Does Relationship-Based Policing Work? An Impact Evaluation of the LAPD Community Safety Partnership using Augmented Synthetic Control Methods

Sydney Kahmann, Erin Hartman, Jorja Leap, P. Jeffrey Brantingham

Departments of Statistics (1,2), Political Science (2), Social Welfare (3), and Anthropology (4) at the University of California, Los Angeles

Link to official evaluation report

Link to corresponding statistical paper

LAPD Community Safety Partnership (CSP)

- Launched in late 2011 in South LA public housing developments, Jordan Downs and Nickerson Gardens
- CSP is shift from paramilitary to community policing, **working with residents to prevent crime**
- Specially-trained CSP officers support and develop community and youth programs to improve quality of life and reduce violent crime [4]
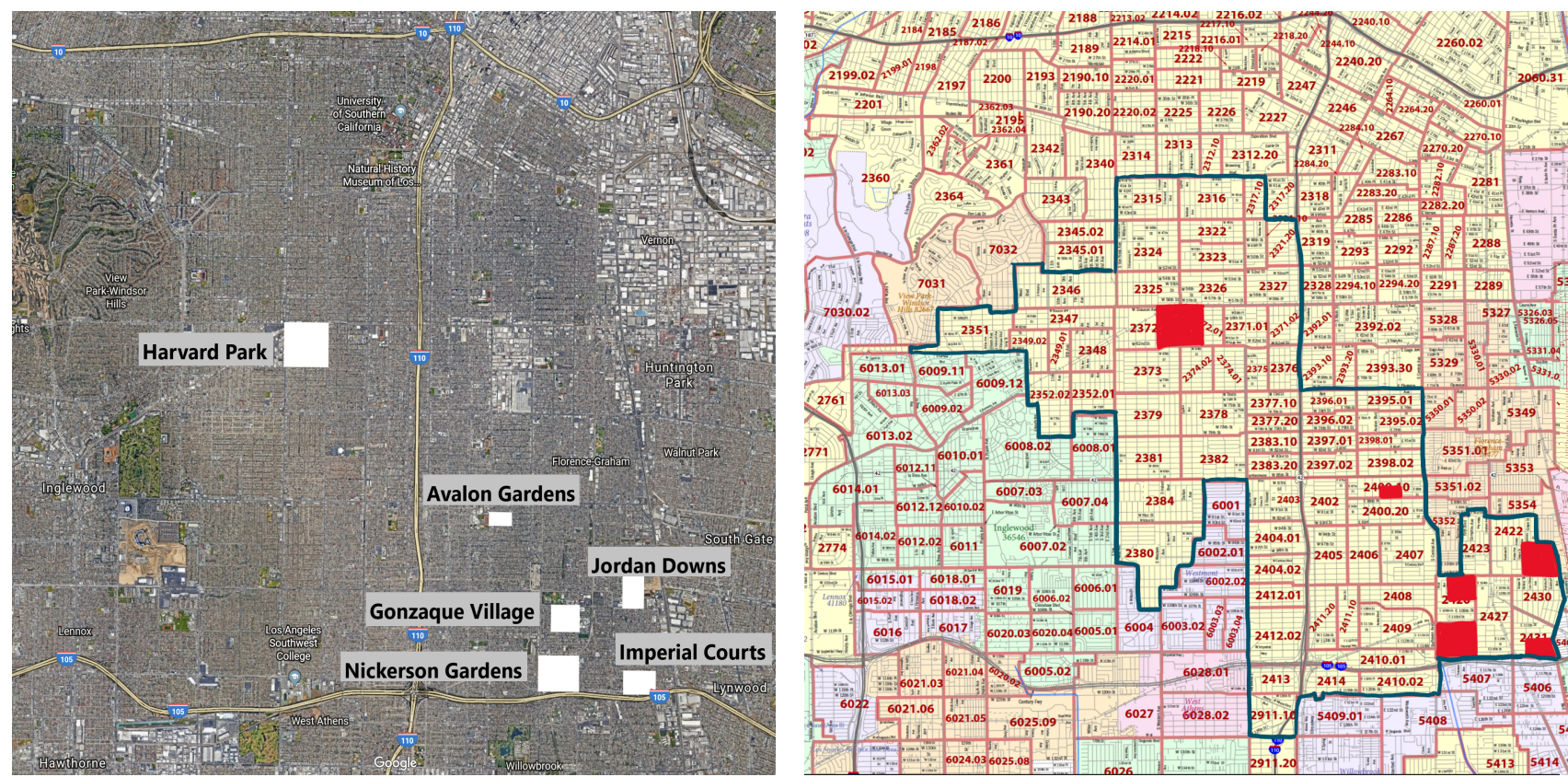- **What is the causal effect of CSP on violent crime outcomes?**

Data

Figure 1: Left: a Google Earth view of the region of interest. Right: South LA region of study (outlined) in terms of Census Tracts. Treated PHDs in red.

- **Reported crime incidents data:** verified incidents, typically originate from calls to the police
- **Calls-for-service data:** calls indicate police demand, may receive multiple calls for same incident
- Events in **violent crime incidents and calls outcomes**: murder/ homicide, assault with a deadly weapon/ attempted homicide, robbery, shots fired
- Treatment Date: 2012, Period of Study: 2007-2017
- Units: Semester (time), Census Block Group (space)

References

[1] Alberto Abadie, Alexis Diamond, and Jens Hainmueller. "Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program". In: *Journal of the American Statistical Association* 105.490 (2010), pp. 493–505.

[2] Dmitry Arkhangelsky et al. *Synthetic difference in differences*. Tech. rep. National Bureau of Economic Research, 2019.

[3] Eli Ben-Michael, Avi Feller, and Jesse Rothstein. "The Augmented Synthetic Control Method". In: (2019).

[4] LAPD News Release. *LAPD's Community Safety Partnership Program NR15021SF*. 2015. URL: %5Curl%7Bhttp://www.lapdonline.org/home/news_view/57887%7D (visited on 10/22/2019).

[5] Yiqing Xu. "Generalized synthetic control method: Causal inference with interactive fixed effects models". In: *Political Analysis* 25.1 (2017), pp. 57–76.

Augmented Synthetic Control Method (ASCM)

The ASCM [3], a derivative of the synthetic control method (SCM) [1], uses a **model-based adjustment to account for bias introduced by inexact balance between the treated and control units**. Given the observed convex hull violation in violent crime outcomes, this also **allows for extrapolation outside the convex hull**. For covariates X_i, weights w_i^*, and time t, this bias is estimated using an outcome model, $\hat{m}$. Therefore, ASCM adds a bias term to the traditional SCM estimator:

$$\widehat{Y_{1t}^{ASCM}} = \sum_i w_i^* Y_{it}(0) + \left(\hat{m}(X_1) - \sum_i w_i^* \hat{m}(X_i) \right)$$

$$\widehat{Y_{1t}^{ASCM}} = \widehat{Y_{1t}^{SCM}} + \left(\hat{m}(X_1) - \sum_i w_i^* \hat{m}(X_i) \right)$$

- Outcome Model, $m(X)$: Generalized SCM [5]
- Standard Errors: Jackknife [2]
- Estimand: $ATT_t = E[Y_{it}(1) - Y_{it}(0)|D_i = 1, T = t]$

Falsification Tests

Extensive falsification tests for confounding and model fit are included in the paper. In the following analyses, **ASCM models should not find evidence of treatment effects where none should exist**, i.e. before CSP or among control units.

- **Model Specification Placebo (Tables 1, 3):** Assess the ability of the ASCM to balance the trajectory of the pre-T outcome for the treated units and the synthetic control by training/testing the ASCM model on the pre-T period
- **In-Time Placebo (Figures 2, 4):** Investigate potential pre-T confounding events by comparing the estimated ATT_t to psuedo-implementation ATT_t
- **In-Space Placebo (see paper):** Examine the substantive significance of the observed treatment effect through comparison to the distribution of placebo effects among the control units
- **Crime Displacement (see paper):** Evaluate potential crime displacement or spillover effects by estimating the effect of CSP on control units neighboring Jordan Downs
- **Per Capita (see paper):** Housing density differs between CSP sites and average control. Violent crime per capita results are consistent

Violent Crime Incidents Reduced by Ave. 27% per Post-T Semester

Falsification Tests

Outcome Type	Estimate (95% CI)
Model Spec.	-2.83 (-13.09, 7.43)

Table 1: Model specification placebo test.

Results

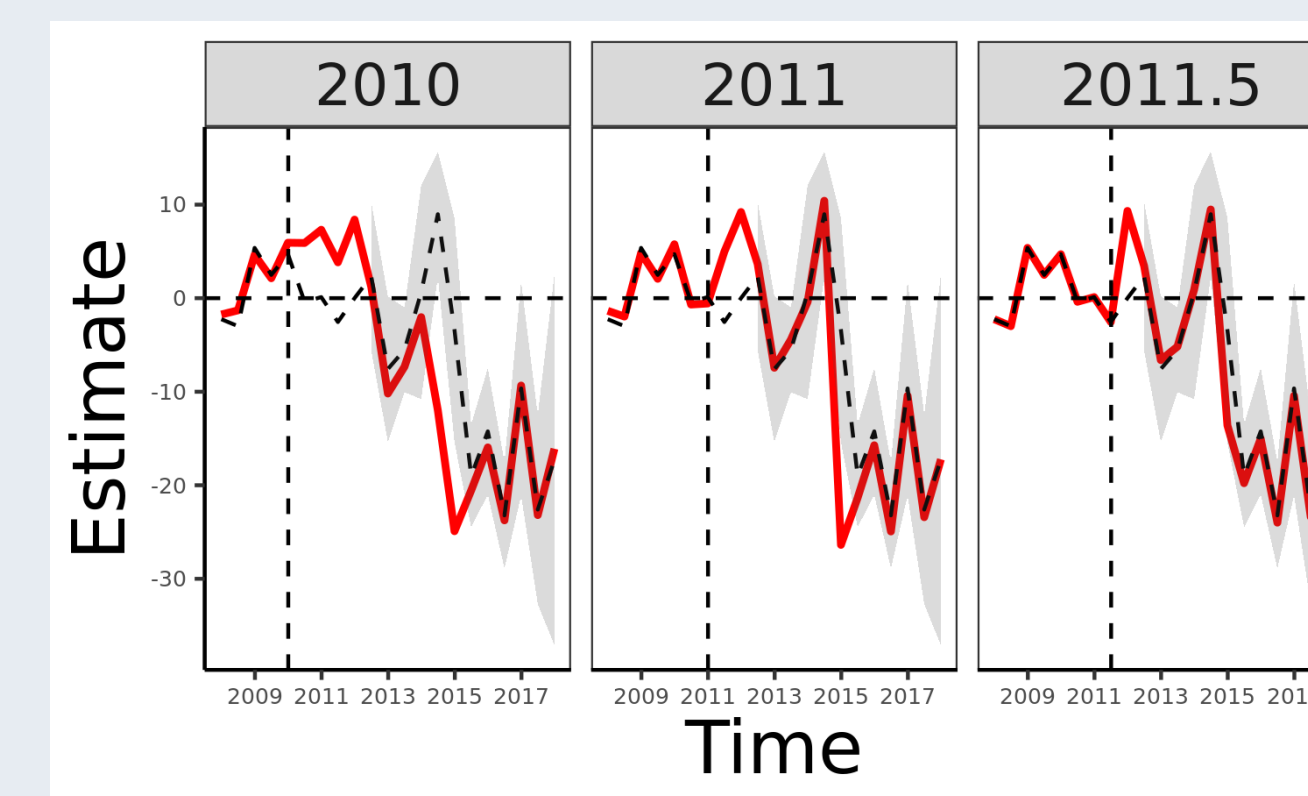| Outcome Type	Estimate (95% CI)	Pre-T Ave.
Results	-9.21 (-10.69, -7.73)	34.11

Table 2: ASCM Results.

Figure 2: In-time placebo comparing psuedo-implementation ATT_ts (red) to the results ATT_t (dashed line with shaded standard errors).
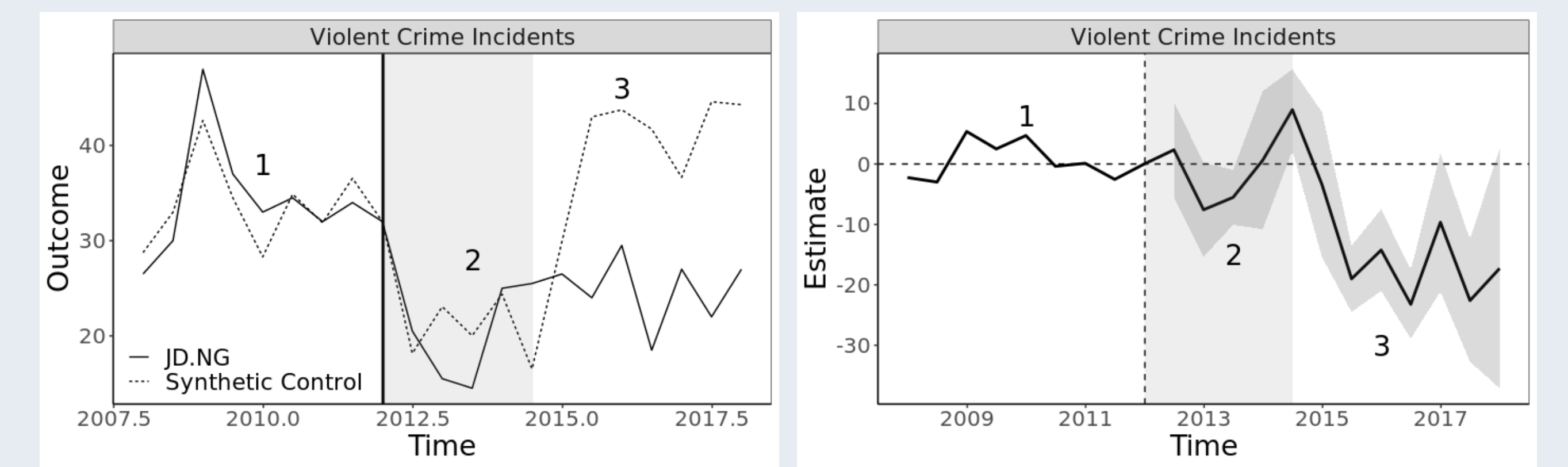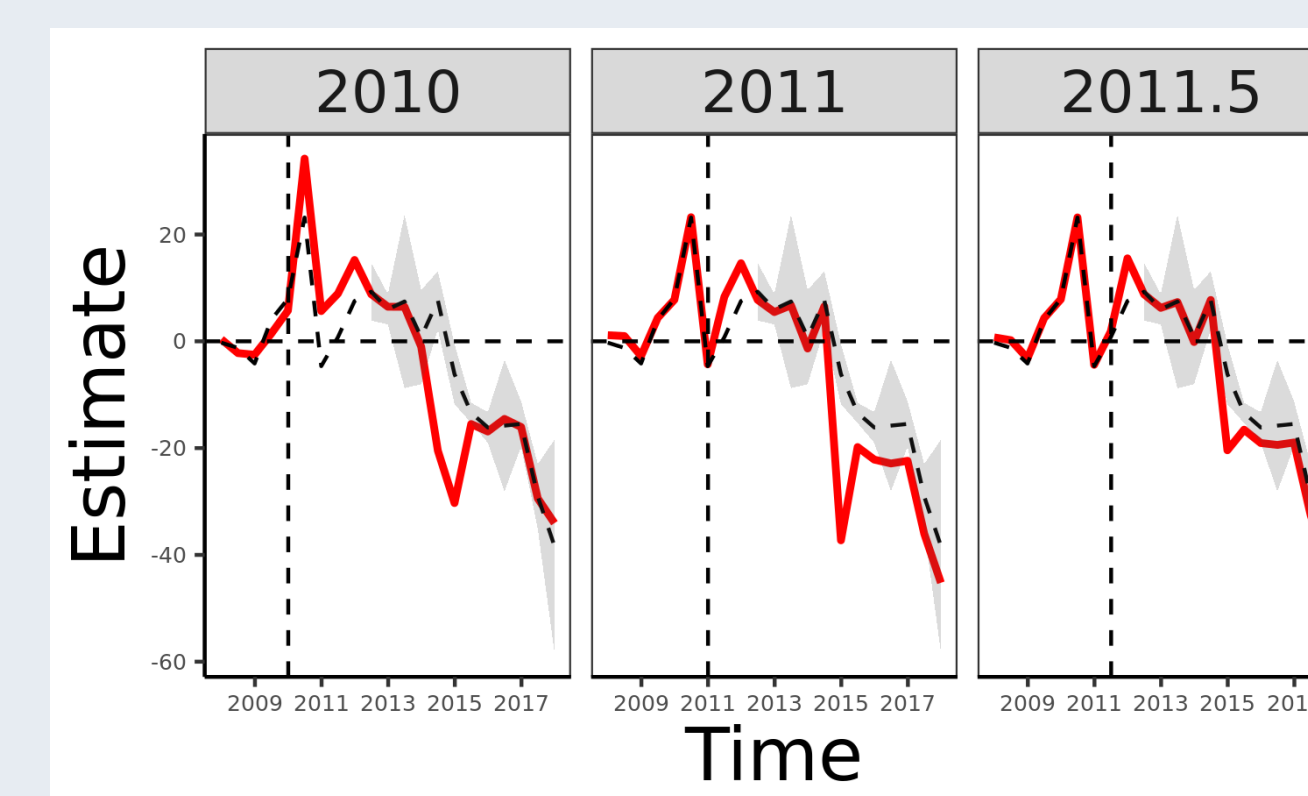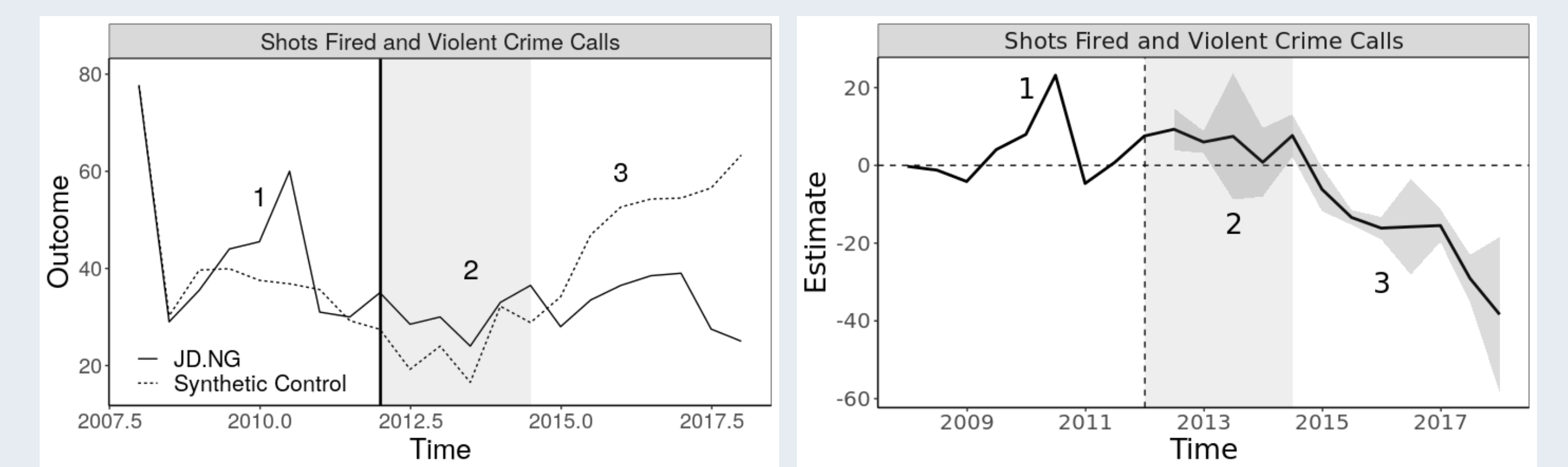

Figure 3: (Left) trajectory for the observed treated units (solid) versus the estimated synthetic control units (dashed). (Right) ATT_t estimate across time with shaded bounds for two jackknife standard errors.

Violent Crime Calls-for-Service Reduced by Ave. 20% per Post-T Semester

Falsification Tests

Outcome Type	Estimate (95% CI)
Model Spec.	-3.44 (-5.96, -0.92)

Table 3: Model specification placebo test.

Results

Outcome Type	Estimate (95% CI)	Pre-T Ave.
Results	-8.60 (-10.68, -6.52)	43.06

Table 4: ASCM Results.

Figure 4: In-time placebo comparing psuedo-implementation ATT_t (red) to the results ATT_t (dashed line with shaded standard errors).

Figure 5: (Left) trajectory for the observed treated units (solid) versus the estimated synthetic control units (dashed). (Right) ATT_t estimate across time with shaded bounds for two jackknife standard errors.

Acknowledgements