Asigment 1

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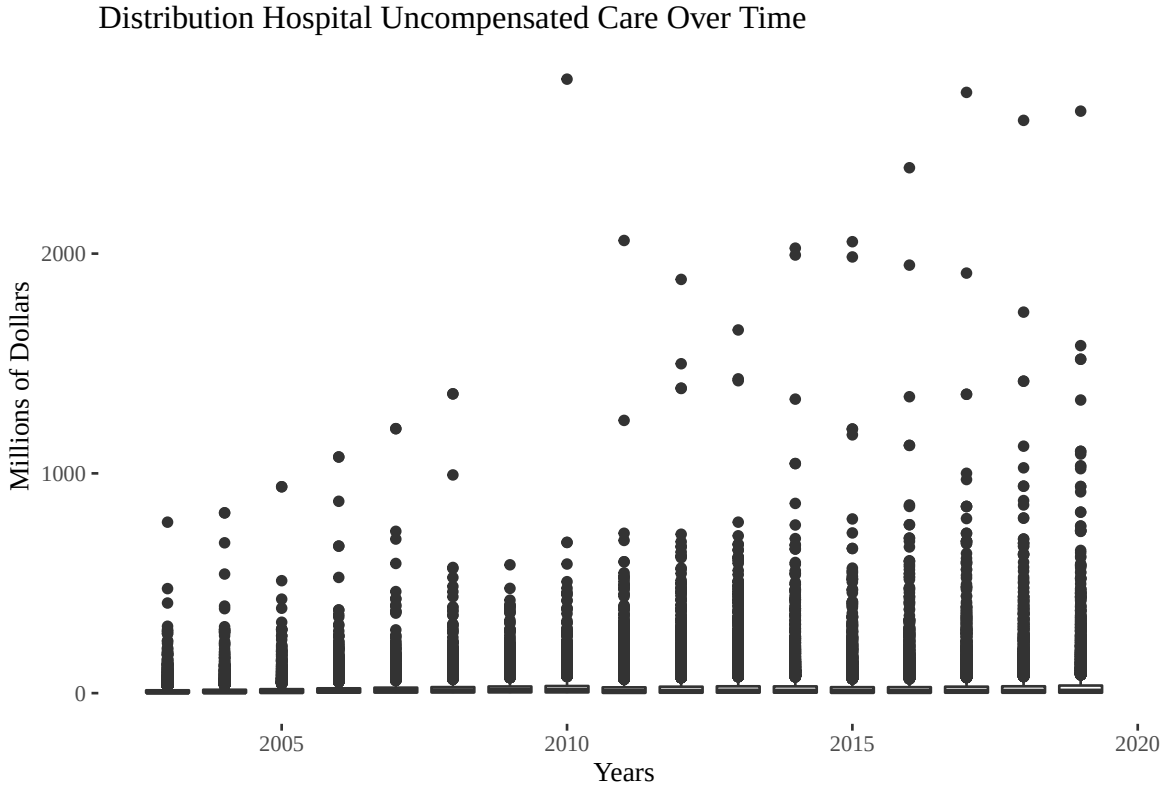
23. September 2022

Summary Statistics

Provide and discuss a table of simple summary statistics showing the mean, standard deviation, min, and max of hospital total revenues and uncompensated care over time.



Distribution Hospital Total Revenue Over Time

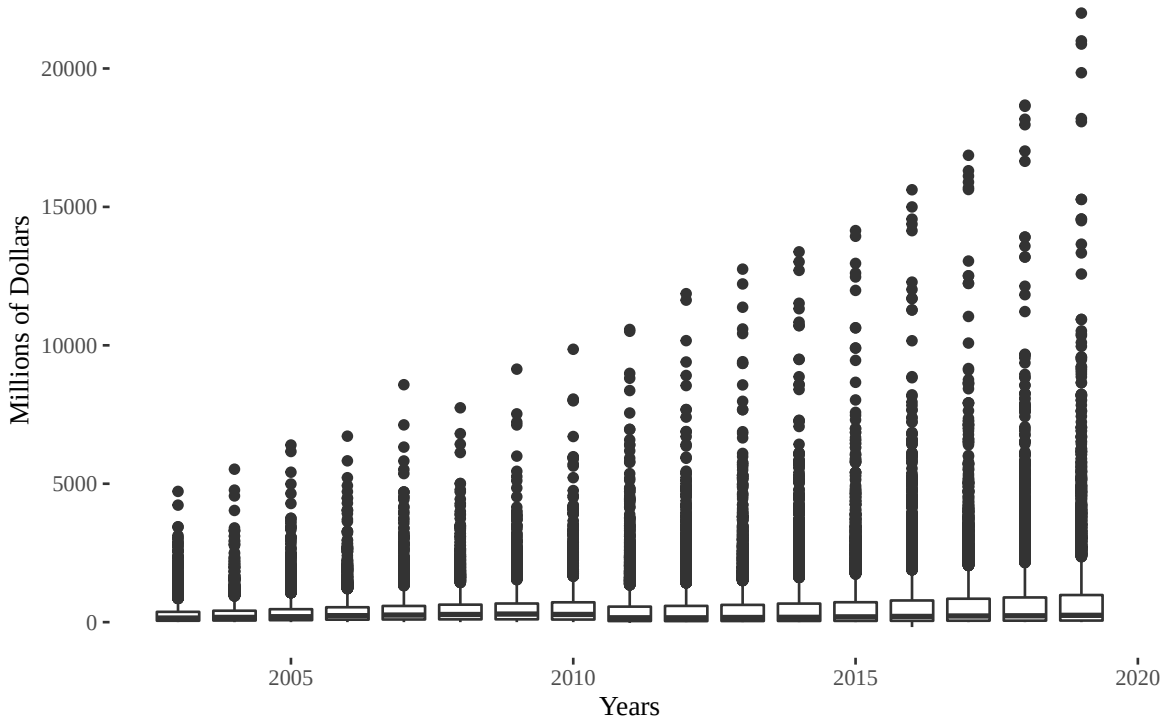
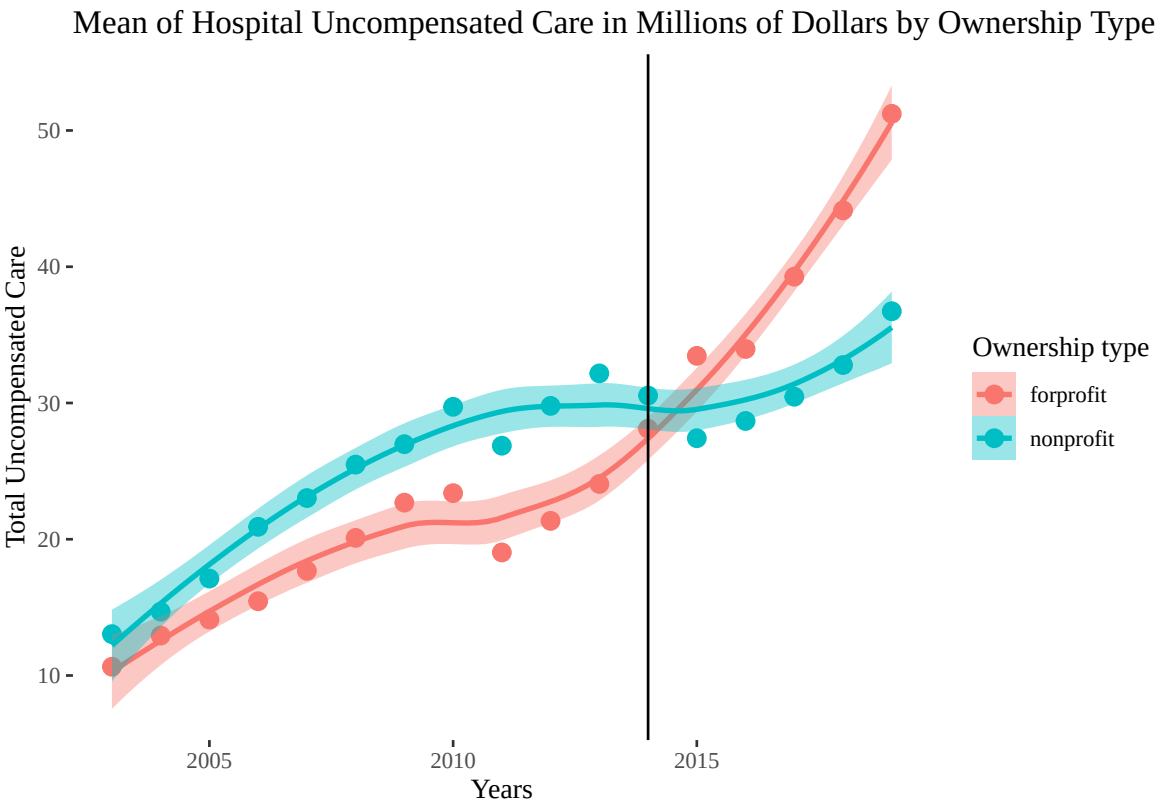


Tabelle 1: Hospital Summary Statistics

	Uncompensated Care				Total Revenue			
year	Mean	Sd	Min	Max	Mean	Sd	Min	Max
2003	13.57	32.05	0	777.99	292.35	397.70	1.66	4722.76
2004	15.33	36.66	0	820.25	327.69	445.42	0.27	5525.73
2005	17.41	37.81	0	939.13	380.14	514.68	1.14	6398.55
2006	20.97	47.16	0	1074.62	433.73	558.58	1.33	6718.17
2007	23.56	51.28	0	1203.37	484.24	646.76	0.99	8577.05
2008	26.43	57.06	0	1361.81	513.43	655.58	0.97	7743.08
2009	27.44	46.42	0	583.98	552.80	718.35	0.89	9139.32
2010	29.89	72.41	0	2793.92	576.62	779.98	0.84	9857.53
2011	26.82	63.17	0	2059.70	480.04	776.84	-27.58	10572.29
2012	29.87	72.54	0	1882.62	505.10	830.36	0.85	11865.32
2013	31.93	72.63	0	1652.58	539.20	903.93	0.95	12751.71
2014	31.79	77.39	0	2024.85	577.45	980.59	1.09	13376.35
2015	29.83	74.67	0	2054.15	623.38	1048.30	1.05	14143.53
2016	31.14	80.95	0	2390.67	677.54	1157.37	-177.03	15618.75
2017	33.38	87.36	0	2733.60	727.36	1263.39	1.00	16863.43
2018	35.90	90.49	0	2606.35	782.42	1386.47	1.07	18677.25
2019	39.82	99.48	0	2648.26	855.33	1538.23	0.72	22000.93

2003-2019	28.77	71.96	0	2793.92	574.79	993.11	-177.03	22000.93

Create a figure showing the mean hospital uncompensated care from 2000 to 2018. Show this trend separately by hospital ownership type (private not for profit and private for profit).



TWFE Specification

Using a simple DD identification strategy, estimate the effect of Medicaid expansion on hospital uncompensated care using a traditional two-way fixed effects (TWFE) estimation:

$$y_{it} = {}_i + {}_t + D_{it} + {}_{it}, \tag{1}$$

where $D_{it} = 1(E_i \;\; t)$ in Equation 1 is an indicator set to 1 when a hospital is in a state that expanded as of year t or earlier, ${}_t$ denotes time fixed effects, ${}_i$ denotes hospital fixed effects, and y_{it} denotes the hospital's amount of uncompensated care in year t. Present four estimates from this estimation in a table: one based on the full sample (regardless of treatment timing); one when limiting to the 2014 treatment group (with never treated as the control group); one when limiting to the 2015 treatment group (with never treated as the control group); and one when limiting to the 2016 treatment group (with never treated as the control group). Briefly explain any differences.

Tabelle 2: Two Way Fixed Effects

	D	D14	D15	D16
Treatment	-28.363***	-31.518***	-12.173***	-12.153***
	(1.893)	(2.185)	(1.848)	(1.550)
Num.Obs.	79557	69824	74768	77624
R2	0.699	0.708	0.690	0.691
R2 Adj.	0.675	0.684	0.666	0.667
AIC	817114.7	720035.7	772873.5	800104.3
BIC	871269.6	767580.1	823742.8	852930.5
RMSE	38.21	38.97	39.48	38.91
Std.Errors	by: pn	by: pn	by: pn	by: pn

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Event Study Specification

Estimate an "event study" version of the specification in part 3:

$$y_{it} = _i + _t + _{<1} D_{it} + _{>=0} D_{it} + _{it}, \tag{2}$$

where $D_{it} = 1(t \ E_i =)$ in Equation 2 is essentially an interaction between the treatment dummy and a relative time dummy. In this notation and context, denotes years relative to Medicaid expansion, so that $= 1$ denotes the year before a state expanded Medicaid, $= 0$ denotes the year of expansion, etc. Estimate with two different samples: one based on the full sample and one based only on those that expanded in 2014 (with never treated as the control group).

SA Specification

Sun and Abraham(SA) show that the coefficients in Equation @ref(eq:event) can be written as a non-conxvex average of all other group-time specific average treatment effects. They propose an interaction weighted specification:

$$y_{it} = _i + _t + _{e\ 1} (D_{it} \ \text{Œ}\ 1(E_i = e)) _{e,} + _{it}.(\#eq \ \ iwevent) \tag{3}$$

Re-estimate your event study using the SA specification in Equation @ref(eq:iwevent). Show your results for $_{e,}$ in a Table, focusing on states with $E_i = 2014$, $E_i = 2015$, and $E_i = 2016$.

Present an event study graph based on the results in part 5. Hint: you can do this automatically in `R` with the `fixest` package (using the `sunab` syntax for interactions), or

with `eventstudyinteract` in `Stata`. These packages help to avoid mistakes compared to doing the tables/figures manually and also help to get the standard errors correct.

CS Specification

Callaway and Sant'Anna (CS) offer a non-parametric solution that effectively calculates a set of group-time specific differences, $ATT(g,t) = E[y_{it}(g)\, y_{it}()|G_i = g]$, where g reflects treatment timing and t denotes time. They show that under the standard DD assumptions of parallel trends and no anticipation, $ATT(g,t) = E[y_{it}\, y_{i,g1}|G_i = g]\, E[y_{it}\, y_{i,g1}|G_i =]$, so that $ATT(g,t)$ is directly estimable from sample analogs. CS also propose aggregations of $ATT(g,t)$ to form an overall ATT or a time-specific ATT (e.g., ATTs for periods before/after treatment). With this framework in mind, provide an alternative event study using the CS estimator. Hint: check out the `did` package in `R` or the `csdid` package in `Stata`.

RR Specification

Rambachan and Roth (RR) show that traditional tests of parallel pre-trends may be underpowered, and they provide an alternative estimator that essentially bounds the treatment effects by the size of an assumed violation in parallel trends. One such bound RR propose is to limit the post-treatment violation of parallel trends to be no worse than some multiple of the pre-treatment violation of parallel trends. Assuming linear trends, such a violation is reflected by

$$(M) = \{\ \ t\ \ 0, |(_{t+1}\ \ _t)\ \ (_t\ \ _{t1})|\ \ \ M\ \mathbb{E}\ \max_{s<0}|(_{s+1}\ \ _s)\ \ (_s\ \ _{s1})|\} .$$

Using the `HonestDiD` package in `R` or `Stata`, present a sensitivity plot of your CS ATT estimates using $M = \{0, 0.5, 1, 1.5, 2\}$. Check out the GitHub repo here for some help in combining the `HonestDiD` package with CS estimates.

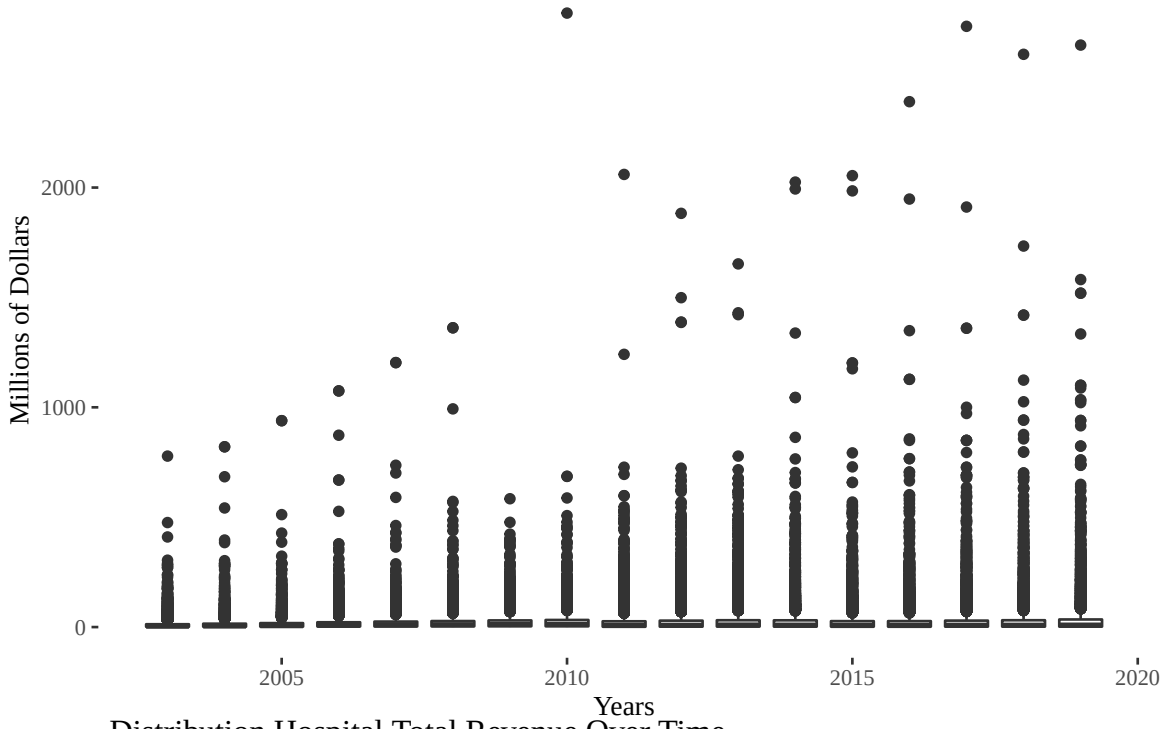
Discussion

Discuss your findings and compare estimates from different estimators (e.g., are your results sensitive to different specifications or estimators? Are your results sensitive to violation of parallel trends assumptions?).

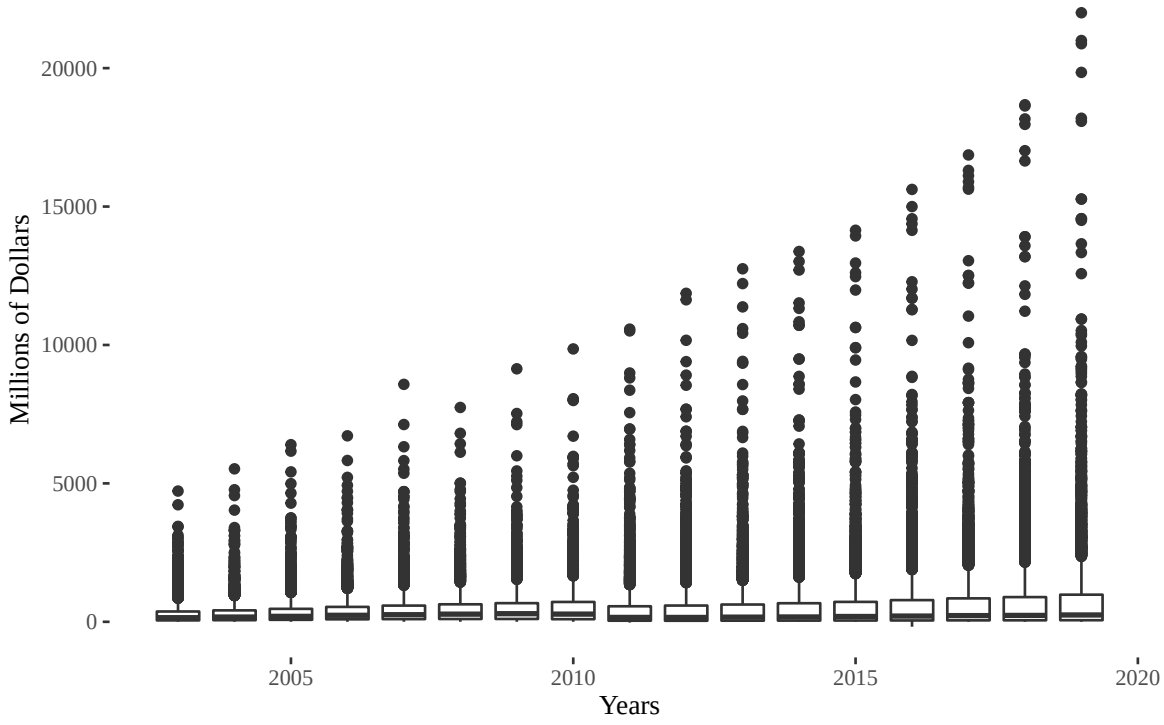
Reflection

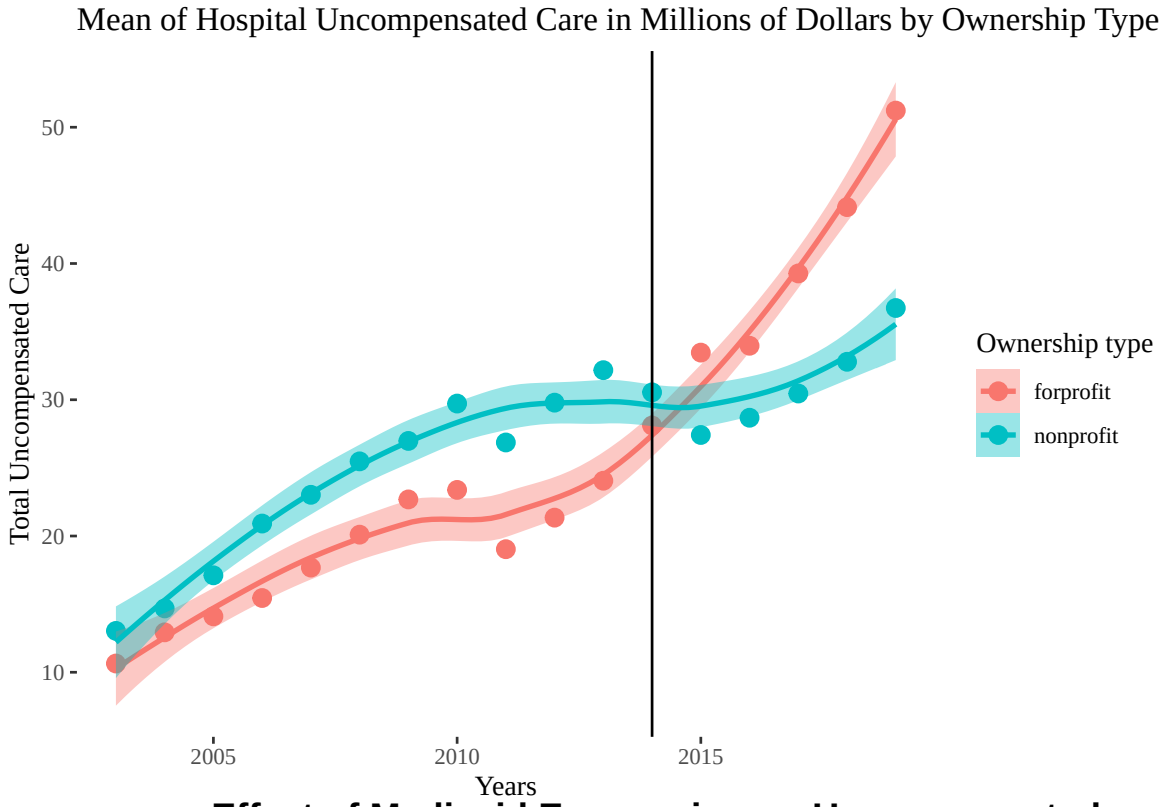
Reflect on this assignment. What did you find most challenging? What did you find most surprising?

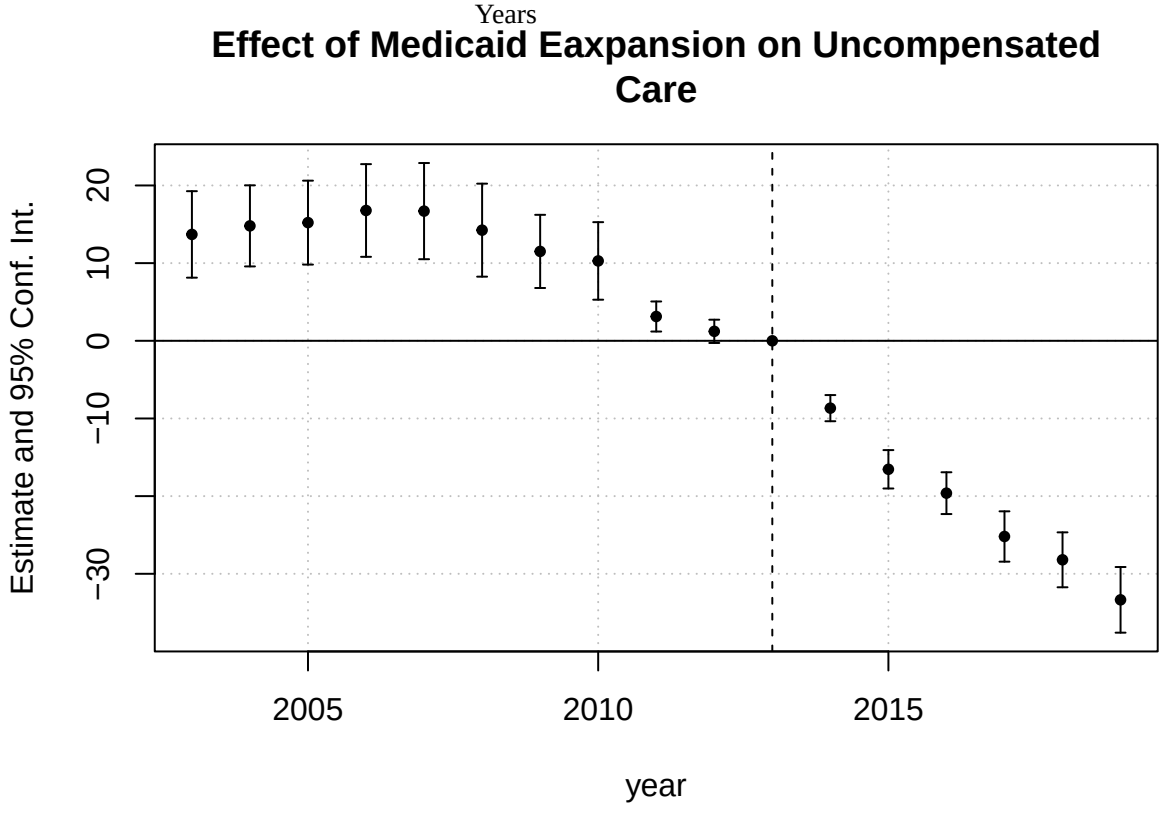
Distribution Hospital Uncompensated Care Over Time

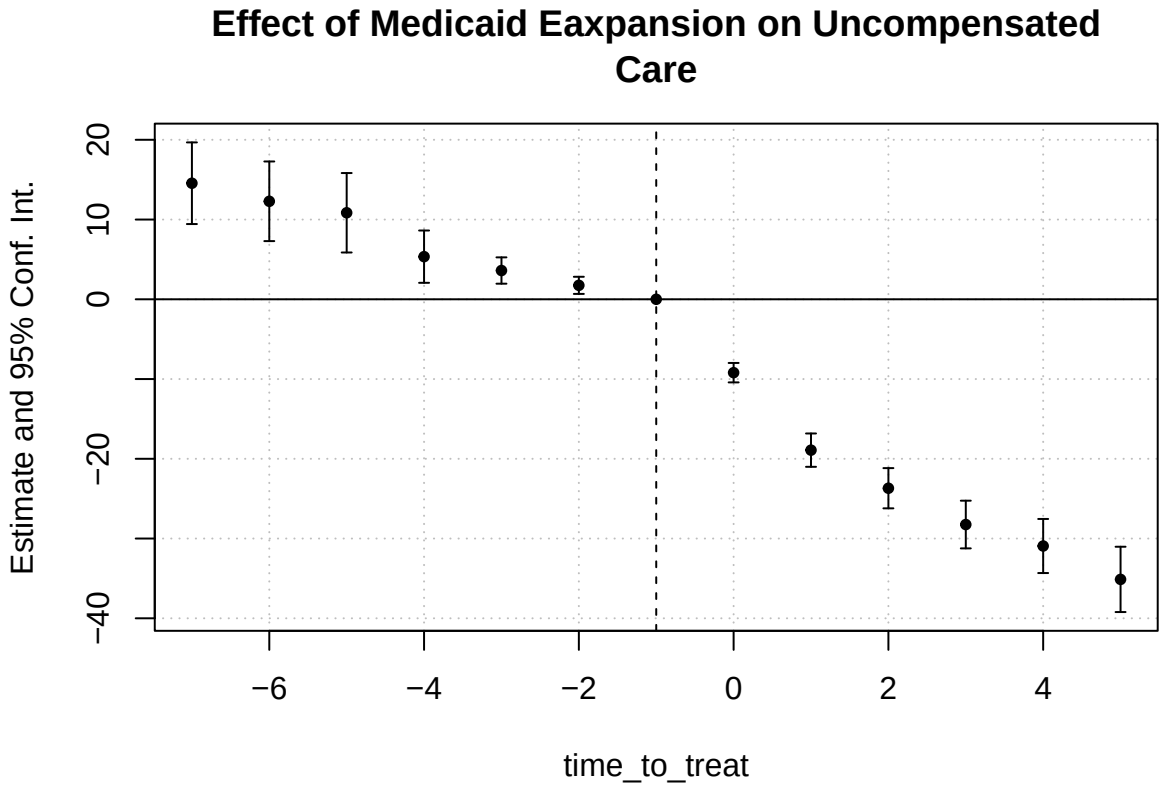


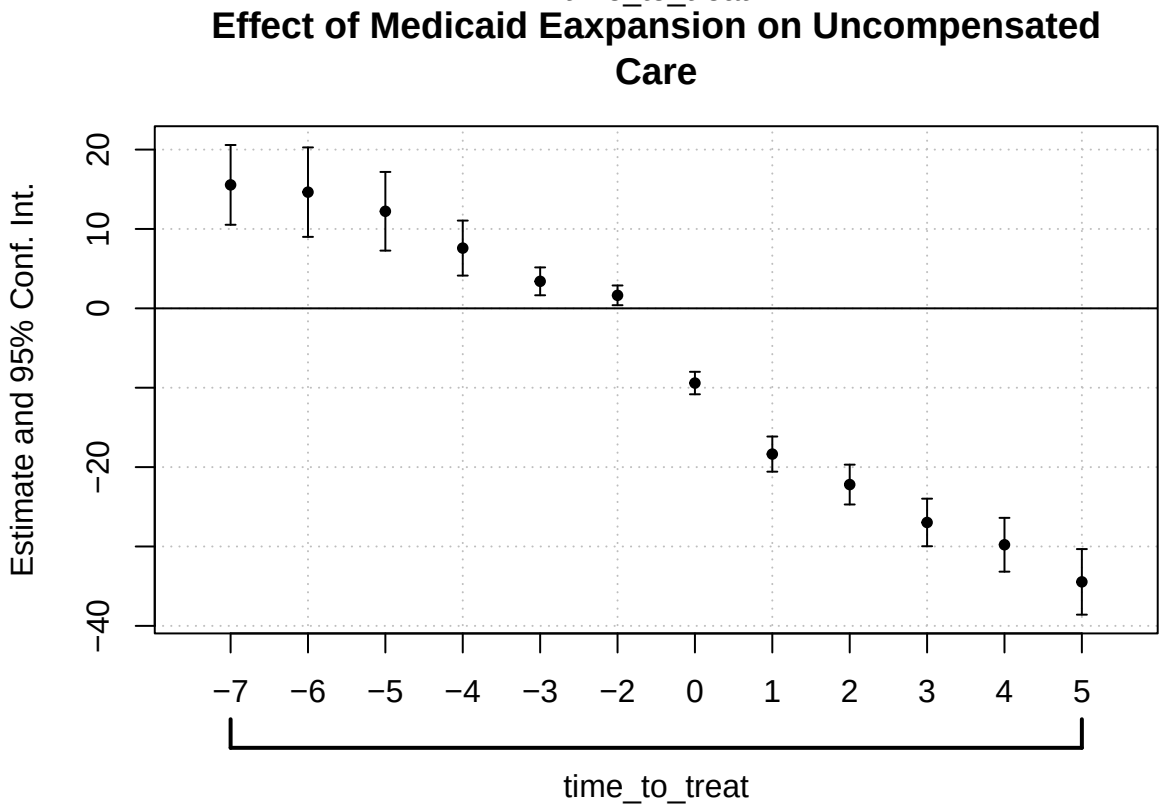
Distribution Hospital Total Revenue Over Time

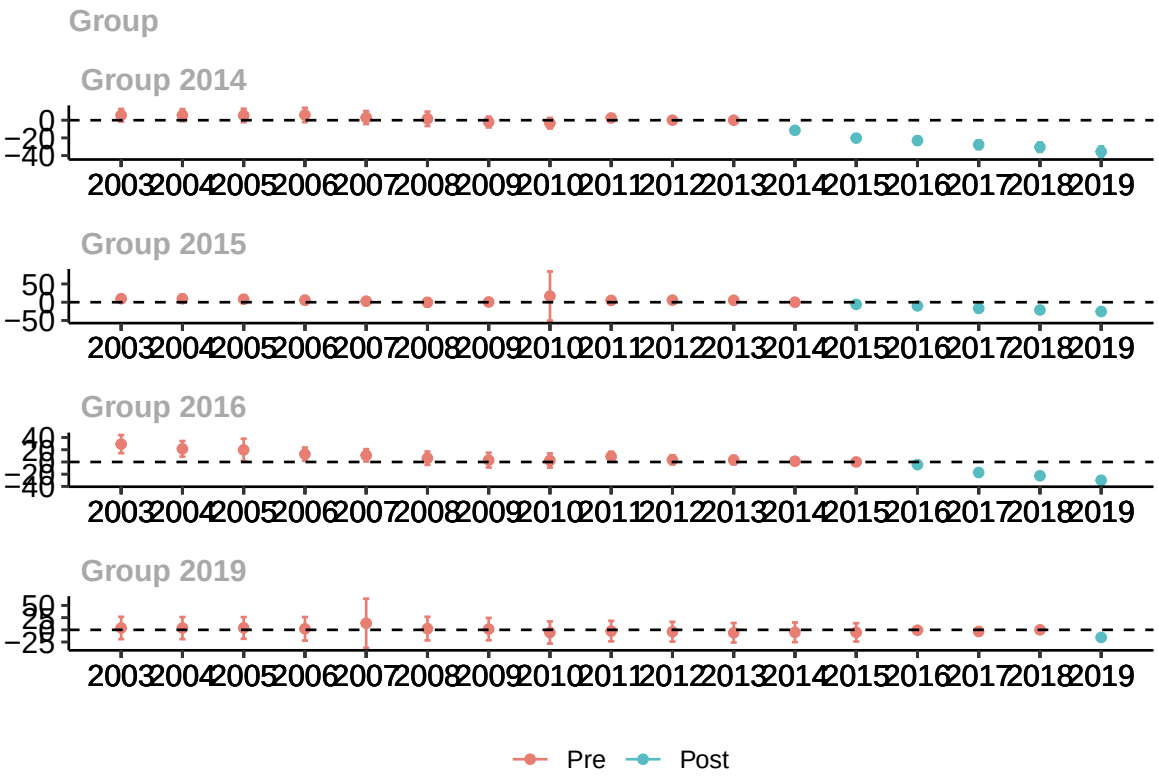


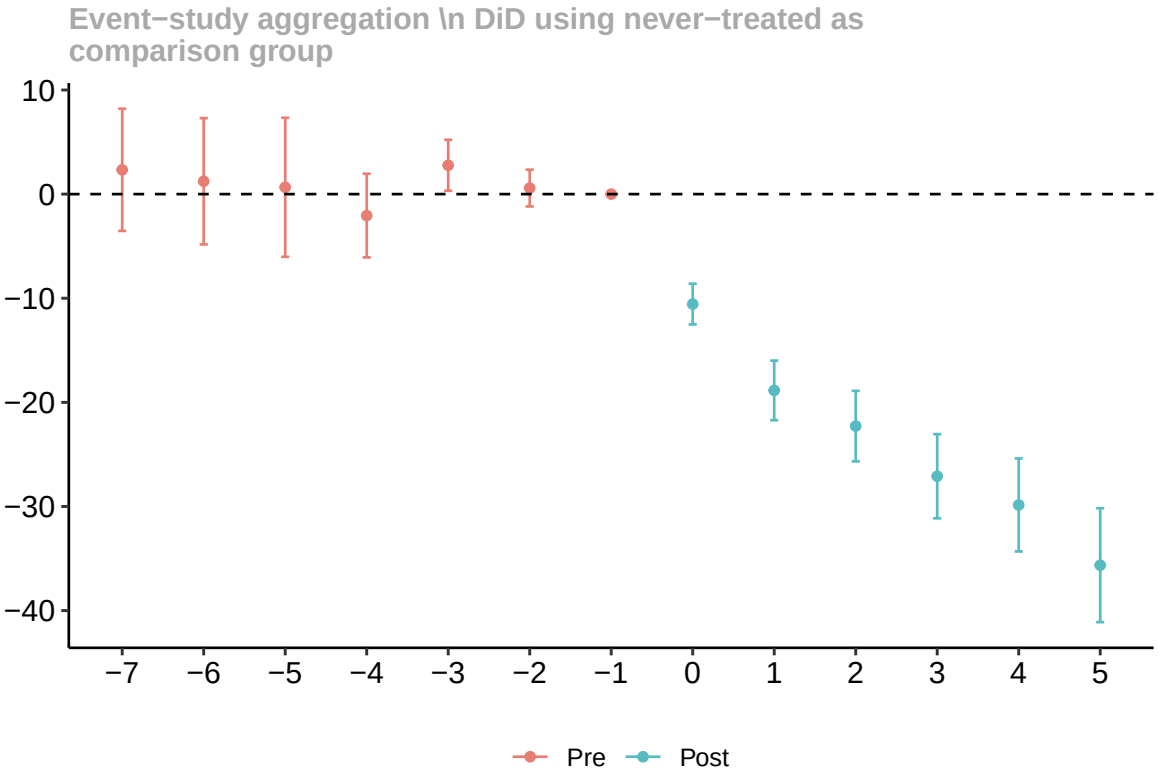

Mean of Hospital Uncompensated Care in Millions of Dollars by Ownership Type
Total Uncompensated Care
50
40
30
20
10
2005
2010
2015
Years
Ownership type
forprofit
nonprofit


Effect of Medicaid Eaxpansion on Uncompensated Care
Estimate and 95% Conf. Int.
20
10
0
−10
−30
2005
2010
2015
year


Effect of Medicaid Eaxpansion on Uncompensated Care
Estimate and 95% Conf. Int.
20
10
0
−20
−40
−6
−4
−2
0
2
4
time_to_treat


Effect of Medicaid Eaxpansion on Uncompensated Care
Estimate and 95% Conf. Int.
20
10
0
−20
−40
−7
−6
−5
−4
−3
−2
0
1
2
3
4
5
time_to_treat


Group
Group 2014
Group 2015
Group 2016
Group 2019
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
Pre
Post


Event−study aggregation \n DiD using never−treated as comparison group
10
0
−10
−20
−30
−40
−7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5
Pre
Post

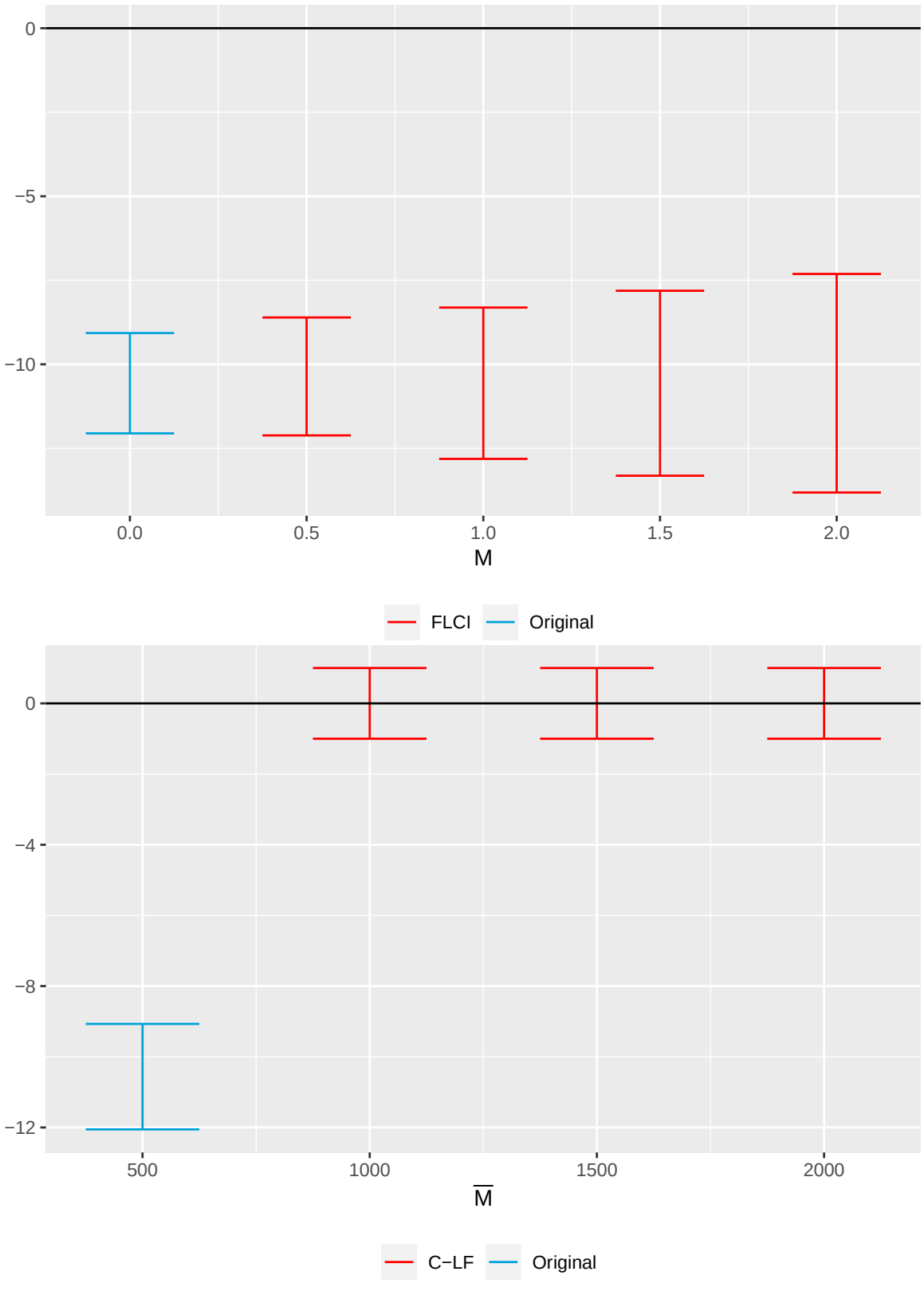

0
−5
−10
0.0
0.5
1.0
1.5
2.0
M
FLCI
Original
0
−4
−8
−12
500
1000
1500
2000
M
C−LF
Original

Tabelle 3: Two Way Fixed Effects long format

	D	D14	D15	D16
Treatment	-28.363***	-31.518***	-12.173***	-12.153***
	(1.893)	(2.185)	(1.848)	(1.550)
Num.Obs.	79557	69824	74768	77624
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Std.Errors	by: pn	by: pn	by: pn	by: pn

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Tabelle 4: Event Study Common Treatment

	Model 1
year = 2003 Œ treated	13.696***
	(2.841)
year = 2004 Œ treated	14.798***
	(2.663)
year = 2005 Œ treated	15.216***
	(2.756)
year = 2006 Œ treated	16.779***
	(3.044)
year = 2007 Œ treated	16.696***
	(3.159)
year = 2008 Œ treated	14.246***
	(3.055)
year = 2009 Œ treated	11.508***
	(2.403)
year = 2010 Œ treated	10.283***
	(2.546)
year = 2011 Œ treated	3.128**
	(0.988)
year = 2012 Œ treated	1.217
	(0.765)
year = 2014 Œ treated	-8.672***
	(0.860)
year = 2015 Œ treated	-16.546***
	(1.262)
year = 2016 Œ treated	-19.616***
	(1.373)
year = 2017 Œ treated	-25.197***
	(1.654)
year = 2018 Œ treated	-28.200***
	(1.804)
year = 2019 Œ treated	-33.353***
	(2.156)
Num.Obs.	79557
AIC	804841.0
BIC	804998.9
RMSE	38.06
Std.Errors	by: pn
FE: pn	X
FE: year	X

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Tabelle 5: Even Study Staggered

	Model 1
time_to_treat = -7 Œ treated	14.553***
	(2.611)
time_to_treat = -6 Œ treated	12.287***
	(2.547)
time_to_treat = -5 Œ treated	10.850***
	(2.542)
time_to_treat = -4 Œ treated	5.346**
	(1.674)
time_to_treat = -3 Œ treated	3.606***
	(0.842)
time_to_treat = -2 Œ treated	1.750**
	(0.548)
time_to_treat = 0 Œ treated	-9.201***
	(0.622)
time_to_treat = 1 Œ treated	-18.916***
	(1.067)
time_to_treat = 2 Œ treated	-23.692***
	(1.287)
time_to_treat = 3 Œ treated	-28.244***
	(1.526)
time_to_treat = 4 Œ treated	-30.934***
	(1.730)
time_to_treat = 5 Œ treated	-35.122***
	(2.088)
Num.Obs.	79557
AIC	804661.4
BIC	804782.1
RMSE	38.02
Std.Errors	by: pn
FE: pn	X
FE: year	X

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Tabelle 6: SA especification

	Model 1
time_to_treat = -7	15.552***
	(2.563)
time_to_treat = -6	14.639***
	(2.875)
time_to_treat = -5	12.228***
	(2.528)
time_to_treat = -4	7.590***
	(1.767)
time_to_treat = -3	3.401***
	(0.895)
time_to_treat = -2	1.638**
	(0.634)
time_to_treat = 0	-9.411***
	(0.723)
time_to_treat = 1	-18.360***
	(1.129)
time_to_treat = 2	-22.200***
	(1.280)
time_to_treat = 3	-26.974***
	(1.528)
time_to_treat = 4	-29.782***
	(1.729)
time_to_treat = 5	-34.456***
	(2.107)
Num.Obs.	79557
AIC	804610.3
BIC	804731.0
RMSE	38.00
Std.Errors	by: pn
FE: pn	X
FE: year	X

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Tabelle 7: CS specification

	Model 1
ATT(2014,2003)	5.619
	(2.375)
ATT(2014,2004)	5.711
	(2.274)
ATT(2014,2005)	5.374
	(2.530)
ATT(2014,2006)	5.922
	(2.684)
ATT(2014,2007)	3.030
	(2.449)
ATT(2014,2008)	1.638
	(2.699)
ATT(2014,2009)	-2.067
	(2.026)
ATT(2014,2010)	-3.365
	(1.991)
ATT(2014,2011)	2.530
	(1.087)
ATT(2014,2012)	0.090
	(0.939)
ATT(2014,2013)	0.000
ATT(2014,2014)	-11.446
	(0.960)
ATT(2014,2015)	-20.250
	(1.319)
ATT(2014,2016)	-23.016
	(1.438)
ATT(2014,2017)	-27.688
	(1.633)
ATT(2014,2018)	-30.492
	(1.775)
ATT(2014,2019)	-35.639
	(2.004)
ATT(2015,2003)	9.581
	(3.160)
ATT(2015,2004)	9.444
	(3.557)
ATT(2015,2005)	8.175
	(3.349)
ATT(2015,2006)	5.645
	(3.583)
ATT(2015,2007)	2.815
	(3.404)
ATT(2015,2008)	-0.399
	(3.676)
ATT(2015,2009)	0.605

Tabelle 8: CS specification Event Study

	Model 1
ATT(-7)	2.333
	(2.261)
ATT(-6)	1.235
	(2.336)
ATT(-5)	0.653
	(2.575)
ATT(-4)	-2.060
	(1.549)
ATT(-3)	2.769
	(0.944)
ATT(-2)	0.581
	(0.680)
ATT(-1)	0.000
ATT(0)	-10.562
	(0.753)
ATT(1)	-18.852
	(1.103)
ATT(2)	-22.281
	(1.305)
ATT(3)	-27.093
	(1.558)
ATT(4)	-29.855
	(1.721)
ATT(5)	-35.639
	(2.108)
Num.Obs.	5815
Std.Errors	by: pn_id
type	dynamic
ngroup	4.000
ntime	17.000
control.group	nevertreated
est.method	dr