Economic downturns and substance abuse treatment: Evidence from admissions data

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Economic downturns and substance abuse treatment: Evidence from admissions data

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Abstract

This study investigates how admission rates to specialty substance abuse treatment facilities vary across the business cycle using administrative data from the Treatment Episodes Data Set between 1992 and 2010. We find that admission rates decrease in economic downturns. Our preferred specification, which controls for a rich set of demand and supply side factors, suggests that a 1 percentage point increase in the lagged state unemployment rate leads to a 2.5% reduction in total admissions, and a 3.0% and 2.3% decrease in alcohol- and illicit drug-related admissions, respectively. We conduct supplementary analyses to explore potential mechanisms for the net effects we estimate in our reduced form models. Our findings offer new evidence on the relationship between economic downturns and behavioral healthcare utilization.

Keywords: alcohol; illicit drugs; admissions; health; economic downturns.

JEL classification: I1; I12; J2

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1. INTRODUCTION

In this study we examine how substance abuse (SA) treatment received in specialty treatment facilities -- inpatient hospital, alcohol or illicit drug rehabilitation center, mental health centers, and outpatient facilities -- varies over the business cycle in the U.S. healthcare system. Existing economic literature has focused primarily on the responsiveness of general healthcare utilization to economic downturns (Ruhm, 2005, Ruhm, 2000, Hughes and Khaliq, 2014, Lusardi et al., 2010, Currie and Tekin, 2011). SA treatment use may respond differentially than that of other healthcare because income effects, which appear to dominate general healthcare utilization decisions during downturns, may be more than offset by true need for SA treatment (i.e., psychological stress related to downturns can lead individuals to misuse substances).

Although there are myriad treatment options available in the U.S., specialty SA treatment accounts for the plurality of total SA treatment expenditures (Substance Abuse and Mental Health Services Administration, 2013a) and specialty treatment has been shown to cost-effectively reduce SA (Stewart et al., 2002, Reuter and Pollack, 2006). Moreover, unlike other areas of healthcare, federal, state, and local governments fund the majority of SA treatment in the U.S. In 2009 the U.S. spent $24 billion on SA treatment and 69% of these expenditures were covered by public payers (Substance Abuse and Mental Health Services Administration, 2013a). The financial costs of treatment likely underestimate the true costs of SA to society as SA is linked with general healthcare use (French et al., 2011), crime (Carpenter, 2007), poor labor market outcomes (Mullahy and Sindelar, 1996), and traffic accidents (Chang et al., 2012).

Although SA arguably imposes high costs on society, only one in ten persons in the U.S. who display levels of SA that would benefit from specialty treatment receives such treatment (Substance Abuse and Mental Health Services Administration, 2013b). Cost and access

problems are commonly reported reasons for failure to receive treatment. During economic downturns such problems may be exacerbated as, for example, income levels (and resources available to purchase SA treatment) decline and government support for SA treatment is reduced due to declining tax revenues and tightened budgets. Understanding how SA treatment utilization varies across the business cycle is essential for prioritizing government spending and understanding unmet need for SA treatment in the population.

We find that admission rates to specialty SA treatment facilities decline in downturns. A 1 percentage point increase in the lagged state unemployment rate leads to a 2.5% reduction in total admissions, and a 3.0% and 2.3% decline in the alcohol and illicit drug admissions respectively. These results are consistent with findings for use of discretionary general healthcare (e.g., doctor visits) across the business cycle (Ruhm, 2005). We conduct a series of auxiliary regressions to shed light on the mechanisms that lie behind our main findings.

2. RELATED LITERATURE

We now review potential channels through which economic downturns may impact admissions to SA treatment. We then use insight gained from this review to develop hypotheses for the relationship between downturns and SA treatment admission rates.

2.1 Economic downturns and general healthcare utilization

A number of studies have investigated the relationship between the business cycle and general healthcare use. Broadly, these studies show that during economic downturns individuals reduce healthcare use overall (Hurd and Rohwedder, 2010), but the reduction is not homogenous across forms of healthcare. In particular, individuals reduce their use of non-emergency or discretionary healthcare (Ruhm, 2000, Ruhm, 2003, Lusardi et al., 2010) but may increase their use of emergency or avoidable care (Hughes and Khaliq, 2014, Currie and Tekin, 2011).

Storti et al. (2011), to the best of our knowledge, is the only study that examines how admissions to SA treatment respond to economic downturns. Using European data the authors find that admissions to outpatient illicit drug abuse treatment decline during downturns. Given differences in healthcare systems across countries, it is not clear how well this study can inform use about specialty SA treatment use in other settings. Moreover, outpatient treatment is only one possible form of SA treatment (and a relatively inexpensive form, both in terms of financial and non-financial costs) and the authors do not consider treatment for alcohol abuse. A related study by Frijters et al. (2013) uses internet search data to demonstrate that searches for alcohol abuse and treatment terms increase in downturns in the U.S. Taken at face value this finding is at odds with Storti et al. (2011), but it is unclear how well internet searches translate into treatment-seeking behaviors.

2.2 Economic downturns and SA

There is a large and mixed literature examining how substance use responds to downturns (Ruhm and Black, 2002, Ruhm, 1995, Arkes, 2011, Arkes, 2007, Dee, 2001). However, the vast majority of individuals who use substances do not require treatment (Substance Abuse and Mental Health Services Administration, 2013c). For our study what is important is how the level of substance use that requires specialty SA treatment varies across the business cycle.

To the best of our knowledge only two studies consider this question, and they focus exclusively on alcohol. Using the National Longitudinal Survey on Alcohol Use and Related Conditions (NESARC), Davalos et al. (2012) show that a 1 percentage point increase in the state unemployment rate leads to 1.17 greater odds of alcohol abuse and/or dependence. As noted earlier, Frijters et al. (2013) find that internet searches for alcohol abuse-related terms increase in downturns. These findings suggest that need for treatment may increase during downturns.

However, an increase in treatment need does not necessarily translate into increases in SA treatment admissions as reduced income or treatment supply may mute any increase in need.

2.3 Economic downturns and SA treatment funding

Economic downturns may impact the supply of SA treatment slots by altering both how much funding is available for treatment and the specific funding sources. Work based on general healthcare suggests that overall spending decreases during downturns (Hartman et al., 2013, Martin et al., 2011, Hartman et al., 2010). Unlike general healthcare, public payers account for the majority (69%) of spending on SA treatment in the U.S. (Substance Abuse and Mental Health Services Administration, 2013a). Thus, relative to overall healthcare expenditures (where 49% of funding is derived from public sources), SA treatment is disproportionately funded by the public sector. State and local governments, Medicaid, Substance Abuse and Mental Health Services Administration (SAMHSA) block grants, other Federal government sources, and Medicare accounted for 31%, 21%, 5%, 11%, and 5%, respectively, of total SA treatment in 2009. Private payers contributed 16% (private insurance), 11% (self-pay), and 5% (other). Moreover, the source of SA funding changes across the business cycle: when the economy enters a downturn the proportion of private spending for SA treatment declines while the proportion of public spending expands (Levit et al., 2013). Put differently, during downturns government "picks up the slack" for private payers. Substitution in payer source may have implications for public expenditures (i.e., need for public support increases when budgets tighten), and access to and quality of SA treatment.

2.4 Predictions for the relationship between economic downturns and SA treatment

Our review of the literature suggests that SA treatment rates are determined by demand and supply side factors, both of which may be influenced by economic downturns. We next formalize pathways in the following set of equations and discuss hypotheses:

(1) $Demand = f(need(UE), price(UE), income(UE), demographics)$

(2) $Supply = g(state(UE), Medicaid(UE), Medicare(UE), private(UE), grant(UE))$

Need for treatment ($need$) potentially increases during downturns through increased use of substances as a form of self-medication, and reduced time costs to procuring and consuming substances. Price of treatment ($price$) incorporates both financial and non-financial costs. Financial costs may increase during economic downturns if individuals lose access to health insurance, which may cover SA treatment services (Cawley et al., 2013, Cawley and Simon, 2005). An important non-financial cost is time, and we expect time costs to decline during downturns. Income declines during downturns, suggesting that substance use and SA treatment (a derivative good of substance use) should also decline. Indeed, the empirical evidence suggests that substances are normal goods even for addicts (Farrell et al., 2003, Bretteville-Jensen and Biorn, 2003, Petry and Bickel, 1998, Petry, 2000). We assume that demographics are not substantially influenced by the changes in the economic environment. Thus, the impact on demand for SA treatment is *ex ante* ambiguous.

We expect that during an economic downturn all sources of public funding – state and local governments ($state$), Medicaid, Medicare, and SAMHSA block grants ($grant$) – will decline due to a reduction in tax receipts, unless governments are willing and/or able to deficit spend. While deficit spending is a possibility for federal payers (Medicare, SAMHSA block grant funds), it is rarely an option for state and local governments (including state Medicaid agencies). Lastly, we expect that private expenditures will also decline in downturns.

Thus, the net effect of economic downturns on SA treatment rates is *ex ante* ambiguous, and will be determined by the relative magnitudes of changes in demand and supply side factors.

3. DATA AND METHODS

3.1 Treatment Episodes Data Set.

We obtain data on admissions to SA treatment from the TEDS between 1992 and 2010. The TEDS is an administrative database compiled annually by SAMHSA in collaboration with state SA agencies. The TEDS includes information on roughly 2 million admissions to specialty SA treatment each year, and contains nearly the universe of specialty SA treatment facilities that receive funding from the state or federal government, are certified by the state to provide specialty SA treatment, or are tracked for some other reason. This data feature has important implications for interpreting our findings as our sample is disproportionately composed of individuals who receive specialty SA treatment in facilities that receive public funding.

In our view, the TEDS are the best available data to examine how U.S. admissions to specialty SA treatment respond to economic downturns. The TEDS are commonly employed within the economic literature to study admissions to specialty SA treatment (Anderson, 2010, Jena and Goldman, 2011, Dave and Mukerjee, 2011, Pacula et al., 2013) and are utilized by the Federal government to estimate the costs of SA treatment to the U.S. (Office of National Drug Control Policy, 2012). Gfroerer et al. (2014) document that the demographics of individuals in the TEDS are comparable to samples of individuals who report having received SA treatment from the nationally representative National Survey on Drug Use and Health. Our ability to study admissions that are disproportionally supported by public funds allows us to consider healthcare utilization that places a direct financial burden on both governments and taxpayers.

The unit of observation in the TEDS is an admission to a specialty SA treatment facility, and the 1992 to 2010 TEDS include nearly 34 million admissions. Admissions referred from the criminal justice system are less likely to capture healthcare decisions made by the consumer (Dave and Mukerjee, 2011) and we exclude such admissions, leaving us with roughly 22 million admissions. We also exclude admissions for detoxification only as detoxification is generally considered a precursor to SA treatment, rather than treatment itself. We have approximately 16 million admissions in our analysis sample.

We aggregate the TEDS to the state/year level.[1] We construct the number of total, alcohol, and illicit drug admissions using information on the primary substance listed at treatment admission. We convert the number of admissions to a rate: the number of admissions per 100,000 persons in a state. We take the logarithm of the admission rate to address skewness and parameter estimates can be interpreted as approximations to the percent change.

3.2 Economic Data.

We proxy economic conditions with the annual state unemployment rate from the Bureau of Labor Statistics Local Area Unemployment Statistics database. We use a one year lag in the unemployment rate to allow for a time delay between the change in economic conditions and admissions. Our results are robust to using other proxies for economic activity, however.

3.3 Demand side variables.

We merge multiple variables from external sources into the TEDS data to proxy for demand-side SA treatment determinants. First, we would like to include a measure of need for SA treatment. Unfortunately, to the best of our knowledge, measures of need are not available for our full study period. Instead, we include the proportion of the state that reports past 30 day alcohol misuse from the Center for Disease Control and Prevention's Behavioral Risk Factor

[1] Not all states report information in all years of the TEDS. Results are robust if we focus on the balanced panel.

Surveillance Survey (BRFSS) to proxy need for SA treatment. We define alcohol misuse as heavy alcohol use (2 [1] or more drinks per day among men [women]) and any binge drinking (drinking 5 [4] or more drinks in one drinking session among men [women]). A limitation of our study is that we do not have a comparable measure for illicit drugs. Next, we include proxies for the price of SA treatment. Using information collected in the Annual Social and Economic (ASEC) Supplement to the Current Population Survey, we include the proportion of the state that is covered by a health insurance plan (public and/or private) to proxy for the financial price of specialty SA treatment and average hourly wage to proxy for time costs. We include family income (ideally we would like to include a measure of anticipated income or financial strain, but such data is not available for our study period) and demographics (sex, age, race/ethnicity, marital status, education, rural status) from the ASEC.

3.4 Supply side variables.

We next merge proxies for SA treatment funding sources into the TEDS. As noted earlier in the manuscript the major payers for SA treatment in the U.S. are state and local governments, Medicaid, private health insurance, SAMHSA block grants, and Medicare. Ideally we would like to include funding specifically for SA treatment from these sources. Unfortunately, such data are not available (apart from SAMHSA block grants). Thus, we use overall expenditures to proxy for specialty SA treatment expenditures.

We include data on state and local health expenditures from the Census of State and Local Governments, Medicaid expenditures from the Centers for Medicare and Medicaid Services (CMS), SAMHSA block grants for SA treatment, and Medicare expenditures from

CMS[2]. We were unable to locate data on private health insurance expenditures that covered our full study period. Instead we use information on SA treatment mandates for private health insurance plans. Given the comorbidity between SA and mental health problems (Hasin et al., 2007) we include mental health treatment coverage mandates. Previous work shows that these laws increase specialty SA treatment admission rates (Dave and Mukerjee, 2011, Wen et al., 2013). To address these changes in private health insurance coverage, we include separate indicators for "strong parity" state laws for 1) SA and 2) mental health services utilizing legal data from the National Conference of State Legislatures (2014).[3] [4] An important exclusion to state parity laws are self-insured firms and large firms are more likely to self-insure (Jensen and Morrisey, 1999). We control for the percentage of large firms (> 500 employees) in the state using Census data to account for this coverage exclusion.

3.5 Empirical Model.

We estimate the relationship between downturns and specialty SA treatment admission rates with the regression model outlined in Equation (3):

(3) $ln(A_{st}) = \alpha_0 + \alpha_1 U_{st-1} + \alpha_2' Demand_{st} + \alpha_3' Supply_{st} + \alpha_4' S_s + \alpha_5' S_s * t_t + \alpha_6 t_t + \varepsilon_{st}$

Here, A_{st} is the rate of specialty SA (total, alcohol, or illicit drug) treatment admissions in state *s* in year *t*. U_{st-1} is the lagged unemployment rate in state *s* in year *t-1*. $Demand_{st}$ and $Supply_{st}$ are vectors of demand and supply side factors that are predicted to influence specialty SA treatment rates. S_s is a vector of state fixed effects. We include state-specific linear time

[2] CMS Medicaid and Medicare data are only available through 2009. We impute expenditures for 2010 using prediction equations that include state fixed effects, a linear time trend, and state-specific linear time trends. The R-squares in these prediction equations are greater than 0.98.

[3] Strong parity laws are of two forms: 1) require plans to cover SA/mental health services at parity with physical health services or 2) require an option of coverage for SA/mental health services be offered or require that if SA/mental health services are offered they must be equal to physical health services.

[4] Some law changes occurred within a calendar year. The TEDS are available at the annual level. Thus, we weight laws based on start date.

trends: $S_s * t_t$ where t_t is a time trend that takes on the values 1992-2010. ε_{st} is the error term. We estimate regression models with least squares and cluster standard errors around the state

Although we have attempted to use a detailed set of demand and supply side factors in our regression models, it is unlikely that we capture all relevant factors. Moreover, some of our measures are crude and thus may poorly proxy the underlying factors that determine SA treatment admission rates. Inclusion of state fixed effects and state-specific linear time trends in our regression models will allow us to control for factors for which we lack data.

4. RESULTS

4.1 Summary statistics.

Table 1 reports summary statistics for our analysis sample. The average annual total, alcohol, and illicit drug admission rates (per 100,000) are 304, 142, and 161 respectively.

4.2 Regression analysis of specialty SA treatment admissions rates.

Table 2 reports selected regression results for SA admission rates. The top panel pertains to total admissions, the middle panel pertains to alcohol use admissions, and the bottom panel pertains to illicit drug admissions. We estimate a series of stacked models to shed light on the mechanisms through which economic downturns may influence SA treatment admissions. Model (1) includes the lagged state unemployment rate, state, linear time trend, and state-specific linear time trends. In Model (2) we include our demand side factors. In Model (3) we include supply side factors and remove demand side factors. We include both demand and supply side factors in Model (4). Estimating this series of regressions allows us to assess 1) if we observe a relationship between admissions to SA treatment and 2) the relative importance of demand and supply side factors as potential mediators of the relationship. Appendix Table A reports a full set of coefficient estimates for Model (4).

The regression results show a counter-cyclical pattern: all three measures of admissions decline when the lagged state unemployment rate rises, although the relationship appears to be stronger for alcohol than illicit drugs. In Model (1), which does not include our proxies for demand and supply side factors, we find that a 1 percentage point increase in the lagged state unemployment rate leads to a 1.9%, 0.5%, and 3.9% reduction in total, alcohol, and illicit drug admissions, respectively (although the coefficient in the alcohol regression is statistically indistinguishable from zero). Including our demand side factors into the regression, Model (2), generates comparable estimates, although there is some change in the magnitude and statistical significance of the relationships. In this model, a 1 percentage point increase in the lagged state unemployment rate leads to a 2.9%, 3.3%, and 2.9% reduction in the total, alcohol, and illicit drug admission rate, respectively (at the $p \leq 0.05$ level or better).

Next we remove the demand side variables and replace them with the supply side variables. In this regression, the coefficients carry the same sign (negative) but the magnitude and statistical significance declines. Finally, in Model (4) we include both demand and supply side proxies. In this model, a 1 percentage point increase in the lagged state unemployment rate leads to a 2.5%, 3.0%, and 2.3% reduction in the total, alcohol, and illicit drug treatment admission rate (at the $p \leq 0.05$ level or better).

4.3 Regression analysis of mechanisms.

We now estimate a series of auxiliary regressions in which we separately model our demand and supply side proxies as a function of the lagged state unemployment rate and state demographics. Our measures of demand include: alcohol misuse prevalence rate (need for treatment, this measure pertains to alcohol admissions only), proportion of the population with health insurance coverage (financial cost of SA treatment), average hourly wage (time costs of

SA treatment and substance use), and the logarithm of family income (available resources). Our supply side proxies include funding for SA treatment as proxied by state and local government health expenditures, Medicaid expenditures, SAMHSA block grants, and Medicare expenditures. Importantly we are able to proxy private health insurance SA treatment expenditures available between 2001 and 2009 from the CMS, we do not include these expenditures in our core models as they are only available for a sub-set of years. We take the logarithm of expenditure variables.

Results are reported in Table 3. We first consider how our demand side variables vary across the business cycle. Counter to our predictions, we find evidence that alcohol misuse, our proxy for SA treatment need, *decreases* during economic downturns. Although our findings depart from the work of Davalos et al. (2012) and Frijters et al. (2013), our findings are consistent with the work of Ruhm and Black (2002) who also use the BRFSS to study the relationship between economic downturns and alcohol misuse. One interpretation of this finding is that our proxy for SA treatment need is poor (i.e., it does not capture sufficiently severe forms of use). The proportion of the population covered by health insurance, our proxy for the price of SA treatment, declines during downturns as do wages and family income.

Turning to our measures of SA treatment supply, we find evidence that Medicare expenditures *increase* while block grant funding *decreases* during downturns. The finding that Medicare expenditures increase is consistent with previous research that shows healthcare providers are more likely to accept Medicare patients during downturns (Ruhm, 2007, McInerney and Mellor, 2012b, McInerney and Mellor, 2012a). We find little evidence that other supply factors are influenced by downturns, however as noted earlier due to data availability we use total expenditures to proxy for SA treatment expenditures and this may mute effects.

To summarize, our findings suggest that during downturns need for SA treatment declines, financial costs of SA treatment increase while non-financial costs of treatment decline, income declines, and there is only limited change in SA funding sources. Nonetheless, our proxies of SA treatment funding are gross and may not accurately reflect the true availability of funds for SA treatment (vis-à-vis other services also paid for by these insurers). Thus, we cannot rule out the possibility that reductions in SA treatment supply mechanically lower admissions.

It is possible that during downturns, individuals in need of SA treatment may substitute non-specialty treatment (e.g., Alcoholics Anonymous) for specialty treatment (which may be more costly, in terms of both financial costs and lost wages due to time in treatment). We cannot measure such behaviors in the TEDS. To assess the empirical importance of treatment substitution, we next turn to the NESARC, a large and nationally representative survey. We use Waves I (collected in 2001/2002) and II (collected in 2004/2005) in unreported analyses. We consider three binary outcomes: receipt of 1) any SA treatment, 2) specialty SA treatment[5], and 3) non-specialty SA treatment[6]. We estimate comparable models as outlined in Equation (3), although we replace state level demographics with individual level measures. Our analysis sample includes 77,746 person/year observations. We estimate weighted linear probability models and cluster standard errors around the state. Our results, although imprecise, suggest that during downturns use of any, and both specialty and non-specialty forms of SA treatment may decline. These findings do not suggest treatment substitution.

5. DISCUSSION

[5] Defined as an inpatient ward of a psychiatric or general hospital, or community mental health program; outpatient clinic; alcohol or drug rehabilitation; or methadone clinic.

[6] Defined as Alcoholics or Narcotics Anonymous; family or social service agency; detoxification ward or clinic; emergency room; halfway house or therapeutic community; crisis center; employee assistance program; religious leader; private physician, psychologist, psychiatrist, social worker, or other professional; and other.

In this study, we provide the first evidence on the impact of economic downturns on admissions to specialty SA treatment in the U.S. healthcare system using rich administrative data from the Treatment Episode Data Set. Our findings show that admission rates to SA treatment facilities that receive public funds decrease during downturns. Our preferred model suggests that a 1 percentage point increase in the lagged state unemployment rate leads to a 2.5% reduction in total admissions, and a 3.0% and 2.3% decrease in alcohol and illicit drug admissions. To better understand potential mechanisms, we directly estimate the impact of economic downturns on plausible mechanisms in a set of auxiliary regressions. We find evidence that both demand and supply side determinants of SA treatment vary across the business cycle.

Combining our analysis with the existing literature, we suspect several possible mechanisms for our findings. First, as observed in general discretionary and non-emergency healthcare individuals may decide to defer SA treatment during economic downturns as income levels decline. Put differently, individuals in need of SA treatment may view such treatment as non-emergency and, as they reduce overall expenditures in response to poor economic conditions and tightened budget constraints, they defer this treatment to a future period when they have more certainty regarding income and employment. Second, reductions in supply of SA treatment may prevent individuals in need of SA treatment from receiving such treatment. Although we do not observe strong evidence of this in our data, our measures of supply are admittedly imperfect and previous works suggests that overall healthcare expenditures, and SA treatment expenditures specifically, decline during downturns. Third, we find evidence that alcohol misuse, our proxy for SA treatment need, declines during economic downturns. These mechanisms are not mutually exclusive, and could instead work in conjunction with one another. We note that because we cannot fully explain our findings, the analysis is somewhat unsatisfactory. Future

work could further study these questions, perhaps using different methods and/or data, to better understand the mechanisms that lie behind our key findings.

This study has limitations. First, the TEDS do not include all SA treatment admissions. Second, in our efforts to control for demand and supply side factors, we likely include endogenous variables in our regressions. Third, it is plausible that we have not adequately controlled for all important predictors of SA treatment in our regression models and our estimates may be vulnerable to omitted variable bias.

Policy makers may find our results useful. If individuals in need of treatment are less likely to enter treatment, due to demand and supply side factors, during downturns SA problems that impose societal costs may go untreated or be treated through less effective means. Policies targeting such individuals, or SA treatment facilities, during downturns could be implemented.

Table 1. Substance abuse treatment admissions, unemployment rates, and state-level demographics: TEDS 1992 to 2010

	Mean/ proportion	Standard deviation	Minimum	Maximum
Specialty SA treatment admission rates (per 100,000 persons)				
Total	303.89	173.19	22.48	837.44
Alcohol	142.67	104.00	7.99	627.11
Illicit drug	161.22	103.79	8.80	535.45
State unemployment rates				
Lagged unemployment rate	5.24	1.61	2.27	13.42
Demand side factors				
Alcohol misuse	0.04	0.02	0.01	0.07
Any health insurance	0.72	0.07	0.51	0.86
Wage	18.41	4.63	13.23	25.34
Family income (1,000s)	69.46	116.88	43.92	105.28
Age (years)	35.92	1.83	29.01	40.69
Female	0.51	0.01	0.47	0.54
Male	0.49	0.01	0.46	0.53
White	0.83	0.14	0.18	1.00
African American	0.11	0.11	0.00	0.71
Other race	0.07	0.10	0.00	0.80
Hispanic	0.08	0.09	0.00	0.45
Married	0.43	0.03	0.22	0.48
Divorced	0.14	0.02	0.08	0.21
Never married	0.43	0.03	0.33	0.60
Urban	0.20	0.15	0.00	1.00
Rural	0.80	0.15	0.00	1.00
Less than high school	0.20	0.04	0.12	0.35
High school	0.31	0.04	0.20	0.44
Some college	0.26	0.04	0.17	0.36
College graduate	0.22	0.05	0.10	0.48
Supply side factors				
State and local health expenditures (millions)	5,579.56	32,847.89	45.87	558,636.10
Medicaid expenditures (millions)	6108.91	8,423.77	205.95	62,131.77
Medicare expenditures (millions)	6580.19	7812.05	163.81	51,875.65
SAMHSA block grants (millions)	36.34	46.71	1.86	353.79
Strong substance abuse parity law	0.17	0.38	0.00	1.00
Strong mental health parity law	0.31	0.46	0.00	1.00
Large firm (>500 employers)	0.03	0.01	0.01	0.07
Observations				

Notes: The unit of observation is a state in a year.

Table 2. Effect of the state lagged unemployment rate on substance abuse treatment admission rates: TEDS 1992 to 2010

	Model (1)	Model (2)	Model (3)	Model (4)
Sample mean	303.89	303.89	303.89	303.89
Total admissions	-0.0185*	-0.0289**	-0.0145	-0.0249**
	(0.0096)	(0.0113)	(0.0091)	(0.0097)
Sample mean	142.67	142.67	142.67	142.67
Alcohol admissions	-0.0051	-0.0327**	-0.0059	-0.0304***
	(0.0105)	(0.0124)	(0.0103)	(0.0107)
Sample mean	161.22	161.22	161.22	161.22
Illicit drug admissions	-0.0387***	-0.0287**	-0.0268***	-0.0228**
	(0.0104)	(0.0116)	(0.0096)	(0.0099)
Demand side factors	No	Yes	No	Yes
Family income	No	Yes	No	Yes
Supply side factors	No	No	Yes	Yes
N	929	929	929	929

Notes: All regressions are estimated with least squares and control for state fixed effects, linear time trend, and state-specific linear time trends. Standard errors are clustered around the state and are reported in parentheses.
***; **; *=statistically different from zero at the 1%; 5%; 10% level.

Table 3. Effect of the state lagged unemployment rate on potential demand and supply side mechanism variables

Outcome variable	Time period	Sample mean	Coefficient	N
Demand side factors				
Alcohol misuse	1992-2010	3.73	-0.1763*** (0.0239)	929
Any health insurance	1992-2010	71.96	-0.8355*** (0.0652)	929
Log(wages)	1992-2010	18.41	-0.0062*** (0.0007)	929
Log(family income)	1992-2010	69.46	-0.0332*** (0.0017)	929
Supply side factors				
Log(state and local healthcare expenditures in millions)	1992-2010	5,579.56	-0.0047 (0.0229)	929
Log(Medicaid expenditures in millions)	1992-2010	6,108.91	-0.0047 (0.0029)	929
Log(Medicare expenditures in millions)	1992-2010	6,580.19	0.0275*** (0.0041)	929
Log(private health insurance expenditures in millions)	2001-2010	13,304.58	0.0003 (0.0026)	489
Log(SAMHSA block grants in millions)	1992-2010	36.34	-0.0311*** (0.0046)	929

Notes: All regressions estimated with least squares and control for state-level demographics, state fixed effects, linear time trend, and state-specific linear time trends. Standard errors are clustered around the state and are reported in parentheses.
***; **; *=statistically different from zero at the 1%; 5%; 10% level.

Appendix Table A. Effect of the state lagged unemployment rate on substance abuse treatment admission rates: TEDS 1992 to 2010

Outcome:	Total admissions	Alcohol admissions	Illicit drug admissions
Sample mean	303.89	142.67	161.22
State lagged unemployment rate	-0.0249**	-0.0304***	-0.0228**
	(0.0097)	(0.0107)	(0.0099)
Demand side factors			
Alcohol misuse	-0.0008	-0.0023	0.0044
	(0.0055)	(0.0048)	(0.0059)
Any health insurance	-0.7210	-0.7479	-0.5880
	(0.6078)	(0.6732)	(0.6221)
Wage	-0.3301	0.1638	-0.9835*
	(0.5225)	(0.5687)	(0.5559)
Family income (1,000s)	-0.2245	-0.7274**	0.2349
	(0.3340)	(0.3300)	(0.3434)
Age (years)	-0.0320	-0.0248	-0.0177
	(0.0257)	(0.0263)	(0.0305)
Male	0.9559	0.9614	1.4018
	(1.7961)	(1.7645)	(2.0154)
African American	-1.5847	-1.9498	-1.5622
	(1.1266)	(1.2104)	(1.2059)
Other race	-0.6499	-0.0608	-1.9394*
	(0.9348)	(1.1039)	(1.1122)
Hispanic	-2.1127	-2.6119	-1.7170
	(1.4730)	(1.6437)	(1.3030)
Divorced	-1.4020	-1.6289	-1.1685
	(1.3326)	(1.5168)	(1.3312)
Never married	-0.2059	0.2700	-0.1808
	(1.1810)	(1.2480)	(1.3538)
Rural	-0.4749	-0.4251	-0.6873
	(0.7585)	(0.8421)	(0.5807)
High school	-1.1927	-1.1092	-0.9385
	(1.5457)	(1.6181)	(1.5137)
Some college	-0.7452	-0.5632	-0.6058
	(1.2278)	(1.1906)	(1.2830)
College graduate	-0.6512	-0.4619	-0.7046
	(1.6630)	(1.7776)	(1.7135)
Supply side factors			
State and local health expenditures	-0.0082	-0.0082	-0.0054
(millions)	(0.0097)	(0.0097)	(0.0108)
Medicaid expenditures (millions)	0.0522	0.0522	0.0066
	(0.1791)	(0.1791)	(0.1771)
Medicare expenditures (millions)	-0.3595	-0.3595	-0.4222*
	(0.2430)	(0.2430)	(0.2443)
SAMHSA block grants (millions)	-0.0166	-0.0166	-0.2048*
	(0.1175)	(0.1175)	(0.1222)
Strong substance abuse parity law	-0.0453	-0.0453	-0.0968
	(0.1483)	(0.1483)	(0.1829)
Strong mental health parity law	-0.0224	-0.0224	0.0046
	(0.0805)	(0.0805)	(0.0930)
Large firm share (>500 employers)	2.7087	2.7087	15.5474
	(14.7430)	(14.7430)	(15.8966)
N	929	929	929

Notes: All regressions are estimated with least squares and control for state fixed effects, linear time trend, and state-specific linear time trends. Standard errors are clustered around the state and are reported in parentheses.
***; **; *=statistically different from zero at the 1%; 5%; 10% level.

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