

Table 1: Pre-treatment plant characteristics for treatment and control groups

	Treatment (1)	Controls (2)	Difference (2) - (1)
<i>Panel (a): 1987–1989 Means</i>			
Log employment	4.907 (0.742)	4.788 (0.860)	-0.119 (-1.714)
Log generation (MWh)	14.176 (1.510)	14.377 (1.408)	0.200 (1.541)
Log capacity (MW)	6.352 (0.848)	6.334 (0.875)	-0.017 (-0.230)
Oldest unit (years)	30.253 (11.032)	24.273 (12.009)	-5.980*** (-5.952)
Muni	0.134 (0.342)	0.261 (0.440)	0.126*** (3.766)
Restructured	0.711 (0.454)	0.272 (0.445)	-0.440*** (-11.055)
Coal	0.468 (0.496)	0.727 (0.445)	0.260*** (6.159)
Gas	0.333 (0.463)	0.239 (0.421)	-0.094* (-2.385)
PM or SO ₂ nonattainment	0.254 (0.436)	0.095 (0.294)	-0.158*** (-4.597)
Title IV NOx	0.279 (0.449)	0.440 (0.497)	0.161*** (3.912)
Title IV SO ₂	0.244 (0.430)	0.289 (0.454)	0.045 (1.156)
Plants	201	357	
<i>Panel (b): 1987–1989 Differences</i>			
Log employment	-0.012 (0.124)	-0.026 (0.099)	-0.014 (-1.291)
Log generation (MWh)	0.099 (0.453)	0.077 (0.412)	-0.022 (-0.560)
Log capacity (MW)	0.003 (0.042)	0.002 (0.049)	-0.001 (-0.140)
Oldest unit (years)	2.150 (2.048)	1.882 (1.843)	-0.268 (-1.480)
Plants	187	331	

Table 2: NOx RACT impact on employment and generation

Dependent Variable:	ln(employment)	ln(MWh)
	(1)	(2)
NOx RACT \times 90–92	−0.030 (0.019)	−0.007 (0.043)
NOx RACT \times 93–98	−0.133*** (0.031)	−0.028 (0.049)
PM or SO ₂ nonattainment \times 90–92	−0.017 (0.019)	0.038 (0.030)
PM or SO ₂ nonattainment \times 93–98	−0.007 (0.030)	0.052 (0.047)
South Coast \times 90–92	−0.014 (0.026)	−0.215*** (0.038)
South Coast \times 93–98	0.015 (0.051)	−0.157* (0.086)
Restructured	−0.062 (0.040)	−0.042 (0.048)
Muni \times 90–92	0.070*** (0.016)	−0.011 (0.048)
Muni \times 93–98	0.073*** (0.022)	−0.086 (0.058)
Title IV NOx	−0.036** (0.018)	0.025 (0.031)
Title IV SO ₂	0.028 (0.024)	−0.148*** (0.037)
Plant F.E.	Yes	Yes
Region \times Year \times Fuel F.E.	Yes	Yes
R ²	0.491	0.300
Plant-years	6424	6424
Plants	594	594

Table 3: Ozone nonattainment impact on employment

Dependent Variable:	ln(employment)			
	(1)	(2)	(3)	(4)
New O ₃	−0.004 (0.064)	−0.010 (0.062)		
All O ₃ × 90–92			−0.026 (0.019)	
All O ₃ × 93–98			−0.120*** (0.027)	
NOx RACT × 90–92				−0.031 (0.020)
NOx RACT × 93–98				−0.141*** (0.032)
Other O ₃ × 90–92				−0.012 (0.019)
Other O ₃ × 93–98				−0.070 (0.046)
PM or SO ₂ nonattainment × 90–92	−0.023 (0.017)	−0.023 (0.017)	−0.017 (0.019)	−0.016 (0.019)
PM or SO ₂ nonattainment × 93–98	−0.030 (0.031)	−0.031 (0.031)	−0.002 (0.032)	−0.001 (0.031)
South Coast × 90–92				−0.015 (0.026)
South Coast × 93–98				0.010 (0.052)
Restructured	−0.071* (0.040)	−0.070* (0.039)	−0.062 (0.040)	−0.061 (0.040)
Muni × 90–92	0.072*** (0.017)	0.072*** (0.017)	0.070*** (0.016)	0.070*** (0.016)
Muni × 93–98	0.079*** (0.023)	0.079*** (0.023)	0.078*** (0.022)	0.075*** (0.022)
Title IV NOx	−0.041** (0.018)	−0.041** (0.018)	−0.038** (0.018)	−0.037** (0.018)
Title IV SO ₂	0.035 (0.025)	0.035 (0.024)	0.030 (0.024)	0.028 (0.024)
Plant F.E.	Yes	Yes	Yes	Yes
Region × Year × Fuel F.E.	Yes	Yes	Yes	Yes
Always nonattainment	Control	Control	Treated	Treated
OTR attainment	Control	Treated	Treated	Treated
R ²	0.481	0.481	0.491	0.492
Plant-years	6424	6424	6424	6424
Plants	594	594	594	594

Table 4: NOx RACT labor productivity impacts

	Dependent Variable: ln(employment)	
	(1)	(2)
NOx RACT \times 90–92	–0.039 [*] (0.019)	–0.038 (0.025)
NOx RACT \times 93–98	–0.132 ^{***} (0.031)	–0.118 ^{***} (0.038)
PM or SO ₂ nonattainment \times 90–92	–0.011 (0.020)	–0.021 (0.028)
PM or SO ₂ nonattainment \times 93–98	0.002 (0.033)	–0.022 (0.046)
South Coast \times 90–92	0.004 (0.021)	0.055 (0.039)
South Coast \times 93–98	0.013 (0.056)	0.046 (0.090)
Restructured	–0.050 (0.039)	–0.040 (0.032)
Muni \times 90–92	0.073 ^{***} (0.019)	0.076 ^{***} (0.027)
Muni \times 93–98	0.079 ^{***} (0.026)	0.109 ^{***} (0.037)
Title IV NOx	–0.037 ^{**} (0.017)	–0.041 ^{**} (0.020)
Title IV SO ₂	0.054 ^{**} (0.020)	0.100 ^{***} (0.031)
ln(MWh)	0.066 ^{***} (0.012)	0.448 ^{**} (0.216)
Plant F.E.	Yes	Yes
Plant-epoch F.E.	Yes	Yes
Region \times Year \times Fuel F.E.	Yes	Yes
Instrument	No	Yes
R ²	0.617	0.327
Plant-years	6424	6424
Plant-epochs	715	715
Plants	594	594

Table 5: NOx RACT impact on employment: Alternate specifications

Dependent Variable:	ln(employment)						
	(1) Matched Sample ^a	(2) Plant Owner ^b	(3) Electricity Market ^c	(4) Other NAAQS ^d	(5) Input Prices ^e	(6) Entry/ Exit ^f	(7) Balanced Panel ^g
NOx RACT \times 90–92	−0.032 [*] (0.016)	−0.034 (0.023)	−0.030 (0.019)	−0.014 (0.023)	−0.035 ^{**} (0.017)	−0.030 (0.019)	−0.023 [*] (0.013)
NOx RACT \times 93–98	−0.106 ^{***} (0.029)	−0.136 ^{***} (0.033)	−0.133 ^{***} (0.036)	−0.134 ^{***} (0.034)	−0.135 ^{***} (0.031)	−0.133 ^{***} (0.031)	−0.115 ^{***} (0.030)
NOx RACT \times 90–92 \times Variable		0.029 (0.044)		−0.078 ^{**} (0.038)			
NOx RACT \times 93–98 \times Variable		0.021 (0.078)	0.002 (0.059)	0.007 (0.078)			
PM or SO ₂ nonattain \times 90–92	−0.048 [*] (0.025)	−0.019 (0.019)	−0.017 (0.019)	0.018 (0.020)	−0.016 (0.019)	−0.017 (0.019)	−0.005 (0.012)
PM or SO ₂ nonattain \times 93–98	−0.034 (0.047)	−0.008 (0.030)	−0.007 (0.030)	−0.009 (0.038)	−0.006 (0.030)	−0.007 (0.030)	−0.014 (0.035)
South Coast \times 90–92	−0.007 (0.019)	−0.021 (0.029)	−0.014 (0.027)	0.013 (0.022)	0.003 (0.029)	−0.014 (0.026)	−0.030 (0.025)
South Coast \times 93–98	0.054 (0.038)	0.010 (0.054)	0.016 (0.051)	0.013 (0.052)	0.032 (0.051)	0.015 (0.051)	0.178 ^{**} (0.073)
Restructured	−0.030 (0.041)	−0.061 (0.041)	−0.062 (0.052)	−0.062 (0.040)	−0.062 (0.042)	−0.062 (0.040)	−0.071 [*] (0.042)
Muni \times 90–92	0.089 ^{***} (0.031)	0.062 ^{***} (0.014)	0.070 ^{***} (0.016)	0.071 ^{***} (0.016)	0.071 ^{***} (0.017)	0.070 ^{***} (0.016)	0.082 ^{***} (0.020)
Muni \times 93–98	0.158 ^{***} (0.043)	0.068 ^{***} (0.020)	0.073 ^{***} (0.021)	0.072 ^{***} (0.022)	0.076 ^{***} (0.024)	0.073 ^{***} (0.022)	0.091 ^{***} (0.030)
Title IV NOx	0.000 (0.032)	−0.036 ^{**} (0.018)	−0.036 ^{**} (0.018)	−0.037 ^{**} (0.017)	−0.038 ^{**} (0.017)	−0.036 ^{**} (0.018)	−0.030 (0.018)
Title IV SO ₂	0.057 (0.034)	0.028 (0.024)	0.028 (0.025)	0.030 (0.025)	0.028 (0.024)	0.028 (0.024)	0.020 (0.025)
ln(wage)					−0.002 (0.022)		
ln(fuel price)					−0.070 (0.047)		
Interaction variable	None	Muni	Restructured	PM or SO ₂	None	None	None
Plant F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region \times Year \times Fuel F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.553	0.491	0.491	0.491	0.494	0.491	0.537
Plant-years	3335	6424	6424	6424	6322	6424	4860
Plants	299	594	594	594	588	594	405

Table 6: Potential plant entry and exit by year and 1993 NOx RACT status

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Potential entries										
NOx RACT	0	0	0	1	0	0	1	0	0	0
Controls	2	0	0	2	0	1	0	0	2	2
Potential exits										
NOx RACT	0	0	0	0	1	0	0	0	0	0
Controls	0	0	0	0	0	0	0	0	0	0

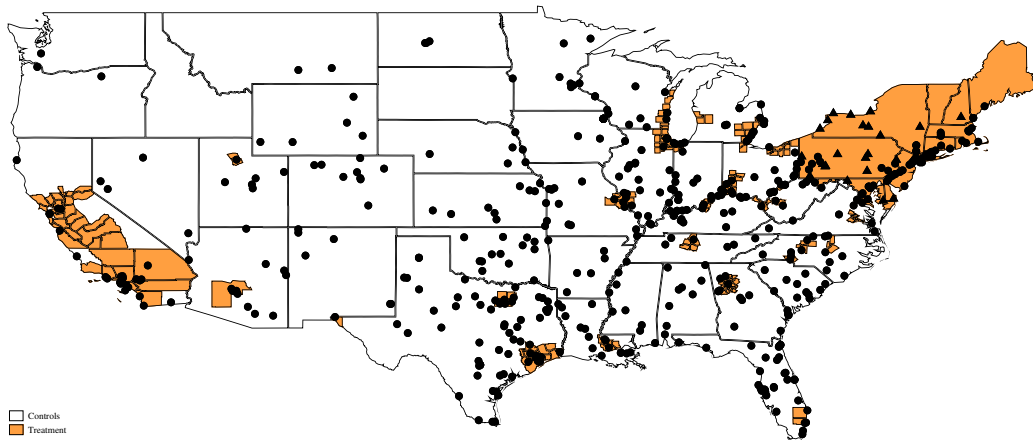


Figure 1: Sample plants by NOx RACT applicability

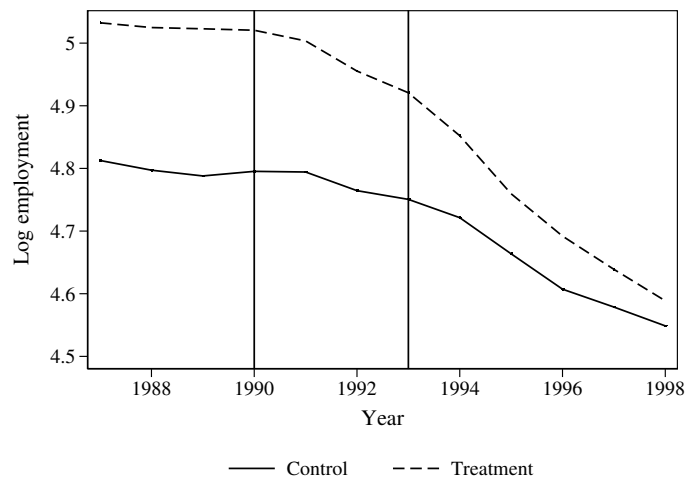


Figure 2: Mean employment trends

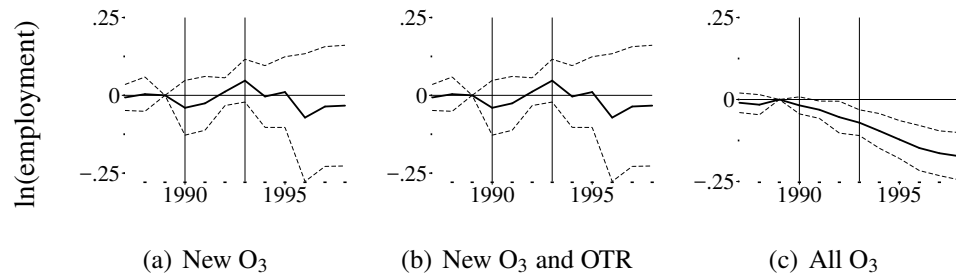


Figure 3: Employment impact of 1993 ozone nonattainment designation over time, by treatment group

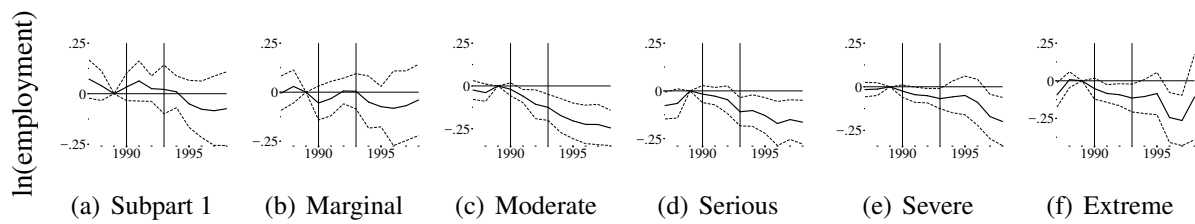


Figure 4: Employment impact of ozone classification over time

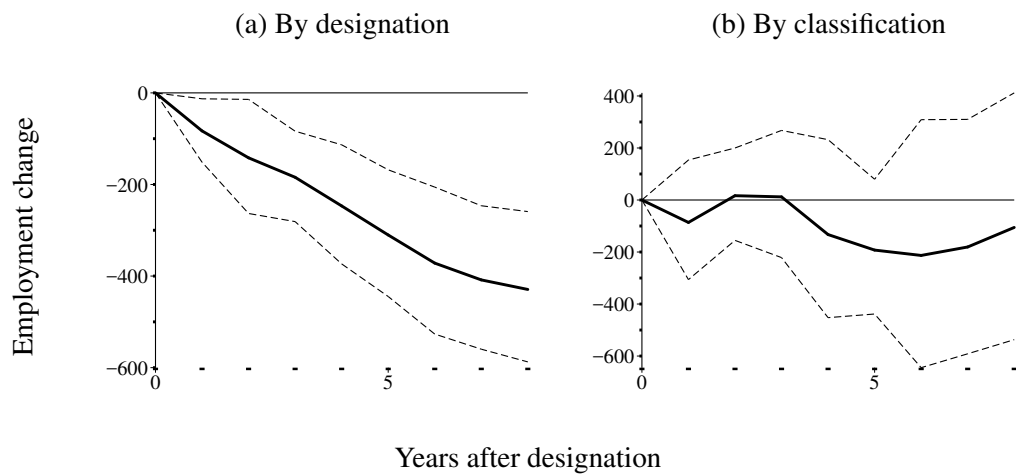


Figure 5: Predicted Employment Impact of 2008 Ozone NAAQS

Table A-1: NOx RACT impact on employment and generation, pre-treatment

Dependent Variable:	ln(employment) (1)	ln(MWh) (2)
NOx RACT \times 1988	-0.006 (0.012)	-0.021 (0.042)
NOx RACT \times 1989	0.003 (0.015)	-0.045 (0.069)
PM or SO ₂ nonattainment \times 1988	-0.024* (0.012)	-0.060 (0.056)
PM or SO ₂ nonattainment \times 1989	-0.020 (0.017)	-0.040 (0.075)
South Coast \times 1988	0.108** (0.050)	0.051 (0.091)
South Coast \times 1989	0.015 (0.034)	-0.118 (0.289)
Muni \times 1988	0.028*** (0.006)	-0.046 (0.038)
Muni \times 1989	0.052*** (0.010)	-0.048 (0.051)
Plant F.E.	Yes	Yes
Region \times Year \times Fuel F.E.	Yes	Yes
R ²	0.141	0.236
Plant-years	1615	1615
Plants	558	558

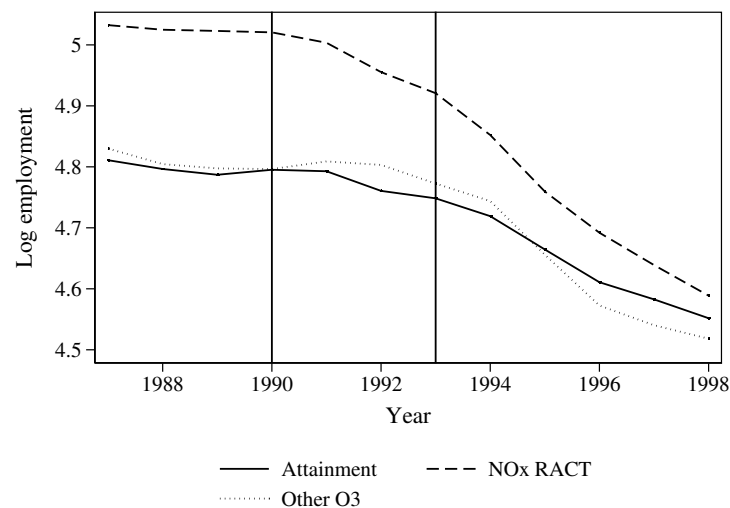


Figure A-1: figure
Mean employment trends

Table A-2: haracteristics by NOx RACT requirements

	Attainment (1)	NOx RACT (2)	Other O ₃ (3)	Differences	
				(1) - (2)	(1) - (3)
<i>Panel (a): 1989 Means</i>					
Log employment	4.782 (0.857)	4.907 (0.742)	4.844 (0.906)	-0.125 (-1.764)	-0.061 (-0.382)
Log generation (MWh)	14.373 (1.410)	14.176 (1.510)	14.414 (1.409)	0.196 (1.483)	-0.041 (-0.163)
Log capacity (MW)	6.323 (0.872)	6.352 (0.848)	6.441 (0.908)	-0.029 (-0.375)	-0.118 (-0.731)
Oldest unit (years)	23.885 (12.220)	30.253 (11.032)	27.843 (9.255)	-6.368*** (-6.158)	-3.958* (-2.320)
Muni	0.258 (0.438)	0.134 (0.342)	0.286 (0.458)	0.123*** (3.597)	-0.028 (-0.344)
Restructured	0.273 (0.446)	0.711 (0.454)	0.257 (0.443)	-0.438*** (-10.802)	0.016 (0.204)
Coal	0.738 (0.440)	0.468 (0.496)	0.629 (0.490)	0.270*** (6.334)	0.110 (1.267)
Gas	0.236 (0.420)	0.333 (0.463)	0.267 (0.441)	-0.097* (-2.422)	-0.031 (-0.392)
PM or SO ₂ nonattainment	0.084 (0.278)	0.254 (0.436)	0.200 (0.406)	-0.179*** (-5.320)	-0.124 (-1.843)
Title IV NOx	0.450 (0.498)	0.279 (0.449)	0.343 (0.482)	0.154*** (3.751)	0.100 (1.232)
Title IV SO ₂	0.289 (0.454)	0.244 (0.430)	0.286 (0.458)	0.024 (0.626)	-0.012 (-0.152)
Plants	322	201	35		
<i>Panel (b): 1987 – 1989 Differences</i>					
Log employment	-0.024 (0.097)	-0.012 (0.124)	-0.045 (0.112)	-0.012 (-1.104)	0.021 (0.970)
Log generation (MWh)	0.075 (0.406)	0.099 (0.453)	0.096 (0.476)	-0.024 (-0.601)	-0.021 (-0.233)
Log capacity (MW)	0.003 (0.051)	0.003 (0.042)	-0.003 (0.017)	-0.000 (-0.016)	0.006 (1.321)
Oldest unit (years)	1.870 (1.932)	2.150 (2.048)	2.000 (0.000)	-0.279 (-1.497)	-0.130 (-1.163)
Plants	301	187	30		

Table A-3: First-stage instrumental variable labor productivity results

Dependent Variable:	ln(MWh)
(1)	
State sales	0.712** (0.283)
NOx RACT \times 90–92	0.008 (0.041)
NOx RACT \times 93–98	−0.023 (0.051)
PM or SO ₂ nonattainment \times 90–92	0.030 (0.040)
PM or SO ₂ nonattainment \times 93–98	0.067 (0.050)
South Coast \times 90–92	−0.128* (0.073)
South Coast \times 93–98	−0.031 (0.163)
Restructured	−0.011 (0.040)
Title IV NOx	0.003 (0.030)
Title IV SO ₂	−0.120*** (0.033)
Muni \times 91–92	−0.010 (0.049)
Muni \times 93–98	−0.081 (0.058)
Plant F.E.	Yes
Plant-epoch F.E.	Yes
Region \times Year \times Fuel F.E.	Yes
R^2	0.407
Plant-years	6424
Plant-epochs	715
Plants	594

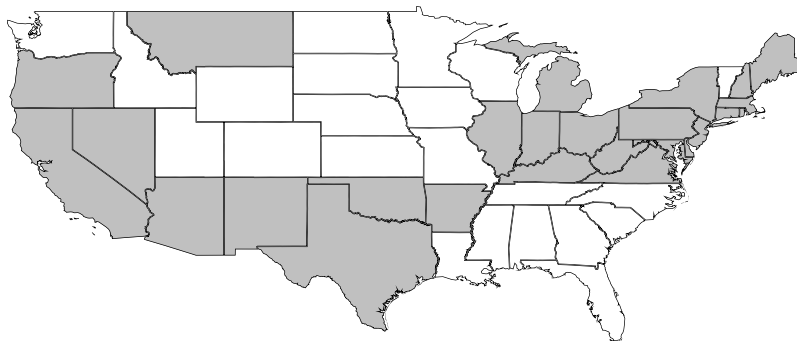


Figure A-2: Electricity market restructuring in the 1990s.