

A Dose of Managed Care: Controlling Drug Spending in Medicaid

Online Appendix

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VIII Appendices

A Point-of-Sale Drug Prices

This section examines whether the effect of privatization on point-of-sale prices varies based on whether a drug is high offset, generic, or neither. It also examines whether privatization affects cost sharing. We begin by estimating a variant of the regression in equation 4, including interactions between privatization and whether the NDC was high offset, generic, or neither. We plot the coefficients from these regressions in Figure A.1. Panels A and C plot coefficients from the regression in which the dependent variable is *Medicaid price per prescription*, which we define to be what Medicaid (rather than the beneficiary) pays per prescription. Panels B and D plot the coefficients from the same regression in which *Cost sharing per prescription* is the dependent variable, which we define to be what the beneficiary pays per prescription. In Panel A, the red line plots the coefficients on lags and leads of the privatization decision interacted with a drug being a generic, whereas the black line plots the coefficients on lags and leads of the privatization decision interacted with a drug being neither a generic nor a high offset drug. In Panel C, the red line plots out the coefficients on lags and leads of the privatization interacted with a drug being high offset, whereas the black line plots out the coefficients on lags and leads of the privatization decision interacted with a drug being neither a generic nor a high offset drug. Thus, the black lines in Panel A and Panel C are identical. Based on Panel A, pharmacy reimbursements from Medicaid are decreasing substantially for drugs that are neither generics nor high offset. By contrast, reimbursements for generics remain similar. Based upon Panel C, the drop in Medicaid per prescription reimbursements is smaller for high offset drugs than for drugs that are neither generic nor high offset.

Table A.1: Privatization and $\ln(\text{price per prescription})$

	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)	Reduced Form (5)	IV (6)
<i>Priv</i>	-0.105 [0.0433]**		-0.0541 [0.0176]***		-0.0524 [0.0214]**	
<i>Share MCO</i>		-0.169 [0.0736]**		-0.0893 [0.0299]***		-0.0878 [0.0346]**
<i>Medicaid expansion</i>					-0.00670 [0.0244]	-0.00369 [0.0236]
Unreported Controls						
state, quarter	x	x				
state-NDC,NDC-quarter			x	x	x	x
N	3,281,002	3,281,002	3,281,002	3,281,002	3,281,002	3,281,002

Notes: Unit of observation is the NDC-state-quarter. The transition quarter in which a state privatizes is omitted.

Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

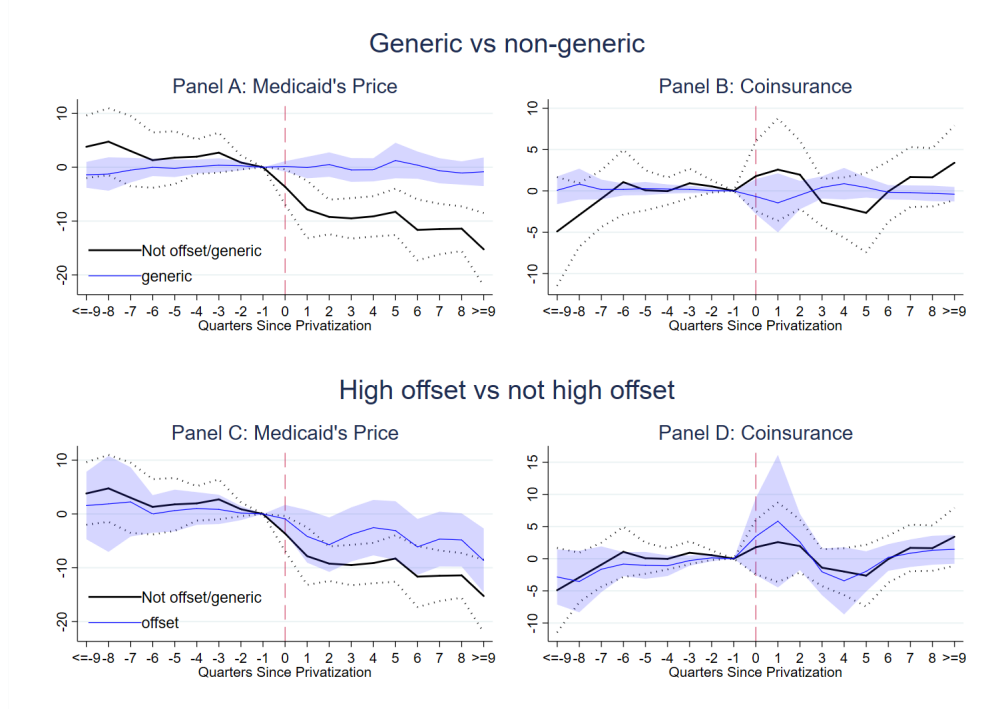
We present a pooled version of the differential effect of privatization on generics and high offset drugs in Table A.2. The decrease in point-of-sale prices to pharmacies is \$6 less for generics than for other drugs. When pooled, there is no evidence of differential point-of-sale prices post-privatization for high offset drugs.

Table A.2: Privatization and point-of-sale prices
(Reduced Form)

Panel A: Dep var = <i>Medicaid price per prescription</i>				
	(1)	(2)	(3)	(4)
<i>Priv</i>	-4.913 [1.244]***	-4.864 [1.215]***	-11.24 [2.400]***	-11.04 [2.401]***
<i>Medicaid expansion</i>		-0.167 [0.980]		-0.791 [2.561]
<i>Priv*1(High offset)</i>			-0.162 [2.458]	-0.170 [2.406]
<i>Priv*1(Generic)</i>			9.361 [2.831]***	9.175 [2.760]***
<i>(Medicaid expansion)*1(High offset)</i>				0.0417 [2.019]
<i>(Medicaid expansion)*1(Generic)</i>				0.728 [2.613]
Panel B: Dep var = <i>Cost sharing per prescription</i>				
<i>Priv</i>	0.821 [0.586]	0.575 [0.644]	1.859 [1.563]	1.124 [1.685]
<i>Medicaid expansion</i>		0.845 [0.638]		2.807 [1.902]
<i>Priv*1(High offset)</i>			0.898 [1.319]	1.225 [1.477]
<i>Priv*1(Generic)</i>			-1.978 [1.668]	-1.400 [1.809]
<i>(Medicaid expansion)*1(High offset)</i>				-1.146 [1.170]
<i>(Medicaid expansion)*1(Generic)</i>				-2.258 [1.755]
N	3,220,610	3,220,610	3,220,610	3,220,610

Notes: Unit of observation is the NDC-state-quarter. Unreported controls include NDC-state fixed effects and NDC-quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

Figure A.1: Privatization and point-of-sale Medicaid reimbursement and cost-sharing



Notes: Unit of observation is the NDC-state-quarter. Includes NDC-state fixed effects, NDC-quarter fixed effects, and a post-Medicaid expansion indicator. Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Point estimates for the effect of quarter pre-post privatization by drug type are presented as lines and 95 percent confidence intervals for those coefficients, based upon standard errors that are clustered by state, are presented with dotted lines/shading.

B Additional heterogeneity in effect based on state characteristics

In this section, we perform additional analyses on heterogeneity in the effect of privatization based on state characteristics. In addition to examining heterogeneity in the effect of privatization based on whether MCOs are allowed to design their own formularies, we consider two further potential sources of heterogeneity. First, we consider whether a state risk adjusts based upon enrollee health. Without perfect risk-adjustment, MCOs may have an incentive to under-provide coverage that will be particularly attractive for sick enrollees, which could in turn affect utilization. Second, we estimate the differential effect of privatizing both the medical and drug benefit at the same time. We replicate our central analysis, adding interactions between privatization and indicators for simultaneous medical and drug privatization, formulary requirements, and risk-adjustment. Table A.3 presents each state's categorization for each of the binary variables and details on data sources.

Table A.3: Privatizing State Characteristics for Heterogeneity Analysis

State	Privatization	Medicaid Expansion	No Prior MCO?	Same formulary?	No risk adj?	Any Willing Provider?	Centene + Molina
MS	2011Q2		Yes	Yes	Yes	Yes	1
NY	2011Q4	2014Q1	No	No	No	No	1
OH	2011Q4	2014Q1	No	No	No	No	2
TX	2012Q1		No	Yes	No	No	2
IL	2012Q3	2014Q1	No	No	Yes	Yes	1
LA	2012Q3	2016Q3	Yes	No	No	No	1
UT	2013Q1		No	No	No	Yes	1
WV	2013Q2	2014Q1	No	Yes	Yes	No	0
NH	2013Q4	2014Q3	Yes	Yes	No	Yes	1
ND	2014Q1	2014Q1	Yes	No	No	Yes	0
DE	2015Q1	2014Q1	No	Yes	No	Yes	0
IN	2015Q1	2015Q1	No	No	No	Yes	1
IA	2016Q2	2014Q1	Yes	Yes	No	No	0

Notes: States with Centene and Molina are determined by examining company annual reports. Same formulary is an indicator for whether MCOs are required to use the state's formulary; MCOs in other states may face oversight in formulary design. We obtain this variable from the 2015 Medicaid Drug Utilization Review (MDUR) for all states, except Iowa, which had not privatized the drug benefit at that time. Based on more recent information from the Kaiser Family Foundation, Iowa requires MCOs to follow the state formulary. No prior MCO is an indicator for whether a state concurrently privatized medical and drug benefits or already had privatized medical benefits prior to privatizing drug benefits. No risk adj is an indicator for whether a state risk adjusts MCO payments based upon enrollee health status is based using responses in Gifford et al. (2011). Based on supplemental internet, all that privatized medical benefits after 2010 risk adjust based upon health. We measure the presence of an any willing pharmacy law as data from the National Conference of State Legislatures.

Table A.4: First stage relationship for analysis on heterogeneity in effect of MCOs across states

	<i>Share MCO</i>	<i>Share MCO</i> *1(<i>Same formulary</i>)	<i>Share MCO</i> *1(<i>No prior MCO</i>)	<i>Share MCO</i> *1(<i>No risk adj</i>)
	(1)	(2)	(3)	(4)
<i>Priv</i>	0.685 [0.0654]***	0.0212 [0.0191]	-0.00730 [0.0113]	-0.0228 [0.0205]
<i>Priv*1(Same formulary)</i>	0.0563 [0.0516]	0.685 [0.0609]***	0.0110 [0.0224]	0.00647 [0.0181]
<i>Priv*1(No prior MCO)</i>	-0.0898 [0.0724]	-0.0200 [0.0415]	0.587 [0.0472]***	0.0276 [0.0202]
<i>Priv*1(No risk adj)</i>	-0.412 [0.0507]***	-0.114 [0.0882]	-0.0128 [0.0166]	0.350 [0.0165]***
<i>Medicaid expansion</i>	0.0629 [0.0343]*	-0.0200 [0.0181]	-0.00566 [0.0189]	0.0200 [0.0334]
N	741	741	741	741

Notes: Includes state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.4 contains the first stages for the four endogenous variables. In the states that do not risk adjust based upon health the effect of privatization on the share of spending by MCOs is 0.27 rather than 0.69. The smaller first stage complicates inference about the effect of full privatization of drug benefits in states that do not risk adjust.

Table A.5 presents the results of these analyses. In the interests of space, we only present results from the IV specification in which the endogenous variables are interactions between *share MCO* and the three indicators, and the instruments are the interactions between *priv* and the three binary variables.

Consistent with the results in Section A., the coefficient on *share MCO*1(Same formulary)* has the opposite sign of the effect of *share MCO* in many of the columns, implying that effect of privatization is stronger in states that allow their MCOs to design their own formularies. Column (2) shows that the effect of full privatization on *Drug spending per enrollee* is effectively zero in states in which MCOs cannot design their own formulary. Consistent with our hypotheses in Section I, Columns (6) through (8) show that the shift towards generics is stronger in states where the MCO designs the formulary.⁴³ Table A.6 shows that differences in point-of-sale prices are not driven by states that allow their MCOs to design their own formularies. Therefore, we conclude that bargaining with pharmacies is critical for achieving lower

⁴³Even in the states in which the MCOs must use the state's formulary, MCOs shifted utilization to high offset drugs (Column (9)) and substituted non-bio-equivalent generics for branded drugs; such shifts could not be achieved through formulary design alone.

Table A.5: IV effect of full privatization
(Heterogeneity by state characteristics)

	<i>ln(drug spending per enrollee)</i> (1)	<i>ln(prescriptions per enrollee)</i> (2)	<i>ln(price per prescription)</i> (3)	<i>ln(drug utilization per enrollee)</i> (4)	<i>Generic accessibility</i> (5)	<i>Generic efficiency</i> (6)	<i>Generic penetration</i> (7)	<i>Share high offset</i> (8)
<i>Share MCO</i>	-0.271 [0.0728]***	0.0736 [0.0452]	-0.344 [0.0553]***	-0.200 [0.0663]***	0.0670 [0.0221]***	0.0578 [0.00848]***	0.103 [0.0228]***	0.0532 [0.0100]***
<i>Medicaid expansion</i>	0.102 [0.0514]*	0.116 [0.0464]**	-0.0134 [0.0270]	0.109 [0.0537]*	0.000734 [0.00660]	0.0104 [0.00439]**	0.0102 [0.00773]	-0.0308 [0.00615]***
<i>Share MCO*(same formulary)</i>	0.293 [0.101]***	0.134 [0.0570]**	0.159 [0.0730]**	0.318 [0.102]***	-0.0339 [0.0226]	-0.0623 [0.00847]***	-0.0809 [0.0238]***	-0.00792 [0.0152]
<i>Share MCO*(no prior MCO)</i>	-0.364 [0.211]*	-0.0888 [0.128]	-0.276 [0.127]**	-0.300 [0.160]*	0.000343 [0.0171]	0.0253 [0.00984]**	0.0227 [0.0198]	0.0148 [0.00717]**
<i>Share MCO*(no risk adj)</i>	-0.246 [0.217]	-0.253 [0.147]*	0.00712 [0.144]	-0.269 [0.207]	-0.0296 [0.0363]	0.0151 [0.0142]	-0.00342 [0.0384]	0.0228 [0.0359]
N	741	741	741	741	741	741	741	741

Notes: Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted.

Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 **

0.05 *** 0.01

Table A.6: Reduced Form relationship between privatization and point-of-sale prices
(heterogeneity by whether MCOs must use state formulary)

	Dep var = <i>Medicaid price per prescription</i> (1)	Dep var = <i>Cost sharing per prescription</i> (2)
<i>Priv</i>	-11.46 [2.808]***	2.846 [1.998]
<i>Priv*1(High offset)</i>	0.108 [3.029]	1.559 [1.759]
<i>Priv*1(Generic)</i>	10.21 [3.417]***	-3.069 [2.149]
<i>Medicaid expansion</i>	-0.593 [2.350]	1.945 [1.946]
<i>(Medicaid expansion)*1(High offset)</i>	-0.0728 [1.789]	-1.310 [1.234]
<i>(Medicaid expansion)*1(Generic)</i>	0.247 [2.369]	-1.413 [1.816]
<i>Priv*1(Same formulary)</i>	1.383 [4.517]	-5.605 [1.545]***
<i>Priv*1(Same formulary)*1(High offset)</i>	-0.989 [4.313]	-1.420 [1.530]
<i>Priv*1(Same formulary)*1(Generic)</i>	-3.295 [4.917]	5.530 [1.748]***
N	3,220,610	3,220,610

Notes: Unit of observation is the NDC-state-quarter. Includes NDC-state fixed effects, NDC-quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted. Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

point-of-sale prices, and restricting formularies is critical for shifting prescriptions to generics.

By contrast, we do not find statistically significant differences between the effect of privatization in the five states that privatized medical and drug benefits concurrently and the effect of privatization in the eight states that added drug benefits into existing MCO contracts. Finally, we examine the coefficient on *share MCO*1(no risk adj)*, which gives the differential effect of full privatization for the three states that do not employ health based risk-adjustment. In these states, we observe larger decreases in *drug spending per enrollee*, driven by decreases in the number of prescriptions written per enrollee. Additional analyses show no differences in the effect of full privatization based on the competitiveness of a state's insurance market or whether the state includes some of the largest Medicaid MCOs.⁴⁴ Overall, the results of this section suggest

⁴⁴These results are presented in Table A.7. Unreported results are qualitatively similar across markets with greater degrees of insurer concentration, as measured by Herfindahl indices of Part D carriers.

that formulary design is an important tool with which MCOs affect drug spending.

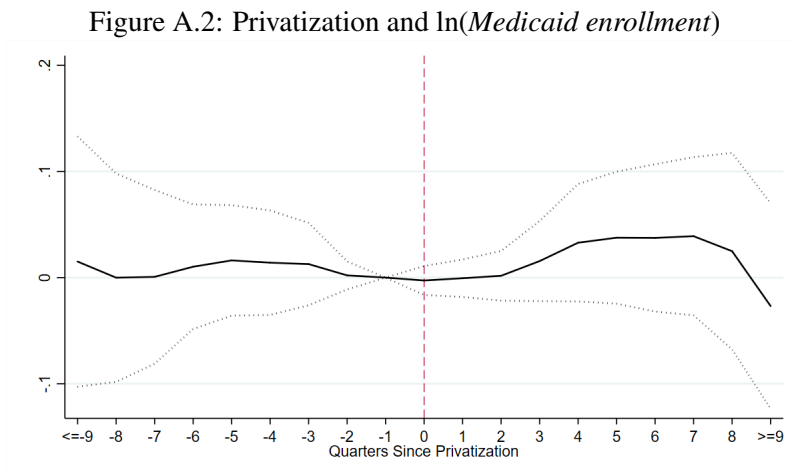
Table A.7: Effect of privatization
(Heterogeneity based on presence of Molina and Centene)

Panel A: Reduced Form									
<i>share</i>	<i>ln(drug spending per enrollee)</i>	<i>ln(Prescriptions per enrollee)</i>	<i>ln(Price per prescription)</i>	<i>ln(drug utilization per enrollee)</i>	<i>Generic accessibility</i>	<i>Generic efficiency</i>	<i>Generic penetration</i>	<i>Share high offset</i>	
<i>MCO</i>	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
(1)									
<i>Priv*[Centene+Molina=0]</i>	0.370 [0.140]**	-0.207 [0.0893]**	-0.0202 [0.0529]	-0.187 [0.0461]***	-0.212 [0.0952]**	0.0253 [0.0100]**	0.0282 [0.0130]**	0.0441 [0.0153]***	
<i>Priv*[Centene+Molina=1]</i>	0.584 [0.116]***	-0.207 [0.0584]***	0.0258 [0.0433]	-0.233 [0.0649]***	-0.157 [0.0476]***	0.0431 [0.0165]**	0.0659 [0.0193]***	0.0346 [0.00914]***	
<i>Priv*[Centene+Molina=2]</i>	0.712 [0.0239]***	0.00144 [0.0478]	0.126 [0.0424]***	-0.125 [0.0196]***	0.0716 [0.0678]	0.00972 [0.00810]	0.0106 [0.00618]*	0.0275 [0.00467]***	
<i>Medicaid expansion</i>	0.0580 [0.0194]***	0.0929 [0.0549]	0.110 [0.0387]***	-0.0172 [0.0339]	0.0981 [0.0527]*	0.00238 [0.00812]	0.0161 [0.00839]*	-0.0290 [0.00528]***	
R-sq	0.941	0.815	0.779	0.830	0.837	0.908	0.884	0.924	0.951
Panel B: IV									
<i>Share MCO*I(Centene+Molina=0)</i>	-0.512 [0.351]	-0.0325 [0.130]	-0.480 [0.242]*	-0.505 [0.365]	0.0675 [0.0409]	0.0270 [0.0217]	0.0797 [0.0519]	0.108 [0.0669]	
<i>Share MCO*I(Centene+Molina=1)</i>	-0.351 [0.0988]***	0.0454 [0.0667]	-0.397 [0.0667]***	-0.266 [0.0834]***	0.0730 [0.0152]***	0.0621 [0.00742]***	0.111 [0.0142]***	0.0593 [0.00819]***	
<i>Share MCO*I(Centene+Molina=2)</i>	-0.0190 [0.0694]	0.169 [0.0555]***	-0.188 [0.0272]***	0.0786 [0.0938]	0.0171 [0.00945]*	0.00684 [0.0123]	0.0203 [0.00793]**	0.0400 [0.00706]***	
<i>Medicaid expansion</i>	0.111 [0.0608]*	0.107 [0.0405]**	0.00441 [0.0345]	0.112 [0.0585]*	-0.00136 [0.00814]	0.0131 [0.00507]**	0.0112 [0.00838]	-0.0324 [0.00533]***	
R-sq	0.801	0.781	0.864	0.822	0.928	0.902	0.943	0.953	
N	741	741	741	741	741	741	741	741	

Notes: Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted.
Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

C Medicaid Expansion and Program Demographics

One concern is that our results could be driven by changes in the composition of the Medicaid population. There are no changes in aggregate Medicaid enrollment that are concurrent with privatization (Figure A.2). However, this section presents a number of analyses that examine whether the Medicaid population is changing post-privatization.



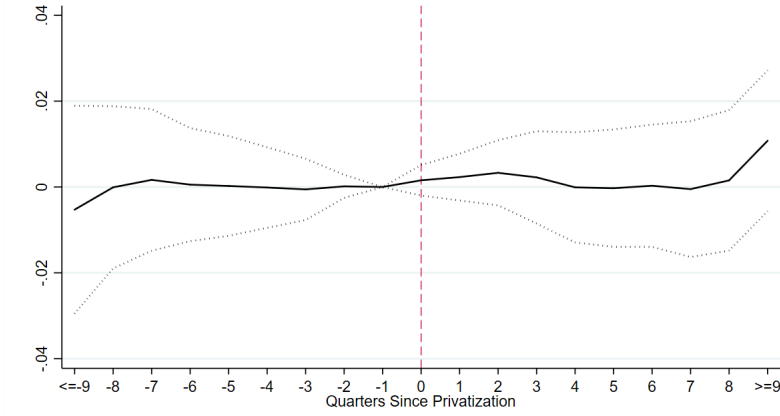
Notes: Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

We illustrate that there is no relationship between privatization and expected drug spending based on Medicaid enrollee characteristics. We use data from both the American Community Survey (ACS) and the Medical Expenditure Panel Survey (MEPS) and restrict to the sample of enrollees that are not Medicare dual eligibles. Medicare-Medicaid dual eligibles receive drug coverage through Medicare rather than Medicaid, their drug spending is not included in the Medicaid State Drug Utilization database, and therefore they are excluded from the paper's central analyses; Figure A.3 illustrates that the share of Medicaid enrollees who are dually eligible does not change around the time of privatization.

The MEPS and the ACS contain the age, sex, and race/Hispanic status of individuals. The MEPS also contains drug spending, but lacks state of residence and is based on a relatively small sample size. By contrast, the ACS lacks drug spending, but includes state of residence and is based on a relatively large sample size. Therefore, we estimate the relationship between age-sex-race/Hispanic status and drug spending with the MEPS, and then apply those estimates to the sample of individuals in the ACS to construct

expected drug spending of Medicaid enrollees based on age-sex-race/Hispanic status for each state-year.⁴⁵

Figure A.3: Privatization and the share of Medicaid enrollees who are dual eligible



Notes: Share of Medicaid enrollees who are dual eligible is calculated from administrative reports. Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

Figure 9 illustrates that there are no changes in the expected spending of Medicaid enrollees based on demographics around the time of privatization.

However, we may lack the power to detect changes in enrollee composition or there may be measurement error in the reporting of health insurance status in government surveys. Figure A.5 confirms that the ACS can detect changes in enrollee composition: it documents a large increase in the risk profile of Medicaid enrollees that is concurrent with the ACA's Medicaid expansions. Pooled results presented in Table A.9 confirm that privatization had no effect on expected spending based on patient demographics, but that the Medicaid expansion did.

Figure A.4 illustrates that other Medicaid enrollee characteristics are not changing concurrently with privatization. By contrast, Figure A.6 illustrates that the Medicaid expansions did affect enrollee characteristics.

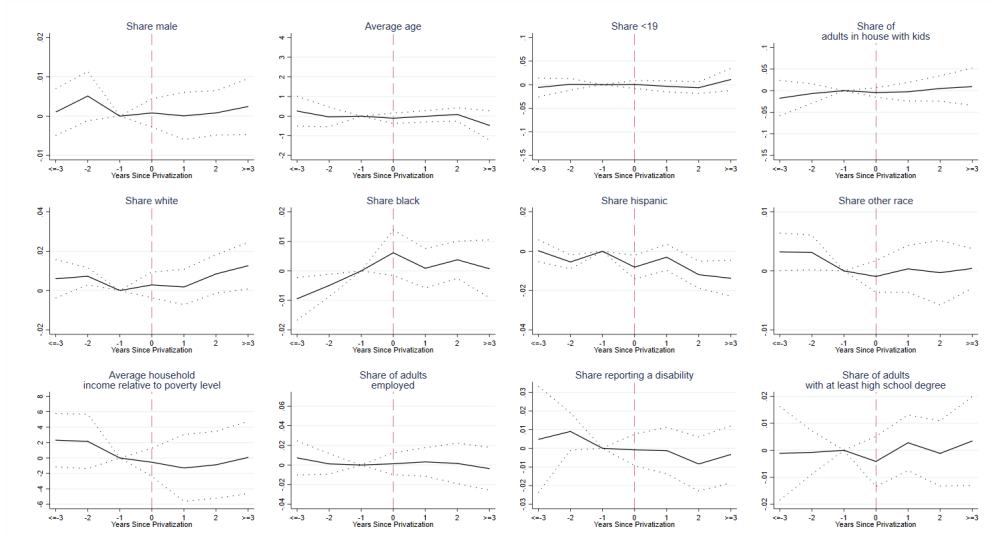
⁴⁵We aggregate race/Hispanic status into four groups: (1) anyone who is Hispanic, (2) non-Hispanic blacks, (3) non-Hispanic whites, (4) other. We model the relationship between age and spending separately for each sex-race/Hispanic group using a non-parametric local linear kernel regression where optimal bandwidth is chosen based on cross-validation.

Table A.8: IV Estimate of effect of full privatization (Robustness to alternative ways of controlling for Medicaid expansion)

Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
<i>ln(drug spending per enrollee)</i>	-0.239 [0.115]**	-0.236 [0.0966]**	-0.235 [0.0962]**	-0.227 [0.110]**	-0.226 [0.111]*	-0.279 [0.108]**
<i>ln(prescriptions per enrollee)</i>	0.0865 [0.0626]	0.0888 [0.0527]	0.0890 [0.0527]	0.0946 [0.0587]	0.0944 [0.0601]	0.0237 [0.0788]
<i>ln(price per prescription)</i>	-0.325 [0.0719]***	-0.325 [0.0688]***	-0.324 [0.0688]***	-0.322 [0.0704]***	-0.321 [0.0704]***	-0.303 [0.0678]***
<i>ln(drug utilization per enrollee)</i>	-0.152 [0.117]	-0.150 [0.0965]	-0.149 [0.0964]	-0.140 [0.111]	-0.139 [0.112]	-0.210 [0.111]*
<i>Generic accessibility</i>	0.0526 [0.0168]***	0.0526 [0.0162]***	0.0522 [0.0161]***	0.0540 [0.0170]***	0.0538 [0.0171]***	0.0669 [0.0180]***
<i>Generic efficiency</i>	0.0408 [0.0161]**	0.0407 [0.0158]**	0.0401 [0.0158]**	0.0407 [0.0162]**	0.0407 [0.0162]**	0.0456 [0.0146]***
<i>Generic penetration</i>	0.0773 [0.0249]***	0.0772 [0.0241]***	0.0763 [0.0241]***	0.0782 [0.0253]***	0.0780 [0.0254]***	0.0921 [0.0244]***
<i>Share high offset</i>	0.0544 [0.00927]***	0.0544 [0.00892]***	0.0546 [0.00903]***	0.0529 [0.00834]***	0.0528 [0.00826]***	0.0539 [0.00848]***
Unreported Controls						
Medicaid expansion						
ln(enrollment)	x	x	x	x	x	
Medicaid expansion*ln(enrollment)						
Medicaid expansion*2013 uninsured rate						
Quarters since Medicaid expansion						
Quarters since Medicaid expansion*2013 uninsured rate						
Medical MCO Share						x

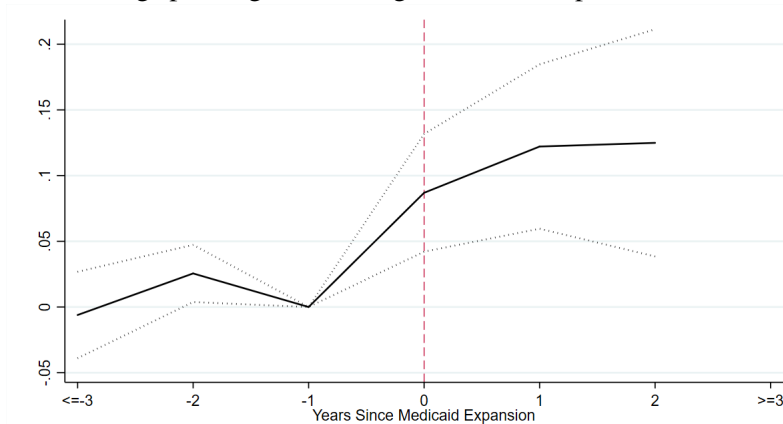
Notes: Specifications are limited to treatment states that privatize for drug benefits and and control states with no MCO drug benefits. Unreported controls includes state FEs, quarter FEs, and an indicator for Medicaid expansion. Additional controls are indicated in each column. Enrollment is non-dual eligible Medicaid enrollment. 2013 uninsured rates are for the 18-64 population and are from Kaiser Family Foundation's analysis of the March Current Population Survey. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

Figure A.4: Privatization and Medicaid enrollee characteristics



Notes: Includes state FEs, year FEs, and a post-Medicaid expansion indicator. The average is calculated for individuals in the ACS with Medicaid and without Medicare for each state-year. Observations are weighted by the ACS respondents underlying these calculations in 2010 for each state. Point estimates for the effect of year pre-post privatization is presented in the dark line and a 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state, is presented with the dotted lines.

Figure A.5: Medicaid expansion and logged Expected Medicaid enrollee drug spending based on age-sex-race/Hispanic status



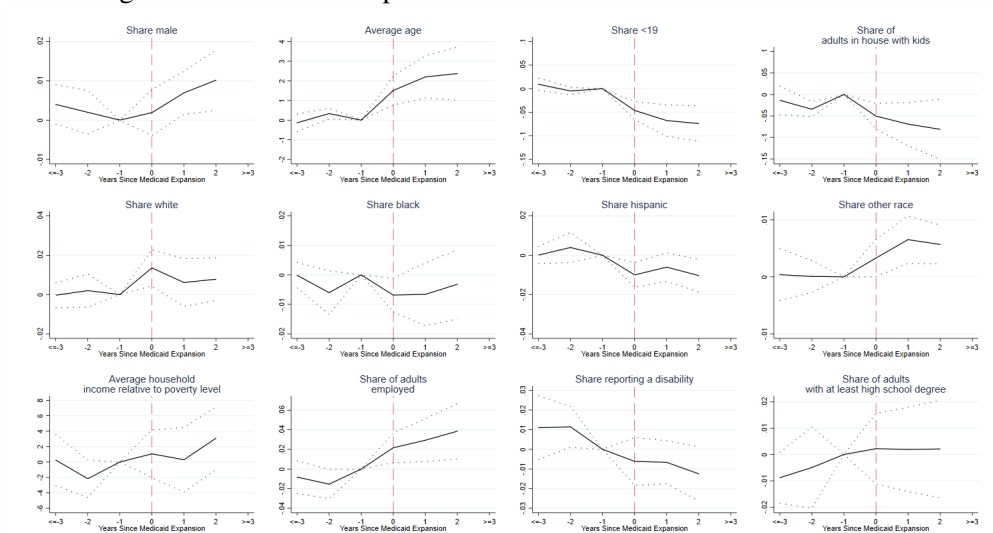
Notes: Includes state FEs, year FEs, and an indicator for whether the state has privatized its drug benefit. The dependent variable is an average drug risk score based on age, sex, and race/Hispanic status. The average is calculated for individuals in the ACS with Medicaid and without Medicare for each state-year. Observations are weighted by the ACS respondents underlying these calculations in 2010 for each state. Point estimates for the effect of years pre-post Medicaid expansion is presented in the dark line and a 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state, is presented with the dotted lines.

Table A.9: Privatization and ln(Expected Medicaid enrollee drug spending based on age-sex-race/Hispanic status)

	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)
<i>Priv</i>	0.0160 [0.0279]		-0.00590 [0.0152]	
<i>Share MCO</i>		0.0256 [0.0470]		-0.00955 [0.0237]
<i>Medicaid expansion</i>			0.105 [0.0295]***	0.105 [0.0295]***
N	190	190	190	190

Notes: Includes state FEs, year FEs, and a post-Medicaid expansion indicator. The transition year in which a state privatizes is omitted. The dependent variable is an average drug risk score based on age and sex. The average is calculated for individuals in the ACS with Medicaid and without Medicare for each state-year. Observations are weighted by the ACS respondents underlying these calculations in 2010 for each state. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

Figure A.6: Medicaid expansion and Medicaid enrollee characteristics



Notes: Includes state FEs, year FEs, and an indicator for whether the state has privatized drug benefits. The average is calculated for individuals in the ACS with Medicaid and without Medicare for each state-year. Observations are weighted by the ACS respondents underlying these calculations in 2010 for each state. Point estimates for the effect of year pre-post Medicaid expansion is presented in the dark line and a 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state, is presented with the dotted lines.

D Impact on overall state spending on Medicaid

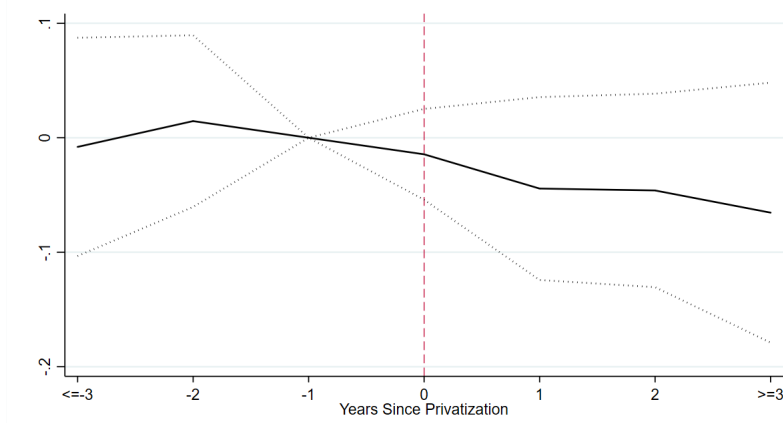
We examine how privatization affects overall Medicaid spending using the Medicaid Financial Management Reports. Because this analysis does not rely on the MCO drug claims, we extend the sample period to 2007 through 2015. Medicare-Medicaid dual eligible enrollees receive drug coverage from Medicare Part D. These individuals are not affected by drug privatization and are not included in the paper's central analyses. Dual eligibles account for only 15 percent of Medicaid enrollment but account for 39 percent of Medicaid spending. We cannot separate premiums or spending for dual eligibles from spending of other Medicaid enrollees. This decreases the anticipated magnitude of any effect of drug spending on overall spending, and makes our estimates imprecise. To partially address this, we add the share of Medicaid enrollees that are dual eligible as an optional control in the analyses in this section.

Figure A.7 presents the relationship between privatization and total spending per enrollee. There is evidence that spending is lower after privatization than before, although it is difficult to ascertain whether this represents a real break from trend. Unsurprisingly, given that drug spending is only a small share of overall Medicaid spending and the aggregated nature of our data, we are unable to rule out very economically large total spending increases or total spending decreases. Table A.10 confirms this fact. The point estimate in column (6) suggests full privatization lowers spending by a (statistically insignificant) 8.1 percent. The upper bound of the 95 percent confidence interval is 1.5 percent. To place these numbers in context, we calculate that if states were to capture all of the savings from privatization, that spending per Medicaid enrollee would decrease by roughly 85 dollars or by 1.2 percent.⁴⁶ Thus, while the evidence is suggestive that state spending decreased, we cannot rule out that MCOs captured the entire surplus.⁴⁷

⁴⁶This calculation relies on a number of facts: (1) pre-rebate quarterly drug spending per non-dual eligible enrollee is roughly 210 dollars in this sample, (2) rebates to states average roughly 47 percent of pre-rebate drug spending, (3) dual eligibles are roughly 15 percent of enrollees, and (4) full privatization lower spending by 21.3 percent, and (5) non-dual prescription spending is roughly 5.5 percent of total Medicaid spending in 2015.

⁴⁷The large point estimate for the effect of privatization on spending may be a result of statistical imprecision or could be suggestive of broader consequences of drug and/or medical privatization.

Figure A.7: Privatization and logged total spending per enrollee



Notes: Sample years are 2007-2015. Includes state fixed effects, year fixed effects, an indicator for whether the state has expanded Medicaid under the ACA, and the share of a state's Medicaid enrollees that are dual eligible. Observations are weighted by drug spending for the second to fourth quarters of 2010. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

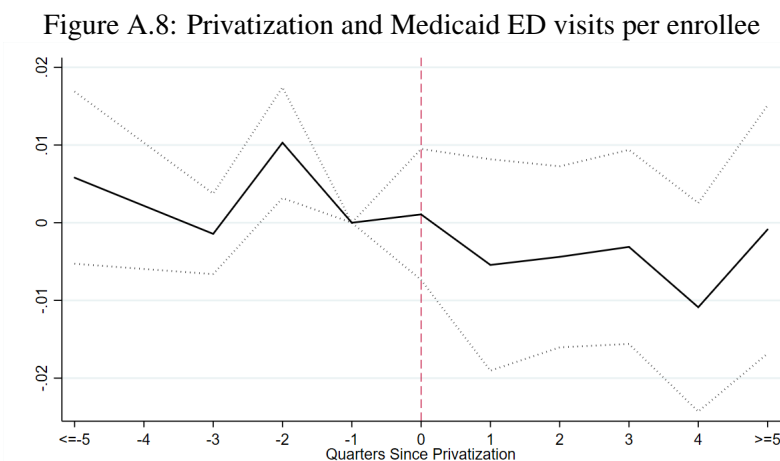
Table A.10: Privatization and logged total spending per enrollee

	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)	Reduced Form (5)	IV (6)
<i>Priv</i>	-0.0904 [0.0503]*		-0.0662 [0.0424]		-0.0563 [0.0348]	
<i>Share MCO</i>		-0.137 [0.0700]*		-0.101 [0.0629]		-0.0857 [0.0501]*
<i>Medicaid expansion</i>			-0.101 [0.0490]**	-0.0978 [0.0500]*	-0.0731 [0.0521]	-0.0694 [0.0526]
<i>Share dual</i>					3.083 [0.763]***	3.177 [0.775]***
N	249	249	249	249	249	249

Notes: Sample years are 2007-2015. Includes state fixed effects, year fixed effects, and a post-Medicaid expansion indicator. The transition year in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in quarter 2 through 4 of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

E Impact on Emergency Department use

To investigate whether there were spillover effects of drug privatization on enrollee health or non-drug spending, we study the effect of privatization on Emergency Department (ED) usage. We downloaded quarterly data on the number of ED visits by Medicaid enrollees per quarter from the Healthcare Cost and Utilization Project (HCUP). These data are only available until the fourth quarter of 2015 and only covers four treatment states (IL, NY, ND, UT) and eight control states (ME, MO, NC, NE, SD, TN, VT, WI).⁴⁸ Figure A.8 presents lags and leads of the privatization decision on Medicaid ED utilization. ED use is lower after privatization than beforehand, although it is unclear whether this is due to a break from or continuation of trend. The pooled point estimate, presented in Table A.11, is negative and marginally statistically significant, and the magnitude of the point estimate is economically sensitive to controlling for the Medicaid expansion. The mean of ED visits per enrollee is 0.185 in our sample, suggesting we can rule out large increases in ED use from privatization.



Notes: Unit of observation is the state x quarter. Specification is restricted to the four treatment states (IL, NY, ND, UT) and eight control states (ME, MO, NC, NE, SD, TN, VT, WI) for which ED data was available. Includes state fixed effects and quarter fixed effects, and a post-Medicaid expansion indicator. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

⁴⁸HCUP reports more limited data from a number of other states that we exclude. We excluded IN and IA, both of which are treatment states but are treated after the end of the data. We also excluded AR, MT, and WY, all of which are control states and only had data available for very limited time periods. Finally, we exclude NY prior to the first quarter of 2011 because of a change in how Medicaid managed care enrollees are coded. Other than excluding the coding changes in NY, these restrictions do not affect the results.

Table A.11: Privatization and Medicaid ED visits per enrollee

	(1)	(2)
<i>Priv</i>	-0.000283 [0.00423]	-0.00792 [0.00421]*
<i>Medicaid expansion</i>		0.0192 [0.0128]
N	254	254

Notes: Unit of observation is the state x quarter. Specification is restricted to the four treatment states (IL, NY, ND, UT) and eight control states (ME, MO, NC, NE, SD, TN, VT, WI) for which ED data was available. Unreported controls includes state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

F MCO Profitability

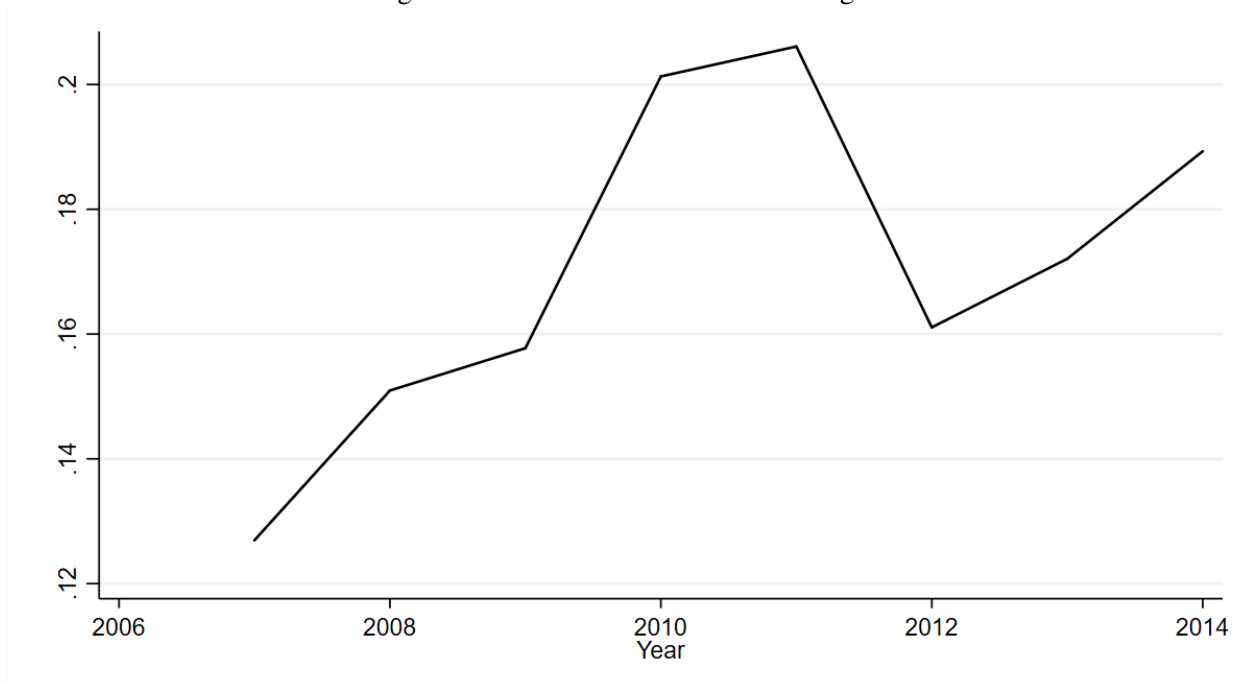
We investigate the effect of privatization on MCO profits using data from the National Association of Insurance Commissioners (NAIC). These data include enrollee months, claims expenses, and premiums for Medicaid MCO enrollees. The NAIC data includes medical spending on dual eligibles in MCOs, even though these enrollees were not affected by drug privatization, which limits our power to detect any effects of drug benefit privatization. NAIC does not include data on enrollees in less comprehensive privately administered benefits, such as PCCMs. Such revenue sources could be meaningful relative to our magnitudes - PCCMs are often reimbursed roughly three dollars per member month to cover administration (Kaiser Family Foundation (2012)). Relatedly, the data do not include administrative costs and therefore does not allow us to calculate MCO margins inclusive of these costs. We eliminate Delaware because the regulators of Medicaid managed care in Delaware does not submit data to NAIC.⁴⁹ Due to data availability, we limit the sample to 2007 through 2014.

As a first exercise, we examine the Medicaid MCO margins, defined as the difference between premiums and claims expenses as a percent of claims expenses. Figure A.9 illustrates that these move over time, but are typically between 0.10 and 0.20 in a year. In the future, federal regulations will mandate that if Medicaid margins are above 0.15, then MCOs will have to return the difference to states. Thus, it is likely that states have captured or will capture at least some of the savings generated by MCOs.

As discussed in the prior section, our central point estimate suggests that MCOs lower drug spending by

⁴⁹ A similar issue affects California and Arizona, two states that are not in sample. We also eliminate years of data for Connecticut and for Utah in which changes in the use of MCOs seem to lead to outliers caused by the timing in which data elements are recorded; for example, when Connecticut stopped using MCOs, there is a year in which claims are reported, but no revenues or enrollees.

Figure A.9: Medicaid MCO insurer margins

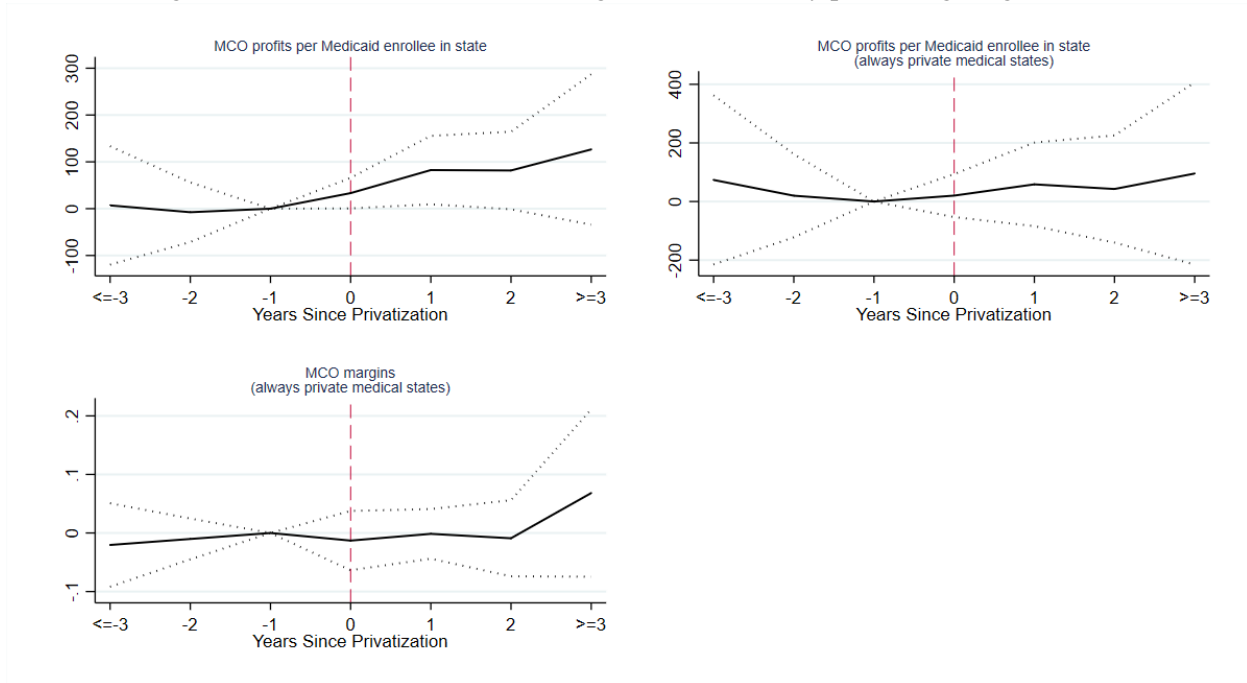


Notes: Sample is limited to states that privatize drug benefits and states with no MCO drug benefits. Source is NAIC data. Margins are premium revenue minus claims costs divided by claims costs.

roughly 85 dollars per Medicaid enrollee per year or by roughly 1.2 percent. Finally, note that drug benefit privatization could affect MCO profitability for a number of reasons, such as spillovers between medical and drug benefits. Furthermore, drug benefit privatization is sometimes concurrent with medical benefit privatization.

With these numbers in mind, we estimated the relationship between MCO profitability and privatization. We considered three measures of profitability. First, MCO profits per Medicaid enrollee in state gives the ratio of revenues minus claims and total state Medicaid enrollment (i.e., regardless of dual eligibility or enrollment in a MCO). We use this measure because it is comparable to state spending per enrollee measures. Note that states without MCOs will have zeros for this measure, and if MCOs are on average profitable, this measure will increase when states switch from public to private administration of medical benefits. We therefore also perform a second analysis where MCO profits per enrollee remains the dependent variable, but where we restrict attention to states that always have privately administered medical benefits. Finally, we consider the effect on MCO margins. Note that all except the first of these three measures are defined only for states with Medicaid MCOs and therefore analyses with those dependent variables are restricted to the states that always have privately administered medical benefits.

Figure A.10: Effect of rebate law change on states already privatizing drug benefits



Notes: Specification is limited to states which had already privatized a substantial share of drug benefits prior to 2010 and to control states with no MCO drug benefits, but excludes Delaware. Sample years are 2007 through 2014. Includes state fixed effects and year fixed effects, an indicator for whether the state has expanded Medicaid under the ACA, and the share of a state's Medicaid enrollees that are dual eligible. Observations are weighted by 2007 Medicaid enrollment. Point estimates for the time varying effect of each year for treatment and control states are presented in the dark line and a 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state, are presented with the dotted lines.

Figure A.10 presents the effect of lags and leads of privatization on these variables. Table A.12 presents pooled estimates. There is suggestive evidence that MCO profits per Medicaid enrollee increase following privatization, although the pooled estimate in Panel A is not statistically significant at conventional levels. Panel B limits the sample to just those states with privately administered medical benefits prior to drug privatization, and the point estimate shrinks meaningfully. The point estimate in Panel B of 44 dollars is roughly half of the decrease in drug spending, and therefore implies that MCOs are capturing roughly half of the decrease and that states are capturing the other half. The point estimate is not, however, statistically significant: we cannot rule out the possibility that the MCO captures none of the decrease in spending or all of the decrease in spending. In Panel C, there is no evidence that margins increase post Medicaid drug benefit privatization, although the estimates are again imprecise. The point estimate suggests margins decrease by roughly 3 percent following drug privatization, although at the top of the 95 percent confidence interval we are unable to rule out a 3 percent increase.

Table A.12: Privatization and MCO profitability

Panel A: Dep var = MCO profits per Medicaid enrollee in state						
	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)	Reduced Form (5)	IV (6)
<i>Priv</i>	75.11 [60.97]		80.88 [57.17]		81.50 [57.25]	
<i>Share MCO</i>		116.5 [97.40]		126.5 [91.12]		126.5 [90.77]
<i>Medicaid expansion</i>			-30.56 [43.69]	-34.12 [40.12]	-29.60 [42.51]	-34.06 [38.91]
<i>Share dual</i>					109.4 [635.0]	6.869 [607.6]
N	210	210	210	210	210	210
Panel B: Dep var = MCO profits per Medicaid enrollee in state (always private medical states)						
<i>Priv</i>	17.14 [106.1]		30.82 [100.1]		20.16 [105.8]	
<i>Share MCO</i>		25.85 [159.9]		46.17 [149.5]		28.70 [150.4]
<i>Medicaid expansion</i>			-56.55 [50.67]	-55.71 [51.33]	-66.60 [40.57]	-67.02 [39.26]
<i>Share dual</i>					-854.4 [1719.5]	-935.0 [1573.9]
N	79	79	79	79	79	79
Panel C: Dep var = MCO margins (always private medical states)						
<i>Priv</i>	-0.0169 [0.0279]		-0.0177 [0.0256]		-0.0208 [0.0222]	
<i>Share MCO</i>		-0.0254 [0.0437]		-0.0266 [0.0391]		-0.0296 [0.0327]
<i>Medicaid expansion</i>			0.00363 [0.0281]	0.00315 [0.0295]	0.000754 [0.0307]	0.00119 [0.0316]
<i>Share dual</i>					-0.245 [0.678]	-0.162 [0.711]
N	79	79	79	79	79	79

Notes: Specification is limited to states which had already privatized a substantial share of drug benefits prior to 2010 and to states that that privatize for drug benefits and control states with no MCO drug benefits, but excludes Delaware. Sample years are 2007 through 2014. Unreported controls includes state FEs and year FEs. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

G Moral Hazard

We obtain data on 160 molecule-generic combinations for which Einav, Finkelstein and Polyakova (2018) published their price elasticities. We create a sample where the unit of observation is the state-molecule-generic status-quarter for these drugs. Drug utilization patterns are quite different for Medicare and Medicaid patients. For example, within the sample of 160 drugs, Atorvastatin Calcium (a statin) is roughly 10 percent of Medicare spending, but only 1 percent of Medicaid spending. By contrast, Quetiapine Fumarate (an antipsychotic) is nearly 9 percent of Medicaid spending within this sample, but is only 1 percent of Medicare spending. The correlation in spending shares is under 0.06, and only roughly a quarter of Medicaid spending is on these drugs. As a result, the estimates on this subsample of Medicaid spending will not perfectly match our central estimates. Furthermore, demand elasticities could differ across these two populations. We proceed nonetheless.

We split drugs into “more elastic” and “less elastic” samples by the revenue weighted median of these drugs (the results are similar when we use a continuous measure of elasticity). For each observation, we calculate the number of *prescriptions per Medicaid enrollee*, the *Medicaid price per prescription*, and *cost sharing per prescription*. We examine the effect of privatization on each of these dependent variables. We also include interactions between privatization and four drug categories: (i) whether the drug is a generic, (ii) whether the drug is relatively price elastic, (iii) whether it is a maintenance drug, and (iv) whether the drug treats a chronic condition.

Tables A.13-A.15 present results from this analysis. Table A.13 presents additional evidence that the point-of-sale price per prescription decreases after privatization, but that prices for generics do not decrease. More elastic drugs have slightly larger price decreases. There is little heterogeneity in the effect of privatization on point-of-sale price per prescription for the remaining drug categories.

Turning to Table A.14, there is no relationship between privatization and cost sharing per prescription, either on average or for any of these specific drug types. In particular, it does not appear that Medicaid MCOs are raising cost sharing on drugs for which demand is particularly price elastic. Given the limited role of cost sharing, this is unsurprising. In Table A.15, we examine the relationship between privatization and logged prescriptions per enrollee for each of these drugs. The interaction term between privatization and being elastic is near zero and statistically insignificant. There is some evidence (although no longer statistically significant) that use of generics increases after privatization. Furthermore, there is marginally

Table A.13: Reduced Form relationship between *Price per prescription*, privatization, and Einav, Finkelstein, Polykova's drug elasticities

	(1)	(2)	(3)	(4)
<i>Priv</i>	-6.082 [1.103]***	-5.646 [1.126]***	-12.22 [2.576]***	-11.18 [3.066]***
<i>Medicaid expansion</i>		-1.307 [1.024]		-3.889 [3.114]
<i>Priv*I(Generic)</i>			10.68 [2.665]***	9.457 [3.010]***
<i>Priv*I(Elastic)</i>			-3.822 [2.338]	-3.377 [2.122]
<i>Priv*I(Maintenance)</i>			-1.399 [1.884]	-1.044 [1.992]
<i>Priv*I(Chronic)</i>			2.330 [3.847]	1.730 [3.689]
<i>(Medicaid expansion)*I(Generic)</i>				4.377 [3.068]
<i>(Medicaid expansion)*I(Elastic)</i>				-1.324 [2.531]
<i>(Medicaid expansion)*I(Maintenance)</i>				-0.978 [1.737]
<i>(Medicaid expansion)*I(Chronic)</i>				1.742 [4.210]
N	67,493	67,493	67,493	67,493

Notes: Unit of observation is the NDC-state-quarter. Unreported controls include NDC-state fixed effects and NDC-quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.14: Reduced Form relationship between *Cost sharing per prescription*, privatization, and Einav, Finkelstein, Polykova's drug elasticities

	(1)	(2)	(3)	(4)
<i>Priv</i>	0.746 [0.470]	0.753 [0.515]	1.335 [1.160]	1.334 [1.310]
<i>Medicaid expansion</i>		-0.0222 [0.268]		-0.00299 [0.918]
<i>Priv*I(Generic)</i>			-1.743 [1.637]	-1.748 [1.788]
<i>Priv*I(Elastic)</i>			0.706 [0.931]	0.623 [0.906]
<i>Priv*I(Maintenance)</i>			0.827 [0.779]	0.874 [0.814]
<i>Priv*I(Chronic)</i>			-0.534 [1.239]	-0.549 [1.417]
<i>(Medicaid expansion)*I(Generic)</i>				0.0231 [0.968]
<i>(Medicaid expansion)*I(Elastic)</i>				0.251 [0.359]
<i>(Medicaid expansion)*I(Maintenance)</i>				-0.139 [0.356]
<i>(Medicaid expansion)*I(Chronic)</i>				0.0454 [0.843]
N	67,493	67,493	67,493	67,493

Notes: Unit of observation is the NDC-state-quarter. Unreported controls include NDC-state fixed effects and NDC-quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.15: Reduced Form relationship between logged *Prescriptions per enrollee*, privatization, and Einav, Finkelstein, Polykova's drug elasticities

	(1)	(2)	(3)	(4)
<i>Priv</i>	0.117 [0.0304]***	0.107 [0.0339]***	-0.0743 [0.0928]	0.0187 [0.107]
<i>Medicaid expansion</i>		0.0293 [0.0364]		-0.305 [0.100]***
<i>Priv*I(Generic)</i>			0.137 [0.0904]	0.0226 [0.102]
<i>Priv*I(Elastic)</i>			0.0110 [0.0397]	-0.00177 [0.0397]
<i>Priv*I(Maintenance)</i>			0.108 [0.0505]**	0.0954 [0.0571]*
<i>Priv*I(Chronic)</i>			0.107 [0.0749]	0.0359 [0.0891]
<i>(Medicaid expansion)*I(Generic)</i>				0.366 [0.0926]***
<i>(Medicaid expansion)*I(Elastic)</i>				0.0389 [0.0427]
<i>(Medicaid expansion)*I(Maintenance)</i>				0.0331 [0.0545]
<i>(Medicaid expansion)*I(Chronic)</i>				0.198 [0.0877]**
N	67,493	67,493	67,493	67,493

Notes: Unit of observation is the NDC-state-quarter. Unreported controls include NDC-state fixed effects and NDC-quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by drug spending for each NDC-state combination in the first quarter in which it appears in the data. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

statistically significant evidence that use of maintenance drugs (which likely overlap with our high offset sample) increases after privatization.

Overall, we conclude that Medicaid MCOs do not increase cost sharing of price elastic drugs to control spending; the mechanism underlying the spending reductions that we observe differ from the one identified in Einav, Finkelstein and Polyakova (2018).

H Appendix Exhibits

Table A.16: State identities by transition type

(medical / drug) t=0	t=T		
	Public/Public	Private/Public	Private/Private
Public/Public	AK, AL, AR, ID, ME, MT, NC, OK, SD, VT, WY	-	IA, LA, MS, NH, ND
Private/Public	CT	NE, MO, WI, TN	IL, UT, TX, WV, NY, IN, DE, OH
Private/Private	-	-	AZ, CA, CO, DC, FL, GA, HI, KS, KY, MA, MD, MI, MN, NJ, NM, NV, OR, PA, RI, SC, VA, WA

Notes: States are classified as private if a significant number of Medicaid enrollees are in MCOs that bear financial risk for enrollees' medical spending. VT is classified as Public/Public, because enrollees are in a state run MCO.

Table A.17: Privatization and per enrollee spending

Panel A: Dep var = <i>Share MCO</i>				
	(1)		(2)	
<i>Priv</i>	0.618 [0.0768]***		0.608 [0.0758]***	
<i>Medicaid expansion</i>			0.0351 [0.0310]	
R-sq	0.933		0.935	
Kleibergen-Paap rk Wald F statistic	38.46		38.93	
<i>Share MCO</i> mean	0.148 (0.28)			
Panel B: Dep var = <i>ln(drug spending per enrollee)</i>				
	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)
<i>Priv</i>	-0.126 [0.0549]**		-0.145 [0.0682]**	
<i>Share MCO</i>		-0.205 [0.0884]**		-0.239 [0.115]**
<i>Medicaid expansion</i>			0.0637 [0.0582]	0.0721 [0.0651]
<i>Spending per enrollee</i> mean	221.79 (75.62)			
Panel C: Dep var = <i>ln(prescriptions per enrollee)</i>				
<i>Priv</i>	0.0805 [0.0355]**		0.0526 [0.0416]	
<i>Share MCO</i>		0.130 [0.0494]**		0.0865 [0.0626]
<i>Medicaid expansion</i>			0.0950 [0.0410]**	0.0919 [0.0405]**
<i>Prescriptions per enrollee</i> mean	2.92 (0.86)			
Panel D: Dep var = <i>ln(price per prescription)</i>				
<i>Priv</i>	-0.207 [0.0480]***		-0.198 [0.0514]***	
<i>Share MCO</i>		-0.335 [0.0608]***		-0.325 [0.0719]***
<i>Medicaid expansion</i>			-0.0312 [0.0339]	-0.0198 [0.0369]
<i>Price per prescription</i> mean	76.76 (18.9)			
Panel E: Dep var = <i>ln(utilization per enrollee)</i>				
<i>Priv</i>	-0.0735 [0.0552]		-0.0925 [0.0695]	
<i>Share MCO</i>		-0.119 [0.0896]		-0.152 [0.117]
<i>Medicaid expansion</i>			0.0648 [0.0585]	0.0702 [0.0644]
<i>Utilization per enrollee</i> mean	223.23 (72.89)			
N	741	741	741	741

Notes: Unreported controls include state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.18: Effect of MCOs on generic penetration

Panel A: Dep var = <i>Generic penetration</i>				
	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)
<i>priv</i>	0.0539 [0.0195]***		0.0470 [0.0171]**	
<i>share MCO</i>		0.0872 [0.0265]***		0.0773 [0.0249]***
<i>Medicaid expansion</i>			0.0236 [0.0102]**	0.0209 [0.00994]**
<i>Generic penetration mean</i>		0.733 (0.046)		
Panel B: Dep var = <i>Generic efficiency</i>				
<i>priv</i>	0.0307 [0.0106]***		0.0248 [0.0102]**	
<i>share MCO</i>		0.0497 [0.0155]***		0.0408 [0.0161]**
<i>Medicaid expansion</i>			0.0202 [0.00715]***	0.0188 [0.00776]**
<i>Generic efficiency mean</i>		0.823 (0.026)		
Panel C: Dep var = <i>Generic accessibility</i>				
<i>priv</i>	0.0339 [0.0146]**		0.0320 [0.0123]**	
<i>share MCO</i>		0.0549 [0.0194]***		0.0526 [0.0168]***
<i>Medicaid expansion</i>			0.00662 [0.00835]	0.00478 [0.00743]
<i>Generic accessibility mean</i>		0.889 (0.035)		
N	741	741	741	741

Notes: Unreported controls include state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010.

Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.19: Effect of increased generic utilization on drug spending per enrollee

Drug type	P	Q	ΔQ	% Δ spend per enrollee (Version 1)	% Δ spend per enrollee (Version 2)
branded with no generic equivalent	248	0.162	-0.0526	-18.26%	-7.51%
branded with a generic equivalent	102	0.177	-0.0247	-3.53%	-3.53%
generic	20	0.661	0.0773	2.16%	2.16%
Overall				-19.62%	-8.87%

Notes: The average point-of-sale prices (P), average quantity shares (Q), and changes in quantities (ΔQ) are based upon the summary statistics for treatment states in Table 2 and the point estimates in Table A.18. Version 1 of the calculation assumes that shifts in demand from privatization are for average priced drugs within three groups of drugs: (i) branded drugs with no generic equivalents, (ii) branded drugs with a generic equivalent, and (iii) generic drugs. Increased use of generics has a large effect on spending because of the large point-of-sale price differentials between branded and generic drugs. As a result, the calculate is sensitive to assumptions about the prices of the branded drugs that are being shifted to generic. Version 2, our preferred calculation, assumes that branded drugs with no generic equivalent that are substituted for with a generic are priced like branded drugs that have a generic.

Table A.20: Decomposition of source of decreases in point-of-sale price per prescription

	NDC 9 (1)	molecule-generic (2)	molecule (3)	VA class-generic (4)	VA class (5)	All prescriptions (6)
<i>Share MCO</i>	-0.0835 [0.0247]***	-0.0178 [0.0105]	-0.0255 [0.0171]	-0.0398 [0.0371]	-0.107 [0.0503]**	-0.0553 [0.0289]*

Notes: To determine why point-of-sale price per prescription decreases, we reprice the prescriptions using coarser and coarser drug classifications. Each column presents the contribution of further repricing to the overall effect of full privatization on point-of-sale price per prescription. For example, column (1) implies that the effect of full privatization on prices would have been 8.4 percentage points smaller if there was no price variation within 9 digit NDC. The coefficient in column (2) implies that the effect of full privatization on prices would have been 1.8 percentage points smaller if there was no price variation within molecule-generic versus than it would have been if there was no price variation within 9 digit NDC. The large coefficients in columns (1) and (5) imply that privatization is lowering point-of-sale prices by lowering prices for identical 9 digit NDCs and by substituting generics within-VA class but across-molecule. Drug sample is limited to drugs matched to both the FDA and VA data. Unit of observation is the state-quarter. Unreported controls includes state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

Table A.21: Privatization and use of high offset drugs

Panel A: Dep var = $\ln(\text{utilization per enrollee, high offset drugs})$				
	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)
<i>Priv</i>	-0.0134 [0.0538]		-0.00503 [0.0646]	
<i>Share MCO</i>		-0.0217 [0.0873]		-0.00827 [0.107]
<i>Medicaid expansion</i>			-0.0286 [0.0570]	-0.0283 [0.0601]
Panel B: Dep var = $\ln(\text{utilization per enrollee, not high offset drugs})$				
<i>Priv</i>	-0.116 [0.0634]*		-0.147 [0.0773]*	
<i>Share MCO</i>		-0.188 [0.101]*		-0.242 [0.130]*
<i>Medicaid expansion</i>			0.103 [0.0591]*	0.112 [0.0666]
Panel C: Dep var = <i>Share high offset</i>				
<i>Priv</i>	0.0249 [0.00719]***		0.0331 [0.00703]***	
<i>Share MCO</i>		0.0403 [0.00936]***		0.0544 [0.00927]***
<i>Medicaid expansion</i>			-0.0278 [0.00461]***	-0.0297 [0.00488]***
N	741	741	741	741

Notes: Unreported controls include state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010.

Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.22: Heterogeneity in IV effect of full privatization on high offset vs non-high offset drugs

Dependent Variable	Non-high offset (1)	High offset (2)
<i>ln(Spending per enrollee)</i>	-0.304 [0.129]**	-0.126 [0.100]
<i>ln(Prescriptions per enrollee)</i>	0.0642 [0.0651]	0.155 [0.0688]**
<i>ln(Price per prescription)</i>	-0.368 [0.0870]***	-0.281 [0.0574]***
<i>ln(Utilization per enrollee)</i>	-0.242 [0.130]*	-0.00827 [0.107]
<i>Generic accessibility</i>	0.0589 [0.0247]**	0.0487 [0.0120]***
<i>Generic efficiency</i>	0.0506 [0.0187]**	0.0189 [0.0139]
<i>Generic penetration</i>	0.0918 [0.0342]**	0.0556 [0.0118]***

Notes: Specifications are limited to treatment states that privatize drug benefits and control states with no MCO drug benefits. Unreported controls includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.23: Heterogeneity in IV effect of full privatization by whether a drug is in one of Medicare's 6 protected class and by orphan drug status

Dependent Variable	Any protected class (1)	Not protected class (2)	Orphan (3)	Not Orphan (4)
<i>ln(drug spending per enrollee)</i>	-0.0328 [0.101]	-0.320 [0.124]**	-0.117 [0.119]	-0.269 [0.117]**
<i>ln(prescriptions per enrollee)</i>	0.138 [0.0782]*	0.0816 [0.0639]	0.163 [0.0564]***	0.0781 [0.0643]
<i>ln(price per prescription)</i>	-0.171 [0.0639]**	-0.402 [0.0821]***	-0.280 [0.0930]***	-0.347 [0.0710]***
<i>ln(drug utilization per enrollee)</i>	0.0258 [0.104]	-0.223 [0.124]*	-0.0528 [0.104]	-0.178 [0.123]
<i>Generic accessibility</i>	0.0532 [0.0181]***	0.0558 [0.0160]***	0.0141 [0.0118]	0.0580 [0.0179]***
<i>Generic efficiency</i>	0.0332 [0.0135]**	0.0434 [0.0168]**	0.0204 [0.0143]	0.0439 [0.0168]**
<i>Generic penetration</i>	0.0668 [0.0206]***	0.0825 [0.0249]***	0.0274 [0.0185]	0.0848 [0.0262]***

Notes: Unreported controls includes state fixed effects and quarter fixed effects. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

Table A.24: Privatization and *rebate share*

	Reduced Form (1)	IV (2)	Reduced Form (3)	IV (4)
<i>Priv</i>	-0.0107 [0.0503]		0.0106 [0.0361]	
<i>Share MCO</i>		-0.0174 [0.0838]		0.0175 [0.0578]
<i>Medicaid expansion</i>			-0.116 [0.0372]***	-0.117 [0.0362]***
N	162	162	162	162

Notes: Unreported controls include state fixed effects and year fixed effects. The transition year in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in quarter 2 through 4 of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.25: IV estimate of effect of full privatization (robustness to sampling restrictions related to Medicaid expansions)

Dependent Variable	Full Sample	Exclude IN and ND	Limit to states expanding Medicaid	Limit to states never expanding Medicaid	Exclude states post-Medicaid expansion
	(1)	(2)	(3)	(4)	(5)
<i>ln(Spending per enrollee)</i>	-0.239 [0.115]**	-0.232 [0.117]*	-0.364 [0.118]***	0.0560 [0.0633]	-0.263 [0.127]**
<i>ln(Prescriptions per enrollee)</i>	0.0865 [0.0626]	0.0917 [0.0617]	-0.0112 [0.0794]	0.248 [0.0541]***	0.0725 [0.0672]
<i>ln(Price per prescription)</i>	-0.325 [0.0719]***	-0.324 [0.0757]***	-0.353 [0.0821]***	-0.192 [0.0319]***	-0.335 [0.0827]***
<i>ln(Utilization per enrollee)</i>	-0.152 [0.117]	-0.147 [0.118]	-0.291 [0.105]**	0.180 [0.0540]***	-0.162 [0.127]
<i>Generic accessibility</i>	0.0526 [0.0168]***	0.0557 [0.0175]***	0.0452 [0.0166]**	0.0344 [0.00508]***	0.0635 [0.0180]***
<i>Generic efficiency</i>	0.0408 [0.0161]**	0.0424 [0.0165]**	0.0496 [0.00709]***	-0.00227 [0.00476]	0.0431 [0.0186]**
<i>Generic penetration</i>	0.0773 [0.0249]***	0.0812 [0.0256]***	0.0797 [0.0151]***	0.0248 [0.00522]***	0.0873 [0.0286]***
<i>Share high offset</i>	0.0544 [0.00927]***	0.0523 [0.00922]***	0.0709 [0.0113]***	0.0329 [0.00770]***	0.0484 [0.00802]***

Notes: Unreported controls includes state FEs and quarter FEs. Column (2) excludes Indiana and North Dakota because they privatized drug benefits and expanded Medicaid at the same time. Column (5) includes both expansion and non-expansion states, but excludes states from the sample after they expand Medicaid. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. * 0.10 ** 0.05 *** 0.01

Table A.26: IV estimate of effect of full privatization (robustness of results to sample decisions)

Dependent Variable	Full sample	Exclude control states	Limit to states with public medical at start of sample	Limit to states with private medical at start of sample	Limit treatment states to states that risk adjust	Limit to states with above median drug spending in 2010Q2	Limit to states with below median drug spending in 2010Q2	Limit to states with Any Willing Pharmacy laws
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>ln(drug spending per enrollee)</i>	-0.239 [0.115]**	-0.411 [0.105]***	-0.483 [0.254]*	-0.261 [0.110]**	-0.219 [0.117]*	-0.435 [0.0994]***	0.0143 [0.109]	-0.120 [0.316]
<i>ln(prescriptions per enrollee)</i>	0.0865 [0.0626]	-0.0487 [0.0814]	0.0884 [0.115]	0.0211 [0.0765]	0.115 [0.0518]**	0.0253 [0.0409]	0.175 [0.100]	0.122 [0.268]
<i>ln(price per prescription)</i>	-0.325 [0.0719]***	-0.362 [0.0846]***	-0.571 [0.185]***	-0.282 [0.0700]***	-0.334 [0.0739]***	-0.460 [0.0749]***	-0.161 [0.0483]***	-0.242 [0.109]**
<i>ln(drug utilization per enrollee)</i>	-0.152 [0.117]	-0.272 [0.110]**	-0.342 [0.201]	-0.171 [0.123]	-0.126 [0.119]	-0.362 [0.0785]***	0.122 [0.121]	-0.0691 [0.318]
<i>Generic accessibility</i>	0.0526 [0.0168]***	0.0424 [0.0143]**	0.0581 [0.0215]**	0.0572 [0.0167]***	0.0545 [0.0189]***	0.0734 [0.0118]***	0.0268 [0.00988]**	0.00267 [0.0207]
<i>Generic efficiency</i>	0.0408 [0.0161]**	0.0302 [0.0146]*	0.0762 [0.0256]***	0.0271 [0.0186]	0.0405 [0.0174]**	0.0646 [0.00682]***	0.0135 [0.0142]	0.0422 [0.0259]
<i>Generic penetration</i>	0.0773 [0.0249]***	0.0596 [0.0226]**	0.113 [0.0378]***	0.0680 [0.0279]**	0.0779 [0.0281]**	0.114 [0.0128]***	0.0335 [0.0134]**	0.0450 [0.0345]
<i>Share high offset</i>	0.0544 [0.00927]***	0.0539 [0.00989]***	0.0663 [0.0117]***	0.0458 [0.0103]***	0.0524 [0.00901]***	0.0717 [0.0116]***	0.0292 [0.00821]***	0.0550 [0.0369]

Notes: Unreported controls includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state.
Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.27: IV estimate of effect of full privatization (further robustness checks)

Dependent variable	Full sample	Full sample; dependent variables winsorized	Balance pre and post periods for treatment states	With state specific linear time trends
	(1)	(2)	(3)	(4)
<i>ln(drug spending per enrollee)</i>	-0.239 [0.115]**	-0.253 [0.116]**	-0.244 [0.114]**	-0.315 [0.115]**
<i>ln(prescriptions per enrollee)</i>	0.0865 [0.0626]	0.0759 [0.0704]	0.0608 [0.0677]	-0.0196 [0.0800]
<i>ln(price per prescription)</i>	-0.325 [0.0719]***	-0.329 [0.0693]***	-0.305 [0.0704]***	-0.295 [0.0698]***
<i>ln(drug utilization per enrollee)</i>	-0.152 [0.117]	-0.166 [0.119]	-0.177 [0.120]	-0.226 [0.122]*
<i>Generic Accessibility</i>	0.0526 [0.0168]***	0.0530 [0.0167]***	0.0490 [0.0205]**	0.0502 [0.0218]**
<i>Generic Efficiency</i>	0.0408 [0.0161]**	0.0415 [0.0158]**	0.0439 [0.0155]***	0.0357 [0.0124]***
<i>Generic Penetration</i>	0.0773 [0.0249]***	0.0776 [0.0246]***	0.0770 [0.0278]**	0.0695 [0.0269]**
<i>Share high offset</i>	0.0544 [0.00927]***	0.0526 [0.00824]***	0.0530 [0.0109]***	0.0493 [0.0130]***

Notes: Unreported controls includes state FEs and quarter FEs. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. In column (2), we run a regression with state and year fixed effects on the dependent variable, and obtain predicted residuals. We then replace any residuals below the first percentile of residuals with the first percentile and any residuals above the 99th percentile of residuals with the 99th percentile of residuals. The winsorized version of our variable is then the predicted values from this regression plus these winsorized residuals. * 0.10 ** 0.05 *** 0.01

Table A.28: IV estimate of effect of full privatization (robustness of results to excluding states one at a time)

Dependent variable	Full sample	Excluding												UT (13)	WV (14)
	(1)	DE (2)	IA (3)	IL (4)	IN (5)	LA (6)	MS (7)	ND (8)	NH (9)	NY (10)	OH (11)	TX (12)			
<i>ln(Spending per enrollee)</i>	-0.239 [0.115]**	-0.242 [0.117]**	-0.230 [0.117]*	-0.218 [0.117]*	-0.231 [0.117]*	-0.171 [0.100]*	-0.258 [0.116]**	-0.240 [0.115]**	-0.233 [0.117]*	-0.174 [0.153]	-0.257 [0.124]**	-0.340 [0.101]***	-0.238 [0.117]*	-0.226 [0.115]*	
<i>ln(Prescriptions per enrollee)</i>	0.0865 [0.0626]	0.0872 [0.0631]	0.0951 [0.0625]	0.120 [0.0535]**	0.0920 [0.0616]	0.103 [0.0634]	0.0721 [0.0641]	0.0863 [0.0626]	0.0929 [0.0633]	0.108 [0.0876]	0.0865 [0.0676]	0.0388 [0.0594]	0.0853 [0.0633]	0.0917 [0.0623]	
<i>ln(Price per prescription)</i>	-0.325 [0.0719]***	-0.329 [0.0734]***	-0.325 [0.0735]***	-0.338 [0.0726]***	-0.323 [0.0755]**	-0.274 [0.0578]***	-0.330 [0.0729]***	-0.326 [0.0721]***	-0.326 [0.0733]***	-0.282 [0.0925]***	-0.343 [0.0752]***	-0.379 [0.0720]***	-0.323 [0.0734]***	-0.317 [0.0721]***	
<i>ln(Utilization per enrollee)</i>	-0.152 [0.117]	-0.154 [0.119]	-0.147 [0.119]	-0.130 [0.120]	-0.147 [0.118]	-0.0984 [0.111]	-0.169 [0.119]	-0.152 [0.117]	-0.147 [0.119]	-0.0793 [0.153]	-0.161 [0.128]	-0.268 [0.0855]***	-0.155 [0.119]	-0.136 [0.116]	
<i>Generic accessibility</i>	0.0526 [0.0168]***	0.0535 [0.0170]***	0.0522 [0.0167]***	0.0553 [0.0181]**	0.0555 [0.0174]**	0.0497 [0.0182]**	0.0530 [0.0170]***	0.0528 [0.0168]***	0.0537 [0.0170]***	0.0302 [0.0109]**	0.0572 [0.0170]***	0.0606 [0.0173]***	0.0535 [0.0168]***	0.0514 [0.0173]***	
<i>Generic efficiency</i>	0.0408 [0.0161]**	0.0411 [0.0165]**	0.0415 [0.0163]**	0.0401 [0.0169]**	0.0424 [0.0165]**	0.0345 [0.0160]**	0.0411 [0.0165]**	0.0407 [0.0162]**	0.0411 [0.0164]**	0.0272 [0.0183]	0.0419 [0.0178]**	0.0581 [0.00827]***	0.0416 [0.0164]**	0.0407 [0.0162]**	
<i>Generic penetration</i>	0.0773 [0.0249]***	0.0782 [0.0253]***	0.0776 [0.0250]***	0.0783 [0.0271]**	0.0811 [0.0255]**	0.0695 [0.0259]**	0.0778 [0.0254]***	0.0773 [0.0250]***	0.0784 [0.0253]***	0.0492 [0.0216]**	0.0816 [0.0269]***	0.0988 [0.0176]***	0.0787 [0.0252]***	0.0761 [0.0253]***	
<i>Share high offset</i>	0.0544 [0.00927]***	0.0559 [0.00931]**	0.0548 [0.00951]**	0.0552 [0.00938]***	0.0525 [0.00921]**	0.0541 [0.00996]***	0.0538 [0.00918]***	0.0542 [0.00927]***	0.0544 [0.00943]***	0.0489 [0.0114]***	0.0556 [0.00981]***	0.0604 [0.00891]***	0.0554 [0.00934]***	0.0526 [0.00904]***	

Notes: Unreported controls includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state.

Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.29: Robustness to including states with drug MCOs prior to 2010Q2 and to using all variation in *share MCO*

	<i>ln(drug spending per enrollee)</i> (1)	<i>ln(Prescriptions per enrollee)</i> (2)	<i>ln(Price per prescription)</i> (3)	<i>ln(drug utilization per enrollee)</i> (4)	<i>Generic accessibility</i> (5)	<i>Generic efficiency</i> (6)	<i>Generic penetration</i> (7)	<i>Share high offset</i> (8)
<i>Lagged share MCO</i>	-0.121 [0.0858]	0.133 [0.0468]***	-0.255 [0.0515]***	-0.0528 [0.0853]	0.0450 [0.0186]**	0.0336 [0.0112]***	0.0647 [0.0230]***	0.0291 [0.00915]***
<i>Medicaid expansion</i>	0.0485 [0.0569]	0.0826 [0.0473]*	-0.0340 [0.0242]	0.0588 [0.0510]	0.00766 [0.00604]	0.0112 [0.00453]**	0.0169 [0.00605]***	-0.0247 [0.00456]***
N	1,174	1,174	1,174	1,174	1,174	1,174	1,174	1,174

Notes: Specification includes all states, except for DC, RI, HI, KS, and the second quarter of 2014 for VA. These are excluded because of implausible spending patterns. Unit of observation is the state-quarter. Unreported controls are state fixed effects and quarter fixed effects. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Significance levels: * 0.10 ** 0.05 *** 0.01

Table A.30: IV estimate of effect of full Medicaid privatization on Medicare drug spending (falsification)

Dependent Variable	
<i>ln(Spending per enrollee)</i>	-0.00919 [0.0167]
<i>ln(Days supply per enrollee)</i>	-0.00795 [0.00643]
<i>ln(Price per days supply)</i>	-0.00123 [0.0135]
<i>ln(Utilization per enrollee)</i>	-0.0141 [0.0139]
<i>Generic accessibility</i>	0.0110 [0.00496]**
<i>Simulated generic accessibility</i>	0.00943 [0.00432]**
<i>Generic efficiency</i>	-0.00146 [0.00137]
<i>Generic penetration</i>	0.00837 [0.00437]*
<i>Share high offset</i>	0.00430 [0.00196]**

Notes: Specifications are limited to treatment states that privatize drug benefits and control states with no MCO drug benefits. Unreported controls include state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Standard errors are clustered by state. Spending is computed for Medicare enrollees 65+ years old who never receive a low income subsidy during the years for which we have data. Data covers the second quarter of 2010 through the fourth quarter of 2014. Significance levels: *0.10 **0.05 ***0.01

Table A.31: Reduced Form Estimate of Effect of Privatization
(Robustness of Results to calculating p-values with Wild Cluster Bootstrap)

Dependent Variable	Original (1)	Wild Cluster Bootstrap (2)
<i>ln(drug spending per enrollee)</i>	-0.145 (0.042)	-0.145 (0.114)
<i>ln(price per prescription)</i>	-0.198 (0.001)	-0.198 (0.008)
<i>ln(drug utilization per enrollee)</i>	-0.0925 (0.194)	-0.0925 (0.270)
<i>Generic Accessibility</i>	0.0320 (0.015)	0.0320 (0.008)
<i>Generic Efficiency</i>	0.0248 (0.022)	0.0248 (0.116)
<i>Generic Penetration</i>	0.0470 (0.010)	0.0470 (0.012)
<i>Share high offset</i>	0.0331 (0.000)	0.0331 (0.000)

Notes: Unreported controls includes state FEs and quarter FEs. The transition quarter in which a state privatizes is omitted. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. In column (1), p-values, reported in (), are computed from standard errors clustered by state. In column (2), p-values, reported in () are computed using a wild-cluster bootstrap with 1000 repetitions, and using the null hypothesis that privatization has no effect on outcomes when resampling errors. These calculations use the Stata command `cgmwildboot` and mirror the baseline suggestions in Cameron, Gelbach, and Miller (2008).

Table A.32: Bacon-Goodman (2018) DD estimates and weights

	<i>share</i>	<i>ln(drug spending</i>	<i>ln(Prescriptions</i>	<i>ln(Price per</i>	<i>ln(drug utilization</i>	<i>Generic</i>	<i>Generic</i>	<i>Generic</i>	<i>Share high</i>
	<i>MCO</i>	<i>per enrollee)</i>	<i>per enrollee)</i>	<i>prescription)</i>	<i>per enrollee)</i>	<i>accessibility</i>	<i>efficiency</i>	<i>penetration</i>	<i>offset</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Early vs late</i>									
DD estimate	0.456	-0.198	-0.014	-0.183	-0.100	0.029	0.014	0.020	0.023
DD weight	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124
<i>Late vs early</i>									
DD estimate	0.382	-0.075	0.030	-0.105	-0.046	0.014	0.012	0.005	0.004
DD weight	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109
<i>treated vs untreated</i>									
DD estimate	0.584	-0.102	0.062	-0.164	-0.068	0.037	0.027	0.015	0.032
DD weight	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767	0.767

Notes: Reported coefficients for DD estimators are from Stata command `ddtiming`, which implements the suggestions in Bacon-Goodman(2018). Unreported controls includes state FEs and quarter FEs. The transition quarter in which a state privatizes is omitted. Observations are unweighted.

Figure A.11: Price setting mechanism under public vs private administration

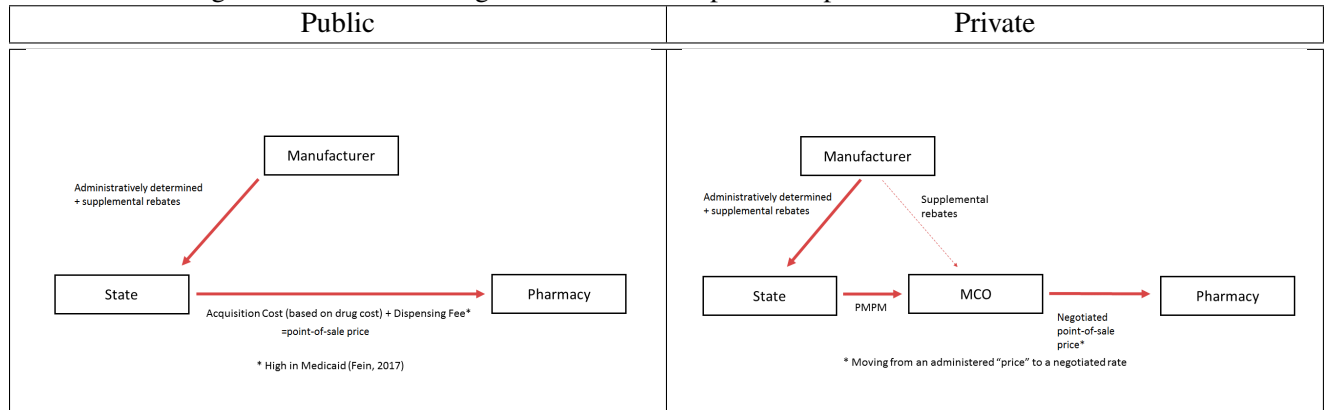
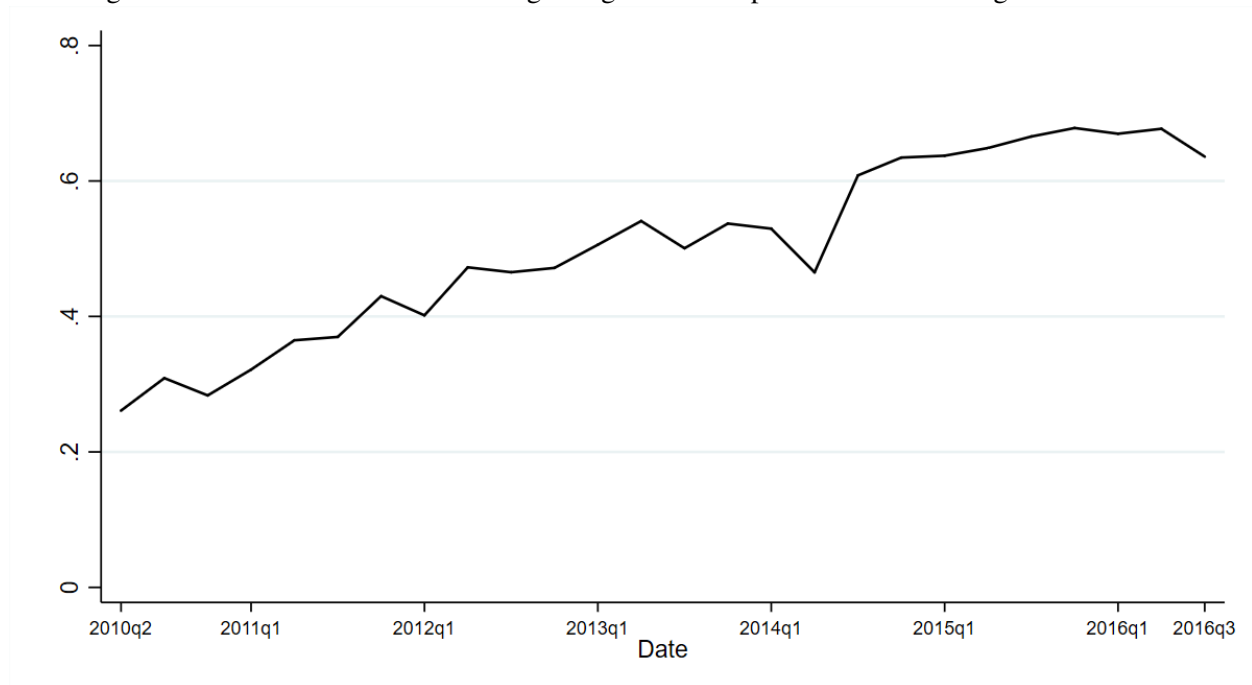
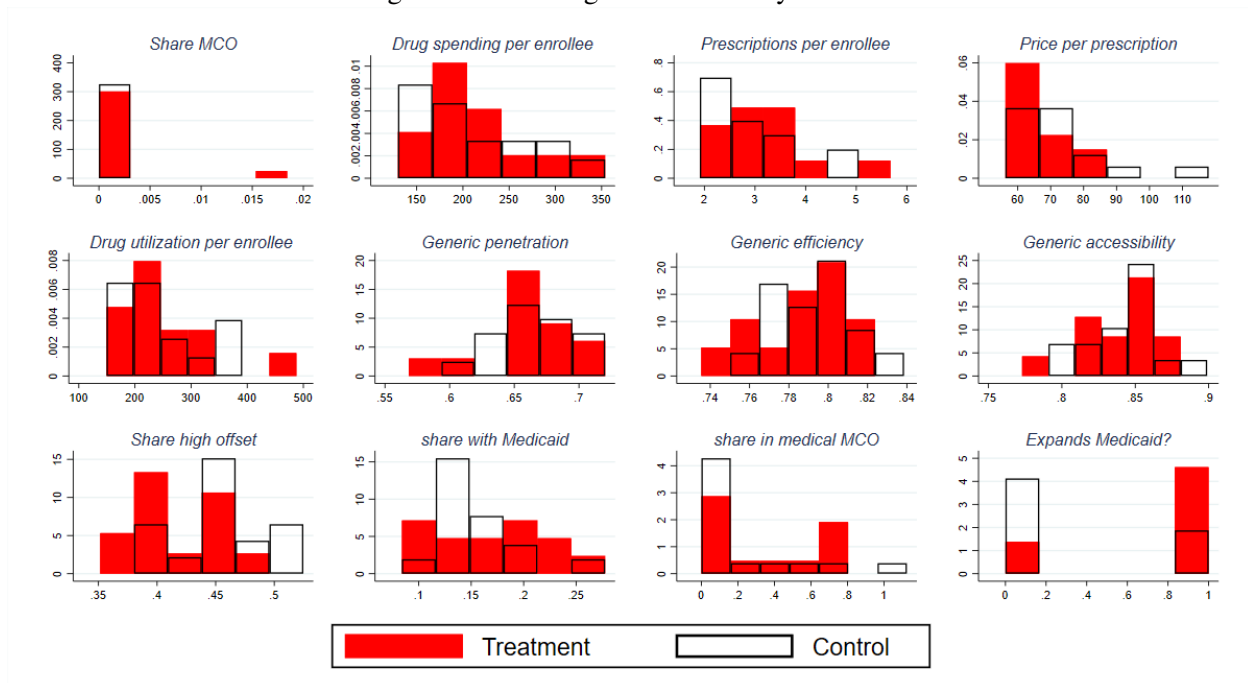


Figure A.12: Share MCO for states beginning with some private Medicaid drug administration



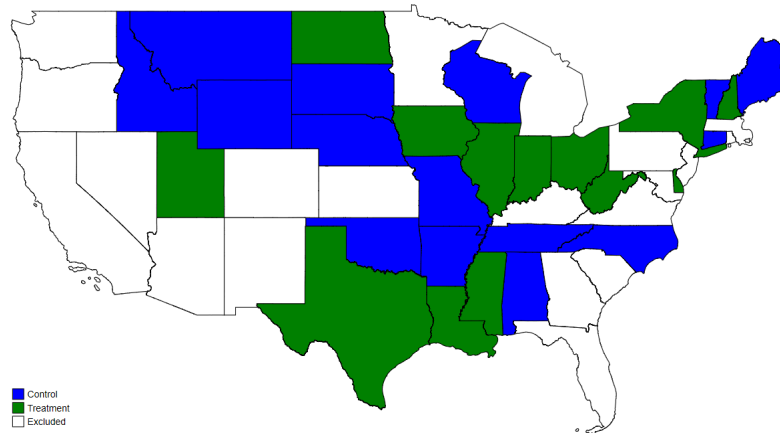
Notes: Excludes DC, MA, and RI because of data limitations.

Figure A.13: Histogram of summary statistics



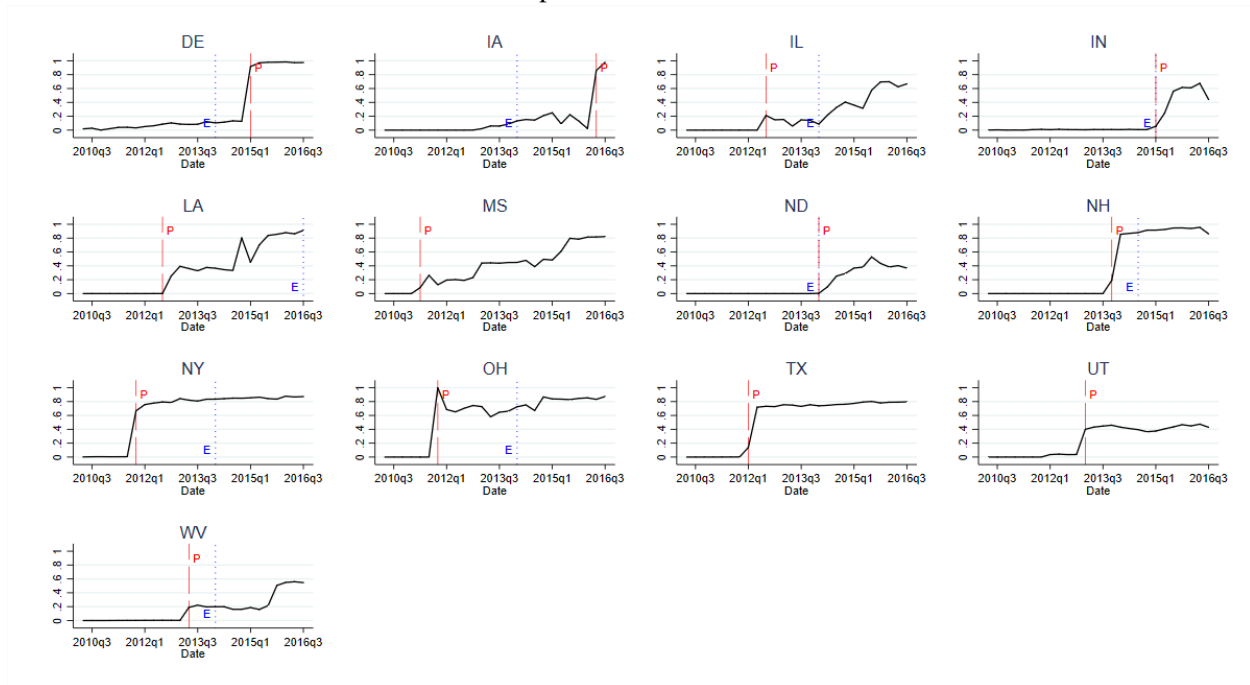
Notes: Unit of observation is the state-quarter for states in the second quarter of 2010.

Figure A.14: Map of states by Medicaid drug MCO status, 2010-2016



Notes: Excludes Alaska (Control) and Hawaii (Excluded).

Figure A.15: Percent of Medicaid drug spending by MCOs, privatization date, and Medicaid expansion date for treatment states



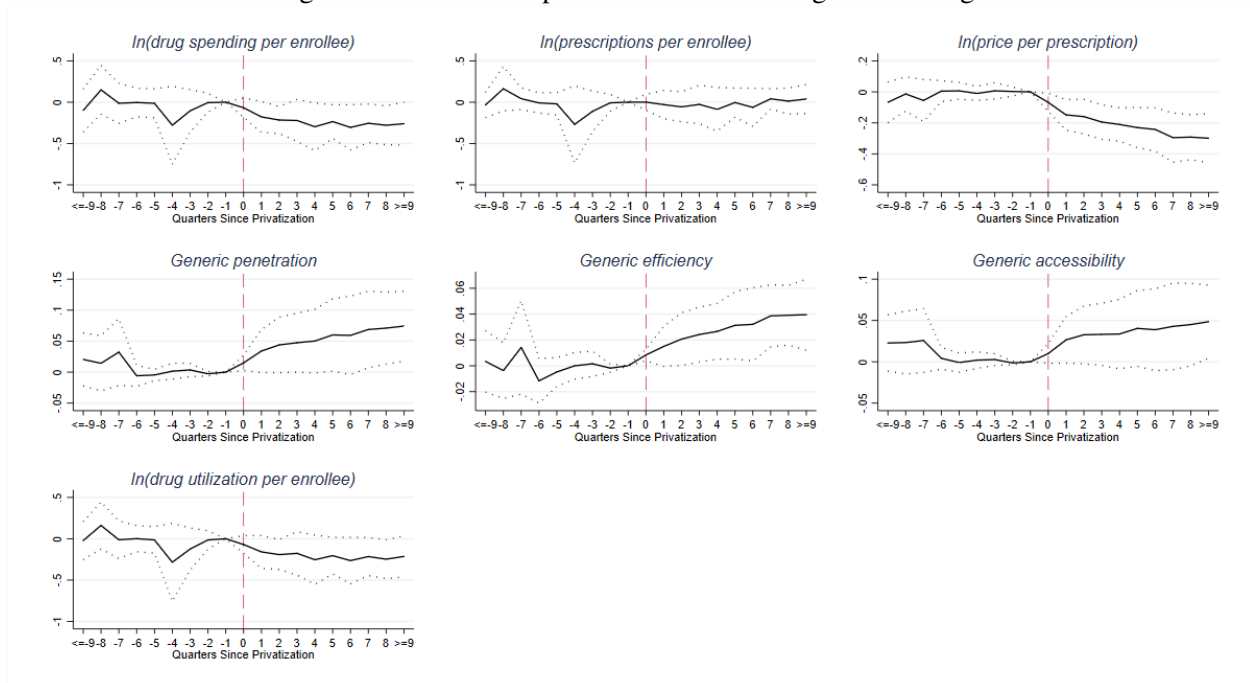
Notes: For each state, the dashed red line accompanied by a **P** indicates the date upon which we record the state as beginning to privatize their drug benefit. The dotted blue line accompanied by a **E** indicates the date upon which the state expanded Medicaid. The y-axis shows the share of drug spending by MCOs.

Figure A.16: Effect of privatization for high offset drugs



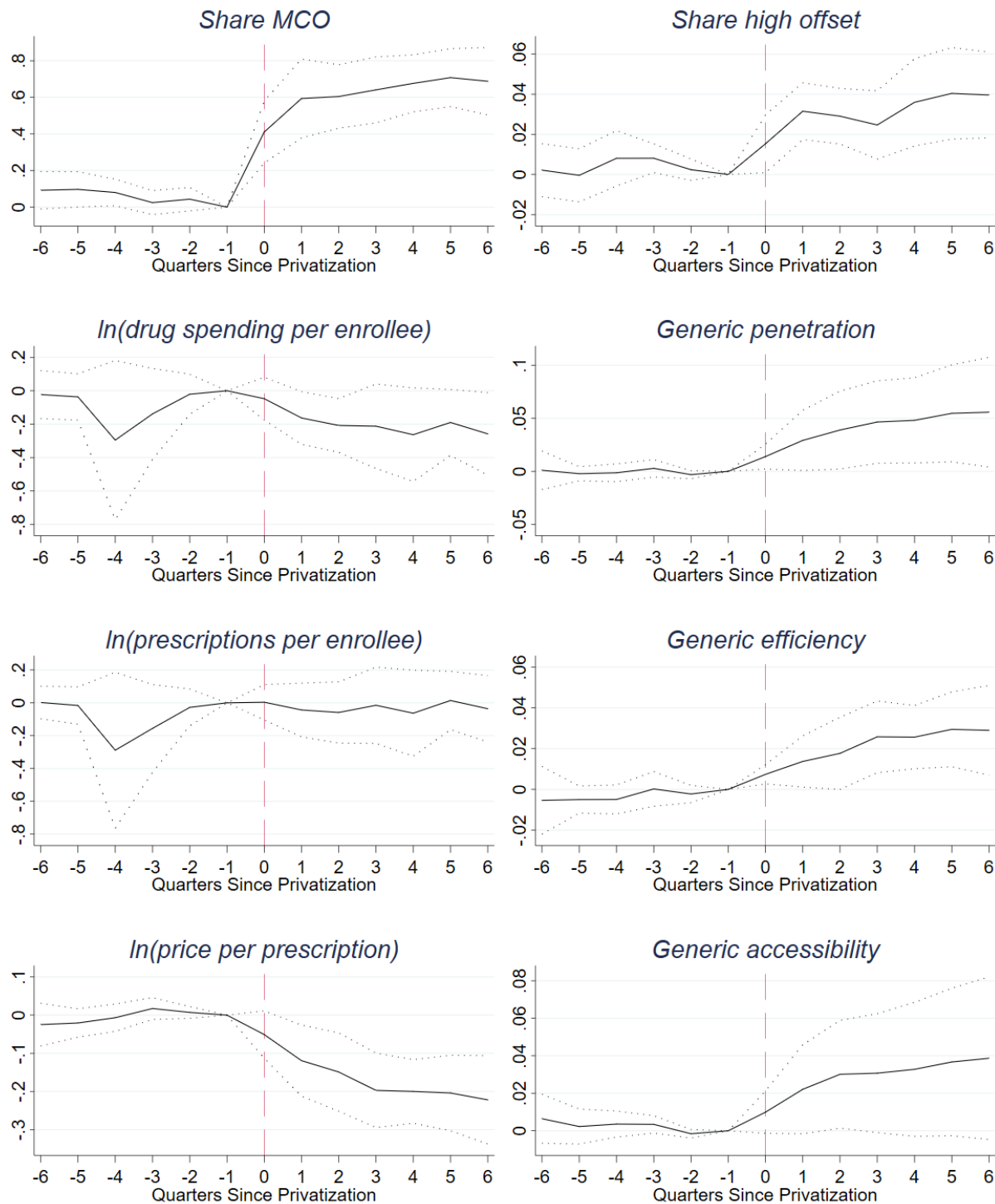
Notes: Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

Figure A.17: Effect of privatization for non-high offset drugs



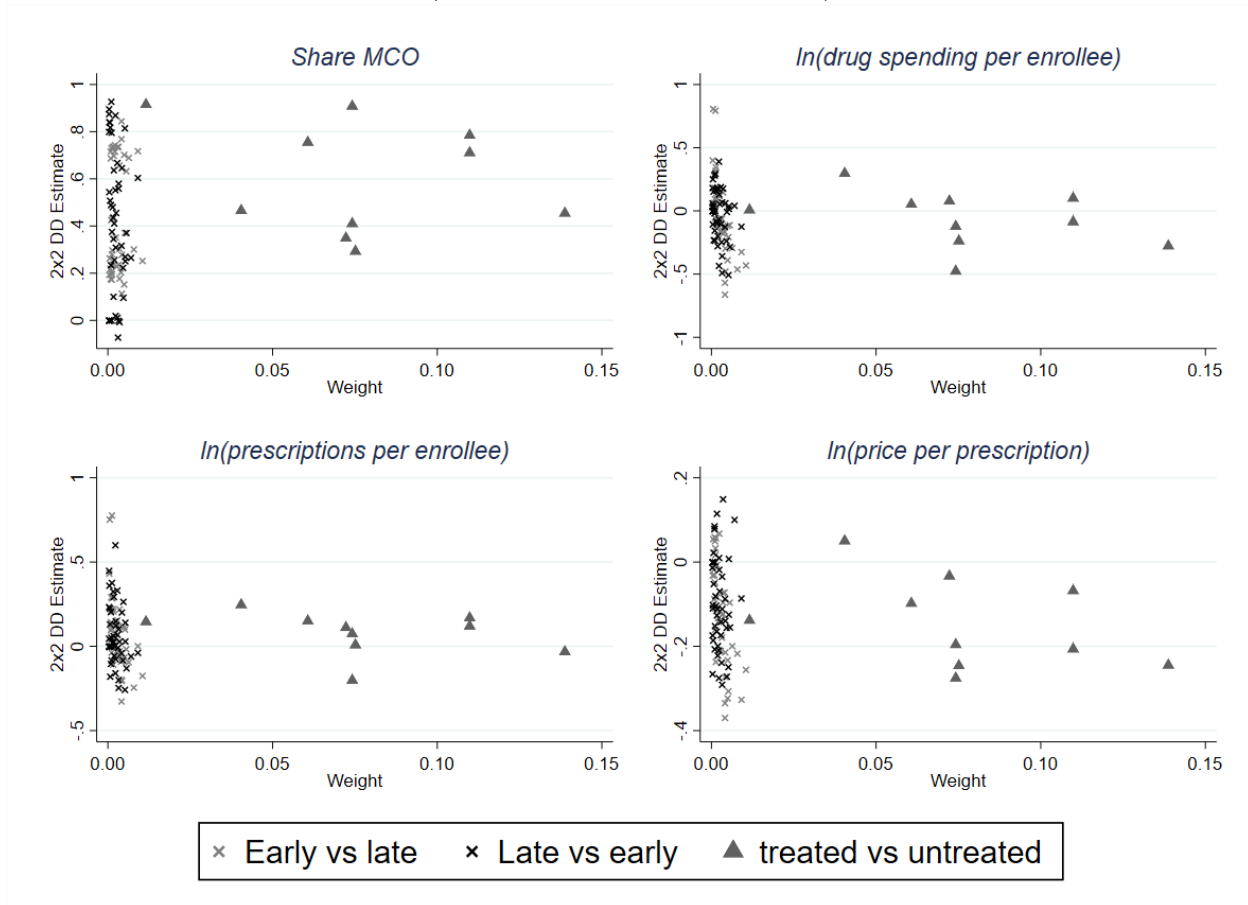
Notes: Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

Figure A.18: Effect of privatization
(Robustness to restricting to treatment states to 6 quarters pre- and post-privatization)



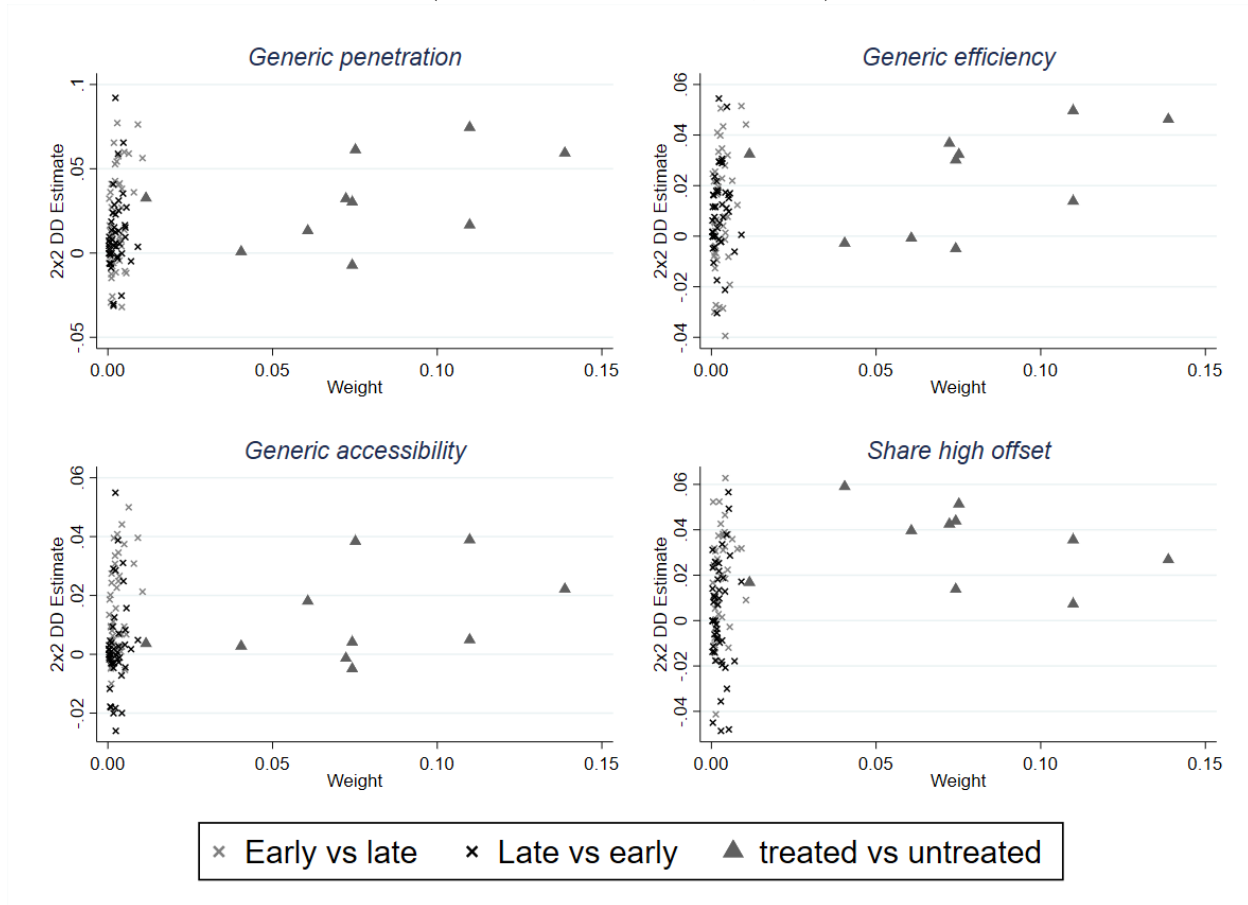
Notes: Includes state fixed effects, quarter fixed effects, and a post-Medicaid expansion indicator. Excludes Iowa and Mississippi, which have fewer than 6 quarters of pre- and post-privatization data. The solid line is point estimates for the effect of quarter pre-post privatization and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by state.

Figure A.19: Treatment effect and weights on Each Timing Group (1 of 2)
(Based on Goodman-Bacon, 2018)



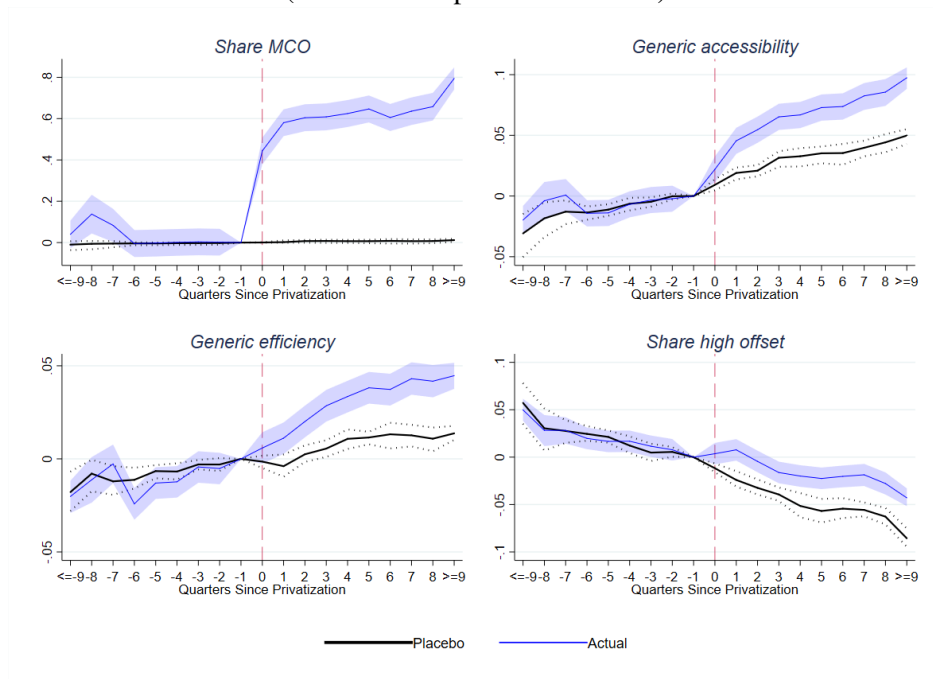
Notes: Reported coefficients for DD estimators are from Stata command `ddtiming`, which implements the suggestions in Goodman-Bacon (2018). Unreported controls include state FEs and quarter FEs. The transition quarter in which a state privatizes is omitted. Observations are unweighted.

Figure A.20: Treatment effect and weights on Each Timing Group (2 of 2)
(Based on Goodman-Bacon, 2018)



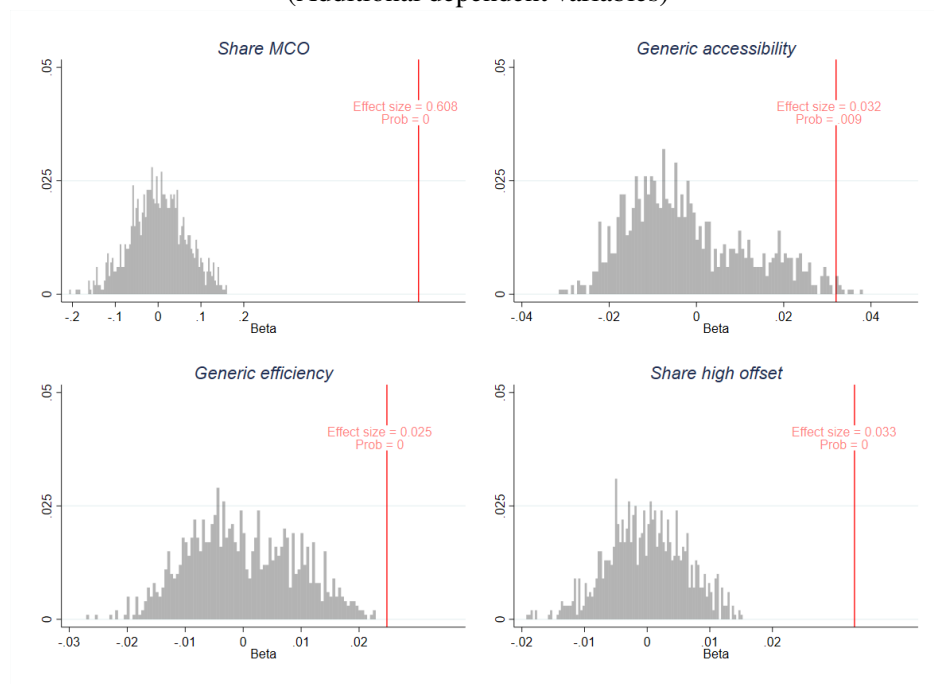
Notes: Reported coefficients for DD estimators are from Stata command `ddtiming`, which implements the suggestions in Goodman-Bacon (2018). Unreported controls include state FEs and quarter FEs. The transition quarter in which a state privatizes is omitted. Observations are unweighted.

Figure A.21: Actual versus placebo privatization and drug usage
(Additional dependent variables)



Notes: Unreported controls include state fixed effects. Observations are weighted by state Medicaid drug spending in the second quarter of 2010. Point estimates for the effect of quarter pre-post privatization for actual privatization are presented as solid thin lines and 95 percent confidence intervals for those coefficients, based upon standard errors that are clustered by state, are presented with shading. Placebo effects are presented with a solid thicker line and the dash lines are the 95 percent confidence interval.

Figure A.22: Distribution of permutation test effect sizes versus actual coefficient estimates
(Additional dependent variables)



Notes: We generated a new dataset under the null hypothesis that privatization had no effect. We re-estimated the central regression for each variable, and generate a new dataset in which we alter the data for the treatment states, so as to take out the estimated actual effect of privatization and proceed as described in the text.