sample in 2010 as MHPAEA became effective in this year and this federal law supersedes state laws (Dave and Mukerjee 2011). Moreover, early private provisions of the ACA became effective in late 2010 (Tello-Trillo 2016) and several states expanded Medicaid in advance of the ACA between 2010 and 2011 (Sommers, Arntson et al. 2013).

The N-SSATS data provide a 'snap shot' of one day of a provider's operations, where a provider is a facility that delivers specialty SUD treatment services. Between 1997 and 2000 the survey day is near the end of September, and the end of March thereafter. Administrators send a survey to all known licensed specialty SUD providers each year. A staff member familiar with the provider's operations completes the survey. Over our study period the N-SSATS response rates are over 85%. The N-SSATS is an unbalanced panel, we observe a provider on average 5 times, and our analysis dataset consists of 158,049 provider/year observations. Due to missing responses to outcome variables, our sample sizes vary to some extent across regressions.

4.2 Outcome variables

We consider several possible margins along which specialty SUD treatment providers may respond to changes in coverage for SUD treatment. First, we examine accepted forms of payment: self-pay, private insurance, and public insurance (Medicaid, Medicare, other state financed, and military).[12] These variables proxy for provider participation in particular markets. Additionally, we explore the provision of price discounts, which is proxied by the use of a sliding scale that allows some patients to pay a reduced fee. We consider this outcome to explore whether, post-expansion, providers have less incentive to accept discounted fees from

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[12] We group all public insurance forms in one group for brevity, but we explore specific public markets formally later in the manuscript.

self-pay patients (who plausibly offer the highest reimbursement rates) as the number of patients with private insurance increases. Finally, we investigate the provision of free care to the uninsured as measured by provision of free care to some or all patients ('charity care'). Payment variables were added to the N-SSATS in 2000 while charity care variables were added in 2003.

Second, we examine treatment quantity: past year admissions and number of patients on the survey day. Third, we consider treatment setting, outpatient and inpatient/residential treatment. Not all providers offer treatment in both settings. However, we expect that passage of a parity law does not affect the propensity of offering treatment in these settings.[13] [14]

4.3 State parity laws

Our source of variation is changes in state parity laws that compel private insurers to provide equal coverage for both alcohol and illicit drug treatment, and general healthcare services between 1997 and 2010.[15] To construct our parity measures, we use data from Robinson, Connolly et al. (2006), Barry and Sindelar (2007), and Wen, Cummings et al. (2013).[16] Between1997 and 2010, 12 states passed a full parity law. Specific states that passed a parity law and associated effective dates are reported in Table 1. We match law effective dates to the N-SSATS survey day; hence our N-SSATS effective dates depart from actual effective dates in some years (details available on request from the corresponding author).

These law changes include states that implemented a parity law for the first time and states that altered existing statue; i.e., increasing the strength of the law from mandated offer or

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[13] We have estimated our quantity, setting, and offered services and programs regressions on the period 2000-2010 to match the market participation and charity care provision analyses. Results are broadly unchanged, although somewhat less precise as there are fewer changes that we can leverage. See Supplementary Tables 2, 3, and 4.

[14] See Supplementary Table 5. We regress the probability that a provider offers outpatient and inpatient care using Equation (1); which is outlined later in the manuscript.

[15] In previous versions of this manuscript we relied on effective dates provided by the National Council of State Legislatures (2017). However, we learned that there were some errors in these data and therefore updated our coding scheme following the recent literature. More details are available on request from the corresponding author.

[16] We thank Hefei Wen and Jason Hockenberry for providing updated information on state parity laws.

minimum mandated benefits. Table 1 also indicates the type of law change (e.g., no law to full parity, minimum mandated benefits to full parity). We note that the treatment 'dose' will vary across states to some extent; e.g., the dose is larger for states that transition from no law to a full parity law than for states that transition from minimum mandated benefits to a full parity law. Henceforth, we refer to full parity laws as simply parity laws.

4.4 Control variables

We merge several state-level variables into the N-SSATS to control for state characteristics in our regression models. First, we merge in the share of the population that is employed by a small firm, defined as less than 100 employees; as larger firms are more likely to self-insure and thus be exempt from state insurance mandates (Kaestner and Simon 2002), from the Annual Social and Economic Supplement to the Current Population Survey (ASEC). We merge state-year level demographic (age, sex, race, ethnicity, education, and family income) variables from the ASEC. We include variables that potentially proxy state-level preferences toward substance use and addiction treatment: the beer tax per gallon from the Brewers' Almanac (The Beer Institute 2012), marijuana decriminalization (Pacula, Chriqui et al. 2003),[17] legalization of medical marijuana (Sabia and Nguyen 2016), a prescription drug monitoring program (PDMP) (Ali, Dowd et al. 2017), and annual funding from the Substance Abuse Prevention and Treatment (SAPT) block grant program (obtained from SAMHSA).[18] We control for the Medicaid income eligibility for a family of three (Hamersma 2013)[19] and Health Insurance Flexibility and Accountability (HIFA) waivers (Wen, Hockenberry et al. 2017).

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[17] We thank Rosalie Pacula for sharing updated marijuana decriminalization data with us.
[18] We thank Brandy Lipton for providing these data to us.
[19] We are grateful to Sarah Hamersma for kindly sharing Medicaid income eligibility with us. We match the Medicaid income data using the 4th (1st) quarter information between 1997 and 2000 (2002 and 2010).

We control for social policies: the effective state minimum wage, maximum Temporary Assistance for Needy Families (TANF) benefit for a family of four, and the state Earned Income Tax Credit (EITC) as a proportion of the federal EITC, and Governor parity (University of Kentucky Center for Poverty Research Center 2016).[20] We include the state population from the U.S. Census Bureau. We inflate all monetary values to 2010 terms using the Consumer Price Index. Finally, we include provider-level controls: primary focus, solo practitioner, ownership, located within a hospital, and government financing (not including public insurance payments).

4.5 Empirical model

We estimate the relationship between state parity laws on SUD provider outcomes with the following differences-in-differences (DD) regression model:

(1) $Y_{ist} = \beta_0 + \beta_1 L_{st-1} + \beta_2' X_{st} + \beta_3' P_{ist} + S_S + \tau_t + \mu_{ist}$

Y_{ist} is a measure of specialty SUD treatment for provider *i* in state *s* in year *t*. L_{st-1} is an indicator variable that takes on a value of one if state *s* has passed a parity law in year *t-1* and zero otherwise. We lag this variable by one year to allow for a time delay between the passage of a law and our outcomes.[21] X_{st} is a vector of state demographics and policies, and P_{ist} is a vector of provider characteristics. S_s and τ_t are vectors of state and year fixed effects. ε_{ist} is the error term. We cluster standard errors around the state.[22] We estimate linear probability models (LPM) when the outcome is binary and OLS when the outcome is continuous.[23]

5. Results

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[20] We follow Maclean and Saloner (2018) and treat the major of DC as the *de facto* mayor of that locality.
[21] Moreover, our admissions variable pertains to the past year. We have estimated a version of Equation (1) that uses the contemporaneous parity laws. Results are very similar. See Supplementary Tables 6, 7, 8, and 9.
[22]The N-SSATS includes all states in all years and we have 51 clusters (Cameron and Miller 2015).
[23] We have estimated binary outcome regressions with a probit model and continuous outcomes with a Poisson model an OLS model in which outcomes are log transformed (we add one to zero values, but results are robust to adding smaller values such as 0.5. These results are available on request from the authors). Results are robust to these alternative specifications. See Supplementary Tables 10, 11, 12, and 13.

5.1 Summary statistics

Table 2 reports summary statistics for the full sample and for states that pass and do not pass a parity law. In terms of market participation and acceptance of discounted payments, in the full sample 91%, 66%, and 68% of providers participate in the self-pay, private, and public markets while 64% offer price discounts through the use of a sliding scale and 52% provide charity care.[24] The average number of annual admissions is 309 and the number of patients receiving treatment on the survey day is 88. There are 25 patients receiving inpatient care and 96 patients receiving outpatient care; the sum of patients receiving inpatient and outpatient care does not equal the average number of total patients as not all facilities offer both inpatient and outpatient treatment. 13% of the state/year observations have a full parity law in place. State demographics and policies are similar to a national sample.

We next examine states that do and do not pass a parity law by 2010. Participation in the insurance markets we study and acceptance of discounted payments is fairly similar across the two groups of states. States that pass a parity law are more likely to provide charity care than states that do not pass such a law: 58% vs. 52%. Moreover, there is a stark difference in the number of annual admissions: 284 in states that pass a parity law and 314 in states that do not pass such a law. Patient volumes, both overall and in particular treatment settings, are similar across these two groups of states.

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[24] We note that the percentages in the analysis sample do not match the shares of patients treated by providers in the Sloan model. In particular, based on the Sloan model we would expect the following order of participation in specific markets: private insurance > public insurance > charity care. However, we find that the share participating in the public market is greater than the share participating in the private market. We suspect that this difference is a result of our variable coding (which we elected in an attempt to maintain a tractable manuscript; otherwise we would report results for four public markets rather than one public market in all analyses of market participation). The Sloan model focuses on Medicaid participation and we group all public insurance together in our main analysis and code a provider as participating in the public market if he/she accepts any form of public insurance. As we show later in the manuscript, participation in any specific public market is lower than participation in the private market as predicted by the Sloan model. For example, the share of providers participating in the Medicaid market is 54%, which is less than the share participating in the private market (66%).

Overall, the two groups of states are broadly comparable in terms of demographics. However, there are important differences in terms of state policies and size. For example, states that pass parity laws have lower beer taxes, are less likely to decriminalize marijuana or legalize medical marijuana, are less likely to have a PDMP, have less generous Medicaid coverage, and have lower SAPT block grant funding. Finally, states that pass parity laws are less likely to have Democrat governors and are smaller in terms of population. The majority of the differences in outcomes and control variables between states that pass and do not pass a parity law by 2010 are statistically different from zero; see Column 4 in Table 2.

5.3 Regression analysis of provider participation in specific insurance markets

Table 3 reports regression results for the effect of parity laws on market participation, discounted payment acceptance, and provision of charity care. We find that, post-expansion, providers in expanding states are 2.6 percentage points (4.1%, we compare the estimated beta to the sample proportion/mean to construct relative magnitudes throughout the paper) less likely to offer price discounts and 3.3 percentage points (4.9%) less likely to participate in the public market relative to providers in non-expanding states. We find no statistically significant evidence that parity law passage leads to changes in self-pay or private market participation or provision of charity care among providers in expanding states.

In Appendix Table 1, we consider the effects of parity laws on participation in distinct public markets: Medicaid, Medicare, other state financed, and military. Our results for public market participation are driven by a reduction in the probability of participating in the Medicaid and other state-financed insurance markets. In particular, post-expansion providers in expanding states are 4.0 percentage points (7.5%) less likely to participate in Medicaid and 3.5 percentage points (9.9%) less likely to participate in other states health insurance programs than providers in

non-expanding states. We find no statistically significant evidence that passage of state parity laws leads to changes in provider participation in the Medicare or military markets.

We also consider parity effects on separate forms of charity care: providing care at no charge to patients who cannot pay and offering free care to all patients in Appendix Table 2. We find no statistically significant evidence that passage of a parity law leads to changes in the probability of offering either type of charity care.

5.4 Regression analysis of treatment quantity

Table 4 reports results for treatment quantity. Post-expansion, treatment quantity increases among providers in expanding states relative to non-expanding states. More specifically, following the passage of a parity law, there are 28.4 (9.2%) additional admissions each year and there are 12.9 (14.7%) more patients receiving treatment on the survey date.

5.5 Regression analysis of treatment setting

We next report estimated effects of parity laws on treatment setting (Table 5). These variables serve as proxies for treatment intensity. We find no statistically significant evidence that the number of patients receiving care in inpatient settings is altered by the passage of a state parity law, although the coefficient estimate is negative which suggests that this number declines, 95% confidence intervals include positive values, however. Post-expansion, the number of patients receiving care in outpatient settings increases by 14.1 (14.7%).

6. Robustness checks

6.1 Heterogeneity by ownership status

Research on hospitals and SUD treatment providers suggests potential differences in expenditures, treatment offerings, and quality of care by ownership status (Sloan, Picone et al. 2001, Richter, Choi et al. 2004, Silverman and Skinner 2004, Horwitz 2005, Bachhuber,

Southern et al. 2014). In particular for-profit hospitals are more likely than government or non-profit hospitals to respond to incentive changes to minimize costs and maximize revenues.[25] Ownership-stratified estimates for market participation, treatment quantity, and treatment setting are reported in Appendix Table 3, 4, and 5. We group government and non-profit providers as non-profits due to the small number of government-owned providers (14.1% of the sample).

Examination of the mean values for our outcome variables across providers of different ownership statuses provides *prima facie* evidence of differences in behavior across the two groups and supports an ownership-stratified analysis. For example, 23.9% of for-profits provide charity care while 63.7% of non-profits provide this type of care, and there are on average 257 admissions to for-profit providers and 329 annual admissions to non-profit providers.

We document heterogeneity in the effects of parity laws on market participation, acceptance of discounted payments, and provision of charity care (Appendix 3). First, we find that the decline in the probability of accepting discounted payments observed in the full sample is driven entirely by for-profits: coefficient estimates are precise and large in magnitude within the for-profit sample, and small and imprecise within the non-profit sample. More specifically, passage of a parity law leads to a 7.7 percentage point (15.4%) decline in the probability that a for-profit provider offer price discounts through a sliding scale in expanding states relative to non-expanding states. While we find no evidence in the full sample that passage of parity leads to changes in the probability of providing charity care, we find that passage of a parity law leads to a 4.6 percentage point (19.2%) reduction in the probability of providing such care among for-

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[25] We explored the possibility that passage of a parity law could lead to changes in ownership status. Interesting, we find evidence that passage of a state parity law leads to a 7% decline in the probability that a provider is for-profit. While we are uncertain as to what lies behind this somewhat unexpected finding, this finding does suggest that stratifying the sample on ownership status may lead to conditional-on-positive bias in our estimates and we urge readers to interpret stratified findings with some caution. See Supplementary Table 14.

profits. The relative effect size (i.e., comparing the estimated beta to the sample proportion) of the decline in the probability of participating in the public market is comparable across for-profits and non-profits. Similarly, we find no statistically significant evidence that either type of provider alters participation in the self-pay or private market post-expansion.

Turning to our measures of treatment quantity (Appendix Table 4), we find evidence that quantity increases post-expansion among both types of providers. However, coefficient estimates are only statistically significant in the non-profit sample and the relative effect sizes are larger among non-profits than among for-profits. For example, post-expansion, the number of admissions increases by 3.7% among for-profits and 12.0% among non-profits. In terms of treatment setting (Appendix Table 5), we observe statistically significant evidence that passage of state parity leads to changes in the number of patients treated in inpatient and outpatient settings among non-profits. Comparable to the full sample, post-expansion we find that the number of inpatients decreases by 9.1% and the number of outpatients increases by 15.7%.

6.2 Patient characteristics

We explore whether there are changes in the composition of patients receiving treatment post-expansion. We have limited patient information in the N-SSATS, which is specifically designed to track SUD services (Substance Abuse and Mental Health Services Administration 2016). However, N-SSATS provides information on the shares of patients in treatment for different types of SUDs: alcohol, illicit drug, and alcohol and illicit drugs. We regress these shares on parity laws and results are reported in Appendix Table 6.

We find that, post-expansion, the share of patients in treatment for illicit drugs only increases by 3.5 percentage points (15.2%) while the share of patients in treatment for alcohol and illicit drugs declines by 3.1 percentage points (5.8%). There is no statistically significant

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evidence that the share of patients in treatment for alcohol use disorder only changes post-expansion. Thus, collectively these estimates suggest that, post-expansion, the patients in treatment may shift away from those who have both alcohol and illicit drug use disorders and towards illicit drug disorder only. Based on clinical evidence that documents patients with poly-SUDs have more severe disorders, patients in treatment post-expansion may have less severe SUDs (Dutra, Stathopoulou et al. 2008, Martinotti, Carli et al. 2009).[26]

6.3 Policy endogeneity

We next estimate event studies to assess policy endogeneity (Autor 2003, Lovenheim 2009, Kline 2011). That is, given that healthcare policies (including the parity laws we study here), are determined within states' political economies, it is plausible that policymakers may implement policies in response to changes in health outcomes or healthcare use (e.g., increasing SUD prevalence). Such a phenomena would imply that, instead of parity laws leading to changes in provider behaviors, such behaviors would lead to implementation of parity laws.

We conduct an event study to test for the existence of policy endogeneity and to examine dynamics in the post-period. We first center the data around the event (i.e., parity law passage) for states that pass a parity law by 2010. Next, we construct an event window that includes the period seven years in advance of the law passage and after the law passage; that is we apply endnotes following Kline (2011). Observations for states that pass a parity law outside the event window are excluded. We create bins seven years pre-law, five to six years pre-law, three to four years pre-law, one to two years pre-law, year of the law passage, one to two years post-law, three to four years post-law, five to six years post law, and seven years post-law. We omit the

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[26] We note that this hypothesis is in line with our finding that outpatient treatment, which is arguably less intensive than inpatient treatment, increases post-expansion. However, we interpret these findings cautiously as we lack clinical detail on patients and hence cannot draw firm conclusions regarding disease severity.

period one to two year pre-law passage. States that do not pass a parity law by 2010 are coded as zero for all bins. We report event study results graphically for each of our outcomes in Appendix Figures 1 through 9. We include a vertical line that divides each figure into the pre- and post-law period. 95% confidence intervals that account for within-state clustering are reported with vertical lines for each parameter estimate.

Overall, our event studies do not reveal evidence of policy endogeneity. Although some coefficient estimates do rise to statistical significance in some specifications, in general – where we observe statistically significant leads – the estimates change in sign and do not reveal a clear pattern. Moreover, even if we do observe evidence of policy endogeneity, controlling for the leads can allow us to recover causal estimate on the lags, the objects of primary interest.

Interesting, the event study for participation in the self-pay market suggests that overtime providers are more likely to participate in this market. Our event study findings support our DD findings for use of price discounts, private and public market participation, and provision of charity care. Turning to our measures of quantity (total admissions and the number of patients), we document that, post-expansion, providers increase quantity of healthcare, and these effects increase in the post-law period. Our event studies provide evidence that declines in the number of patients treated in inpatient settings and increases in the number of patients treated in outpatient settings (our proxies for treatment intensity) escalate with time after the expansion.

6.4 Offered services and programs

We next investigate whether passage of a state parity law alters the services and programs offered by SUD treatment providers. Specifically, we consider measures of offered services and programs: the number of offered services (e.g., employment assistance), the number of special programs for particular populations (e.g., pregnant and post-partum women), and the use of

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medication in treatment (e.g., buprenorphine; a prescription medication indicated for opioid use disorder). These variables may proxy for measures of treatment intensity not captured by treatment setting and/or differences across patients in the types of treatment demanded. Appendix Table 7A provides more information on these variables.

In Appendix Table 7B we report selected coefficient estimates from the regressions of our services and programs on passage of a state parity law generated in Equation (1). We find no statistically significant evidence that passage of a parity law leads to changes in these outcomes.

6.5 Between-state heterogeneity

In our primary specification, we control for between state differences by including a wide range of time-varying control variables and state fixed effects. A concern with this specification is that some of the control variables may themselves be influenced by parity laws and including these variables in the regression model may lead to bias (Angrist and Pischke 2009). On the other hand, these models may not offer sufficient control for between state heterogeneity. To address this concern, we estimate first models that exclude all time-varying controls and second include state-specific linear time trends. Finally, we augment Equation (1) with provider fixed effects, which leverage within-provider variation in parity laws.[27]

Results are reported in Appendix Tables 8 (market participation), 9 (treatment quantity), and 10 (treatment setting). Overall, while we lose precision in some specifications as coefficients decline in magnitude, our findings are broadly robust to these alternative specifications. Exceptions to this pattern are that our estimates for treatment quantity and treatment settings are somewhat sensitive to inclusion of state-specific linear time trends and

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[27] More specifically, we replace state fixed effects with provider fixed effects as provider fixed effects subsume state fixed effects. More details available on request from the corresponding author.

provider fixed effects. However, 95% confidence intervals for these estimates overlap with our baseline estimates and hence we cannot rule out the possibility that results are stable.[28]

6.6 Providers whose primary focus is SUD treatment provision

All providers in our sample offer a specialized program in SUD treatment. However, SUD treatment is not the primary focus of all providers in our sample, roughly 14% of providers have a non-SUD treatment primary focus (e.g., mental healthcare services). We next retain only those providers that list SUD treatment as their primary focus and re-estimate Equation (1). Results are reported in Appendix Tables 11 to 13 and are in line with our main findings. Listing SUD treatment as a primary focus is not affected by parity law passage.[29]

6.7 Changes in the number of providers

A concern with our analysis thus far is that parity laws may induce some providers to enter (or perhaps exit) the market, which would lead to compositional-on-positive bias (Angrist and Pischke 2009). We explore this possibility by regressing the number of total, for-profit, and non-profit providers in our sample on state parity laws using Equation (1). We find no statistically significant evidence that state parity laws alter the number of providers in our sample (Appendix Table 14). However, the coefficient estimates carry a negative sign and suggest that parity laws, if anything, may lead, unexpectedly, some providers to exit the market.

7. Discussion

In this study we apply insight from standard health economic models (Sloan, Mitchell et al. 1978, McGuire 2000) to the context of substance use disorder (SUD) treatment providers.

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[28] For example, the 95% confidence interval in the total admissions regression that includes state-specific linear time trends is [-24.853, 17.901] and the 95% confidence intervals surrounding our baseline total admissions DD estimate is [-0.989, 57.856]. Hence, there is non-trivial overlap across these intervals.

[29] We regressed the probability of listing SUD treatment as a primary focus on parity laws using Equation (1) and found no relationship that rose to statistical significance. See Supplementary Table 15.

Specifically, we test whether private health insurance expansions for SUD treatment services impact the insurance markets in which providers are willing to participate, price discounts, provision of charity care, the quantity of healthcare provided, and setting in which treatment is received. Our findings suggest that private health expansions lead providers to reduce their use of price discounts and participation in public insurance markets; in particular Medicaid and other state-financed insurance programs. Moreover, post-law, providers increase the quantity of healthcare provided in terms of annual admissions and number of patients in treatment, and care becomes less intensive as measured by treatment setting.

Our findings for participation in the self-pay and public market are in line with predictions from our conceptual model. However, findings for private market participation and treatment intensity depart from our predictions. While our data will not allow us to explore these disconnects between the model and the empirical findings, we can offer some hypotheses. In terms of private market participation, we are only able to examine the extensive market (participate/not participate) and thus we miss the relevant margin to private market participation effects: the number of patients/patient mix (i.e., the intensive margin). While we expected treatment intensity to increase, it is possible that well-established capacity constraints within the SUD treatment delivery system (Carr, Xu et al. 2008, Buck 2011) prevent such a response.

Because our analysis is intent-to-treat, we must consider whether the size of our estimated effects is reasonable. One possible way to examine the plausibility of our estimated treatment effect magnitudes is to consider the extent to which private insurance is used to pay for SUD treatment services by patients themselves. As noted earlier in the manuscript, historically private (and public) insurance has played a relatively smaller role in the financing of SUD treatment relative to general healthcare services in the U.S. However, this differential does not

imply that private insurance is not an important source of financing within the SUD treatment delivery system. Indeed, data from the 2010 – the last year of our study period – National Survey of Drug Use and Health (NSDUH) suggests that 40% of patients receiving specialty SUD treatment in the past year used private health insurance as a source of payment for their last treatment episode (Substance Abuse and Mental Health Services Administration 2010).[30]

Another approach to thinking about our estimated effect size is to consider the share of the population that is affected by state parity laws. According to Jensen and Morrisey (1999), this share ranges from 33% to 43% of the population. More recent evidence from the Medical Expenditure Panel Survey suggests that during our study period 49% to 57% of private-sector workers insurance beneficiaries worked for a self-insured firm, suggesting that 51% to 43% of such employees were potentially impacted by the policies we study here.[31] Finally, in our sample, 42% of employees worked for a small firm – 100 or less workers – (see Table 2).

We can also examine estimated effect sizes within the related literature. A clinical study by Wen, Cummings et al. (2013) document that passage of a state parity law leads to a 9% increase in SUD treatment admissions, with even larger increases when only those facilities that accept private insurance are considered. Our comparable estimate suggests that passage of a parity law leads to a 9.2% increase in admissions, which is very similar to the estimate of Wen and colleagues. While not definitive, we believe that collectively these statistics suggest that the magnitude of the treatment effect estimates we generate are indeed reasonable.

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[30]This estimate potentially understates the true role of private insurance in the financing of SUD treatments as it does not include those individuals who received multiple SUD treatments but did not use private insurance as a source of payment in the last treatment episode.

[31] Data accessed on December 20th, 2016 from the following table: https://meps.ahrq.gov/mepsweb/data_stats/quick_tables_results.jsp?component=2&prfricon=yes&searchText=insured&subcomponent=2&tableSeries=2&year=-1.

Our study has limitations. First, we lack information on the extent to which a provider participates in a particular health insurance market; instead we know whether or not a provider participates. While we lack data on this important margin of treatment provision, we can turn to a previous study by Dave and Mukerjee (2011) which explores, among other outcomes, the effect of state parity laws for SUD treatment on the probability that patients will use private insurance to pay for treatment services. The authors document that, following passage of a state parity law, the probability that a patient uses private insurance to pay for treatment increases. This finding suggests that the share of patients in treatment may shift toward the privately insured following passage of a state parity law. Second, our analysis relies on variation from 12 parity law changes. While we have argued that these changer states are comparable to non-changer states in terms of many observable characteristics (see Table 2), the generalizability of our findings is not clear. Third, our findings represent a combination of supply and demand side factors. Our reduced form methods will not allow us to isolate the relative contribution of these factors. Fourth, we lack a standard measure of treatment intensity, e.g., length of stay (Kolstad and Kowalski 2012). Fifth, we focus on specialty SUD treatment and the generalizability of our findings to other settings is unclear.

In summary, we offer new evidence on how SUD providers respond to private health insurance markets expansions. These findings may have implications for understanding how expansions that impact specific segments of the healthcare market, either at the state or federal level, impact provider behaviors and, in turn, the type of patients who are able to access care, and the amount and intensity of care provided. If regulations allow for inequalities across insurance markets in terms of coverage generosity, reimbursement rates, etc. then these regulations may lead to differences in access to care and, in turn, outcomes for patients. These findings may be

useful to policymakers who are currently considering re-shaping the future directions of the U.S.

healthcare delivery system.

Table 1. States that pass a full parity law by 2010

State	Effective date	Parity law transition
Arkansas	2009/10	Mandated offer to full parity
Connecticut	2000 (no month)	None to full parity
Delaware	2001 (no month)	None to full parity
Kansas	2009/07	Mandated benefits to full parity
Louisiana	2009/01	Mandated benefits to full parity
Maine	2003 (no month)	Mandated benefits to full parity
Maryland	1994 (no month)	None to full parity
Oregon	2007/07	Mandated benefits to full parity
Rhode Island:	2002 (no month)	Mandated benefits to full parity
Texas	2005/04	Mandated benefits to full parity
Vermont	1998 (no month)	None to full parity
West Virginia	2004 (no month)	None to full parity

Notes: See text for details on parity law sources. If there is no month, we assume that the law became effective January 1st of the listed year.

Table 2. Summary statistics: N-SSATS 1997 to 2010

Sample:	Full sample	Pass parity law	Do not pass parity law	Difference (*p*-value)*
Market participation (2000-2010)				
Self-pay	0.906	0.912	0.905	0.0005
Price discount	0.640	0.643	0.639	0.2606
Private insurance	0.661	0.691	0.656	0.0000
Any public	0.678	0.700	0.674	0.0000
Charity care**	0.525	0.582	0.515	0.0000
Quantity				
Total annual admissions	308.9	283.9	313.8	0.0000
Total clients	88.26	85.45	88.81	0.0020
Treatment setting				
Inpatient clients	24.73	24.75	24.72	0.9654
Outpatient clients	95.91	91.38	96.80	0.0000
Parity law				
Full parity (lagged one year)	0.131	0.453	0	0.0000
State controls				
Small firm	0.421	0.418	0.422	0.0000
Age	36.29	36.34	36.28	0.0000
Male	0.490	0.488	0.491	0.0000
Female	0.510	0.512	0.509	0.0000
Less than high school	0.196	0.205	0.194	0.0000
High school or more	0.804	0.795	0.806	0.0000
White	0.809	0.818	0.808	0.0000
Non-white	0.191	0.182	0.192	0.0000
Hispanic	0.135	0.139	0.135	0.0000
Family income	75697	75469	75742	0.0000
Unemployment	7.184	6.877	7.244	0.0000
Beer tax per gallon ($)	0.266	0.214	0.276	0.0000
Decriminalization	0.391	0.184	0.432	0.0000
Medical marijuana law	0.229	0.179	0.239	0.0000
Prescription drug monitoring program	0.583	0.414	0.616	0.0000
Medicaid income threshold (family of 3; $)	1298	1037	1349	0.0000
Medicaid HIFA waiver	0.052	0.058	0.051	0.0000
SAPT block grants (millions; $)	80.39	50.72	86.18	0.0000
Maximum monthly TANF benefit (family of 4; $)	608.2	537	622	0.0000
Democratic governor	0.492	0.439	0.503	0.0000
Population (millions)	12.17	8.161	12.96	0.0000
Provider controls				
Primary focus: substance abuse treatment services	0.602	0.640	0.595	0.0000
Primary focus: mental health services	0.0802	0.0824	0.0797	0.1449
Primary focus: mix of mental health and substance abuse	0.254	0.213	0.263	0.0000
Primary focus: general health care	0.0290	0.0266	0.0295	0.0113
Primary focus: other	0.0341	0.0384	0.0333	0.0000
Solo practice	0.0604	0.0810	0.0564	0.0000
Ownership: private for-profit organization	0.273	0.299	0.267	0.0000
Ownership: private non-profit organization	0.587	0.555	0.593	0.0000
Ownership: state government	0.0324	0.0566	0.0276	0.0000
Ownership: local, county, or community government	0.0703	0.0540	0.0734	0.0000
Ownership: tribal government	0.0134	0.00705	0.0147	0.0000

Ownership: federal government	0.0246	0.0281	0.0239	0.0001
Located in/operated by hospital	0.136	0.121	0.139	0.0000
Receive funding from government (grants and contracts)***	0.550	0.542	0.551	0.0078
Observations	158049	25831	132218	--

*Difference between states that pass and do not pass a full parity law by 2010. p-value from a two-tailed t-test reported in parentheses.

**Available 2003-2010.

***This variable does not include acceptance of public insurance programs (e.g., Medicaid).

Table 3. Effect of a state parity law passage on market participation: N-SSATS 2000-2010

Outcome:	Self-pay	Price discount	Private	Public	Charity care+
Proportion:	0.906	0.640	0.661	0.678	0.525
Parity (lagged one	0.010	-0.026**	0.018	-0.033***	-0.006
year)	(0.011)	(0.010)	(0.012)	(0.012)	(0.013)
Observations	133884	133884	133884	133884	107026

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
+Available 2003-2010.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Table 4. Effect of a state parity law passage on treatment quantity: N-SSATS 1997-2010

Outcome:	Admissions	Patient volume
Mean:	308.9	88.26
Parity (lagged one year)	28.434*	12.935***
	(14.649)	(4.757)
Observations	145014	147391

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Table 5. Effect of a state parity law passage on treatment setting: N-SSATS 1997-2010

Outcome:	Inpatient volume	Outpatient volume
Mean:	24.73	95.91
Parity (lagged one year)	-1.567	14.064*
	(1.409)	(7.021)
Observations	55737	121269

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 1. Effect of a state parity law passage on participation in specific public markets: N-SSATS 2000-2010

Outcome:	Medicaid	Medicare	Other state financed	Military
Proportion:	0.536	0.342	0.355	0.331
Parity (lagged one year)	-0.040**	0.017	-0.035**	0.011
	(0.017)	(0.011)	(0.014)	(0.017)
Observations	133884	133884	133884	133884

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 2. Effect of a state parity law passage on provision of specific types of charity care: N-SSATS 2003-2010

Outcome:	No charge for some patients	No charge for all patients
Proportion:	0.524	0.033
Parity (lagged one year)	0.031	-0.005
	(0.021)	(0.005)
Observations	133884	133884

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 3. Effect of a state parity law passage on market participation by ownership status: N-SSATS 2000-2010

Outcome:	Self-pay	Price discount	Private	Public	Charity care+
Proportion:	0.981	0.499	0.666	0.541	0.239
For-profit	0.002	-0.077***	0.003	-0.028**	-0.046***
	(0.004)	(0.012)	(0.019)	(0.014)	(0.016)
Observations	36804	36804	36804	36804	29998
Proportion:	0.877	0.693	0.659	0.731	0.637
Non-profit	0.011	-0.008	0.022	-0.037***	0.011
	(0.014)	(0.010)	(0.015)	(0.011)	(0.019)
Observations	97080	97080	97080	97080	77028

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
+Available 2003-2010.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 4. Effect of a state parity law passage on treatment quantity by ownership status: N-SSATS 1997-2010

Outcome:	Admissions	Patient volume
Mean:	257.4	88.71
For-profit	9.423	10.501
	(25.924)	(10.255)
Observations	39915	40621
Mean:	328.5	88.09
Non-profit	39.309***	13.021**
	(14.514)	(5.227)
Observations	105099	106770

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 5. Effect of a state parity law passage on treatment setting by ownership status: N-SSATS 1997-2010

Outcome:	Inpatient volume	Outpatient volume
Mean:	21.97	90.72
For-profit	3.535	6.964
	(2.837)	(10.469)
Observations	9149	37506
Mean:	25.27	98.23
Non-profit	-2.296**	15.439**
	(1.053)	(7.202)
Observations	46588	83763

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 6. Effect of a state parity law passage on share of patients in treatment for alcohol, illicit drug, and alcohol and illicit drug treatment: N-SSATS 1997-2010

Outcome:	Alcohol	Illicit drug	Alcohol and illicit drug
Mean:	23.24%	23.20%	53.42%
Parity (lagged one year)	-0.119	3.519***	-3.099***
	(1.456)	(1.066)	(1.076)
Observations	143993	143984	143993

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 7A. Offered services, special programs, and medication-assisted treatment: N-SSATS 1997-2010

Variable:	Specific variables
Offered services	Comprehensive SUD assessment at intake, comprehensive mental health assessment at intake, alcohol blood testing, alcohol/illicit drug urine testing, HIV/AIDS testing, other STD testing, TB testing, discharge planning, aftercare counseling, child care, social services assistance, employment assistance, housing assistance, domestic violence education, HIV/AIDS education, transportation assistance, acupuncture, individual counseling, group counseling, family counseling, and outcome follow-up after discharge
Special programs	Adolescents, dually diagnosed, persons with HIV/AIDS, women, pregnant/postpartum women, and other groups.
Medication assisted treatment	Antabuse, Naltrexone, Campral, Nicotine replacement therapies, psychotropics, Methadone, Buprenorphine, and other prescription medications

Notes: Medication assisted therapy variable availability varies across year. More details available on request.

Table 7B. Effect of a state parity law passage on offered services, special programs, and medication-assisted treatment: N-SSATS 1997-2010

Outcome:	Offered services	Special programs	Medication assisted treatment
Mean/proportion:	11.32	1.45	0.357
Parity (lagged one year)	-0.077	-0.062	0.003
	(0.127)	(0.037)	(0.020)
Observations	157989	157989	157989

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 8. Effect of a state parity law passage on market participation using alternative approaches to controlling for between-state heterogeneity: N-SSATS 2000-2010

Outcome:	Self-pay	Price discount	Private	Public	Charity care+
Proportion:	0.906	0.640	0.661	0.678	0.525
Model (1)	0.010	-0.026**	0.018	-0.033***	-0.006
	(0.011)	(0.010)	(0.012)	(0.012)	(0.013)
Model (2)	0.006	-0.034***	0.004	-0.041**	0.001
	(0.012)	(0.012)	(0.014)	(0.016)	(0.014)
Model (3)	-0.007	-0.021***	-0.005	-0.020**	0.000
	(0.011)	(0.007)	(0.012)	(0.010)	(0.017)
Model (4)	0.003	-0.021**	0.006	-0.031***	0.009
	(0.005)	(0.008)	(0.014)	(0.006)	(0.009)
Observations	133884	133884	133884	133884	107026

Notes: *Notes*: All models estimated with LS. Model (1) includes provider characteristics, and state and year fixed effects (baseline model). Model (2) includes state and year fixed effects. Model (3) provider characteristics, state-specific linear time trends, and state and year fixed effects. Model (4) includes provider characteristics, year fixed effects, and provider fixed effects (provider fixed effects subsume state fixed effects). Standard errors clustered at the state level and reported in parentheses.
+Available 2003-2010.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 9. Effect of a state parity law passage on treatment quantity using alternative approaches to controlling for between-state heterogeneity: N-SSATS 1997-2010

Outcome:	Admissions	Patient volume
Mean:	308.9	88.26
Model (1)	28.434*	12.935***
	(14.649)	(4.757)
Model (2)	31.136**	11.885**
	(15.443)	(5.434)
Model (3)	-3.476	4.454
	(10.643)	(5.757)
Model (4)	18.364	6.960*
	(12.275)	(3.519)
Observations	145014	147391

Notes: All models estimated with LS. Model (1) includes provider characteristics, and state and year fixed effects (baseline model). Model (2) includes state and year fixed effects. Model (3) provider characteristics, state-specific linear time trends, and state and year fixed effects. Model (4) includes provider characteristics, year fixed effects, and provider fixed effects (provider fixed effects subsume state fixed effects). Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 10. Effect of a state parity law passage on treatment setting using alternative approaches to controlling for between-state heterogeneity: N-SSATS 1997-2010

Outcome:	Inpatient volume	Outpatient volume
Mean:	24.73	95.91
Model (1)	-1.567	14.064*
	(1.409)	(7.021)
Model (2)	-2.180*	14.010*
	(1.104)	(7.855)
Model (3)	6.821***	1.457
	(2.513)	(5.820)
Model (4)	1.838**	7.520
	(0.888)	(5.211)
Observations	55737	121269

Notes: All models estimated with LS. Model (1) includes provider characteristics, and state and year fixed effects (baseline model). Model (2) includes state and year fixed effects. Model (3) provider characteristics, state-specific linear time trends, and state and year fixed effects. Model (4) includes provider characteristics, year fixed effects, and provider fixed effects (provider fixed effects subsume state fixed effects). Standard errors clustered at the state level and reported in parentheses.

***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 11. Effect of a state parity law passage on market participation among providers whose primary focus is SUD treatment: N-SSATS 2000-2010

Outcome:	Self-pay	Price discount	Private	Public	Charity care+
Proportion:	0.909	0.648	0.646	0.659	0.527
Parity (lagged one	0.008	-0.030**	0.015	-0.037***	-0.010
year)	(0.010)	(0.011)	(0.012)	(0.013)	(0.009)
Observations	118955	118955	118955	118955	96001

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
+Available 2003-2010.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 12. Effect of a state parity law passage on treatment quantity among providers whose primary focus is SUD treatment: N-SSATS 1997-2010

Outcome:	Admissions	Patient volume
Mean:	317.04	92.31
Parity (lagged one year)	34.473**	12.496**
	(15.553)	(4.836)
Observations	124525	126393

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
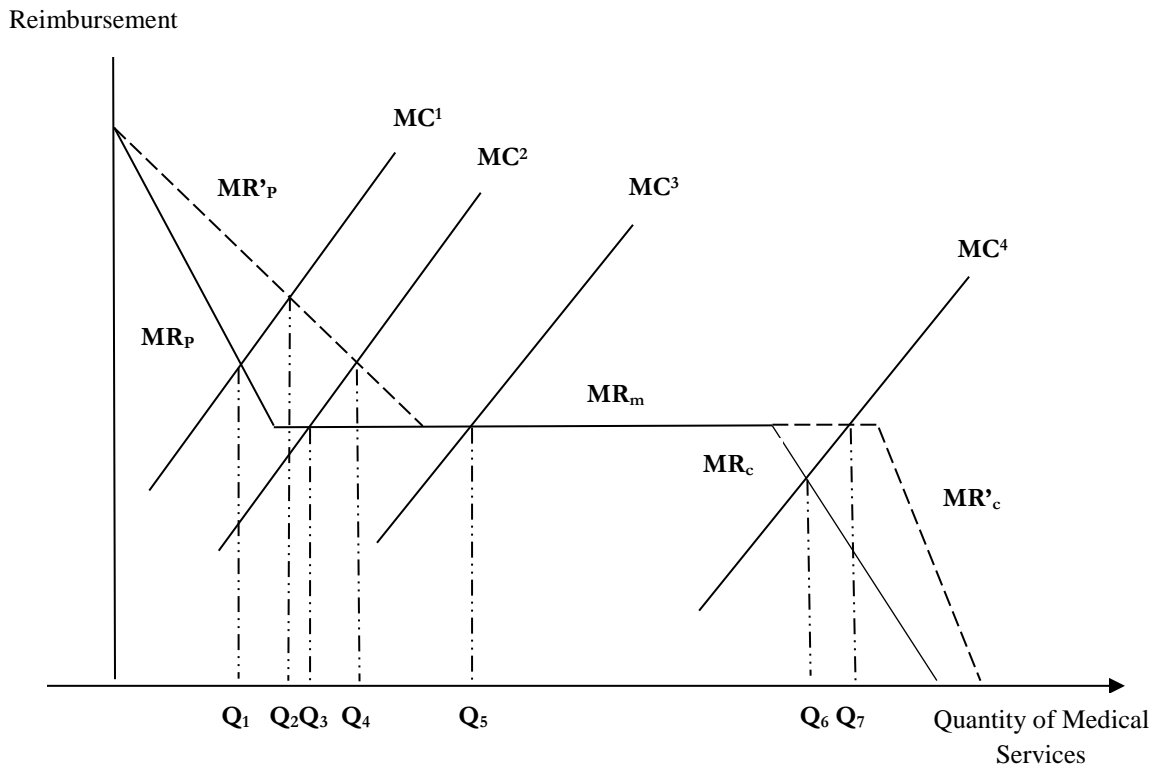***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 13. Effect of a state parity law passage on treatment setting among providers whose primary focus is SUD treatment: N-SSATS 1997-2010

| Outcome:	Inpatient volume	Outpatient volume
Mean:	26.43	101.59
Parity (lagged one year)	0.725	12.306*
	(1.411)	(7.160)
Observations	46366	102783

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Appendix Table 14. Effect of a state parity law passage on the number of facilities: N-SSATS 1997-2010

Outcome:	Total facilities	For-profit facilities	Non-profit facilities
Mean/proportion:	258.25	70.38	187.87
Parity (lagged one year)	-15.455	-8.321	-7.133
	(19.751)	(6.849)	(13.542)
Observations	612	612	612

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.

***;**;*=statistically different from zero at the 1%;5%;10% level.

**Figure 1. Sloan mixed economy model. Adopted from Sloan et al (1978)**

Reimbursement

MC^1

MC^2

MC^3

MC^4

MR'$_P$

MR$_P$

MR$_m$

MR$_c$

MR'$_c$

Q$_1$ Q$_2$Q$_3$ Q$_4$ Q$_5$ Q$_6$ Q$_7$ Quantity of Medical
                                                                                                              Services

Appendix Figure 1. Effect of a state parity law passage on self-pay market participation using an event study model: N-SSATS 2000-2010
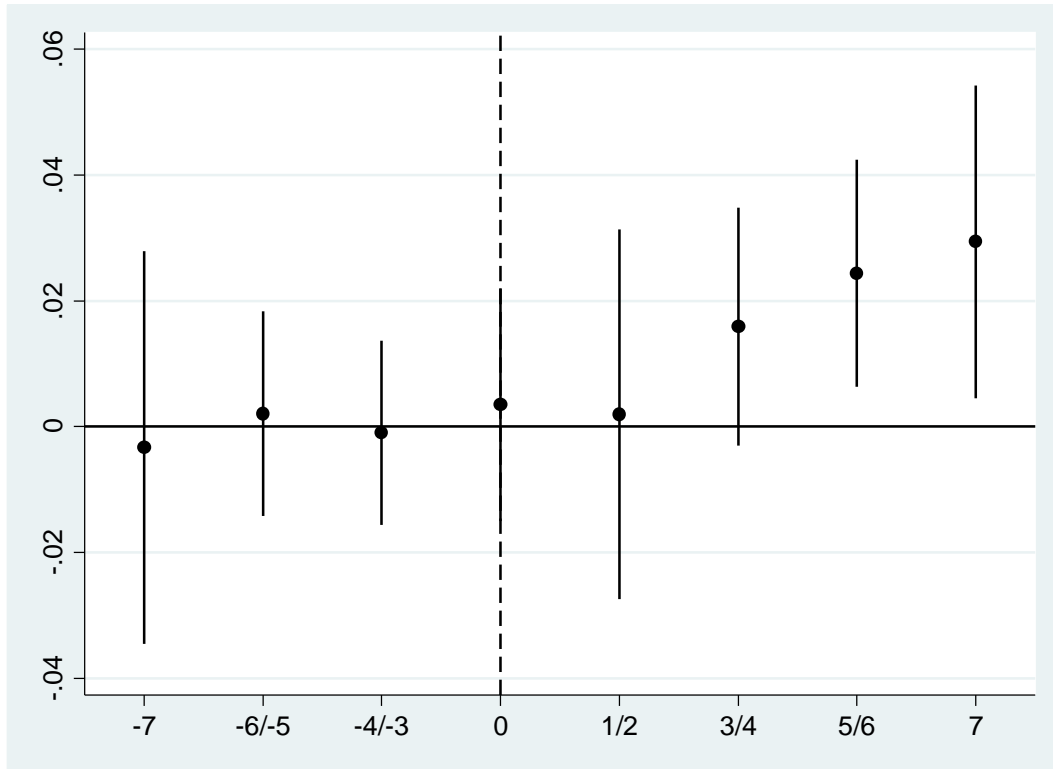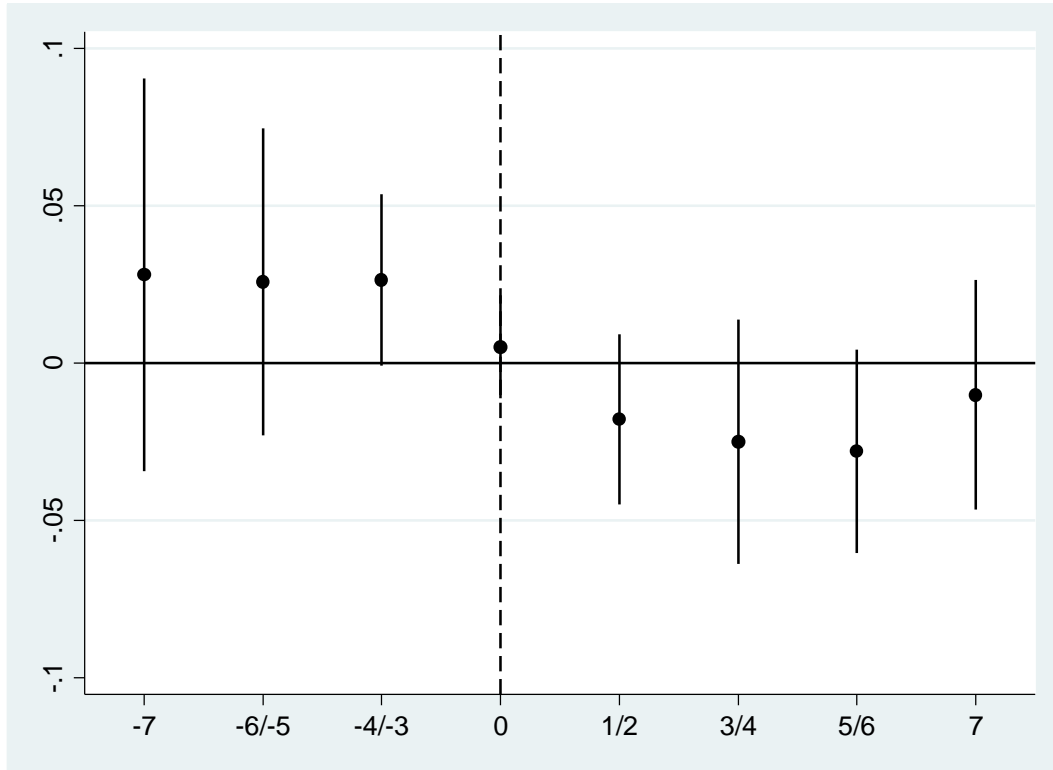

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 2. Effect of a state parity law passage on use of price discounts: N-SSATS 2000-2010
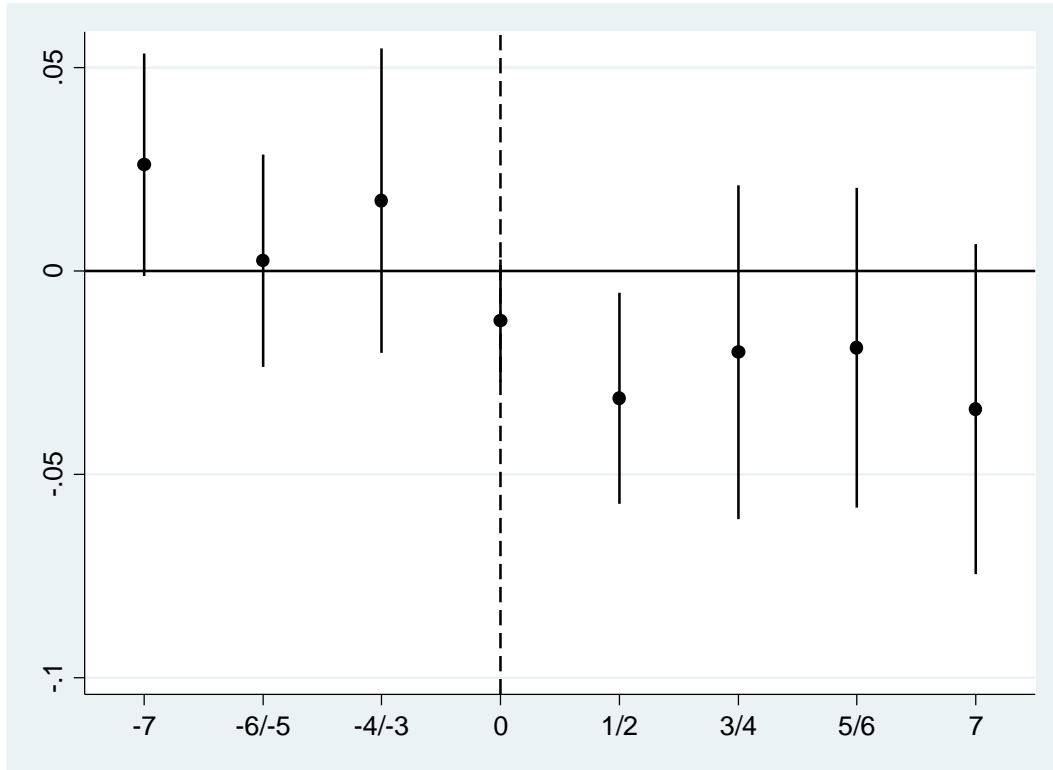
Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 3. Effect of a state parity law passage on private market participation: N-SSATS 2000-2010
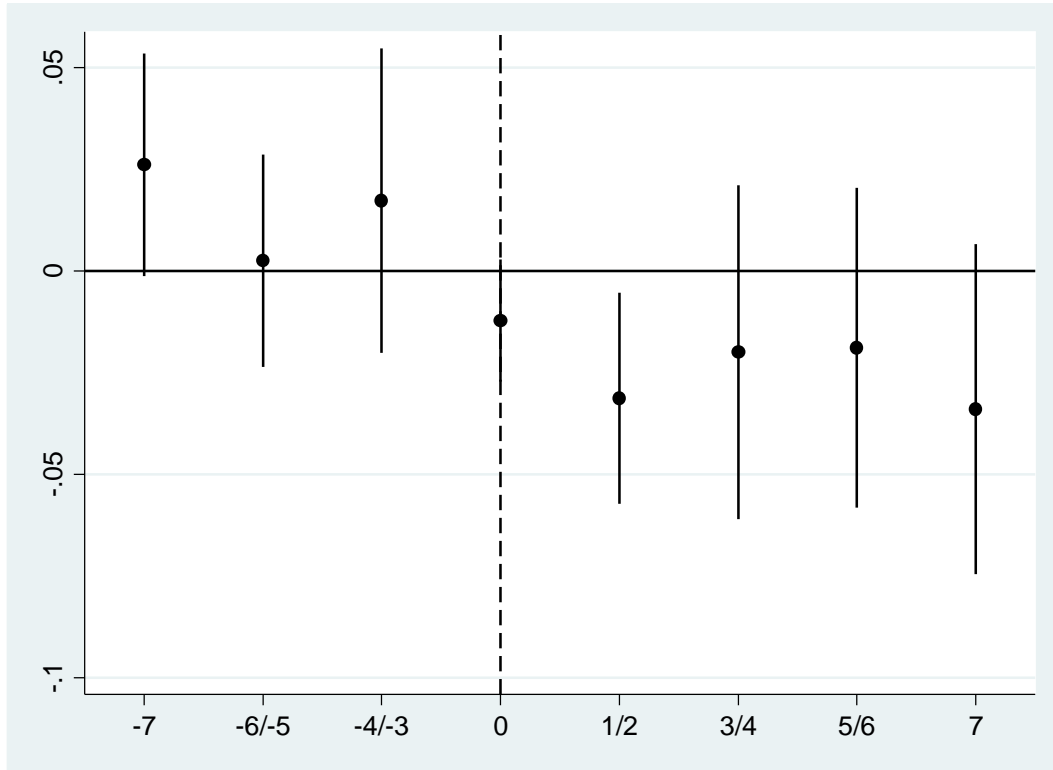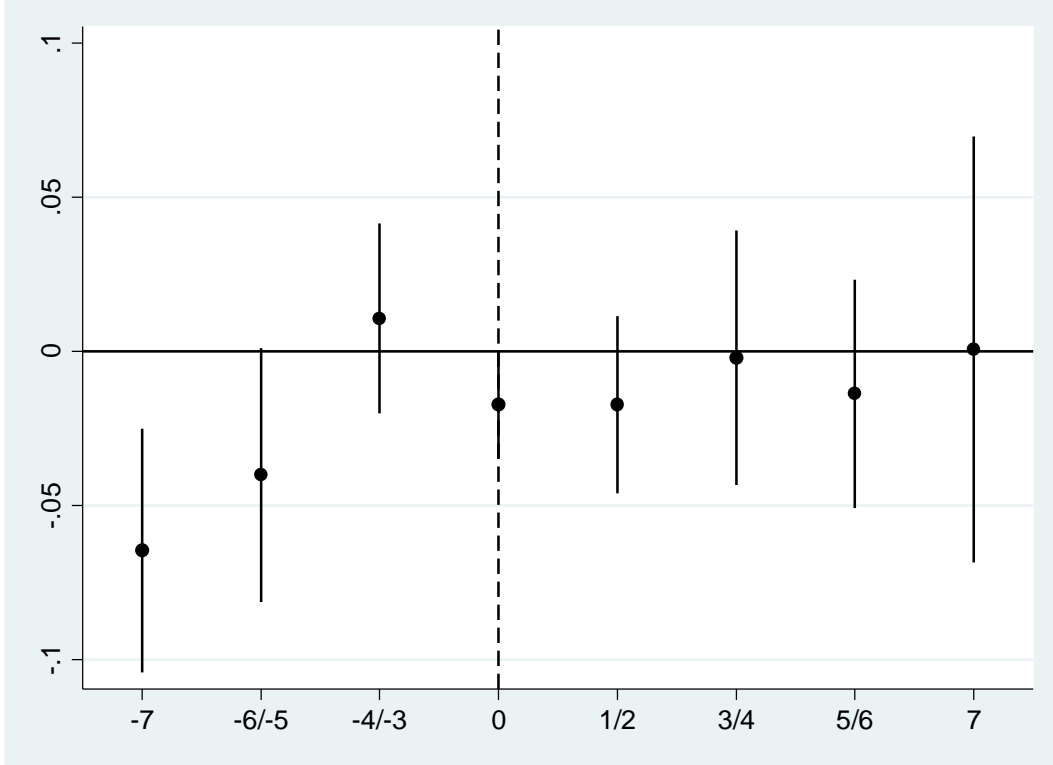

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 4. Effect of a state parity law passage on public market participation: N-SSATS 2000-2010
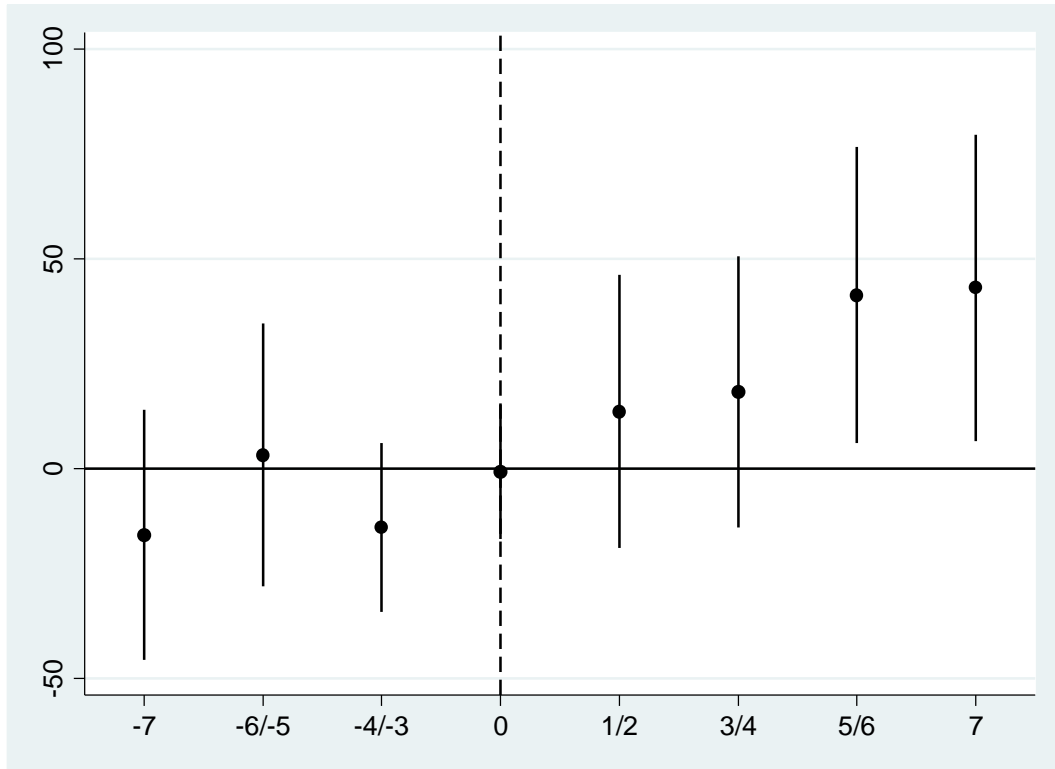

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 5. Effect of a state parity law passage on charity care provision using an event study model: N-SSATS 2003-2010
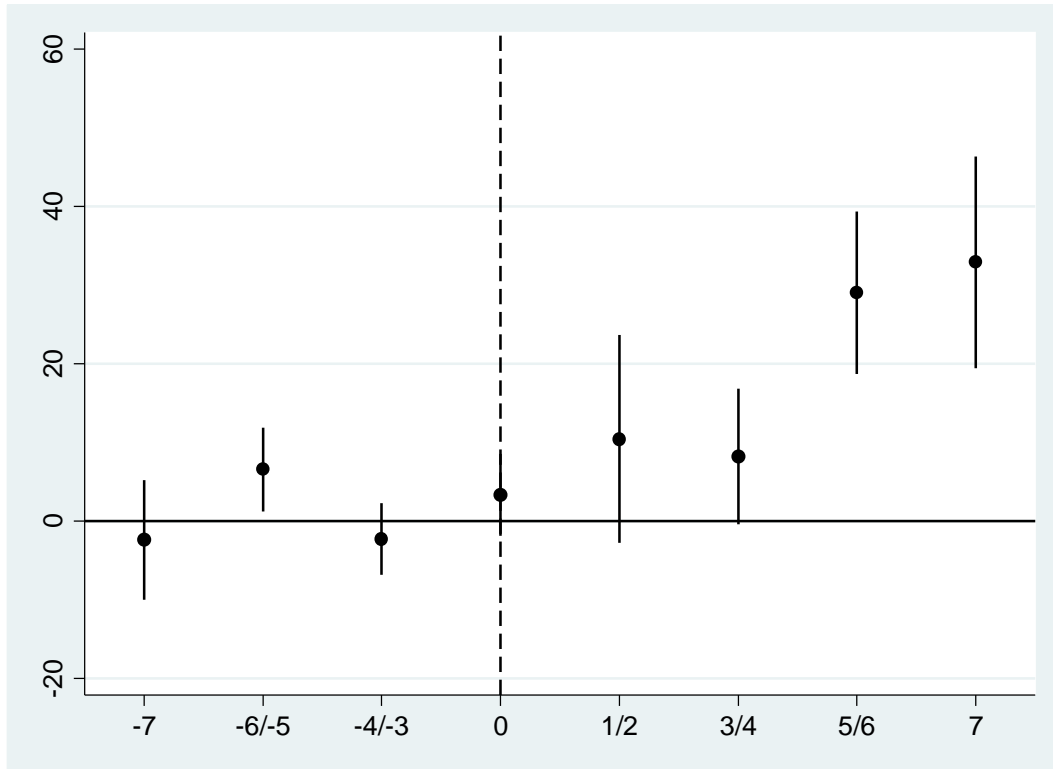

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 6. Effect of a state parity law passage on total annual admissions using an event study model: N-SSATS 1997-2010

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 7. Effect of a state parity law passage on clients in treatment using an event study model: N-SSATS 1997-2010
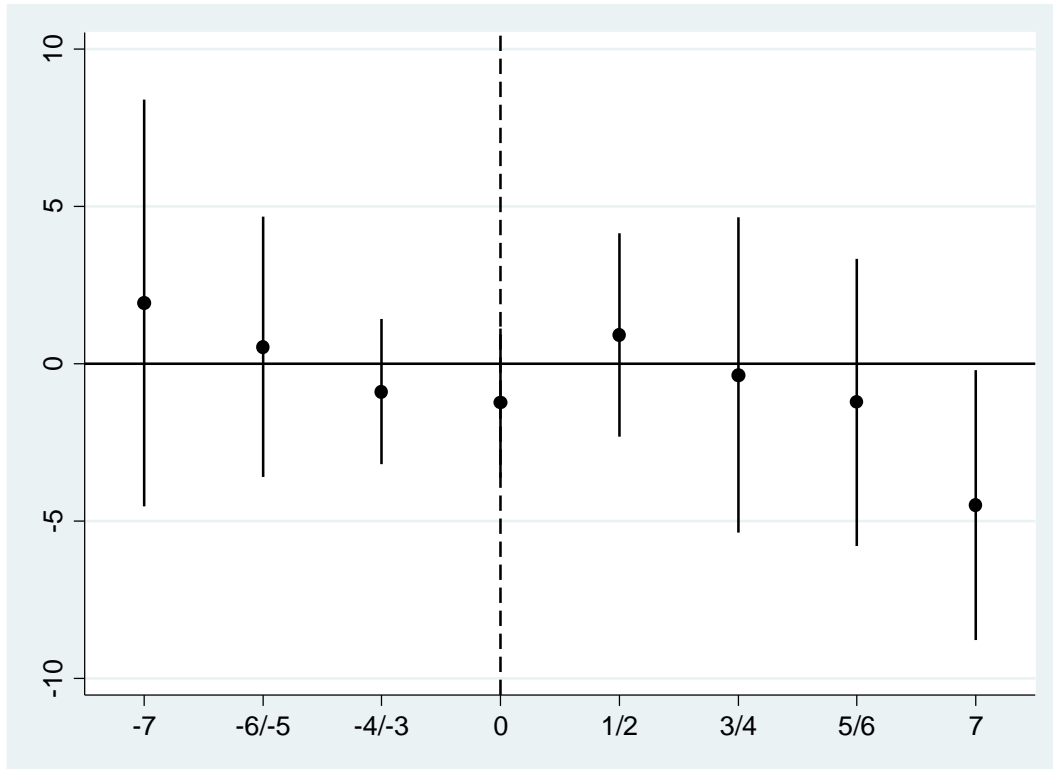

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 8. Effect of a state parity law passage on clients in inpatient treatment using an event study model: N-SSATS 1997-2010
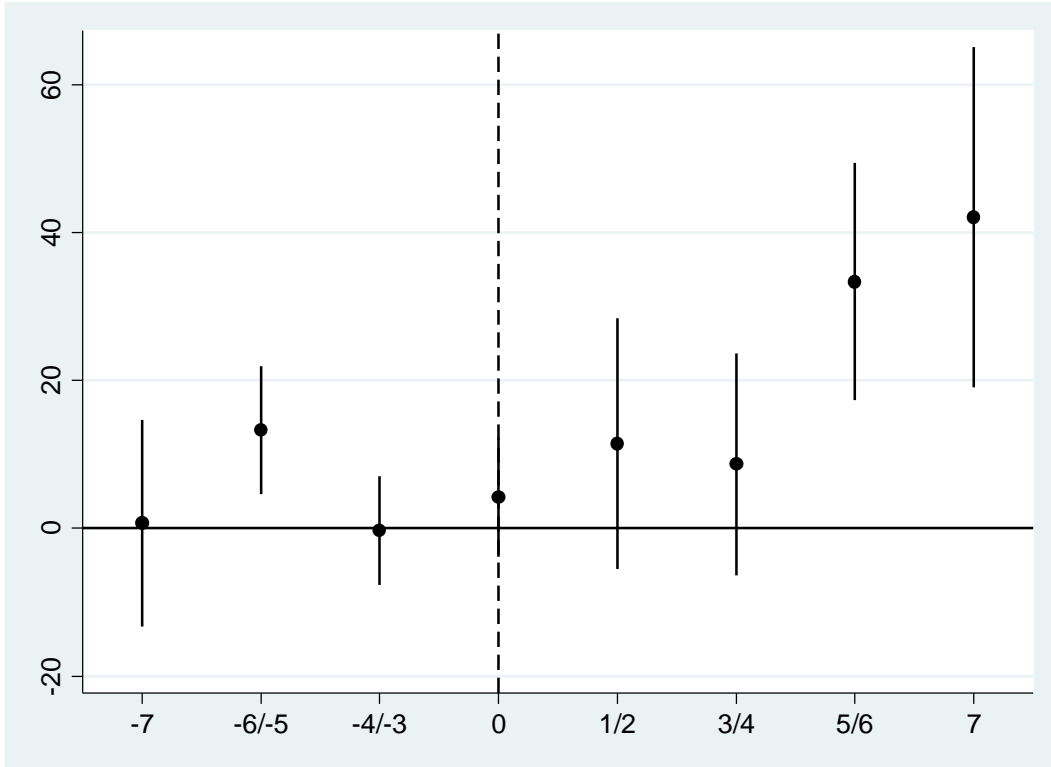

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Appendix Figure 9. Effect of a state parity law passage on clients in outpatient treatment using an event study model: N-SSATS 1997-2010

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Omitted category is the year prior to the law passage. The event window is -7 to +7. Observations outside the event window are excluded. States that do not pass a parity law by 2010 are coded as zero for all bins. 95% confidence intervals that account for within-state clustering are reported with vertical lines.

Supplementary Table 1. Effect of a state parity law passage on insurance status: Annual Social and Economic Supplement to the Current Population Survey: 1997-2010

Outcome:	Any insurance	Private insurance	Public insurance
Proportion:	0.829	0.737	0.132
Parity (lagged one year)	0.007	-0.004	0.017***
	(0.005)	(0.005)	(0.005)
Observations	612	612	612

Notes: All models estimated with LS and control for state characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 2. Effect of a state parity law passage on treatment quantity: N-SSATS 2000-2010

Outcome:	Admissions	Patient volume
Mean:	301.9	88.75
Parity (lagged one year)	28.943*	12.361**
	(15.392)	(5.466)
Observations	122715	124645

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 3. Effect of a state parity law passage on treatment setting: N-SSATS 2000-2010

Outcome:	Inpatient volume	Outpatient volume
Mean:	28.00	98.41
Parity (lagged one year)	2.456**	13.090*
	(1.051)	(7.373)
Observations	40755	100803

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 5. Effect of a state parity law passage on the probability of treating patients in different settings: N-SSATS 1997-2010

Outcome:	Any inpatients	Any outpatients
Proportion:	0.300	0.732
Parity (lagged one year)	-0.004	0.016*
	(0.007)	(0.009)
Observations	157989	157989

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 6. Effect of a state parity law passage on market participation using the contemporaneous law: N-SSATS 2000-2010

Outcome:	Self-pay	Price discount	Private	Public	Charity care+
Proportion:	0.906	0.640	0.661	0.678	0.525
Parity	0.009	-0.026***	0.019*	-0.025*	-0.013
(contemporaneous)	(0.012)	(0.008)	(0.010)	(0.014)	(0.013)
Observations	133884	133884	133884	133884	107026

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
+Available 2003-2010.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 7. Effect of a state parity law passage on treatment quantity using the contemporaneous law: N-SSATS 1997-2010

Outcome:	Admissions	Patient volume
Mean:	308.9	88.26
Parity (contemporaneous)	22.075*	9.288*
	(12.860)	(4.759)
Observations	140334	142597

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 8. Effect of a state parity law passage on treatment setting using the contemporaneous law: N-SSATS 1997-2010

Outcome:	Inpatient volume	Outpatient volume
Mean:	24.73	95.91
Parity (contemporaneous)	-2.330**	9.303
	(1.094)	(7.018)
Observations	53876	117217

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 10. Effect of a state parity law passage on market participation using a Probit model: N-SSATS 2000-2010

Outcome:	Self-pay	Price discount	Private	Public	Charity care+
Proportion:	0.906	0.640	0.661	0.678	0.525
Parity (lagged one year)	0.008	-0.025**	0.017	-0.033***	-0.007
	(0.010)	(0.010)	(0.013)	(0.012)	(0.014)
Observations	133884	133884	133884	133884	107026

Notes: All models estimated with a probit model and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses. Average marginal effects reported.
+Available 2003-2010.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 11. Effect of a state parity law passage on treatment quantity using a Poisson model and a logged OLS model: N-SSATS 1997-2010

Outcome:	Admissions	Patient volume
Mean:	308.9	88.26
Poisson model	20.316	10.440**
	(13.948)	(5.134)
Logged LS model	0.152***	0.087**
	(0.043)	(0.036)
Observations	145014	147391

Notes: All models estimated with a Poisson and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses. Population is the exposure variable. Average marginal effects reported.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 12. Effect of a state parity law passage on treatment setting using a Poisson model and a logged OLS model: N-SSATS 1997-2010

Outcome:	Inpatient volume	Outpatient volume
Mean:	24.73	95.91
Poisson model	-1.503	12.455*
	(1.007)	(6.767)
Logged LS model	0.006	0.057
	(0.053)	(0.072)
Observations	55737	121269

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses. Population is the exposure variable in the Poisson model. Average marginal effects reported.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 14. Effect of parity law passage on the probability of for-profit status: N-SSATS 1997-2010

Outcome:	Prob (for-profit)
Mean/proportion:	0.273
Parity (lagged one year)	-0.019**
	(0.009)
Observations	157989

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

Supplementary Table 15. Effect of parity law passage on the probability of listing SUD treatment as a primary focus: N-SSATS 1997-2010

Outcome:	Prob (SUD treatment primary focus)
Mean/proportion:	0.857
Parity (lagged one year)	0.009
	(0.012)
Observations	157989

Notes: All models estimated with LS and control for state characteristics, provider characteristics, and state and year fixed effects. Standard errors clustered at the state level and reported in parentheses.
***;**;*=statistically different from zero at the 1%;5%;10% level.

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