

# Simulation Results

Tobias Schnabel

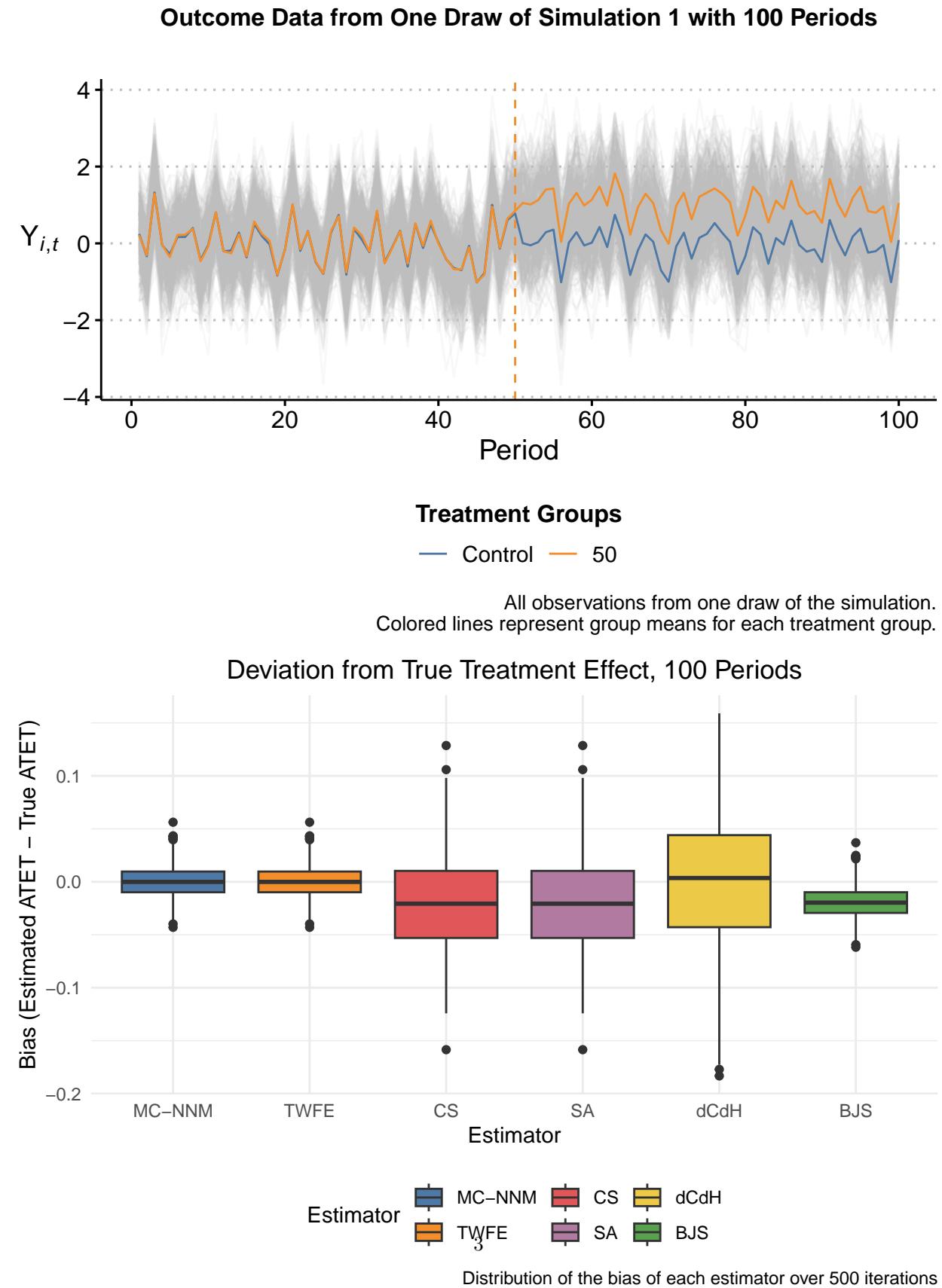
Last compiled on January 03, 2024

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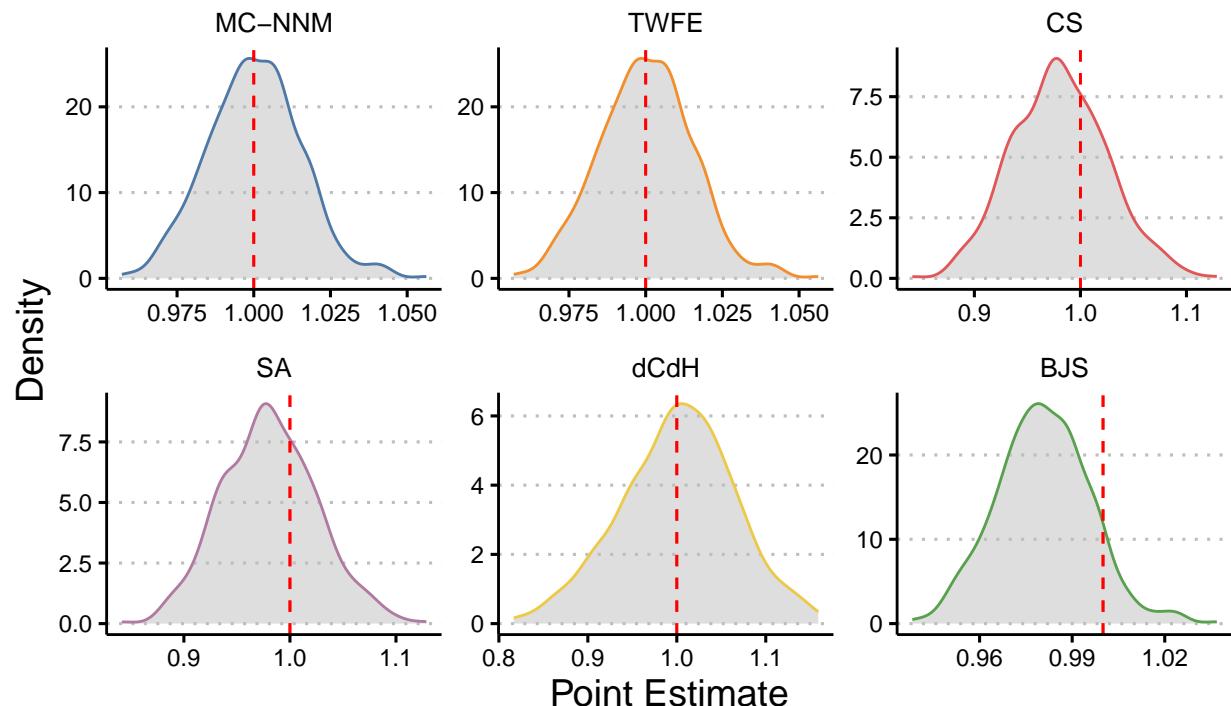
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**DGP 1: One treatment group, TE is unit-and time- homogeneous,  
100 periods**



### Distributions of ATET Estimates, 100 Periods

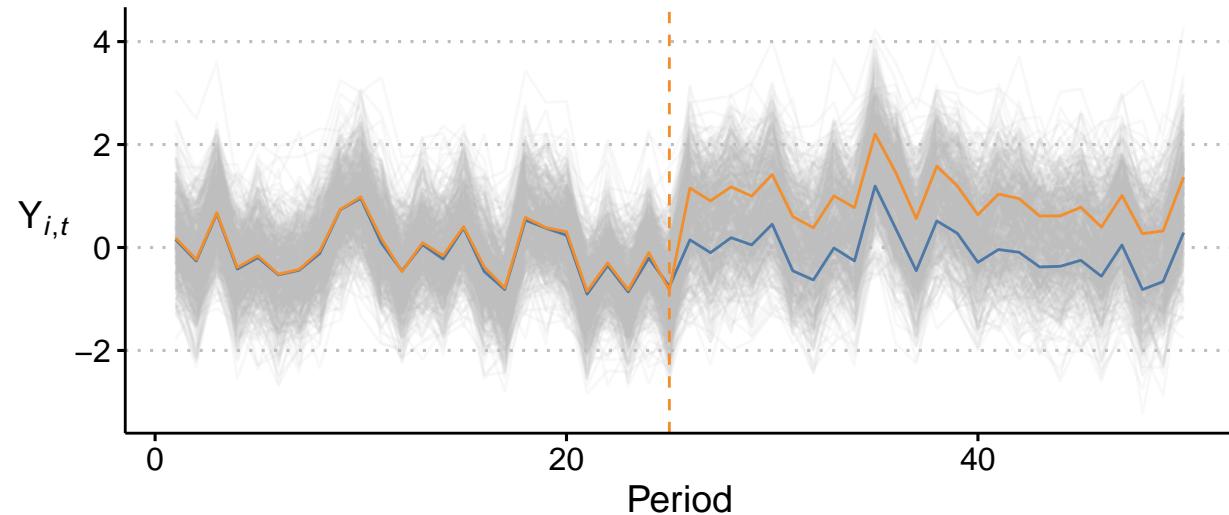


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	1.000	1.000	1.000	0.000		
2	MC-NNM	0.957	1.000	1.056	0.015	0.000	0.015
3	TWFE	0.957	1.000	1.056	0.015	0.000	0.015
4	CS	0.842	0.981	1.129	0.045	-0.019	0.049
5	SA	0.842	0.981	1.129	0.045	-0.019	0.049
6	dCdH	0.817	1.001	1.159	0.063	0.001	0.063
7	BJS	0.938	0.981	1.037	0.015	-0.019	0.024

50 periods

### Outcome Data from One Draw of Simulation 1 with 50 Periods

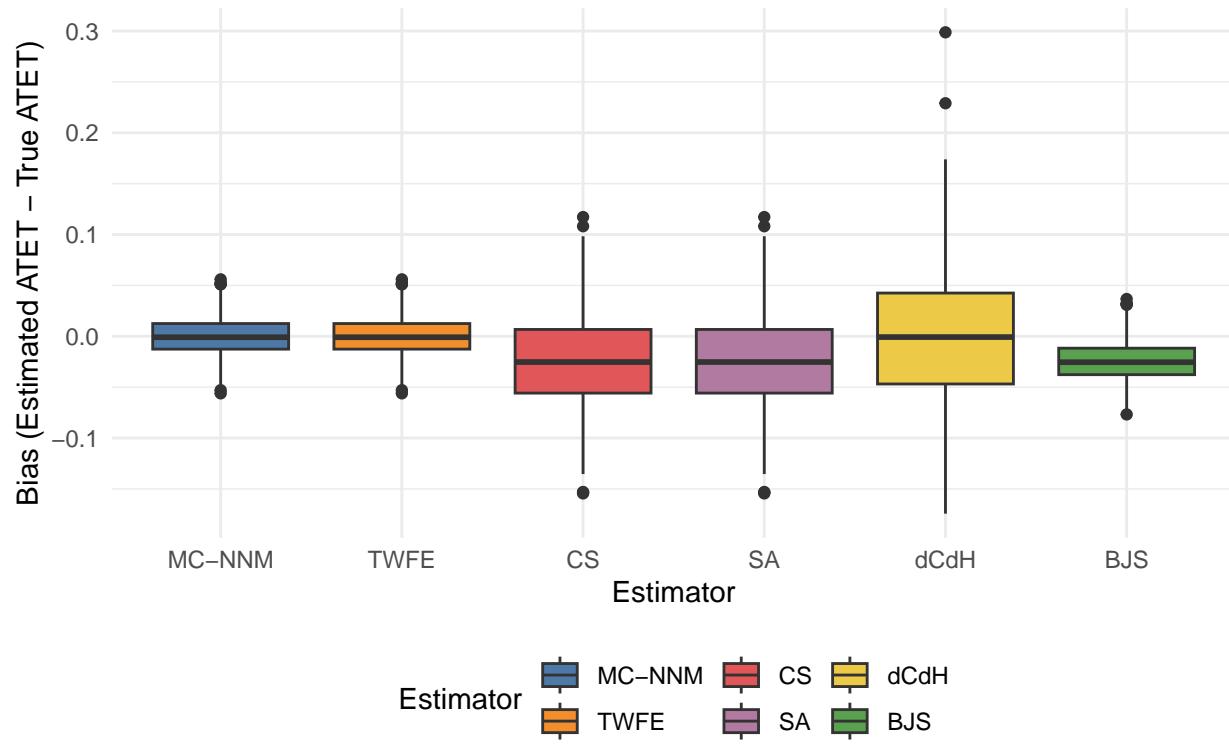


### Treatment Groups

— Control — 25

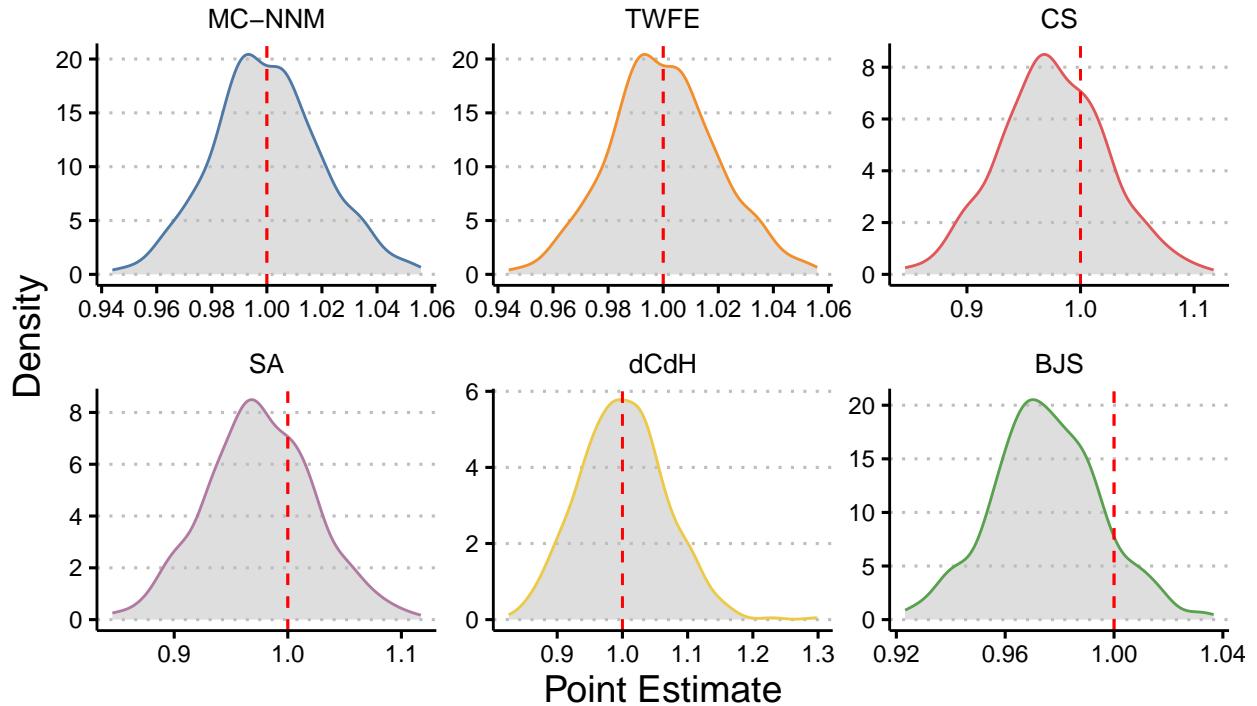
All observations from one draw of the simulation.  
Colored lines represent group means for each treatment group.

### Deviation from True Treatment Effect, 50 Periods



Distribution of the bias of each estimator over 500 iterations

### Distributions of ATET Estimates, 50 Periods

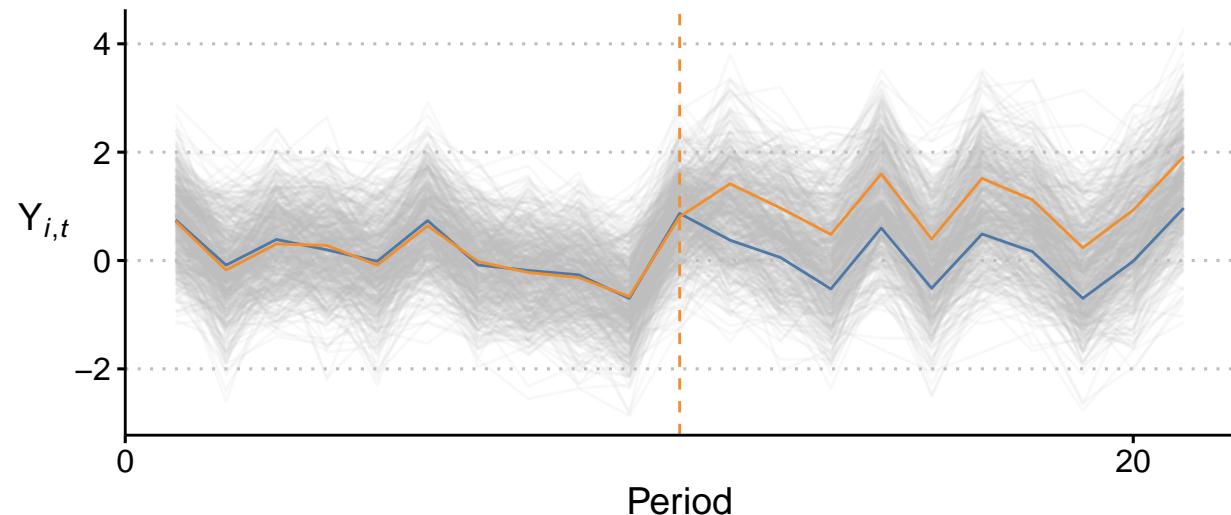


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	1.000	1.000	1.000	0.000		
2	MC-NNM	0.944	1.000	1.056	0.020	0.000	0.020
3	TWFE	0.944	1.000	1.056	0.020	0.000	0.020
4	CS	0.846	0.976	1.117	0.048	-0.024	0.053
5	SA	0.846	0.976	1.117	0.048	-0.024	0.053
6	dCdH	0.826	1.000	1.299	0.066	0.000	0.066
7	BJS	0.923	0.975	1.037	0.020	-0.025	0.032

21 periods

### Outcome Data from One Draw of Simulation 1 with 21 Periods

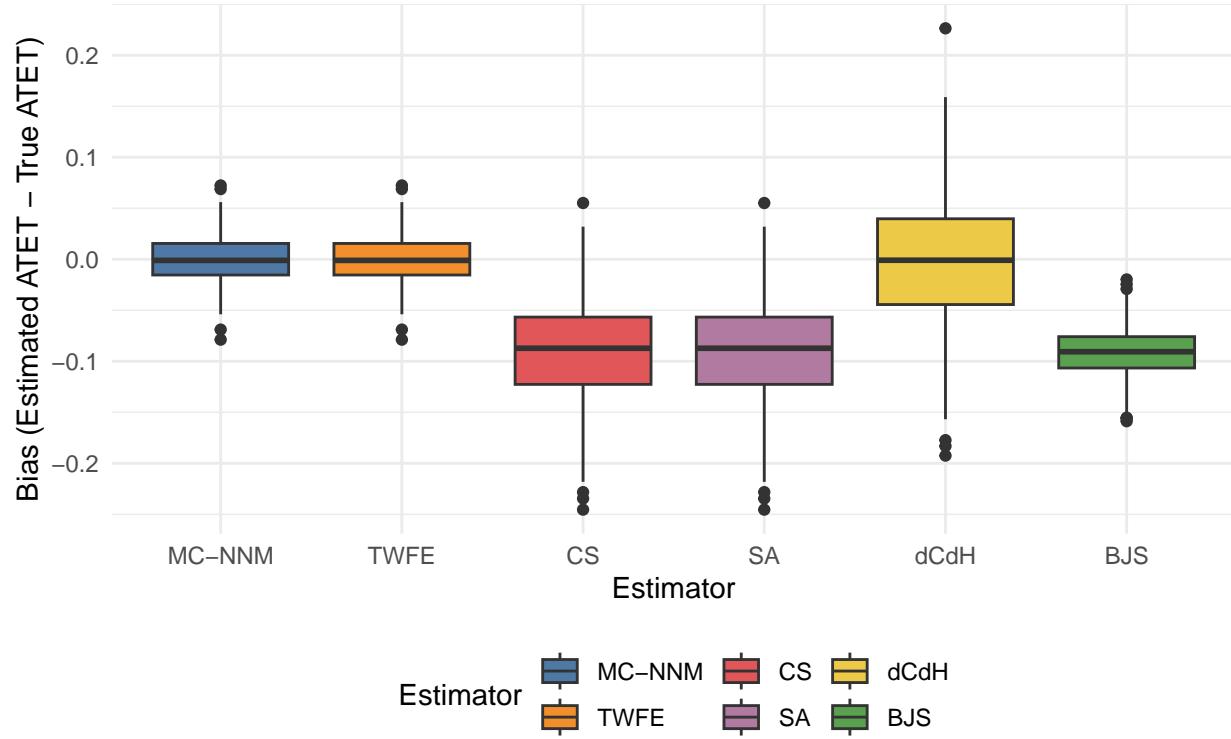


### Treatment Groups

— Control — 11

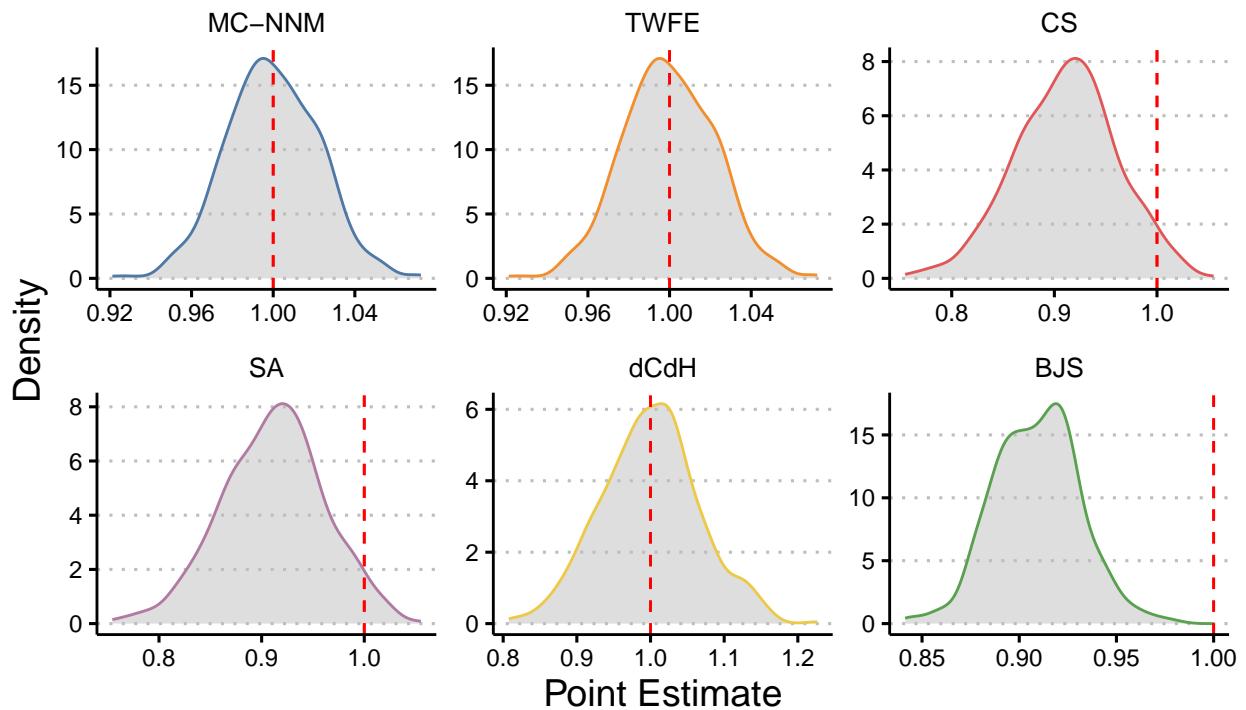
All observations from one draw of the simulation.  
Colored lines represent group means for each treatment group.

### Deviation from True Treatment Effect, 21 Periods



Distribution of the bias of each estimator over 500 iterations

### Distributions of ATET Estimates, 21 Periods

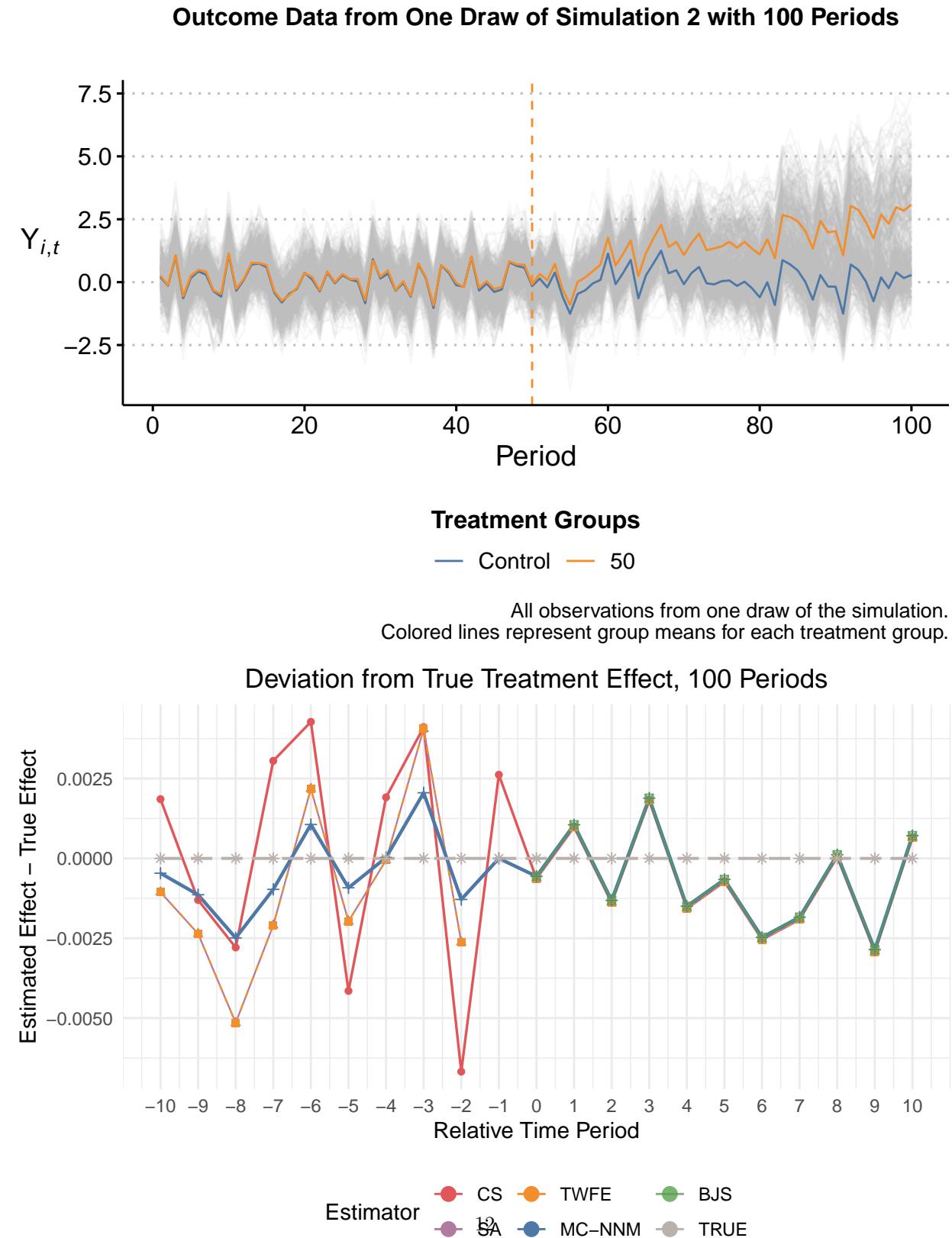


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	1.000	1.000	1.000	0.000		
2	MC-NNM	0.921	1.000	1.072	0.023	-0.000	0.023
3	TWFE	0.921	1.000	1.072	0.023	-0.000	0.023
4	CS	0.755	0.911	1.055	0.050	-0.089	0.102
5	SA	0.755	0.911	1.055	0.050	-0.089	0.102
6	dCdH	0.808	0.999	1.226	0.066	-0.001	0.066
7	BJS	0.841	0.909	0.980	0.022	-0.091	0.094

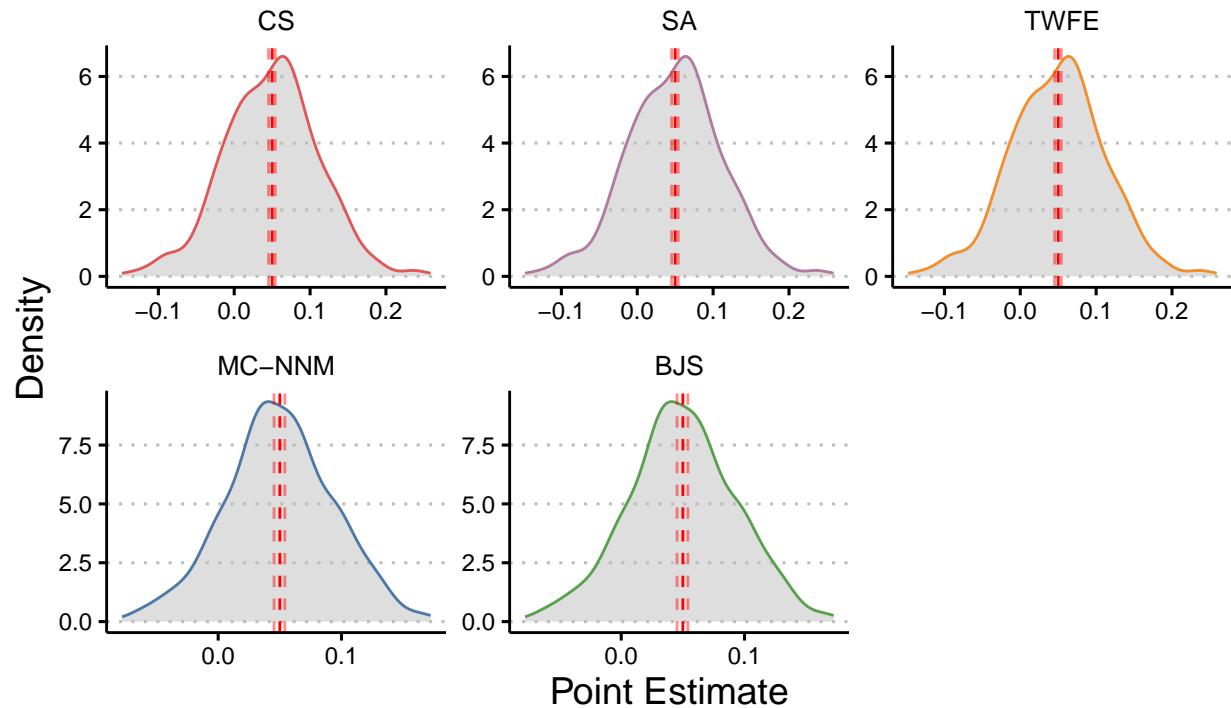
**DGP 2: One treatment group, TE is unit-homogeneous, time-varying**

100 periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 100 Periods

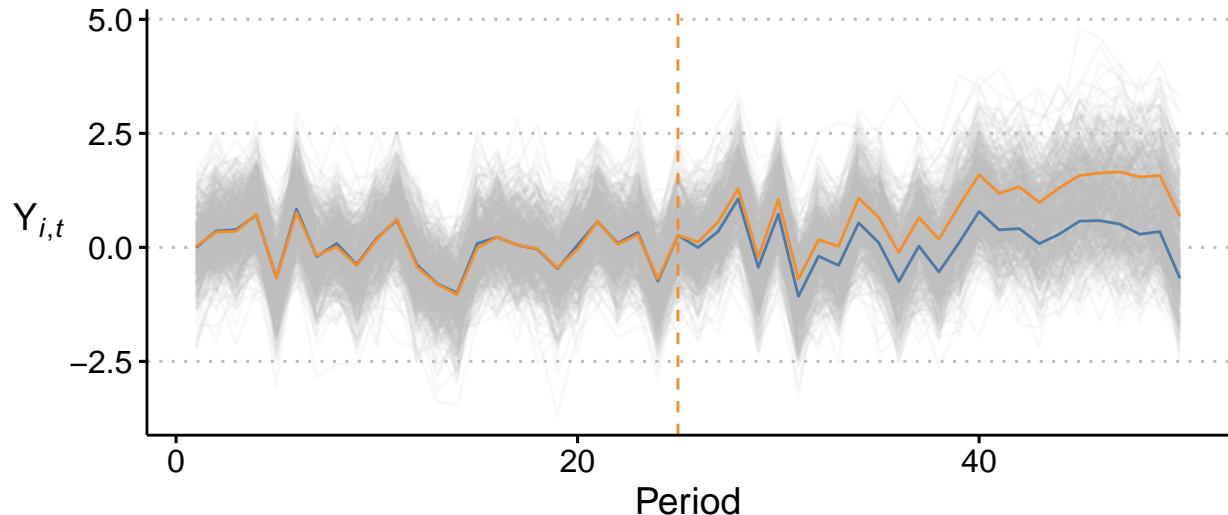


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.045	0.050	0.054	0.002			
2	MC-NNM	-0.078	0.049	0.172	0.044	-0.001	0.044	0.000
3	TWFE	-0.148	0.049	0.259	0.062	-0.001	0.062	0.000
4	CS	-0.148	0.049	0.259	0.062	-0.001	0.062	0.000
5	SA	-0.148	0.049	0.259	0.062	-0.001	0.062	0.000
6	BJS	-0.078	0.049	0.172	0.044	-0.001	0.044	0.000

50 periods

### Outcome Data from One Draw of Simulation 2 with 50 Periods

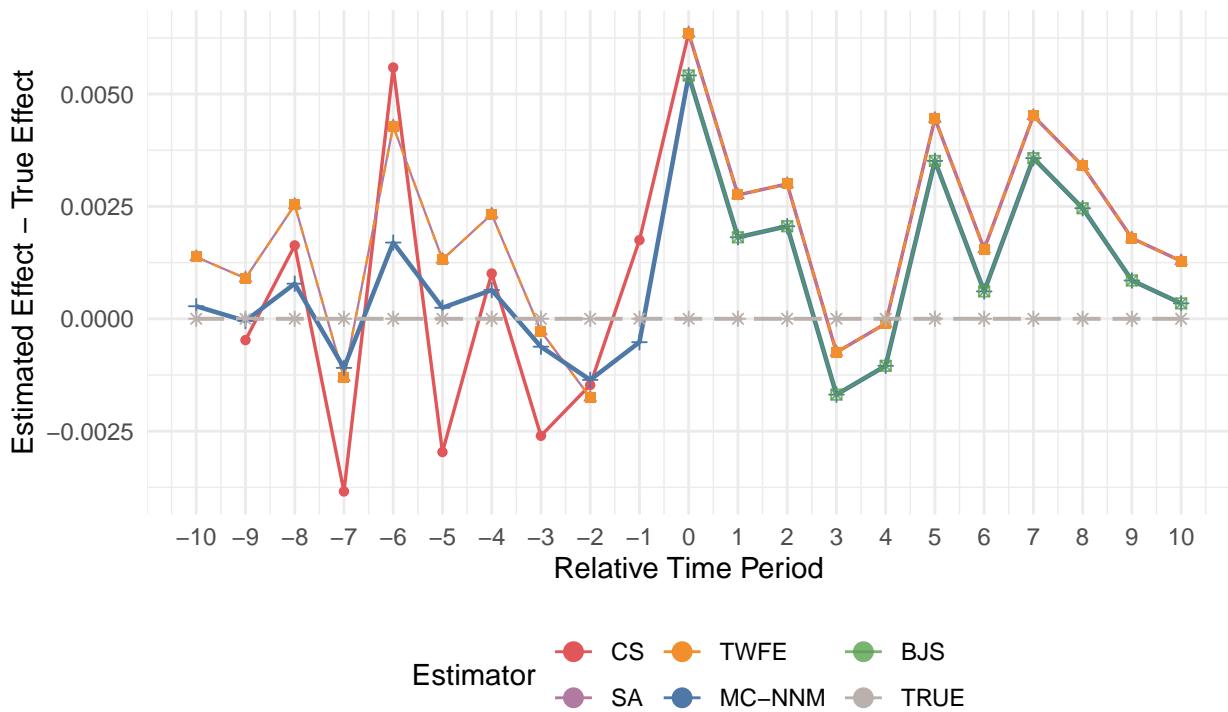


### Treatment Groups

— Control — 25

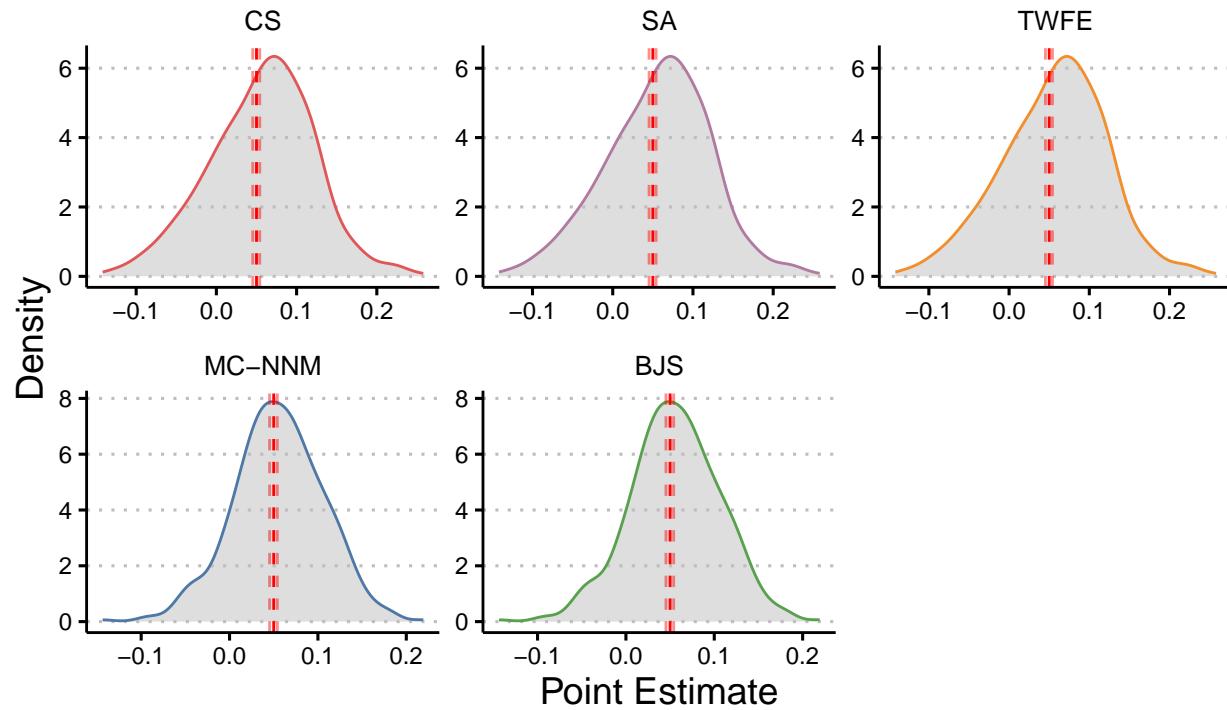
All observations from one draw of the simulation.  
Colored lines represent group means for each treatment group.

### Deviation from True Treatment Effect, 50 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 50 Periods

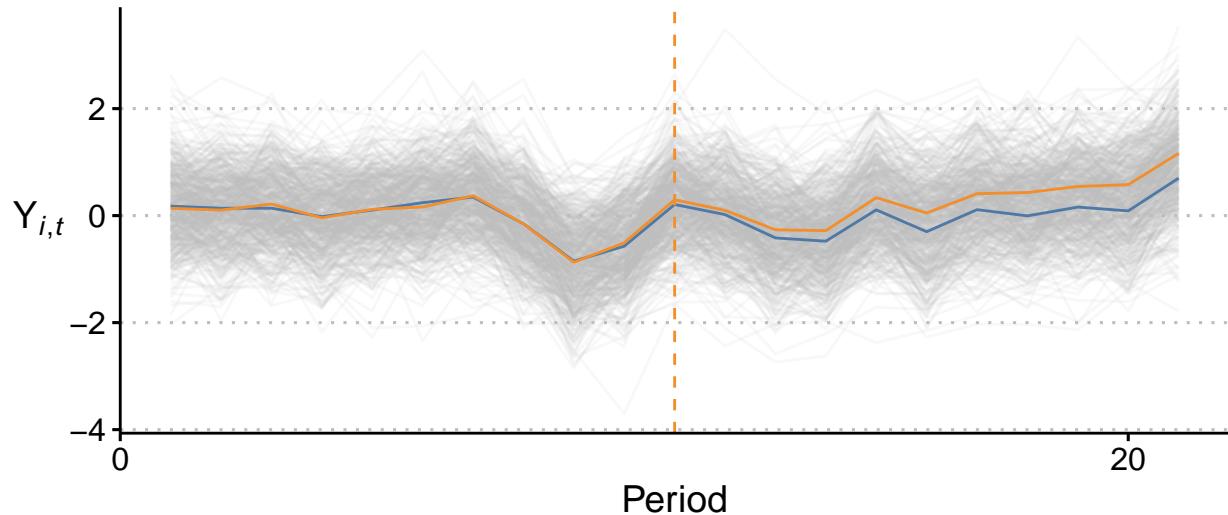


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.045	0.050	0.054	0.002			
2	MC-NNM	-0.144	0.055	0.219	0.051	0.005	0.051	0.001
3	TWFE	-0.142	0.056	0.258	0.065	0.006	0.066	0.002
4	CS	-0.142	0.056	0.258	0.065	0.006	0.066	0.001
5	SA	-0.142	0.056	0.258	0.065	0.006	0.066	0.002
6	BJS	-0.144	0.055	0.219	0.051	0.005	0.051	0.001

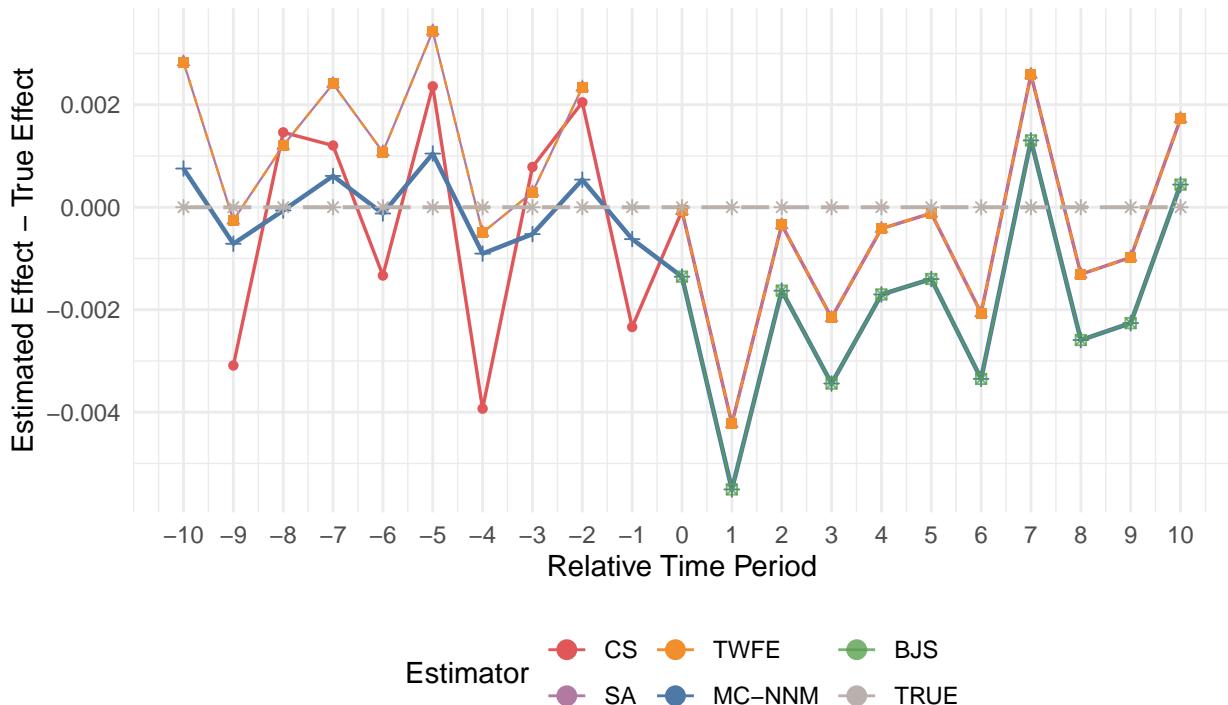
21 periods

### Outcome Data from One Draw of Simulation 2 with 21 Periods



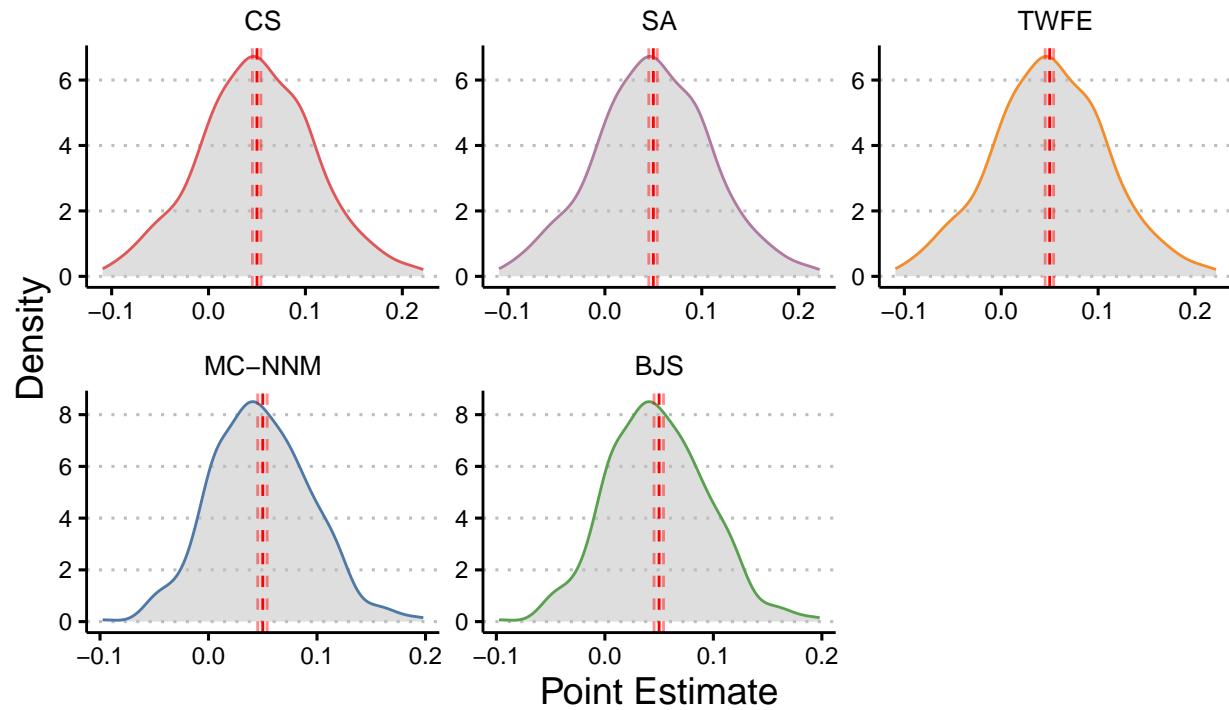
All observations from one draw of the simulation.  
Colored lines represent group means for each treatment group.

### Deviation from True Treatment Effect, 21 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

## Distributions of Relative Period 0 Effect Estimates, 21 Periods

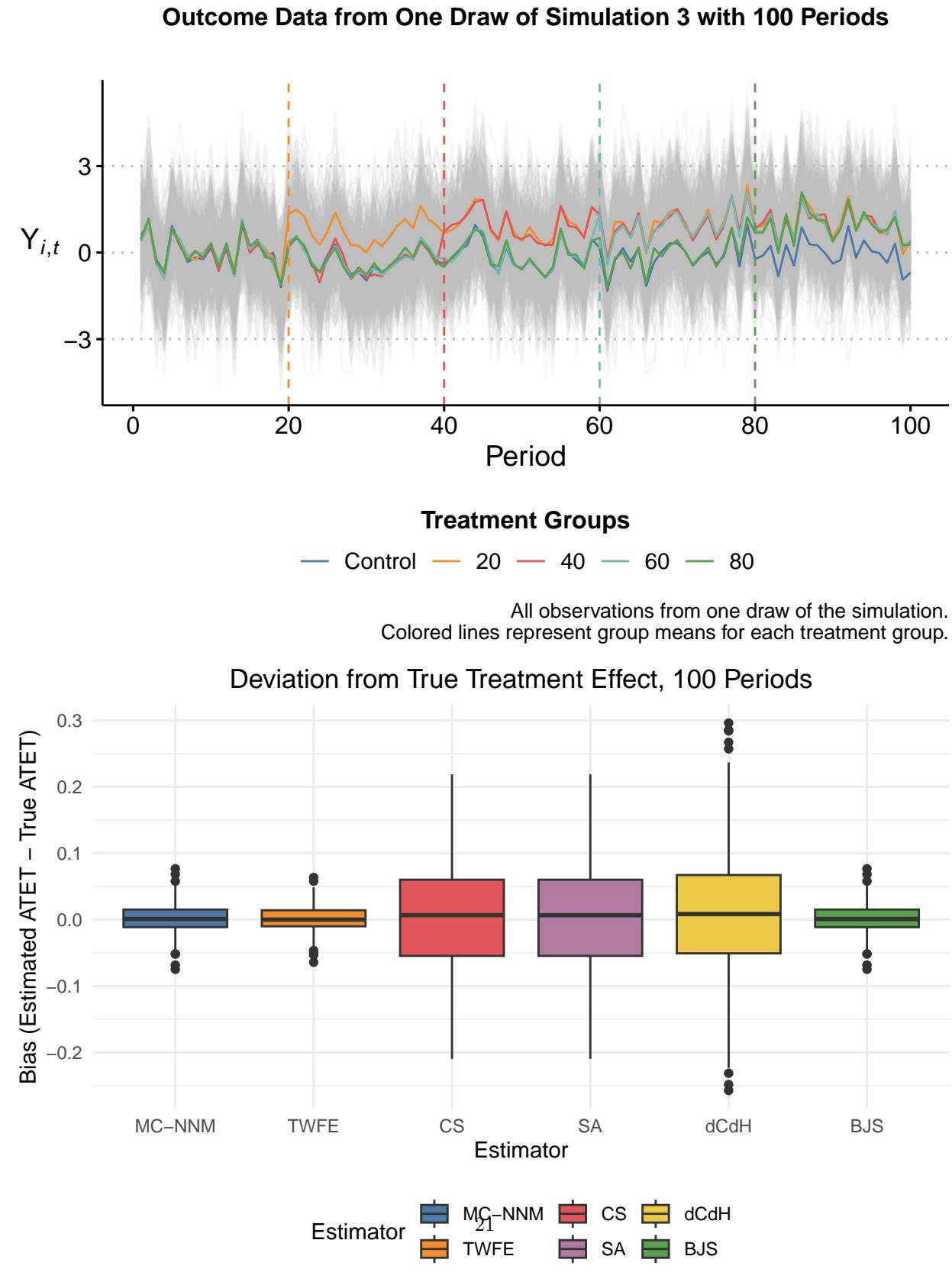


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

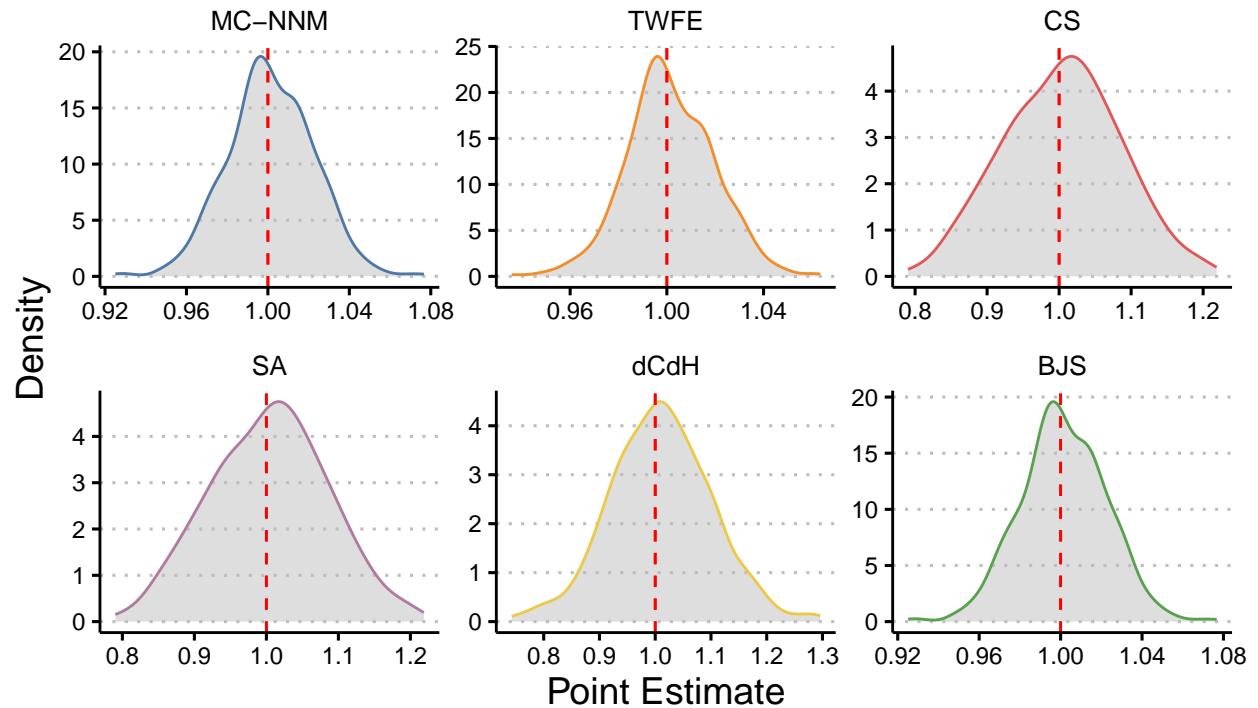
	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.045	0.050	0.054	0.002			
2	MC-NNM	-0.098	0.049	0.198	0.046	-0.001	0.046	-0.001
3	TWFE	-0.109	0.050	0.222	0.060	-0.000	0.060	0.000
4	CS	-0.109	0.050	0.222	0.060	-0.000	0.060	-0.001
5	SA	-0.109	0.050	0.222	0.060	-0.000	0.060	0.000
6	BJS	-0.098	0.049	0.198	0.046	-0.001	0.046	-0.002

## DGP 3: Multiple Treatment Groups, Time-Invariant Homogeneous TE

100 periods



### Distributions of ATET Estimates, 100 Periods

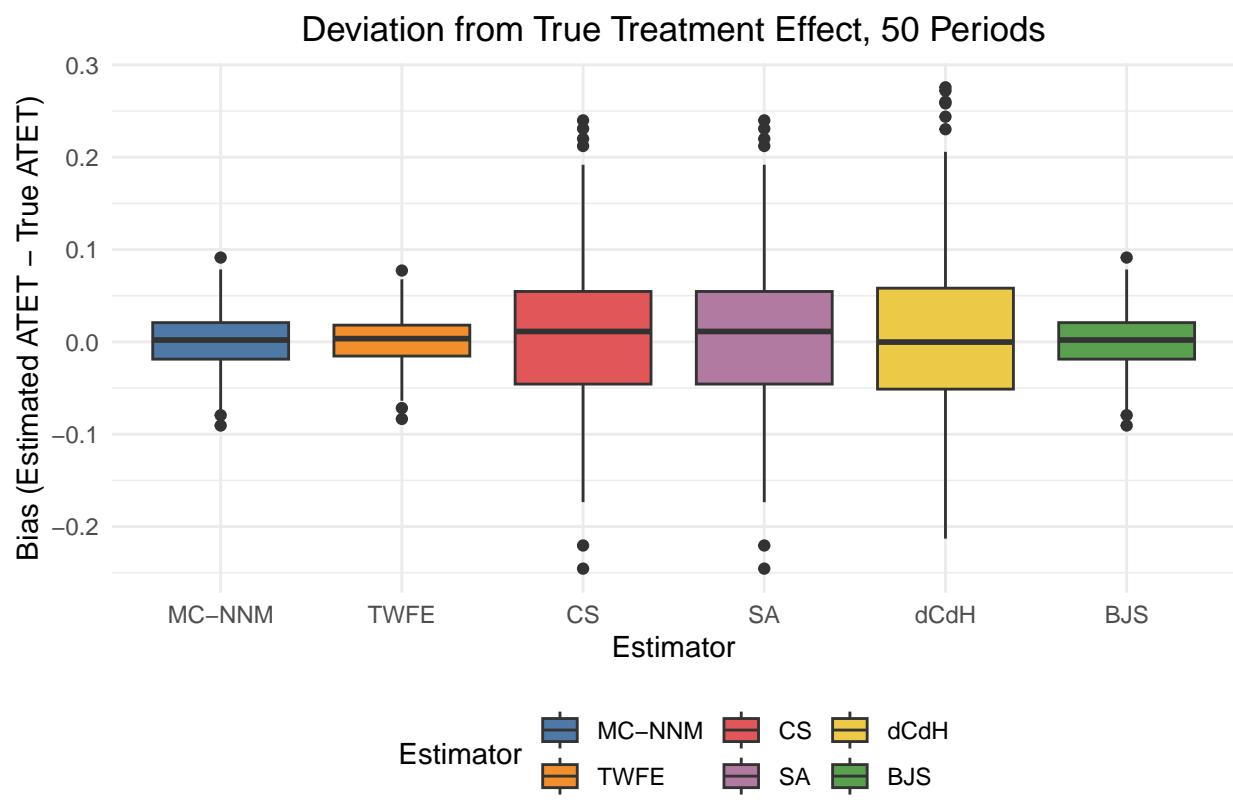
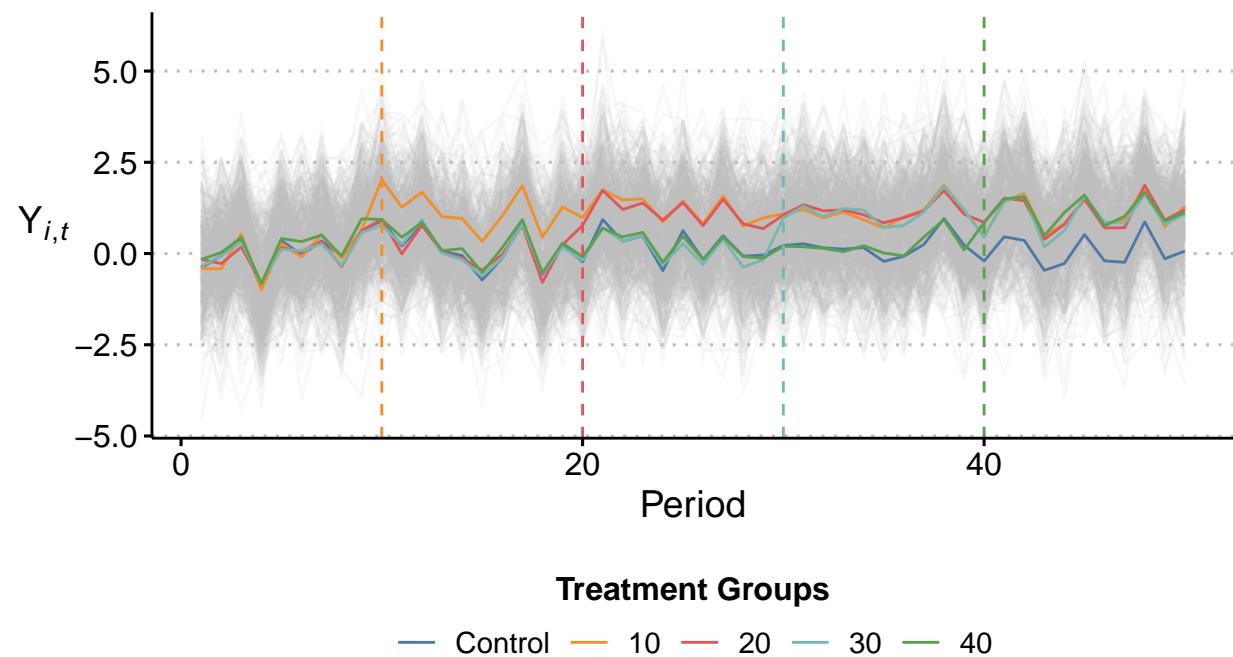


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

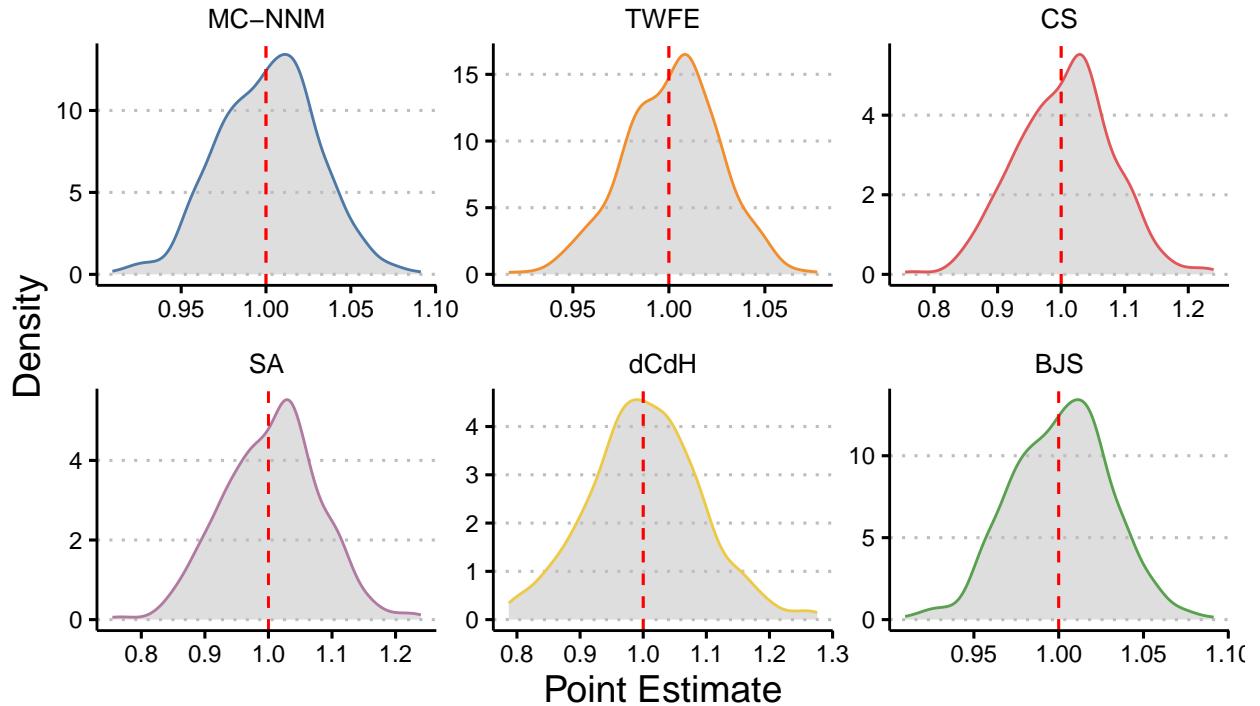
	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	1.000	1.000	1.000	0.000		
2	MC-NNM	0.925	1.001	1.077	0.021	0.001	0.021
3	TWFE	0.936	1.001	1.063	0.018	0.001	0.018
4	CS	0.790	1.004	1.219	0.081	0.004	0.081
5	SA	0.790	1.004	1.219	0.081	0.004	0.081
6	dCdH	0.743	1.011	1.296	0.091	0.011	0.091
7	BJS	0.925	1.001	1.077	0.021	0.001	0.021

50 periods

### Outcome Data from One Draw of Simulation 3 with 50 Periods



### Distributions of ATET Estimates, 50 Periods

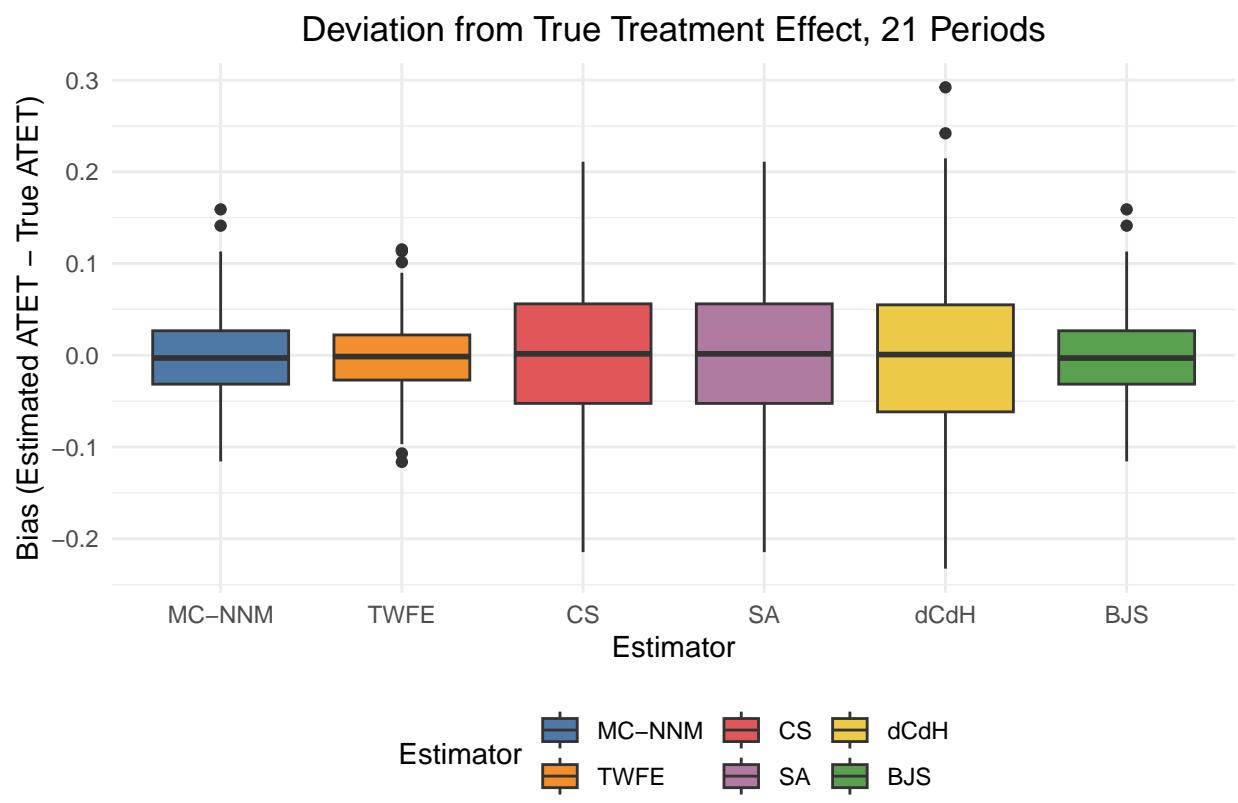
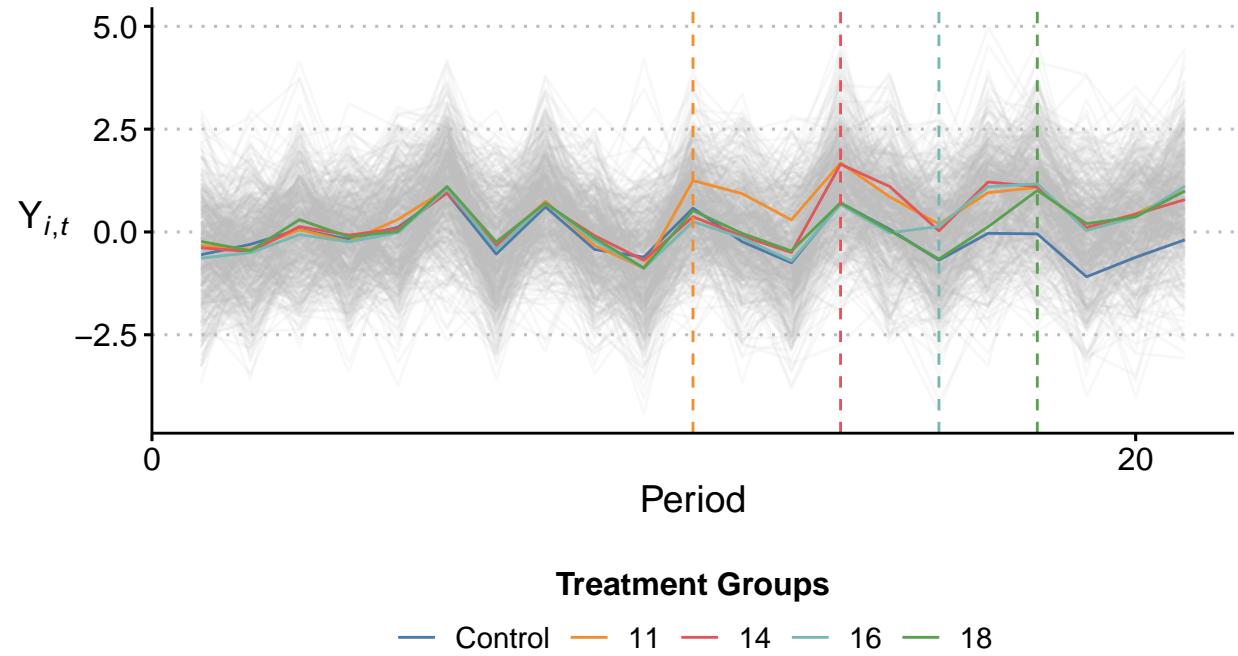


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

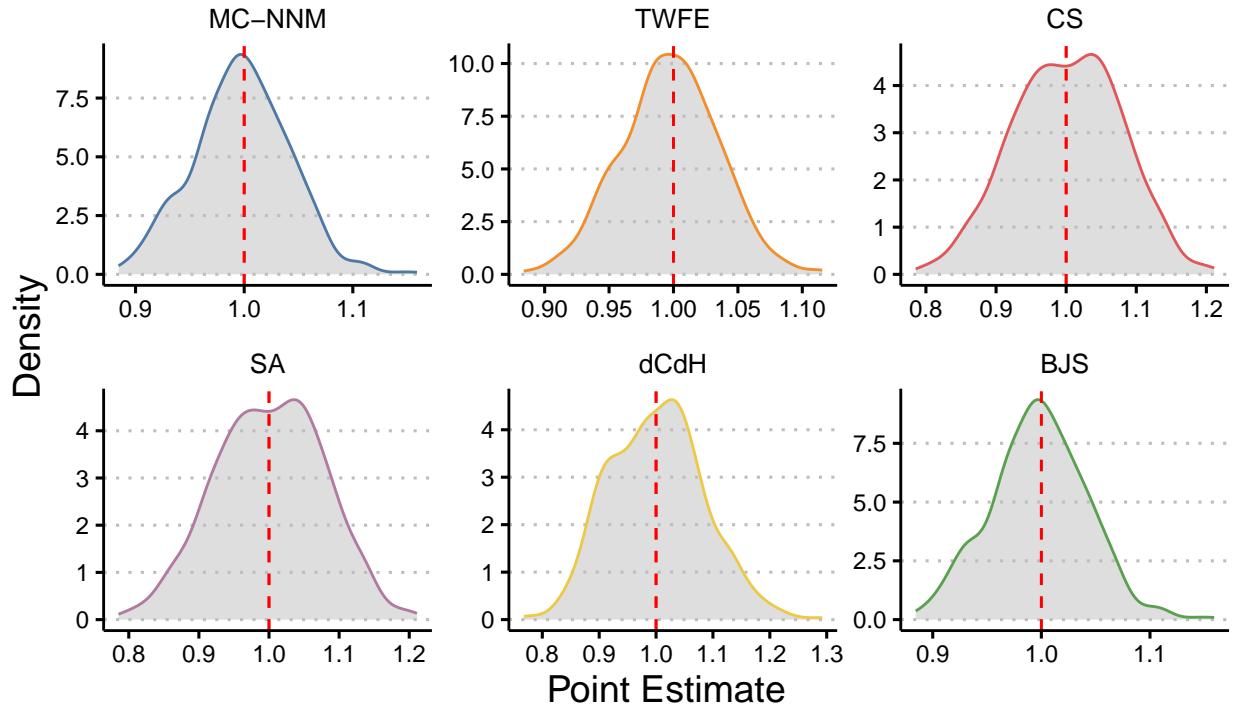
	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	1.000	1.000	1.000	0.000		
2	MC-NNM	0.909	1.001	1.091	0.029	0.001	0.029
3	TWFE	0.917	1.002	1.077	0.025	0.002	0.025
4	CS	0.754	1.006	1.240	0.075	0.006	0.075
5	SA	0.754	1.006	1.240	0.075	0.006	0.075
6	dCdH	0.787	1.003	1.276	0.088	0.003	0.088
7	BJS	0.909	1.001	1.091	0.029	0.001	0.029

21 periods

### Outcome Data from One Draw of Simulation 3 with 21 Periods



### Distributions of ATET Estimates, 21 Periods



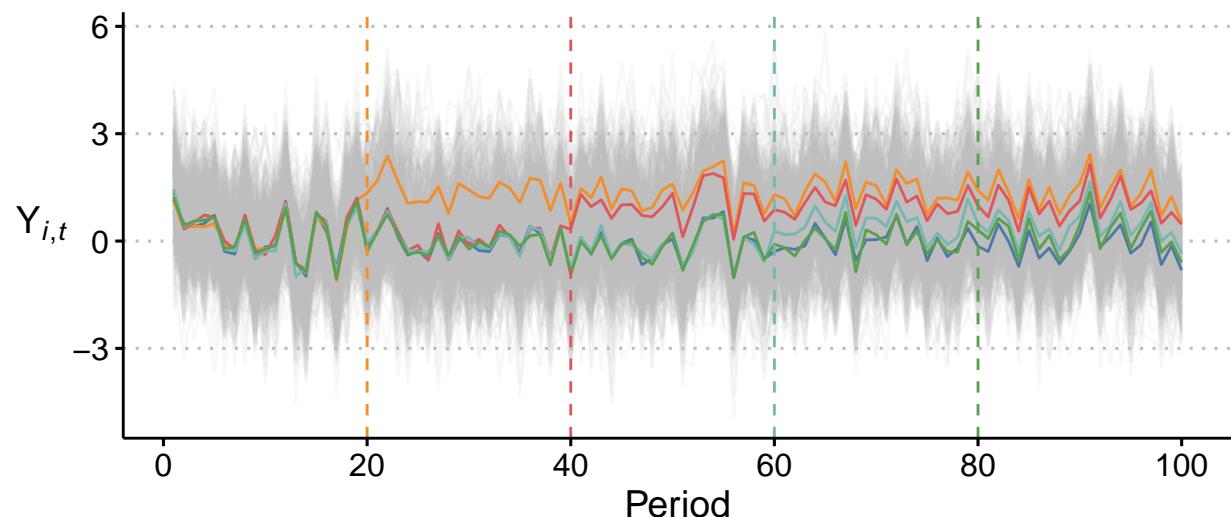
Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	1.000	1.000	1.000	0.000		
2	MC-NNM	0.884	0.998	1.159	0.044	-0.002	0.044
3	TWFE	0.884	0.997	1.115	0.038	-0.003	0.038
4	CS	0.785	1.001	1.211	0.076	0.001	0.076
5	SA	0.785	1.001	1.211	0.076	0.001	0.076
6	dCdH	0.767	1.001	1.292	0.082	0.001	0.082
7	BJS	0.884	0.998	1.159	0.044	-0.002	0.044

## DGP 4: Multiple Treatment Groups, Time-Invariant Heterogeneous TE

100 periods

**Outcome Data from One Draw of Simulation 4 with 100 Periods**

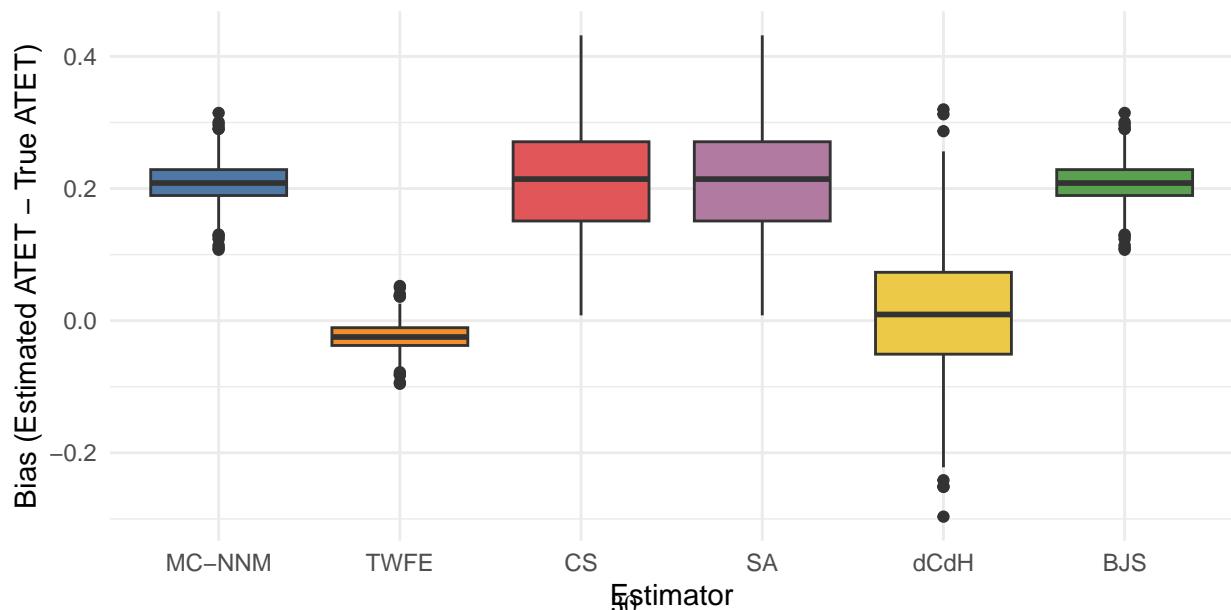


**Treatment Groups**

— Control — 20 — 40 — 60 — 80

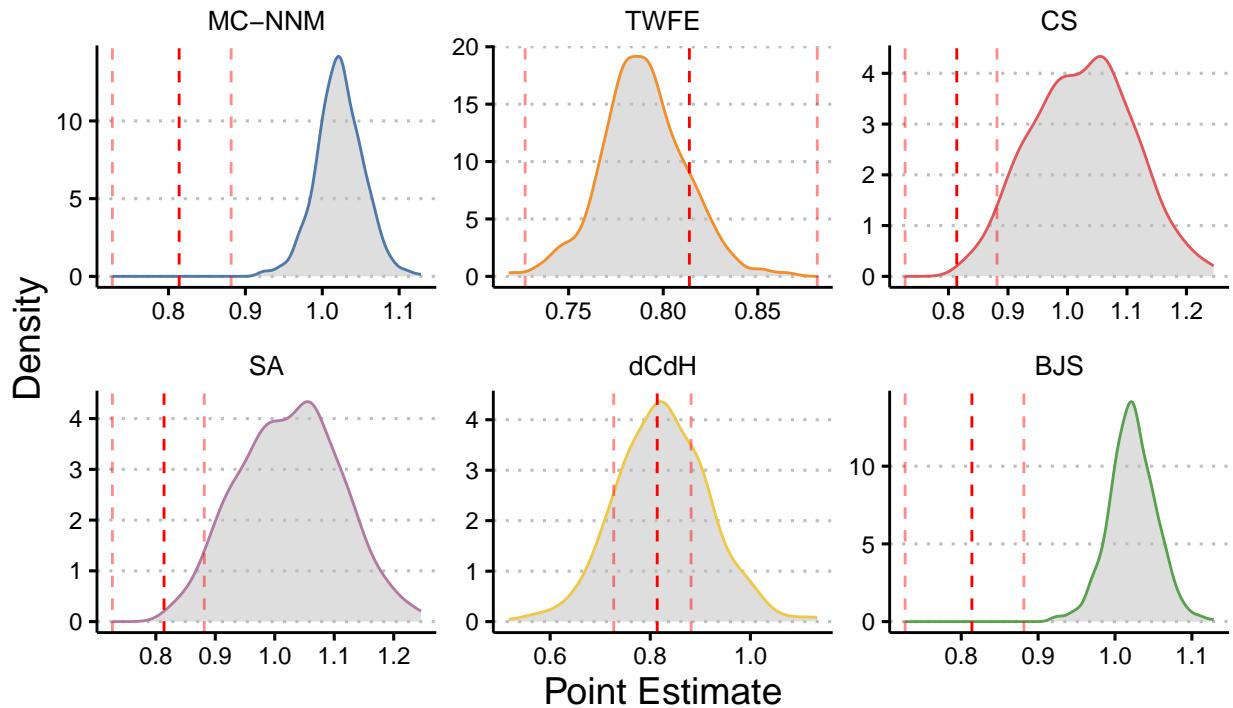
All observations from one draw of the simulation.  
Colored lines represent group means for each treatment group.

**Deviation from True Treatment Effect, 100 Periods**



Estimator      MC-NNM      CS      dCdH  
                  TWFE      SA      BJS

### Distributions of ATET Estimates, 100 Periods

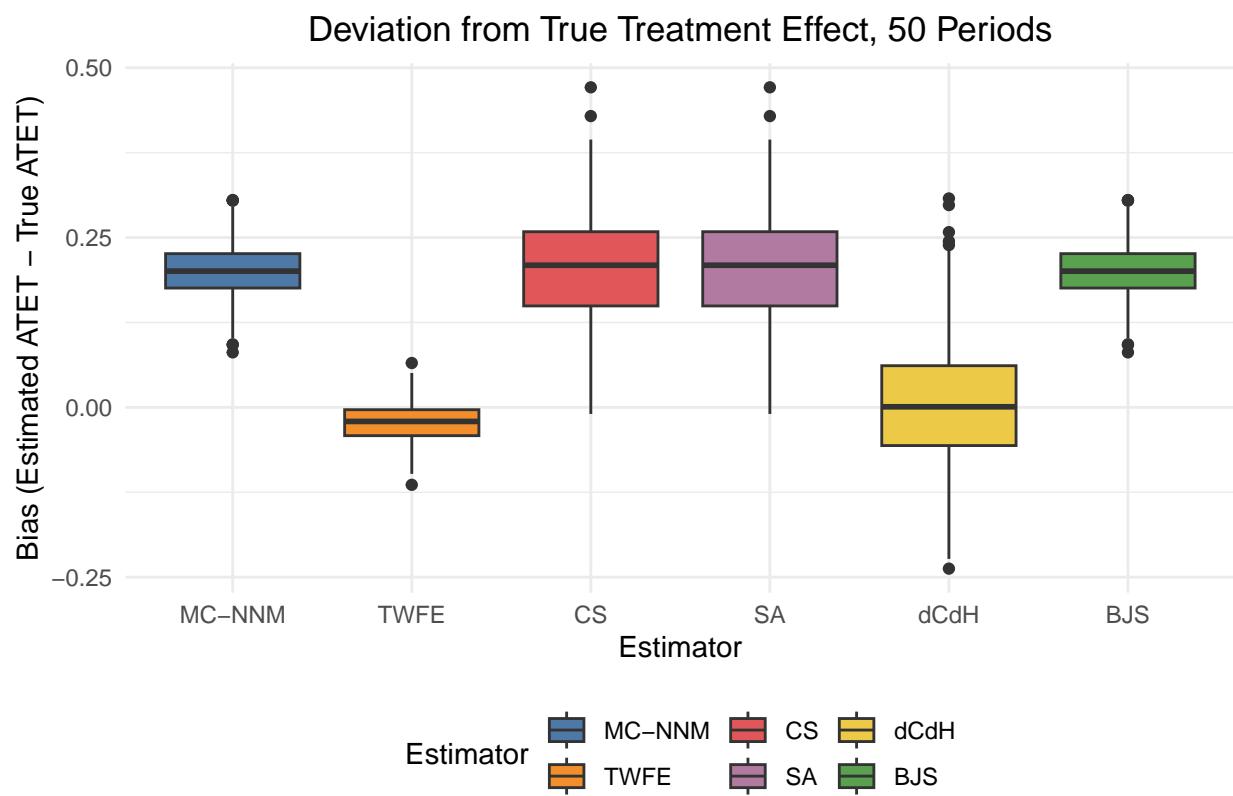
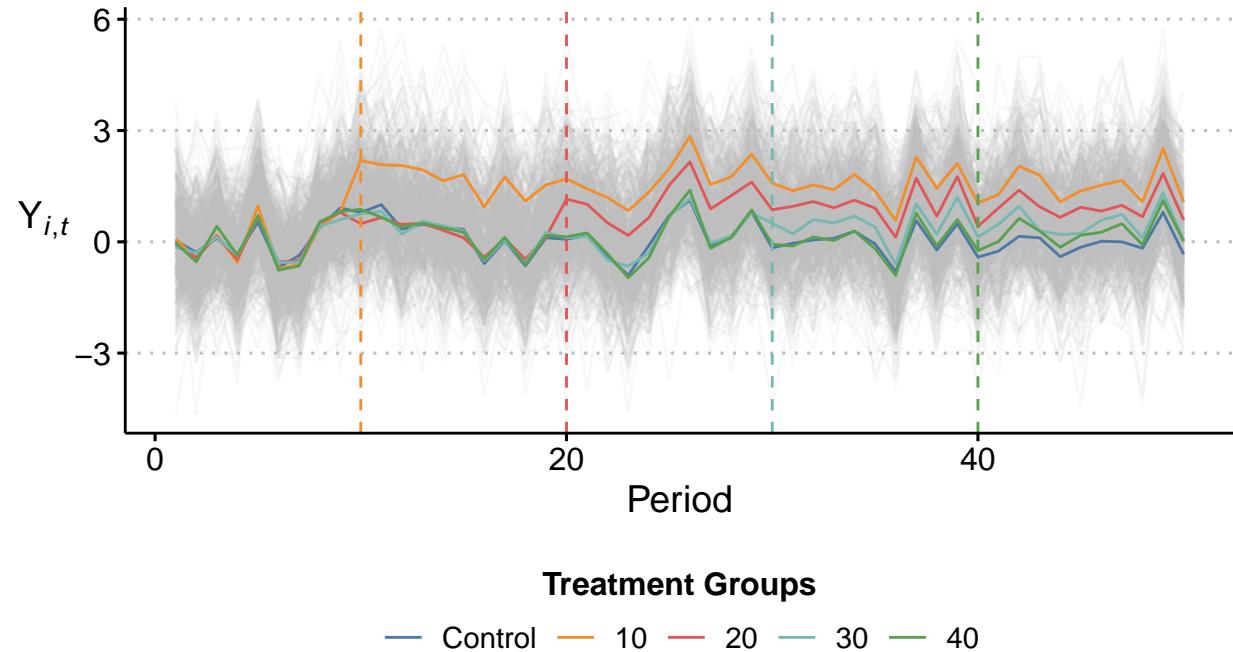


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

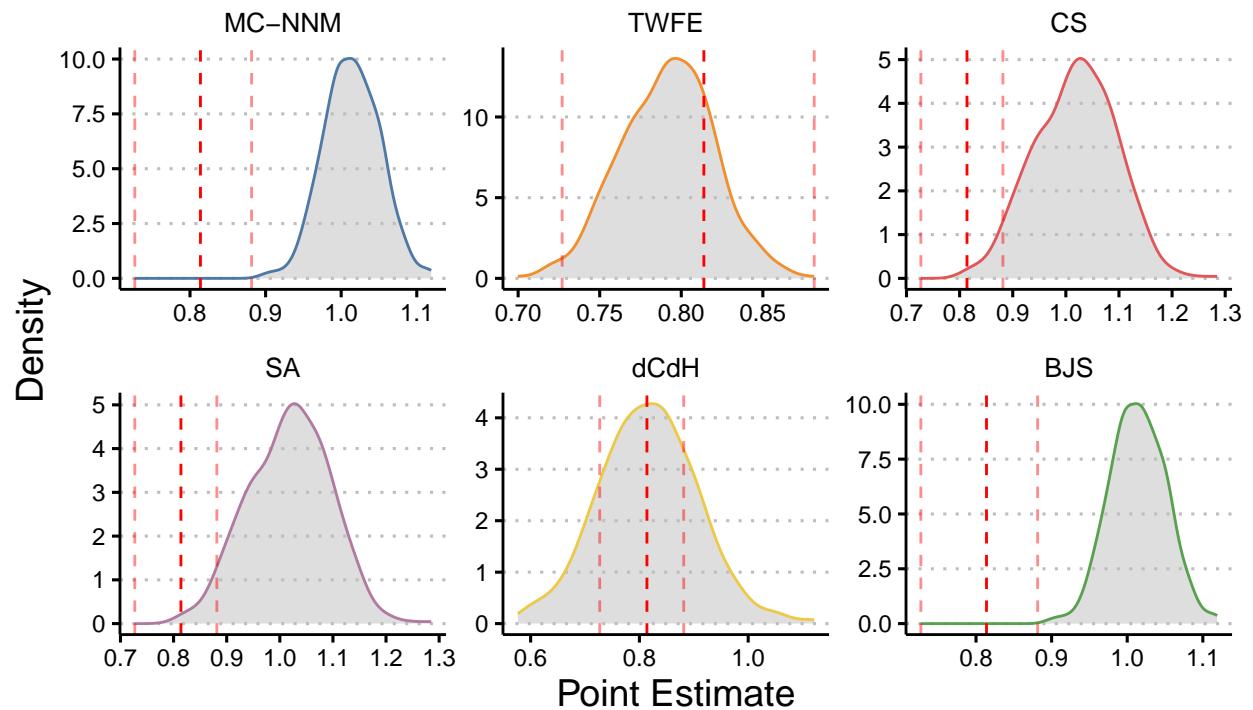
	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	0.727	0.814	0.881	0.024		
2	MC-NNM	0.921	1.023	1.128	0.031	0.209	0.210
3	TWFE	0.718	0.790	0.866	0.022	-0.024	0.032
4	CS	0.822	1.025	1.246	0.085	0.212	0.227
5	SA	0.822	1.025	1.246	0.085	0.212	0.227
6	dCdH	0.517	0.824	1.134	0.093	0.011	0.091
7	BJS	0.921	1.023	1.128	0.031	0.209	0.210

50 periods

### Outcome Data from One Draw of Simulation 4 with 50 Periods



### Distributions of ATET Estimates, 50 Periods

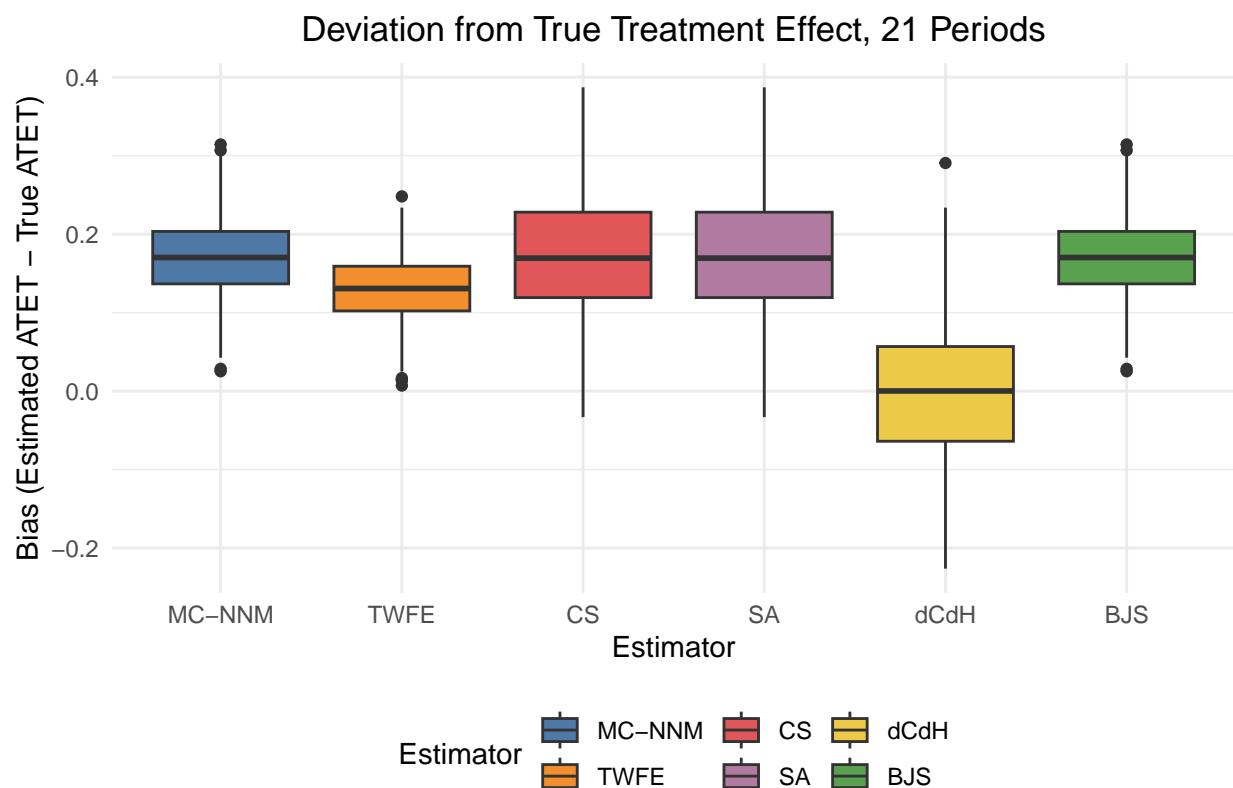
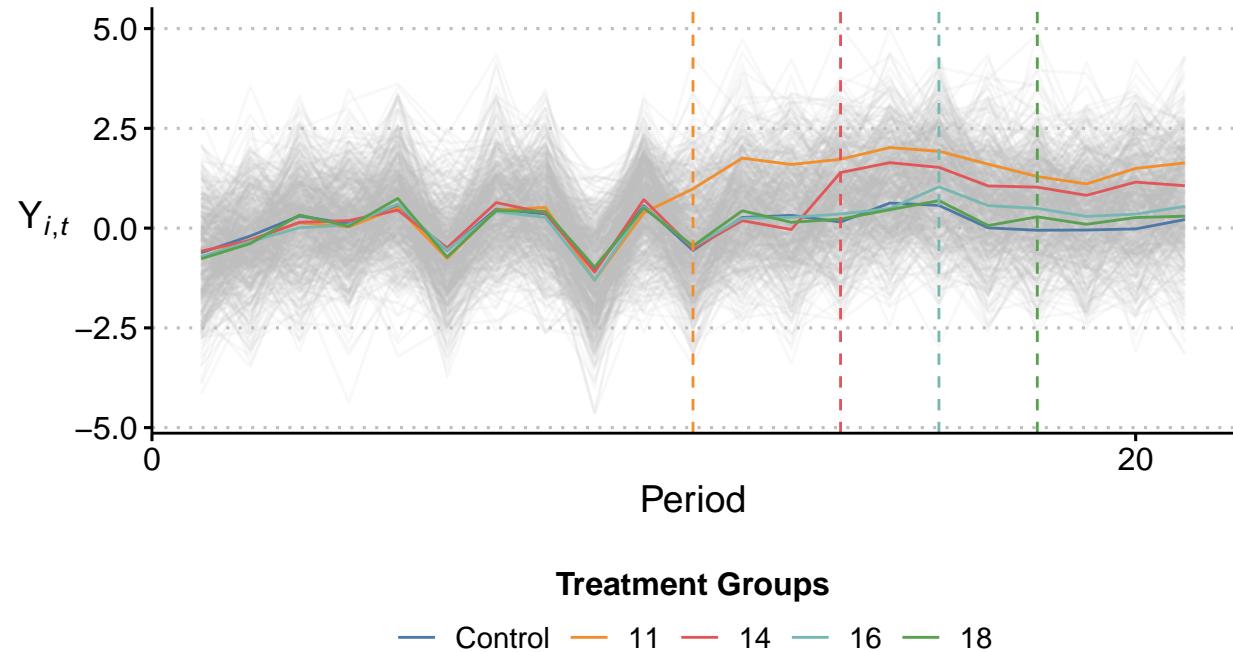


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

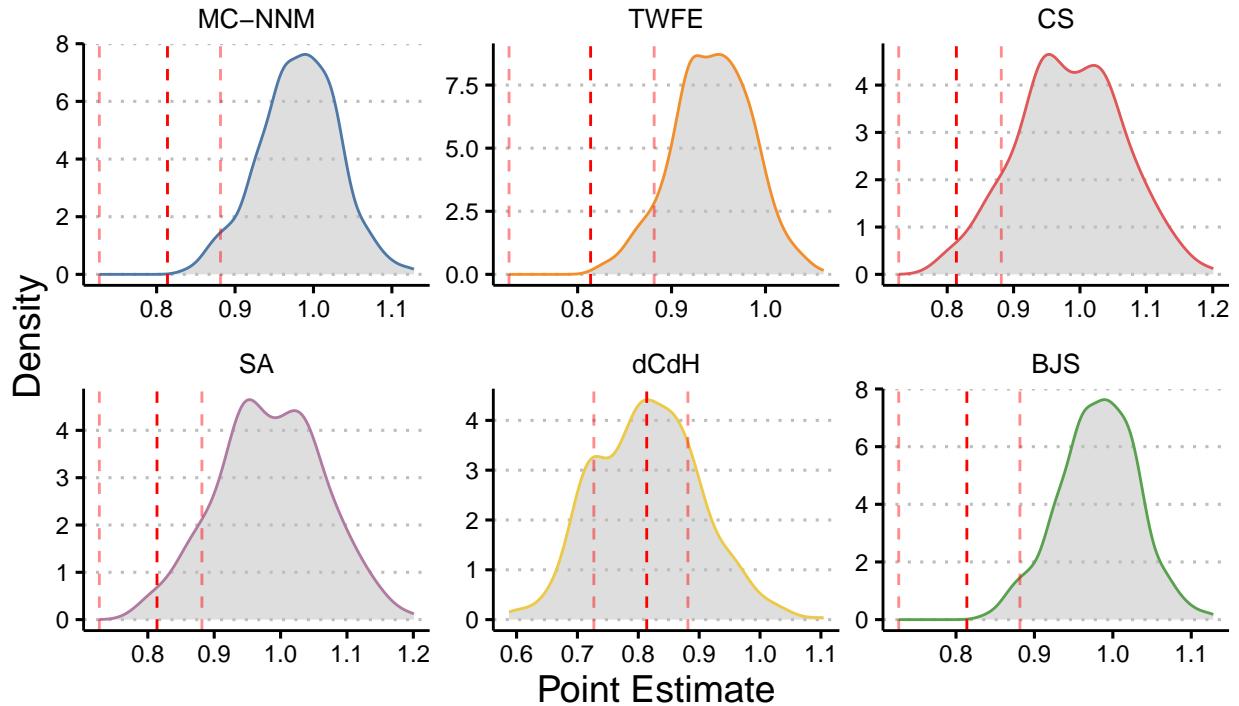
	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	0.727	0.814	0.881	0.024		
2	MC-NNM	0.895	1.014	1.119	0.037	0.200	0.202
3	TWFE	0.700	0.791	0.879	0.029	-0.022	0.035
4	CS	0.804	1.018	1.285	0.077	0.204	0.218
5	SA	0.804	1.018	1.285	0.077	0.204	0.218
6	dCdH	0.576	0.816	1.121	0.091	0.003	0.088
7	BJS	0.895	1.014	1.119	0.037	0.200	0.202

21 periods

### Outcome Data from One Draw of Simulation 4 with 21 Periods



### Distributions of ATET Estimates, 21 Periods

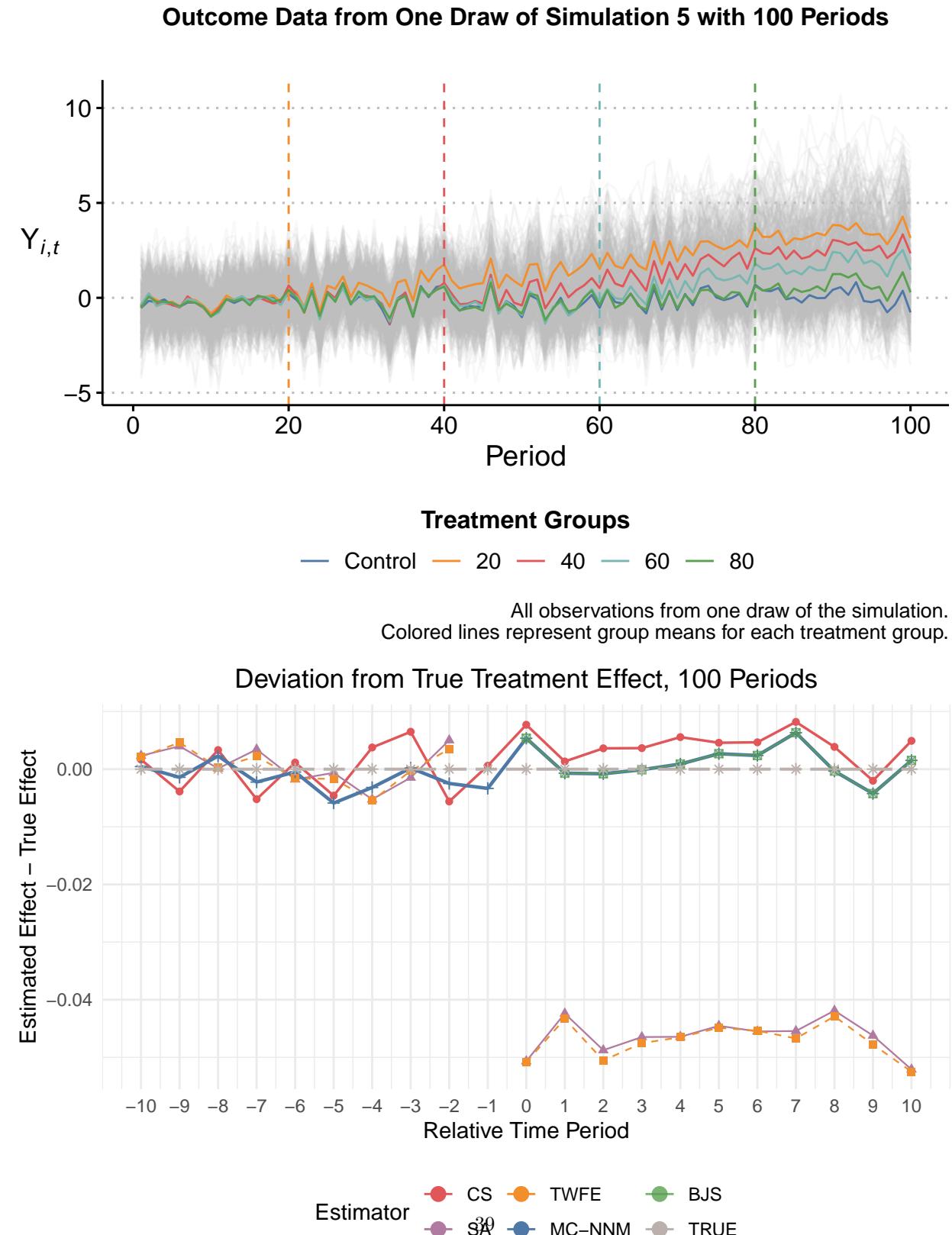


Density of point estimates of the ATET for each estimator. Vertical Red Lines indicate minimum, mean, and maximum of true parameter value, if only one is visible, the true value does not vary.

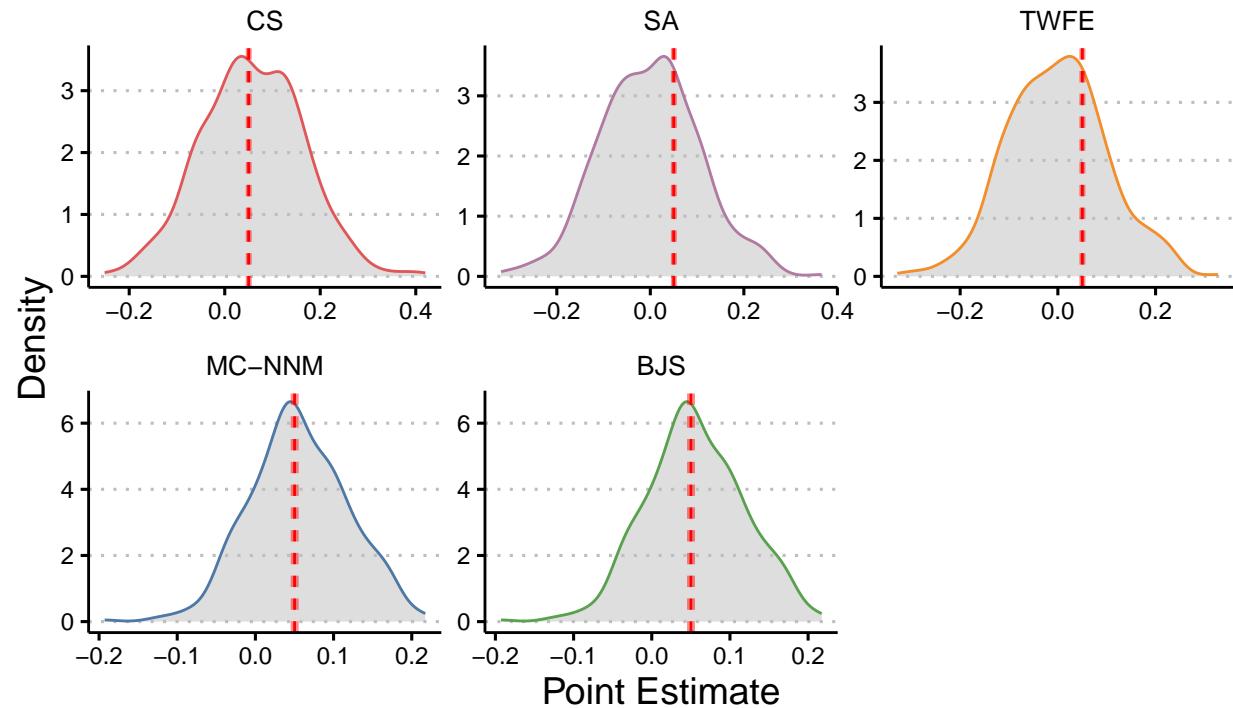
	<b>Estimator</b>	<b>Min</b>	<b>Mean</b>	<b>Max</b>	<b>SD</b>	<b>Bias</b>	<b>RMSE</b>
1	TRUE	0.727	0.814	0.881	0.024		
2	MC-NNM	0.839	0.981	1.128	0.050	0.167	0.173
3	TWFE	0.821	0.943	1.062	0.042	0.129	0.135
4	CS	0.781	0.985	1.201	0.080	0.171	0.187
5	SA	0.781	0.985	1.201	0.080	0.171	0.187
6	dCdH	0.588	0.815	1.104	0.085	0.001	0.082
7	BJS	0.839	0.981	1.128	0.050	0.167	0.173

## DGP 5: Multiple Treatment Groups, Time-Varying Homogeneous TE

100 periods



### Distributions of Relative Period 0 Effect Estimates, 100 Periods

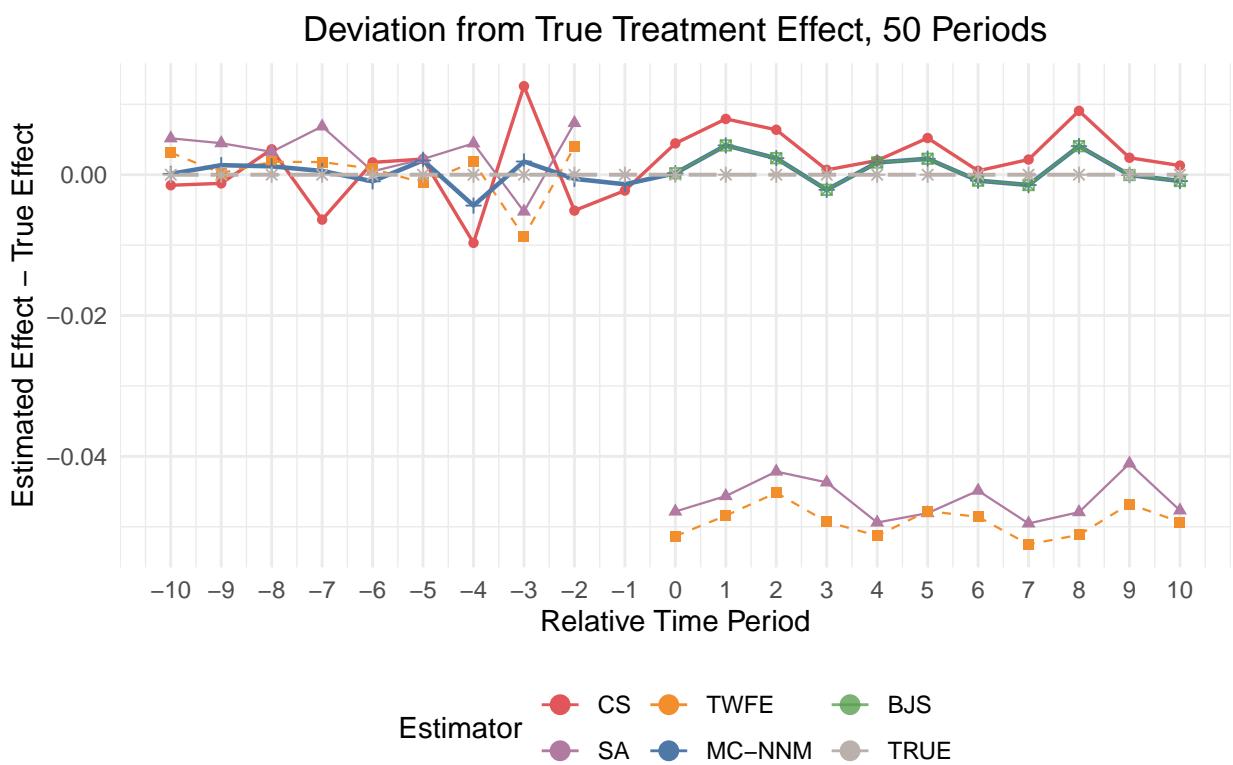
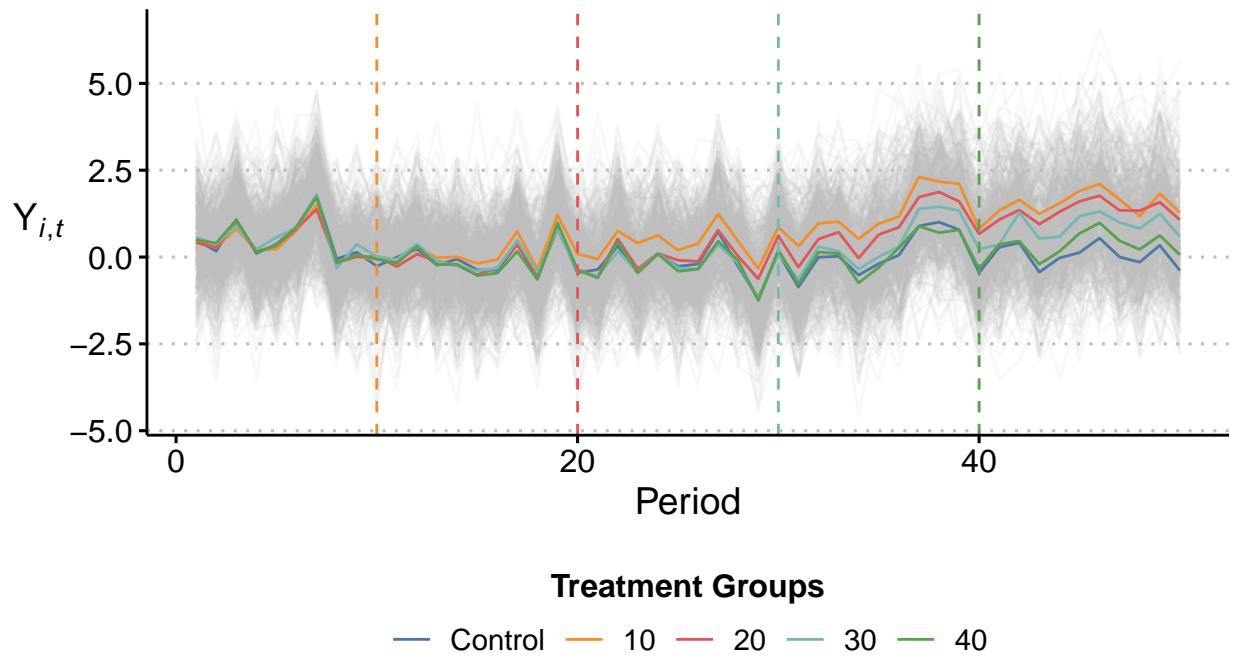


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.047	0.050	0.054	0.001			
2	MC-NNM	-0.193	0.055	0.217	0.063	0.005	0.063	0.001
3	TWFE	-0.329	-0.001	0.328	0.102	-0.051	0.114	-0.039
4	CS	-0.251	0.058	0.420	0.106	0.008	0.106	0.003
5	SA	-0.319	-0.001	0.366	0.106	-0.051	0.117	-0.038
6	BJS	-0.193	0.055	0.217	0.063	0.005	0.063	0.001

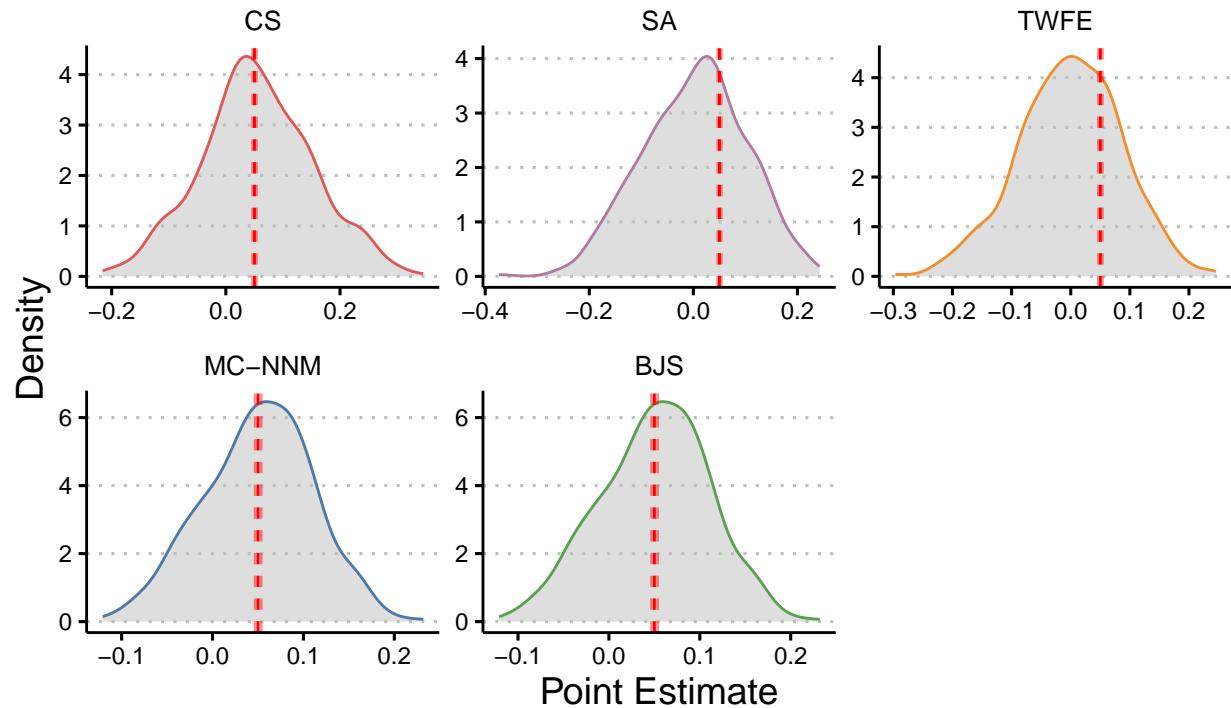
50 periods

### Outcome Data from One Draw of Simulation 5 with 50 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods  $-10$  to  $10$  over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 50 Periods

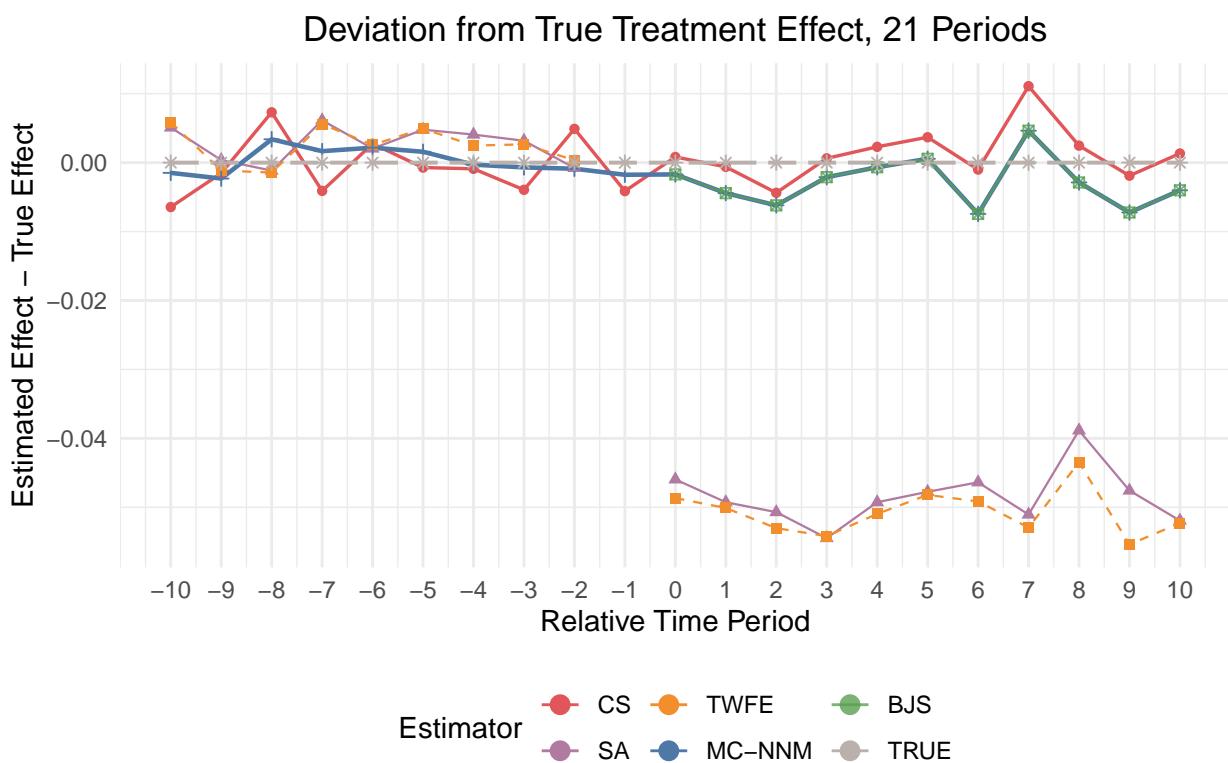
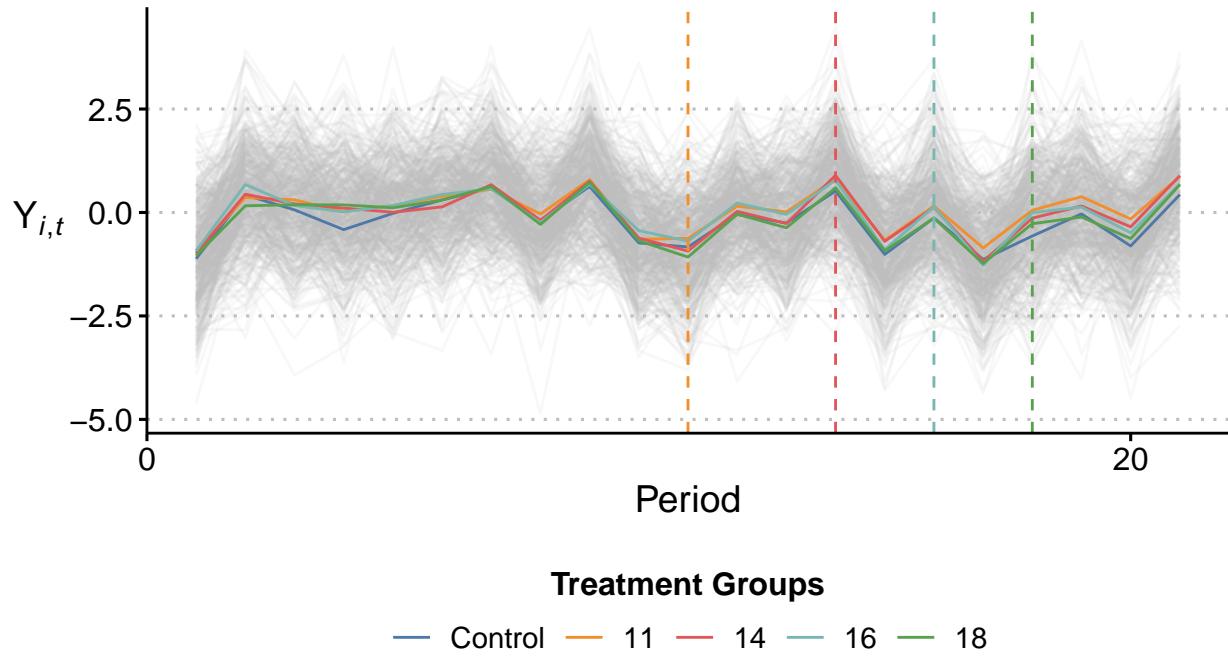


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.047	0.050	0.054	0.001			
2	MC-NNM	-0.121	0.050	0.232	0.060	0.000	0.060	0.001
3	TWFE	-0.297	-0.001	0.246	0.087	-0.051	0.101	-0.040
4	CS	-0.216	0.055	0.346	0.098	0.004	0.098	0.005
5	SA	-0.373	0.002	0.243	0.099	-0.048	0.110	-0.036
6	BJS	-0.121	0.050	0.232	0.060	0.000	0.060	0.001

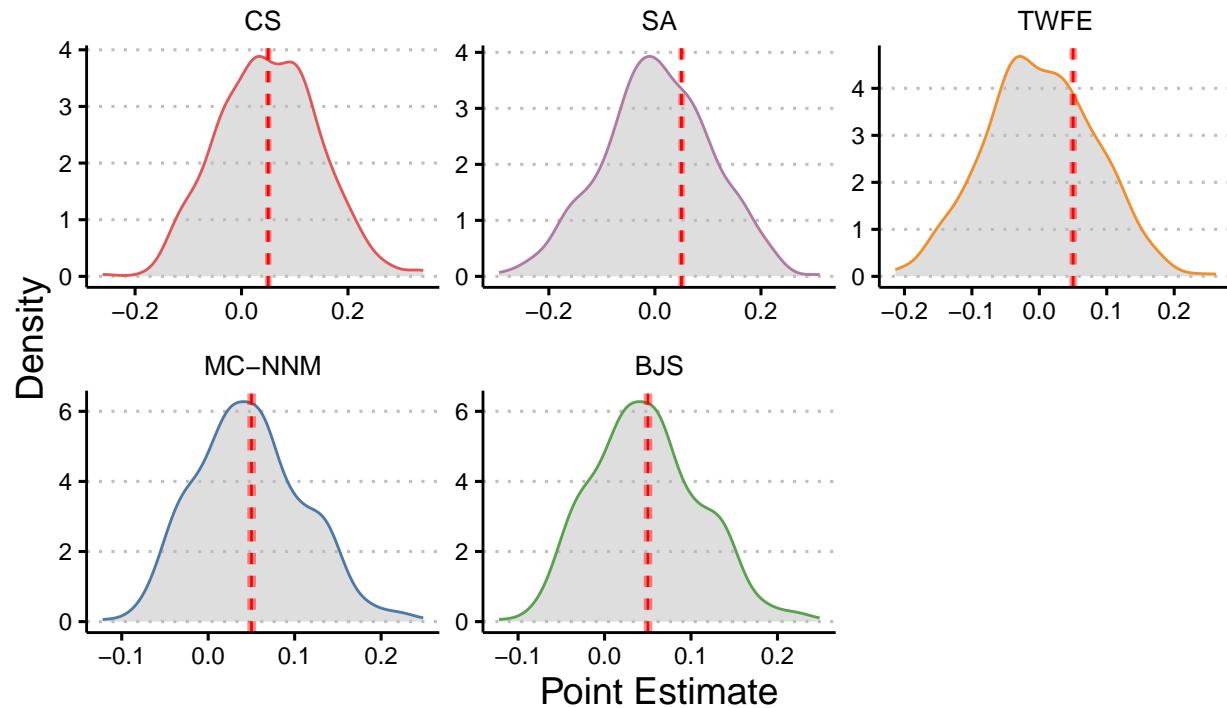
21 periods

### Outcome Data from One Draw of Simulation 5 with 21 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods –10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

## Distributions of Relative Period 0 Effect Estimates, 21 Periods

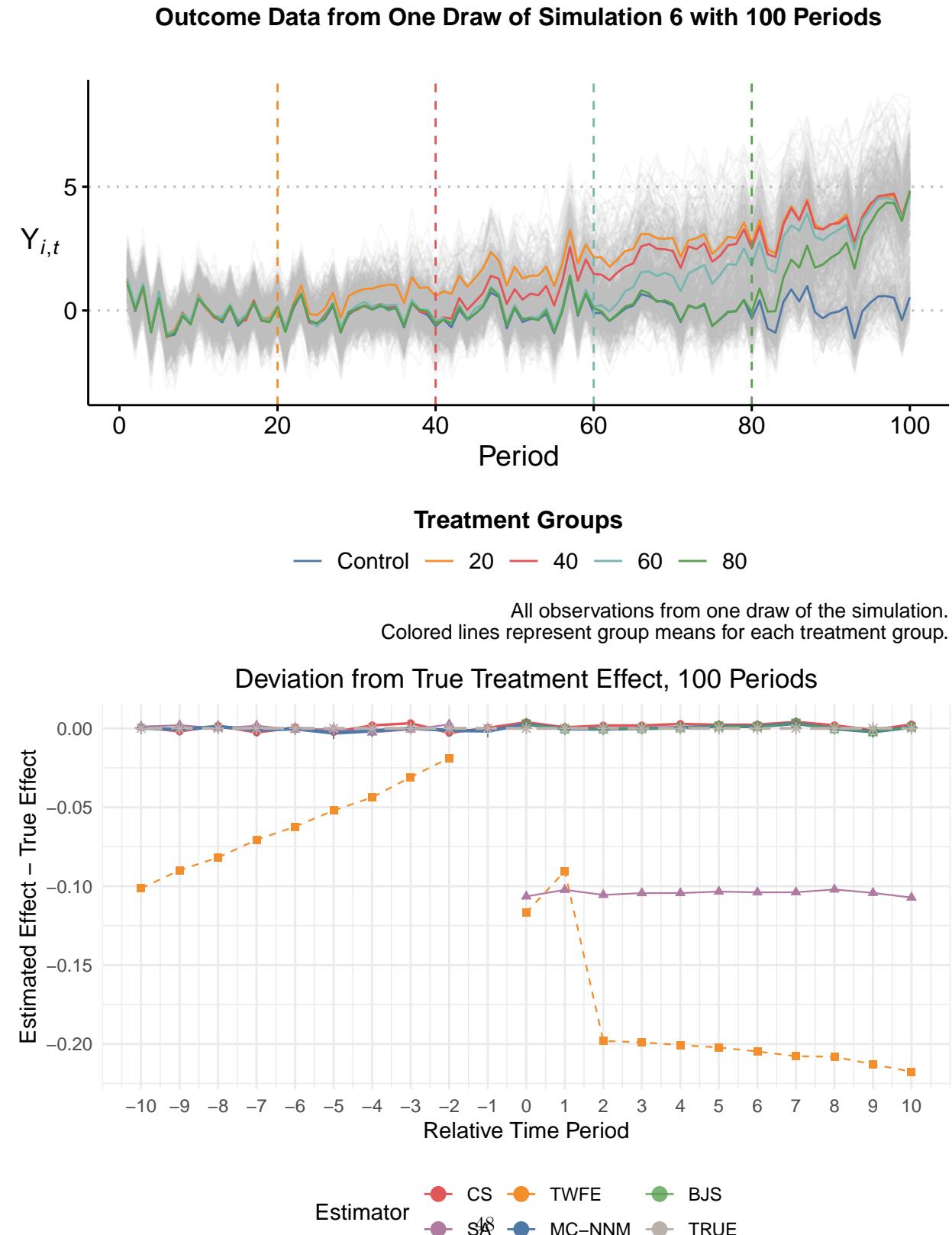


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

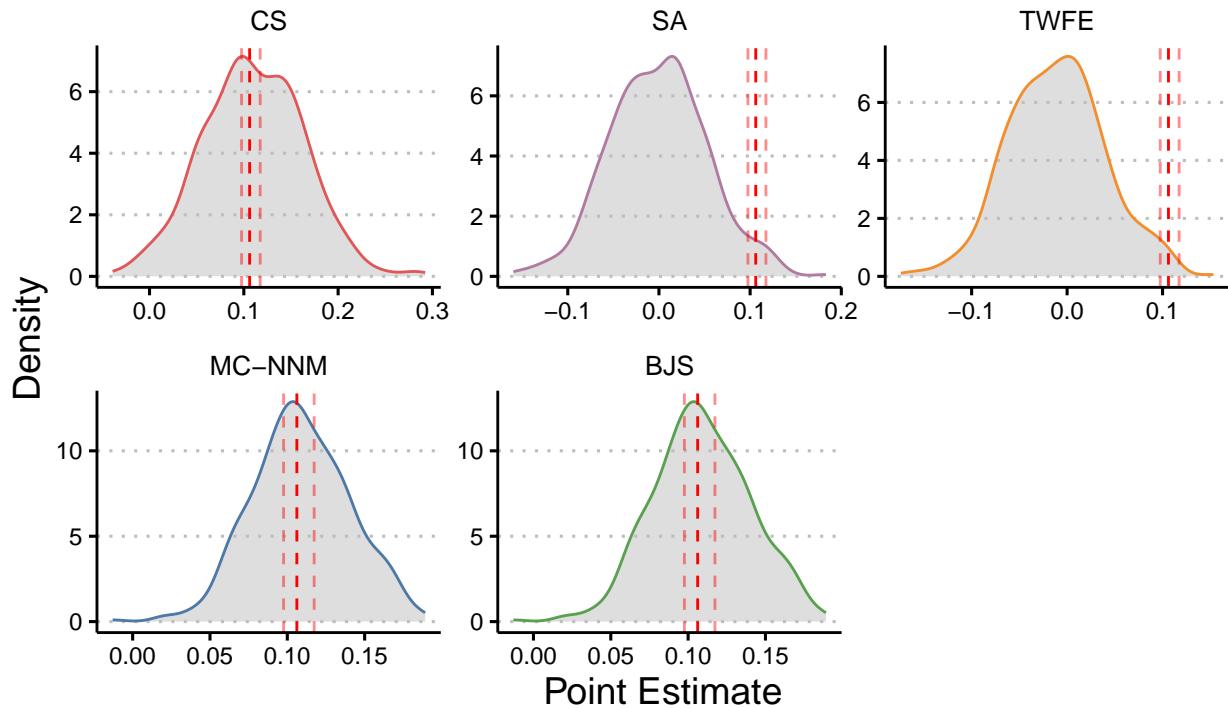
	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.047	0.050	0.054	0.001			
2	MC-NNM	-0.122	0.048	0.249	0.062	-0.002	0.062	-0.001
3	TWFE	-0.214	0.001	0.262	0.081	-0.049	0.094	-0.027
4	CS	-0.261	0.051	0.342	0.094	0.001	0.094	0.000
5	SA	-0.294	0.004	0.311	0.102	-0.046	0.112	-0.025
6	BJS	-0.122	0.048	0.249	0.062	-0.002	0.062	-0.003

## DGP 6: Multiple Treatment Groups, Time-Varying Heterogeneous TE

100 periods



### Distributions of Relative Period 0 Effect Estimates, 100 Periods

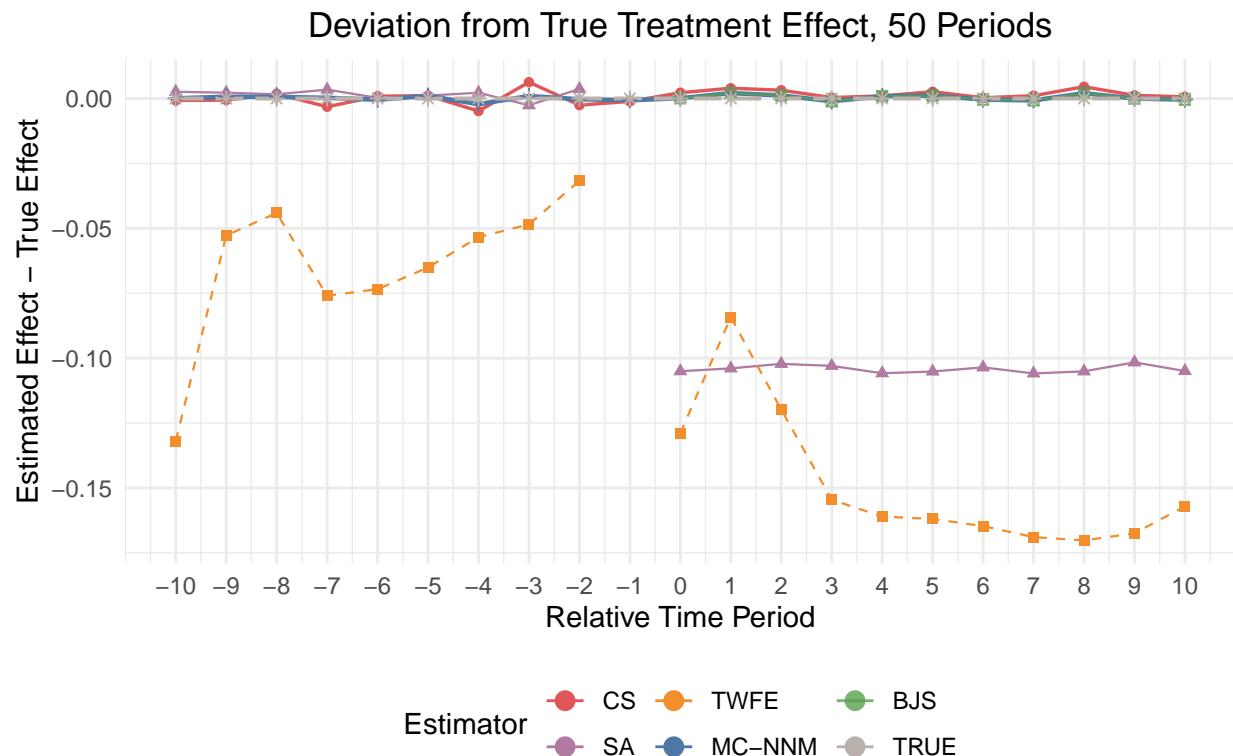
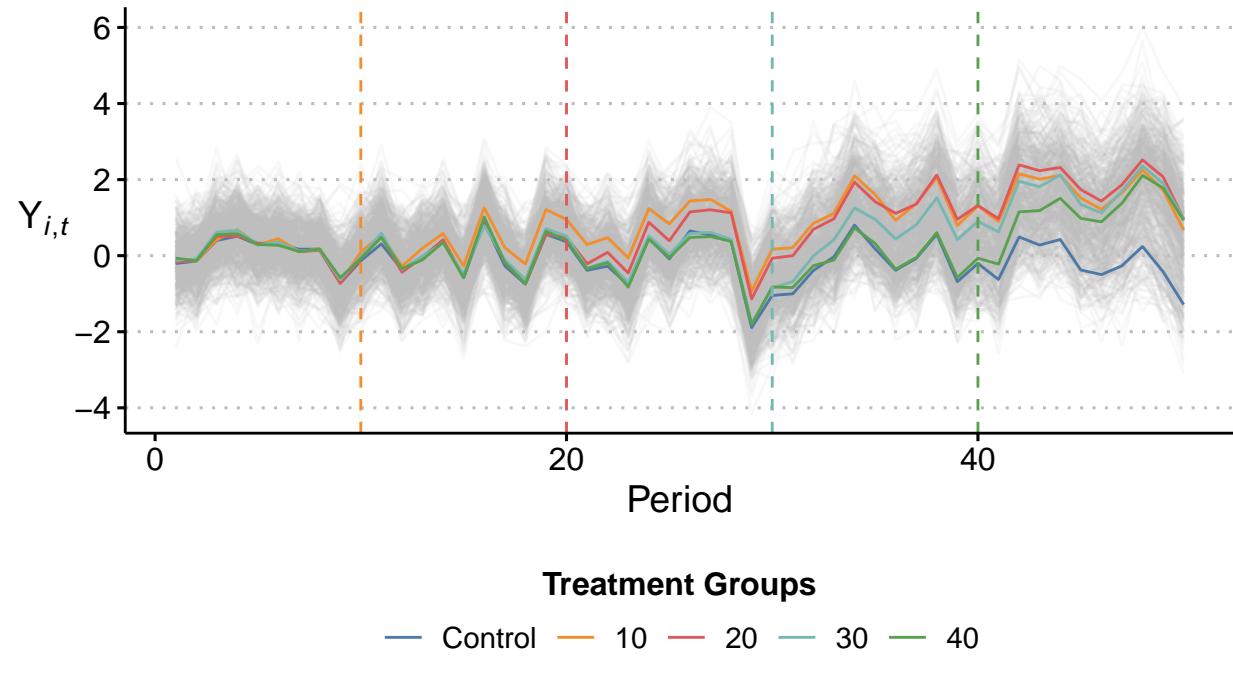


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.098	0.106	0.117	0.003			
2	MC-NNM	-0.013	0.109	0.189	0.031	0.003	0.032	0.000
3	TWFE	-0.174	-0.011	0.153	0.051	-0.117	0.127	-0.037
4	CS	-0.039	0.110	0.292	0.053	0.004	0.053	0.001
5	SA	-0.160	-0.000	0.183	0.053	-0.106	0.119	-0.039
6	BJS	-0.013	0.109	0.189	0.031	0.003	0.032	0.000

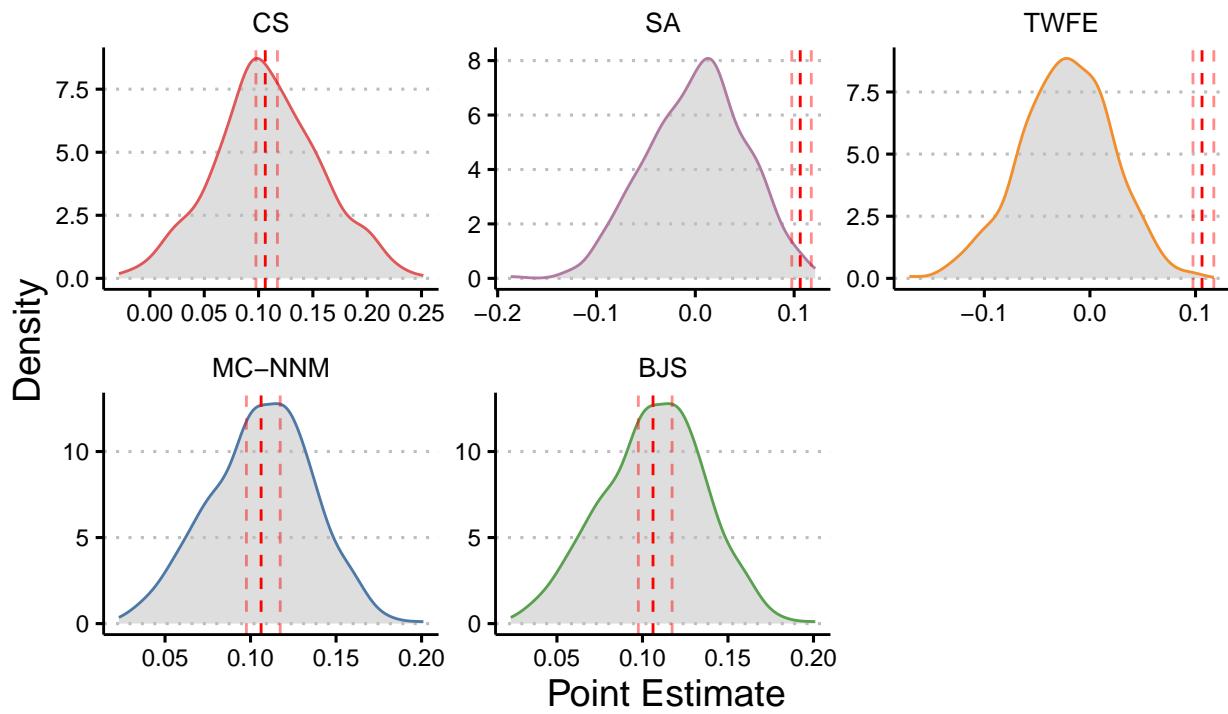
50 periods

### Outcome Data from One Draw of Simulation 6 with 50 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 50 Periods

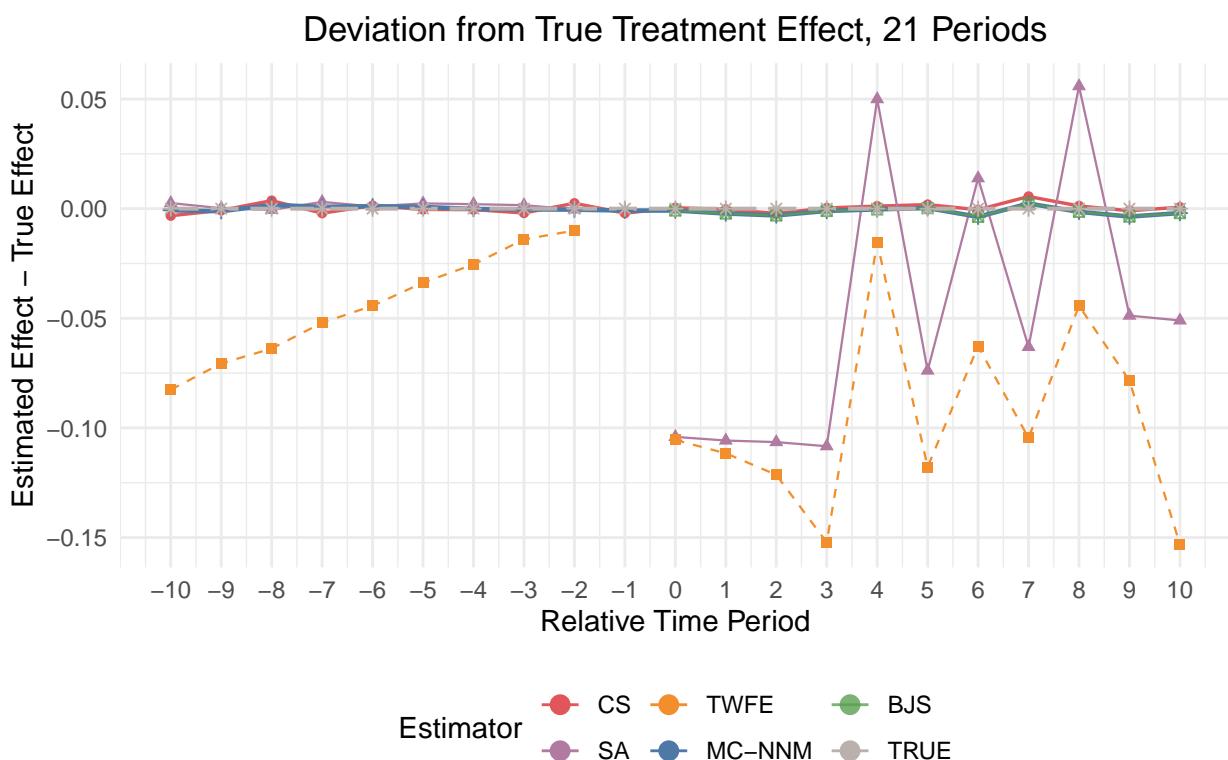
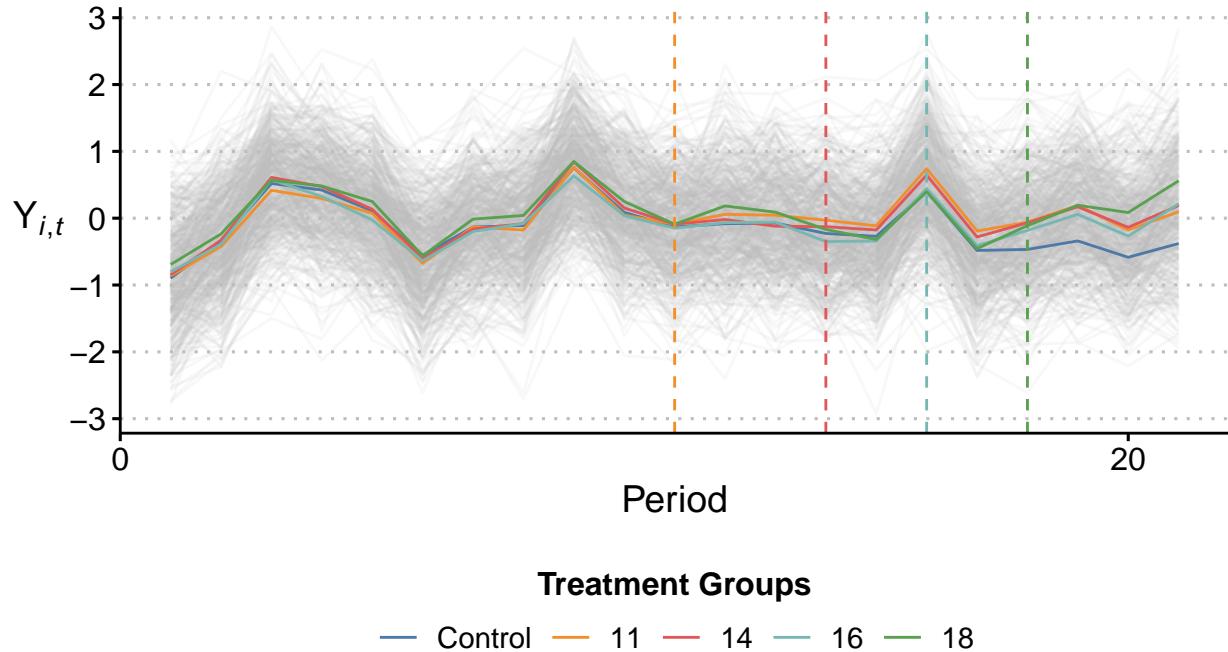


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.098	0.106	0.117	0.003			
2	MC-NNM	0.023	0.106	0.201	0.030	0.000	0.030	0.000
3	TWFE	-0.171	-0.023	0.102	0.044	-0.129	0.136	-0.044
4	CS	-0.029	0.108	0.252	0.049	0.002	0.049	0.002
5	SA	-0.187	0.001	0.121	0.050	-0.105	0.116	-0.038
6	BJS	0.023	0.106	0.201	0.030	0.000	0.030	0.001

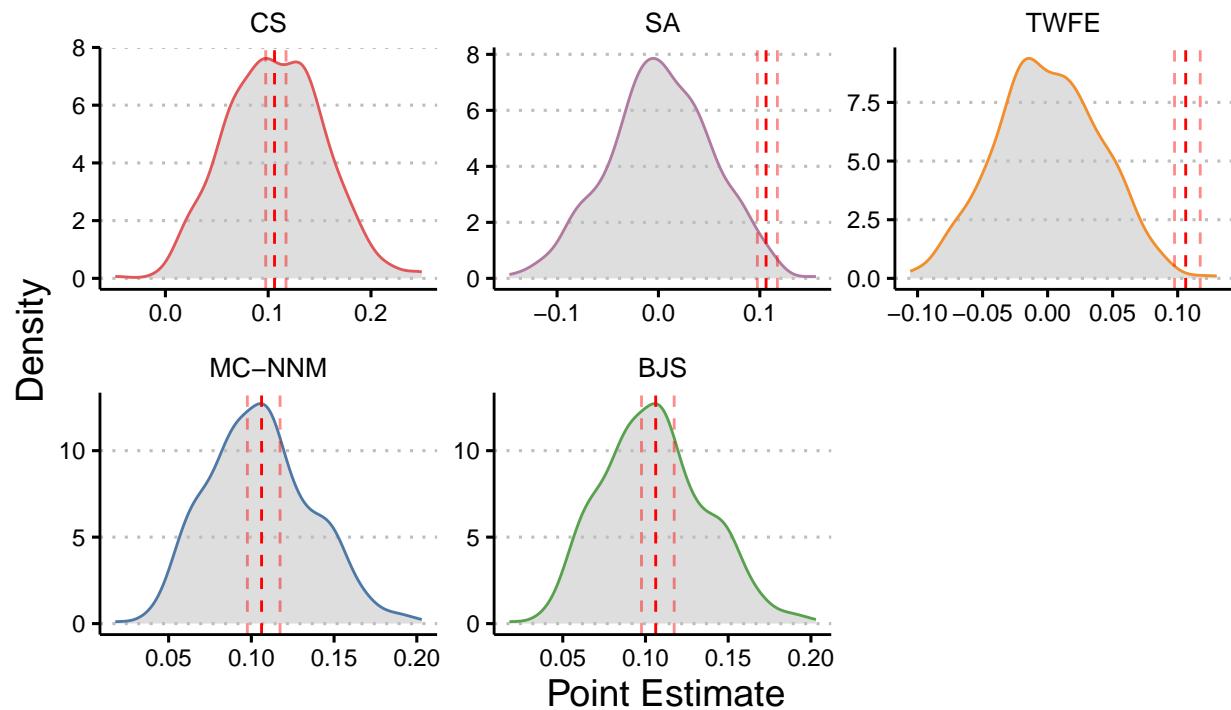
21 periods

### Outcome Data from One Draw of Simulation 6 with 21 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 21 Periods

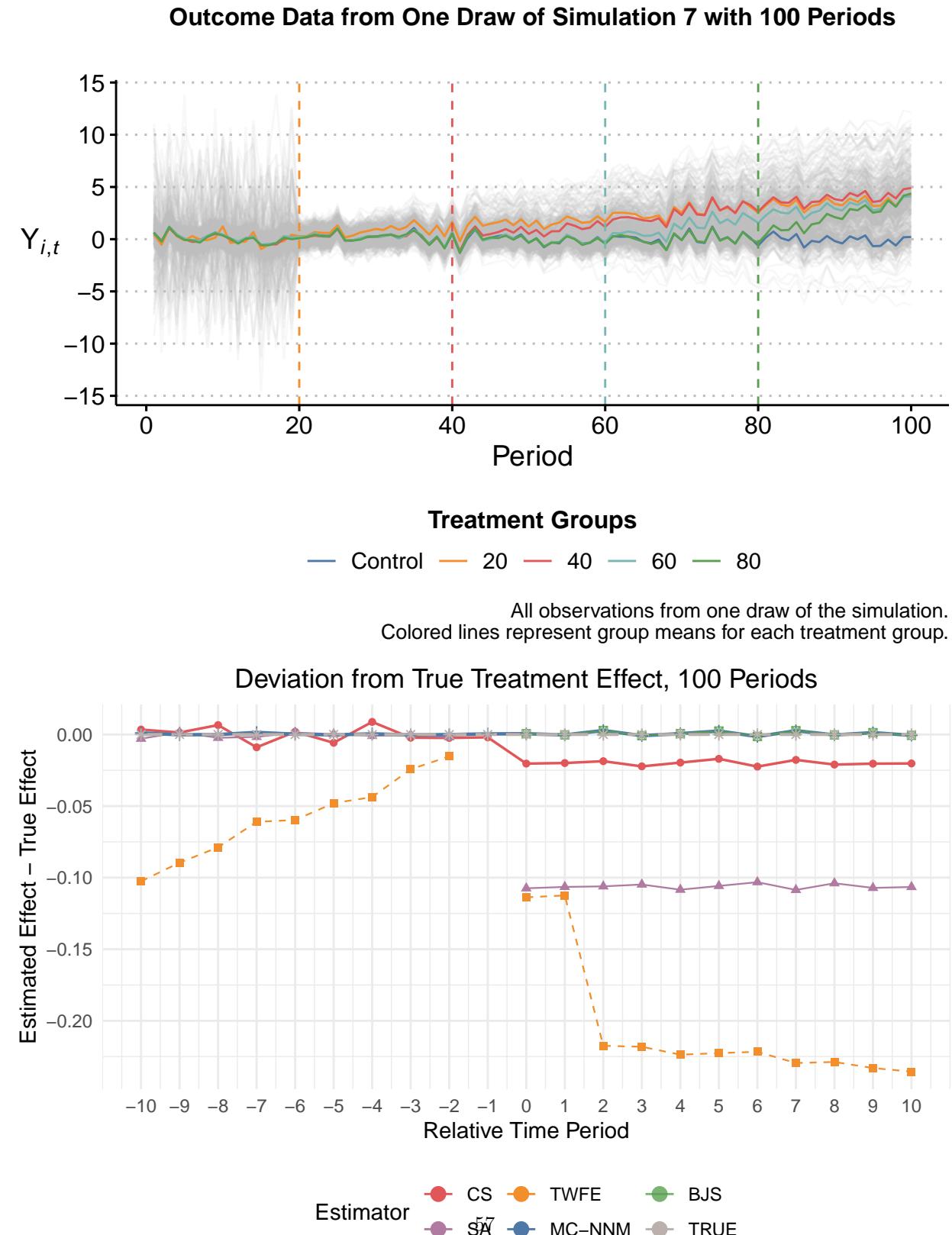


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

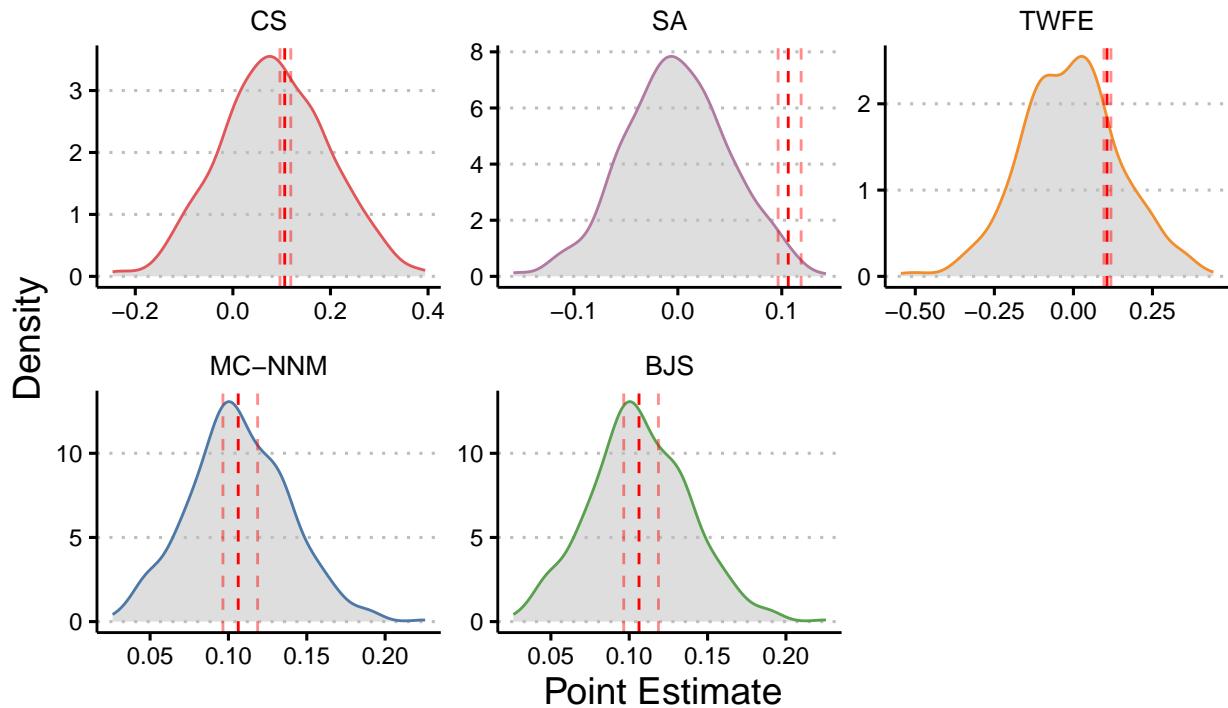
	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.098	0.106	0.117	0.003			
2	MC-NNM	0.018	0.105	0.203	0.031	-0.001	0.031	-0.001
3	TWFE	-0.106	0.001	0.130	0.040	-0.106	0.113	-0.073
4	CS	-0.049	0.107	0.249	0.047	0.000	0.047	0.000
5	SA	-0.147	0.002	0.155	0.051	-0.104	0.116	-0.026
6	BJS	0.018	0.105	0.203	0.031	-0.001	0.031	-0.001

## DGP 7: Multiple Treatment Groups, Time-Varying Heterogeneous TE, Unconditional Parallel Trends Violated

100 periods



### Distributions of Relative Period 0 Effect Estimates, 100 Periods

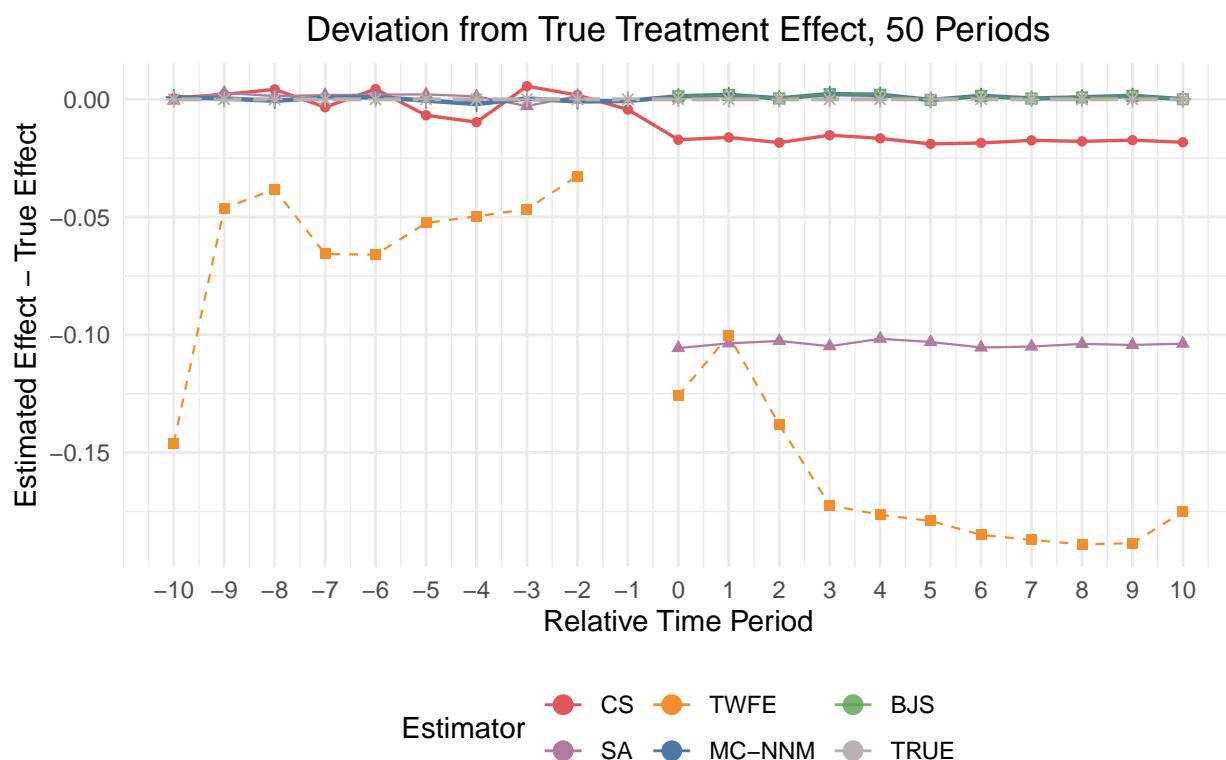
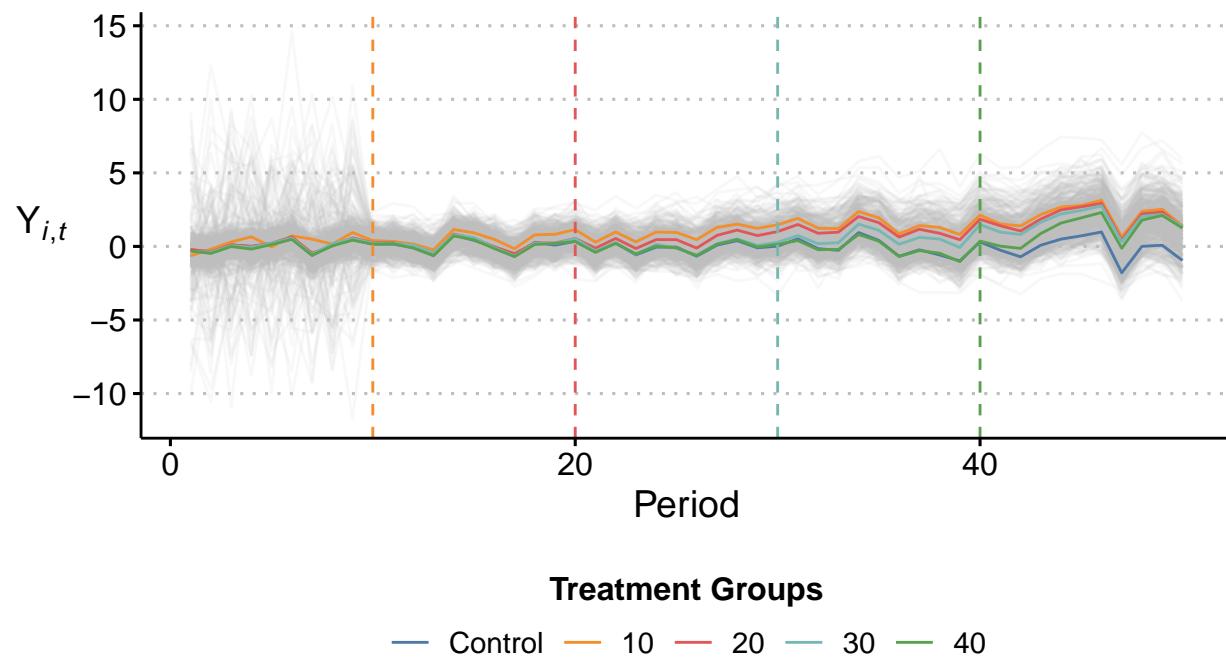


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.097	0.106	0.119	0.004			
2	MC-NNM	0.026	0.107	0.226	0.032	0.001	0.032	0.000
3	TWFE	-0.546	-0.008	0.443	0.157	-0.114	0.193	-0.062
4	CS	-0.247	0.086	0.394	0.110	-0.020	0.112	-0.034
5	SA	-0.158	-0.001	0.143	0.050	-0.107	0.119	-0.041
6	BJS	0.026	0.107	0.226	0.032	0.001	0.032	0.000

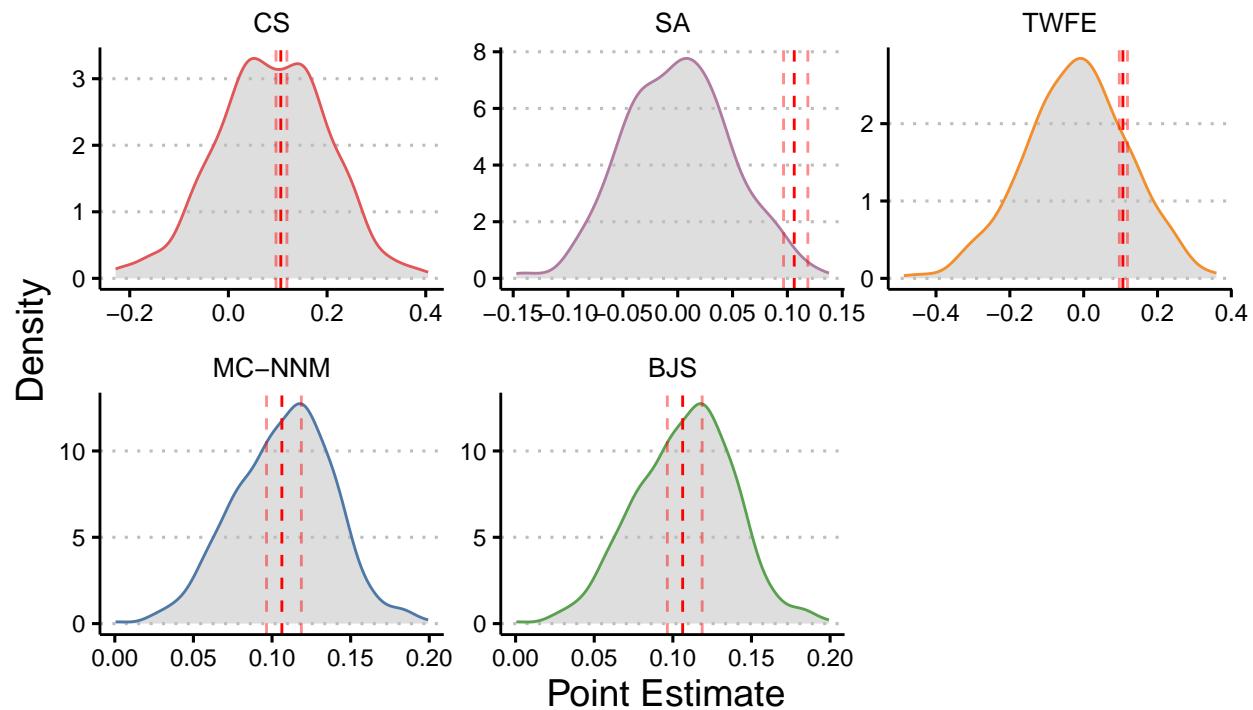
50 periods

### Outcome Data from One Draw of Simulation 7 with 50 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 50 Periods

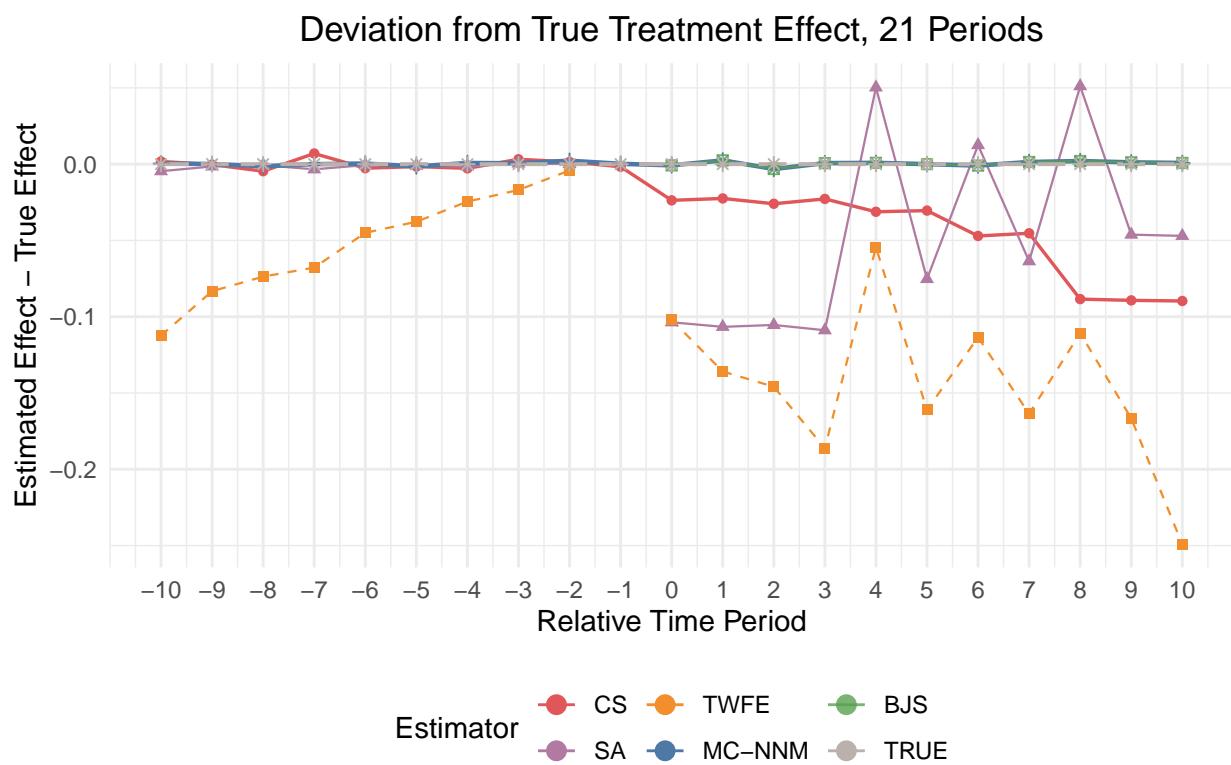
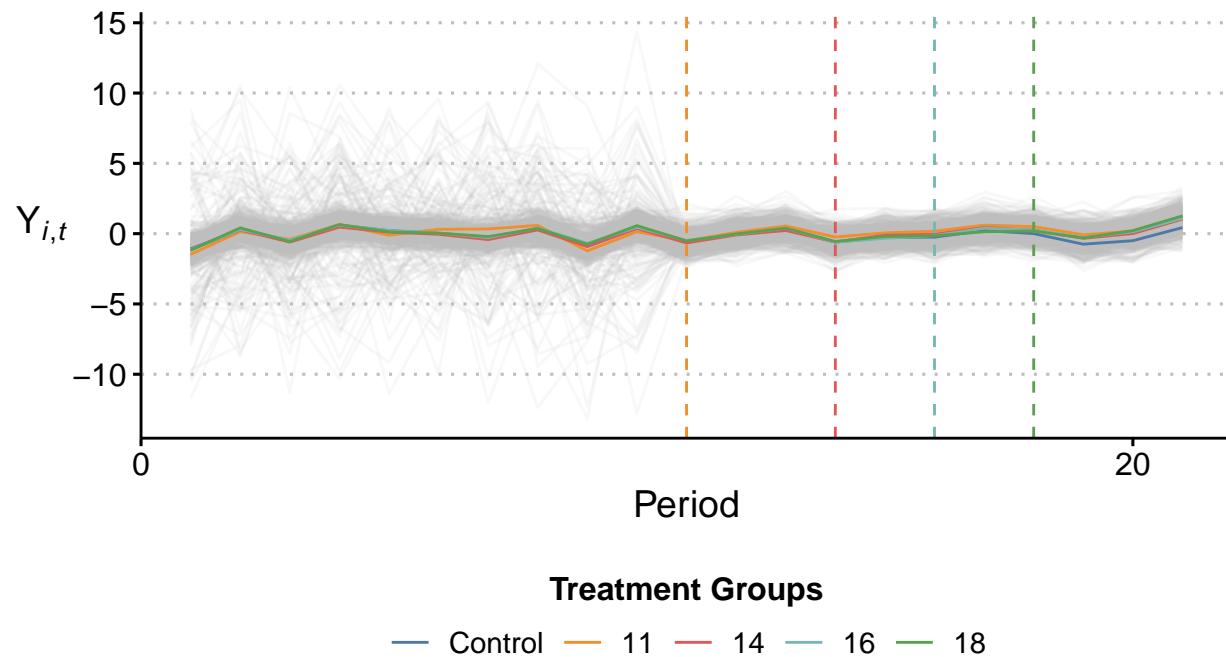


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.097	0.106	0.119	0.004			
2	MC-NNM	0.001	0.108	0.199	0.031	0.001	0.031	0.002
3	TWFE	-0.487	-0.020	0.360	0.141	-0.126	0.188	-0.067
4	CS	-0.229	0.089	0.405	0.112	-0.017	0.112	-0.028
5	SA	-0.147	0.001	0.138	0.049	-0.106	0.116	-0.037
6	BJS	0.001	0.108	0.199	0.031	0.001	0.031	0.002

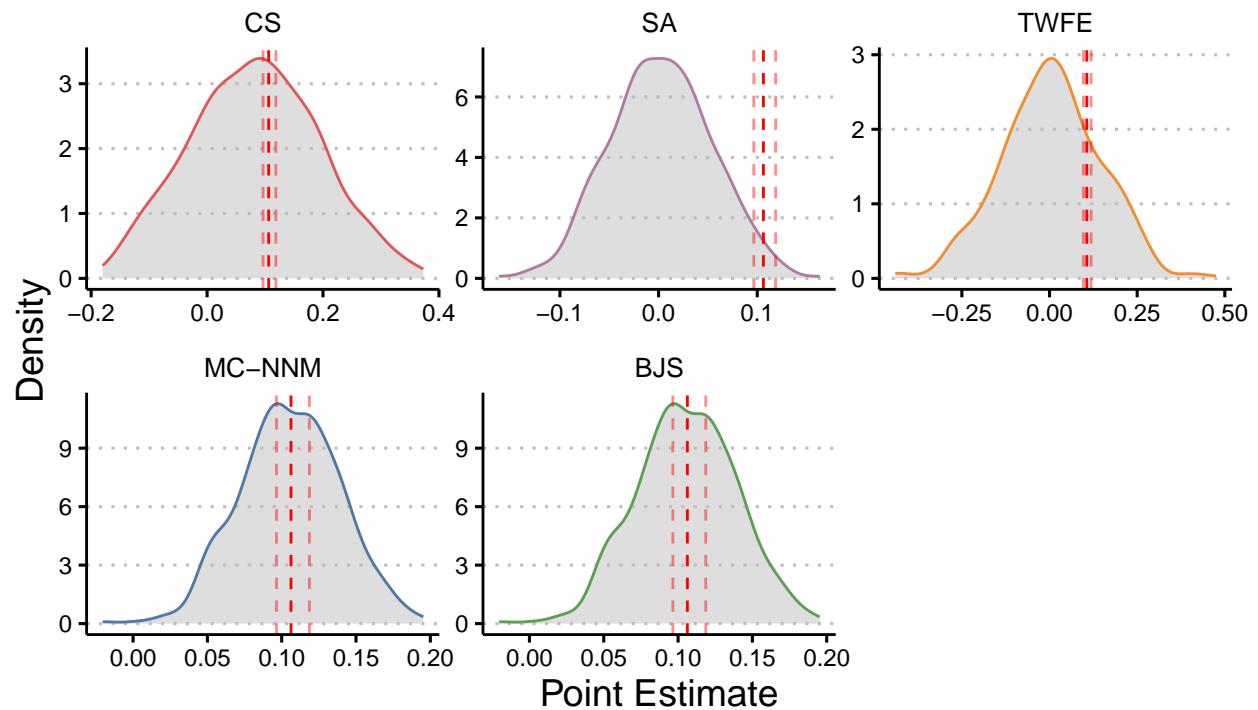
21 periods

### Outcome Data from One Draw of Simulation 7 with 21 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 21 Periods

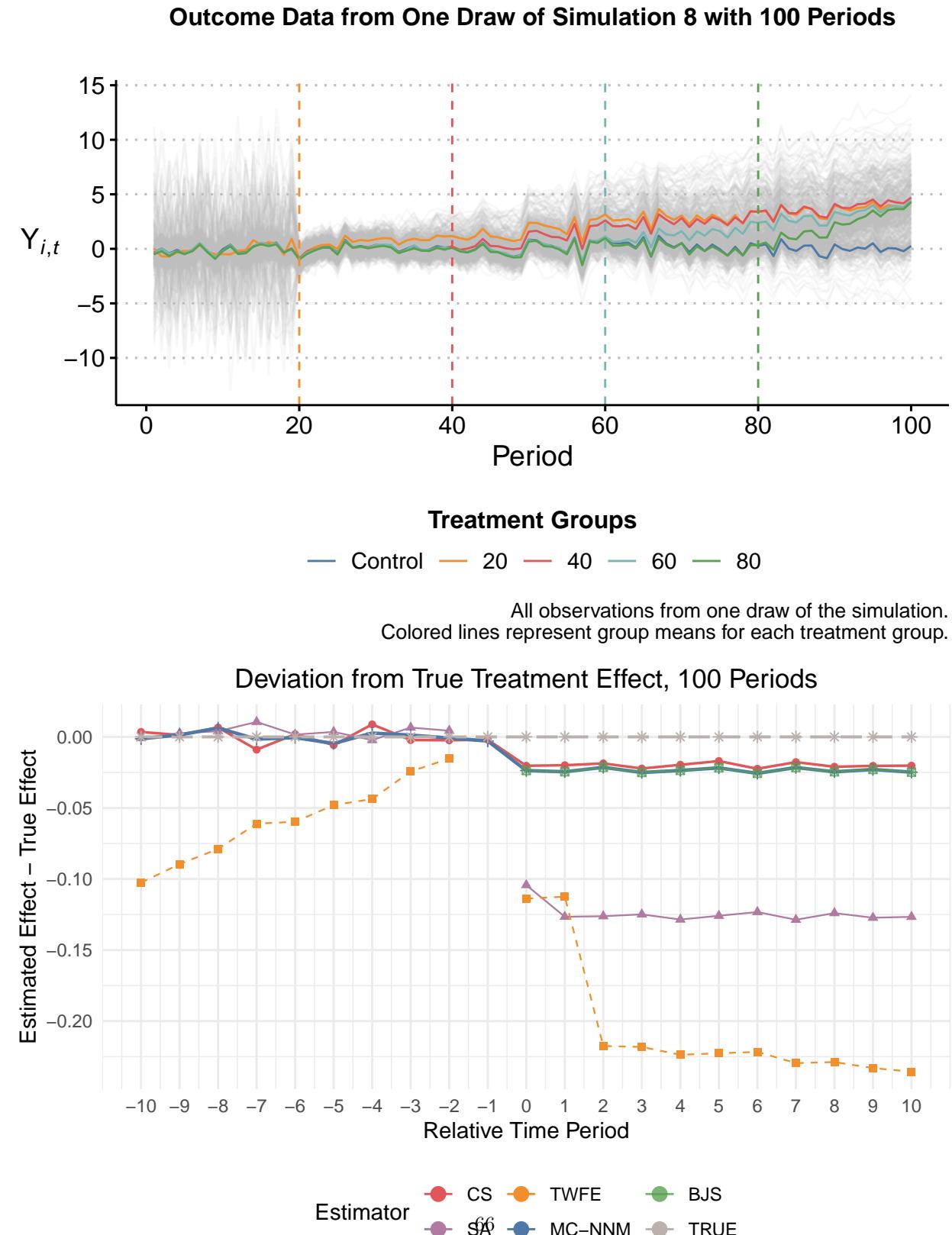


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

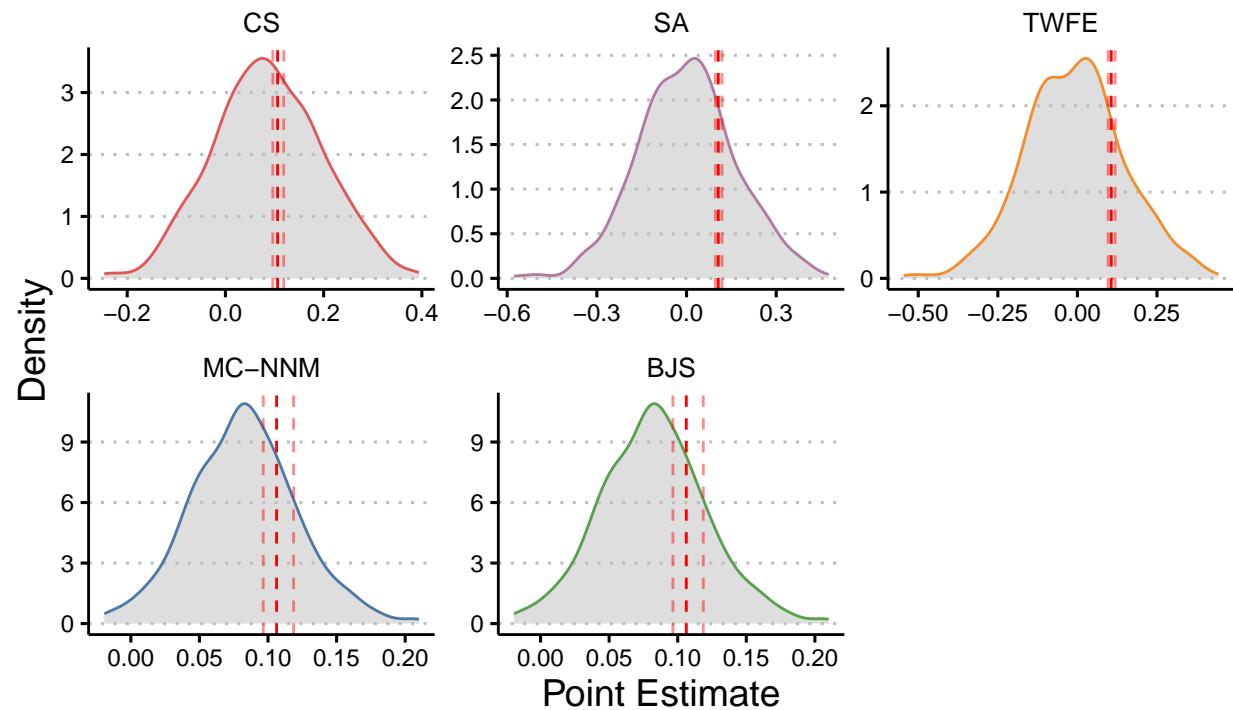
	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.097	0.106	0.119	0.004			
2	MC-NNM	-0.020	0.105	0.195	0.033	-0.001	0.033	0.000
3	TWFE	-0.440	0.004	0.475	0.142	-0.102	0.175	-0.103
4	CS	-0.180	0.083	0.373	0.110	-0.024	0.112	-0.025
5	SA	-0.162	0.003	0.163	0.051	-0.104	0.116	-0.028
6	BJS	-0.020	0.105	0.195	0.033	-0.001	0.033	0.000

## DGP 8: Multiple Treatment Groups, Time-Varying Heterogeneous TE, Parallel Trends Violated

100 periods



### Distributions of Relative Period 0 Effect Estimates, 100 Periods

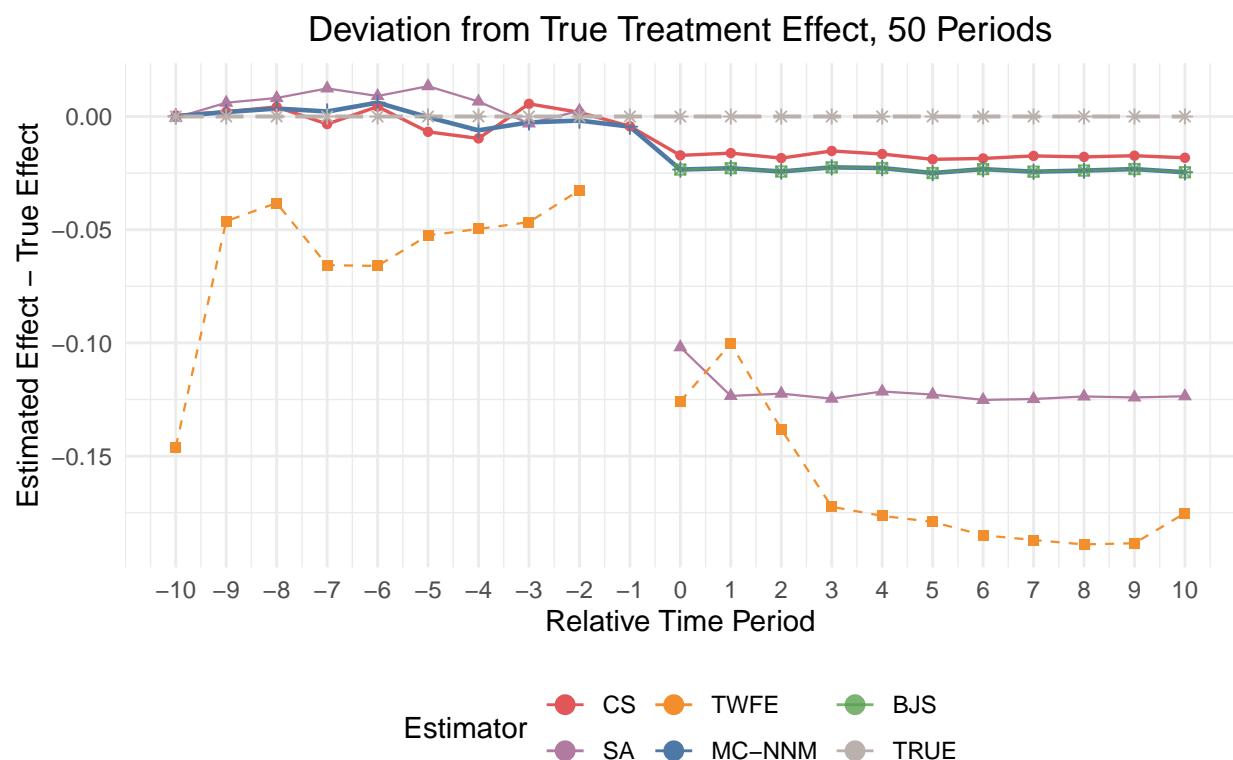
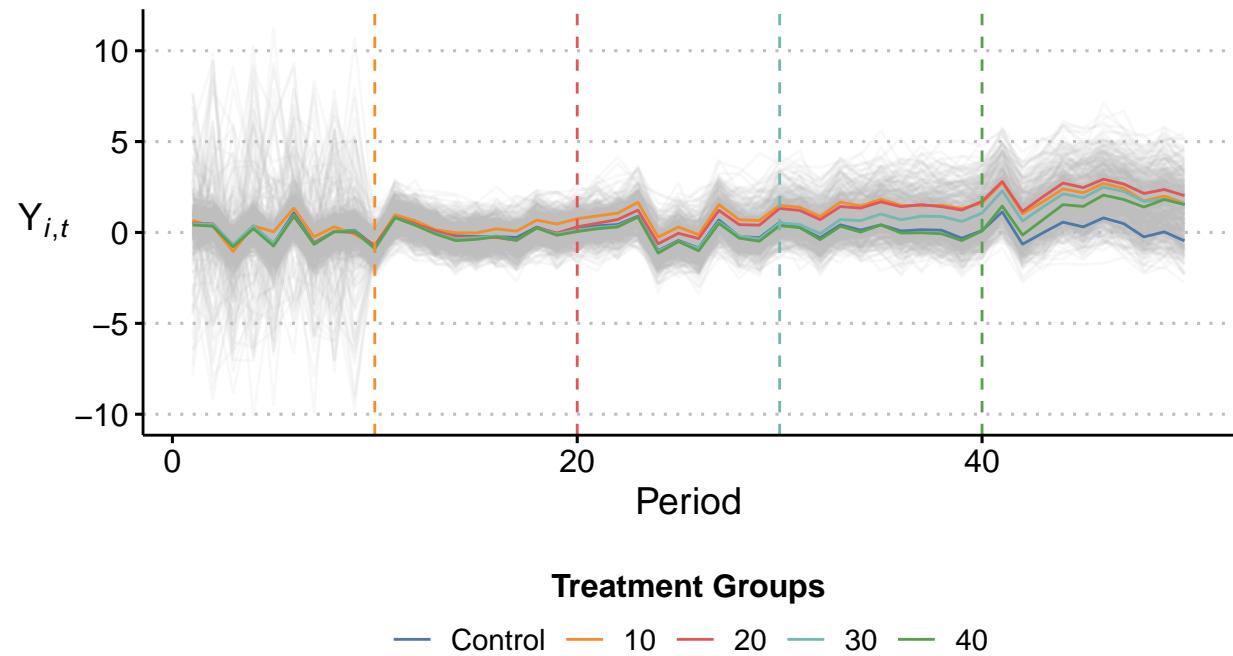


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.097	0.106	0.119	0.004			
2	MC-NNM	-0.019	0.083	0.210	0.039	-0.024	0.045	-0.040
3	TWFE	-0.546	-0.008	0.443	0.157	-0.114	0.193	-0.062
4	CS	-0.247	0.086	0.394	0.110	-0.020	0.112	-0.034
5	SA	-0.577	0.002	0.475	0.163	-0.104	0.194	-0.073
6	BJS	-0.019	0.083	0.210	0.039	-0.024	0.045	-0.050

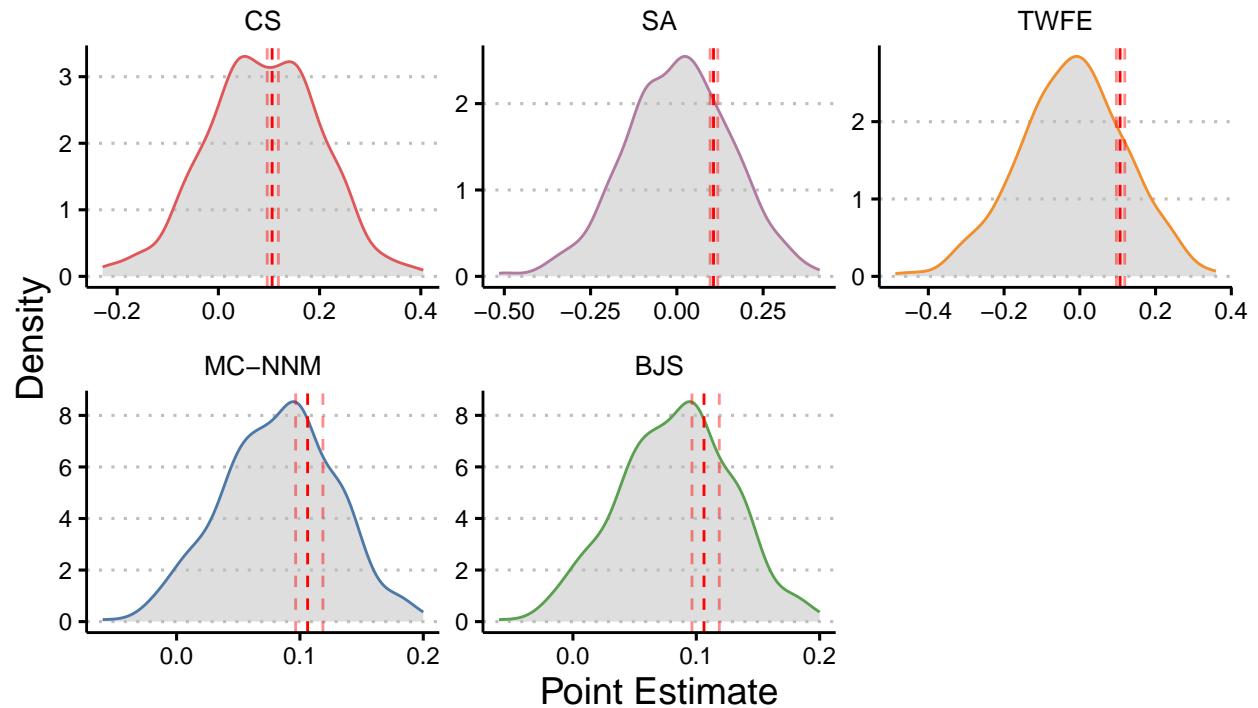
50 periods

### Outcome Data from One Draw of Simulation 8 with 50 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

### Distributions of Relative Period 0 Effect Estimates, 50 Periods

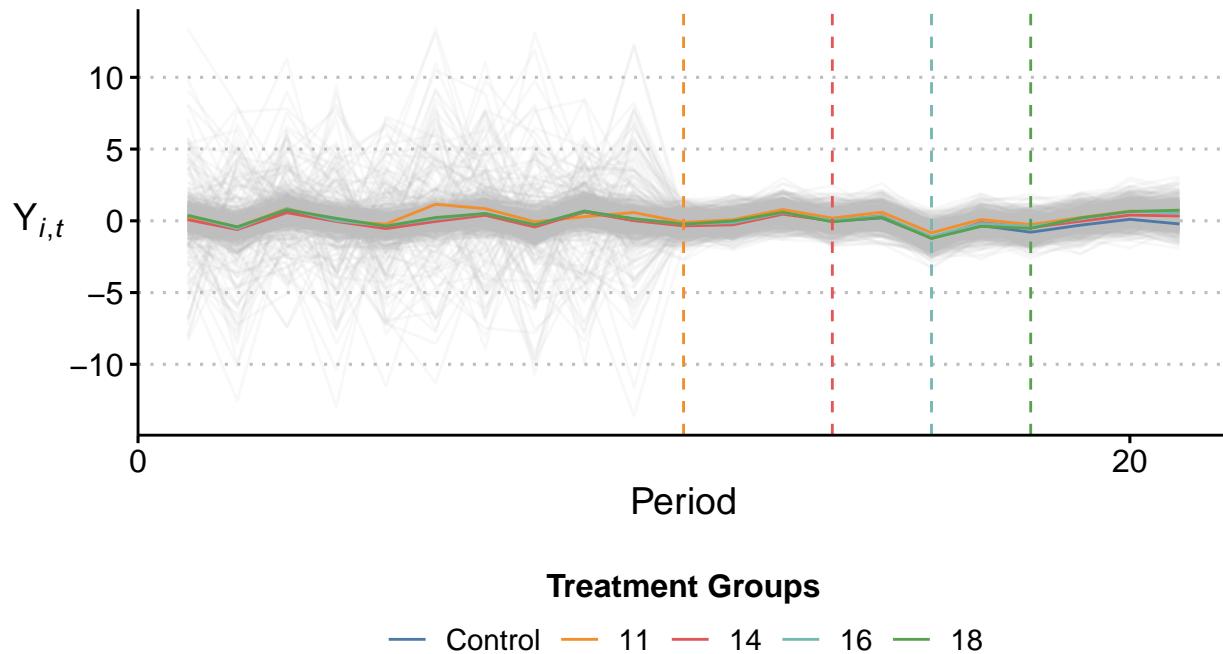


Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

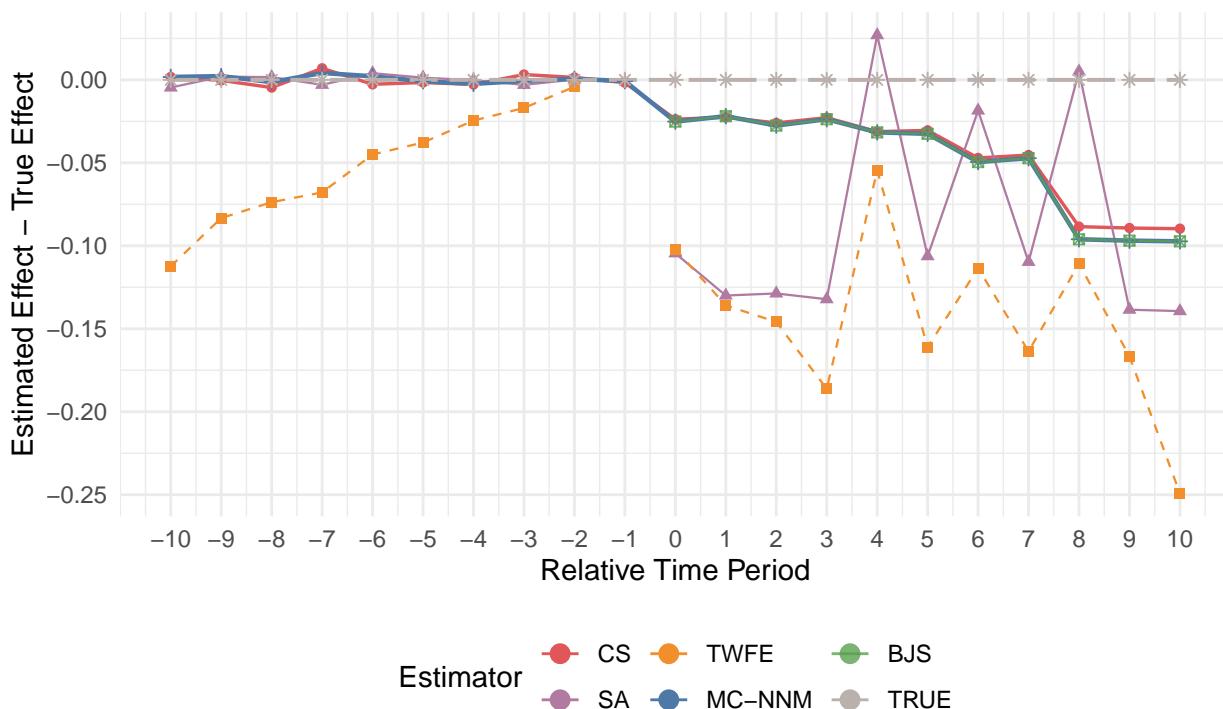
	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.097	0.106	0.119	0.004			
2	MC-NNM	-0.060	0.083	0.200	0.045	-0.023	0.051	-0.039
3	TWFE	-0.487	-0.020	0.360	0.141	-0.126	0.188	-0.067
4	CS	-0.229	0.089	0.405	0.112	-0.017	0.112	-0.028
5	SA	-0.515	0.004	0.414	0.153	-0.102	0.184	-0.067
6	BJS	-0.060	0.083	0.200	0.045	-0.023	0.051	-0.049

21 periods

### Outcome Data from One Draw of Simulation 8 with 21 Periods

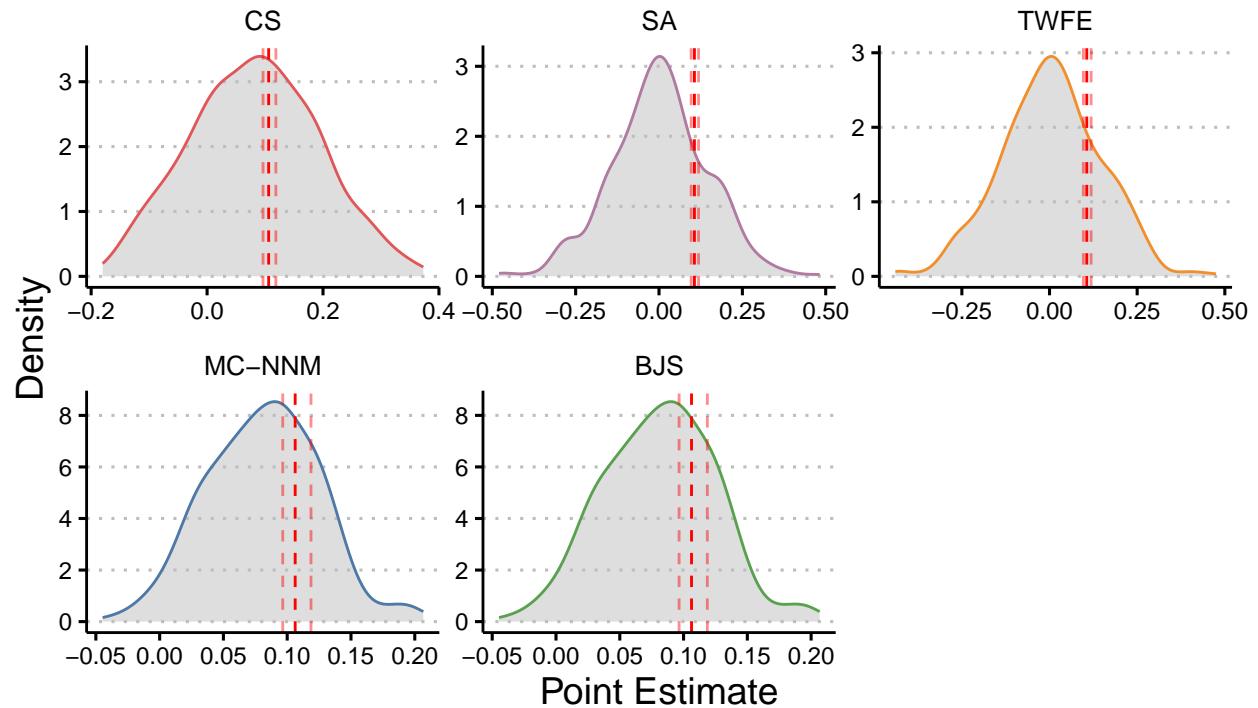


### Deviation from True Treatment Effect, 21 Periods



Mean of point estimates of the Treatment Effect for each estimator in Relative Periods -10 to 10 over 500 iterations .  
Missing Points mean that an Estimate is not produced for that relative period.

## Distributions of Relative Period 0 Effect Estimates, 21 Periods



Density of point estimates of the treatment effect in relative period 0 for each estimator.  
Vertical Red Lines indicate minimum, mean, and maximum of true parameter value.

	Estimator	Min	Mean	Max	SD	t=0 Bias	t=0 RMSE	All Relative Periods Bias
1	TRUE	0.097	0.106	0.119	0.004			
2	MC-NNM	-0.045	0.081	0.207	0.044	-0.025	0.050	-0.026
3	TWFE	-0.440	0.004	0.475	0.142	-0.102	0.175	-0.103
4	CS	-0.180	0.083	0.373	0.110	-0.024	0.112	-0.025
5	SA	-0.480	0.002	0.482	0.142	-0.105	0.176	-0.049
6	BJS	-0.045	0.081	0.207	0.044	-0.025	0.050	-0.050