Online Appendix

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A Classifying Observed Variables as Detectable and Undetectable Confounders

Here we provide details of how we implemented the exercise described in Appendix B.1 of the paper. Consider the baseline model below:

$$\text{Crime}_{jt} = \sum_{\tau=1}^{\bar{\tau}} \beta_\tau \text{Crime}_{jt-\tau} + \sum_{\tau=1}^{\bar{\tau}} \Delta_\tau D_{jt-\tau} + \epsilon_{jt} \tag{1}$$

for $\bar{\tau} = 1, ..., 6$. For each $\bar{\tau}$, we assess whether every potential confounder w belongs to $\hat{\mathbb{W}}_1^D$, $\hat{\mathbb{W}}_2^D$ or $\hat{\mathbb{W}}^C$ in the respective model. The full list of observed variables w is described in Section A.4.

A.1 Testing for whether w is a confounder (i.e. $w \in \hat{\mathbb{W}}$)

To assess whether w is a confounder, we test if its inclusion as a control in equation (1) affects the OLS estimates of $\hat{\beta}_\tau$ for some $\tau \leq \bar{\tau}$. If it does, then we can classify w as a confounder in this model since its omission contributes to a biased estimate. To allow for w to enter non-linearly in equation (1), we let $\boldsymbol{W} = (w, w^2, w^3, w^4, w^5, \log(1+w), \frac{1}{1+w}, \sqrt{w})$ be a vector of specific deterministic functions of w, all of which are continuous in the full support of w. We then jointly test for all $\tau \leq \bar{\tau}$ whether $\hat{\beta}_\tau^{OLS}$ changes when $\boldsymbol{W}$ is included in equation (1). If we reject the null hypothesis that it does not change, then we can conclude that $w \in \hat{\mathbb{W}}$, i.e., w is a confounder in this baseline model.[1]

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[1] We implement these tests at the 5% significance level, with standard errors clustered at the sector $\times$ year $\times$ c level. Results are robust to other standard choices of significance level (1% and 10%) and to the other clustering levels discussed in Section 7.2 of the paper.

A.2 Testing for whether $w \in \hat{\mathbb{W}}^D$

Next, for all variables $w \in \hat{\mathbb{W}}$, we assess whether there exists an x such that w varies discontinuously with Crime^x_{jt-1} at $\text{Crime}^x_{jt-1} = 0$ conditional on Crime^{-x}_{jt-1}. Specifically, for each $\bar{\tau}$, we test whether $\hat{\Delta}^w_\tau = 0$, jointly for all $\tau \leq \bar{\tau}$ in the following regression:

$$w = \sum_{\tau=1}^{\bar{\tau}} \beta^w_\tau \text{Crime}_{jt-\tau} + \sum_{\tau=1}^{\bar{\tau}} \Delta^w_\tau D_{jt-\tau} + \epsilon^w_{jt} \tag{2}$$

If we reject the null hypothesis, then we conclude that $w \in \hat{\mathbb{W}}^D$.

A.3 Testing for whether $w \in \hat{\mathbb{W}}^D_1$

Finally, for all variables $w \in \hat{\mathbb{W}}^D$, we assess whether w happens to be a confounder when $\text{Crime}^x_{jt-1} = 0$ for some x by repeating the test in A.1 on the restricted subsample of observations where $\text{Crime}^x_{jt-1} = 0$ for some x. If $\hat{\beta}^{OLS}_\tau$ does change for some $\tau \leq \bar{\tau}$ on this restricted subsample, then we can conclude that w belongs to $\hat{\mathbb{W}}^D_1$.

A.4 List of Potential Confounders w

The variables that we consider as potential confounders are constructed from two sources: the 2010 Census and the universe of all Dallas police reports from which our main estimating sample is constructed. None of these variables are deterministic functions of any other potential confounders (e.g., $w^2, \log w$, $1 - w$, etc). In total there are 691 such variables.

From the 2010 Census, we obtain sector level measures (w_j) of total population, its gender composition, its age distribution (broken down into the following bins: under 5, 5-9, 10-14, 15-17, 18-19, 20-34 and 35-59 years of age), and its racial and ethnic composition (subdivided into non-Hispanic Whites, non-Hispanic Blacks, Hispanics and Asians). In total, we obtain 13 observed variables from this data source.

From Dallas police reports, we include the following sets of sector-week level variables $w_{jt-\tau}$ (a total of 678 variables from this data source):

1. Crimes not included in $\mathbb{C}$ (60 variables): murder, larceny, carrying a concealed weapon, sex offenses, drugs, gambling, illegal liquor sales, DWI, other traffic offenses, and a more general variable that classifies any reported crime that does not belong to $\mathbb{C}$. In total there are 10 such variables for each $\tau = 1, ..., 6$.

2. Variables potentially omitted due to over-aggregation of crimes (210 variables): fractions of light crimes sub-classified as criminal mischief, drunk and disorderly conduct,

fence and vice; fraction of assaults deemed "aggravated"; and the number of crimes of type $x \in \mathbb{C}$ committed on a weekend, outdoor, at day time (8am-8pm), in a private residence, or in the beat at the center of the corresponding sector.[2] In total there are 35 such variables for each $\tau = 1, ..., 6$.

3. Variables potentially omitted due to under-aggregation of crimes (252 variables): Number of crimes of type $x \in \mathbb{C}$ committed in the corresponding division, in sectors within 1, 3 and 5 miles from corresponding sector,[3] in the sector in the center of corresponding division,[4] in winter weeks, and in summer weeks. In total there are 42 such variables for each $\tau = 1, ..., 6$.

4. Policing variables (84 variables): average response speed to the scene of the crime for each crime of type $x \in \mathbb{C}$ (police arrival time to crime scene minus time of call for service), and average duration at the scene of the crime for each crime of type $x \in \mathbb{C}$ (police departure time from crime scene minus police arrival time to crime scene). In total there are 12 such variables for each $\tau = 0, 1, ..., 6$.[5]

5. Variables potentially omitted due to misreporting (72 variables): fractions of crimes of type $x \in \mathbb{C}$ that are reported anonymously and by commercial establishments. In total there are 12 such variables for each $\tau = 1, ..., 6$.

B Supplemental Tables

[2] This is defined as the beat whose centroid is closest to the centroid of the sector.

[3] These distances are based on the centroids of the sectors.

[4] This is defined as the sector whose centroid is closest to the centroid of the division.

[5] For the policing variables we also consider $\tau = 0$ as discussed in Section 8 of the paper.

Figure 1: Cumulative Dynamic Spillovers From Unit Crime Reductions

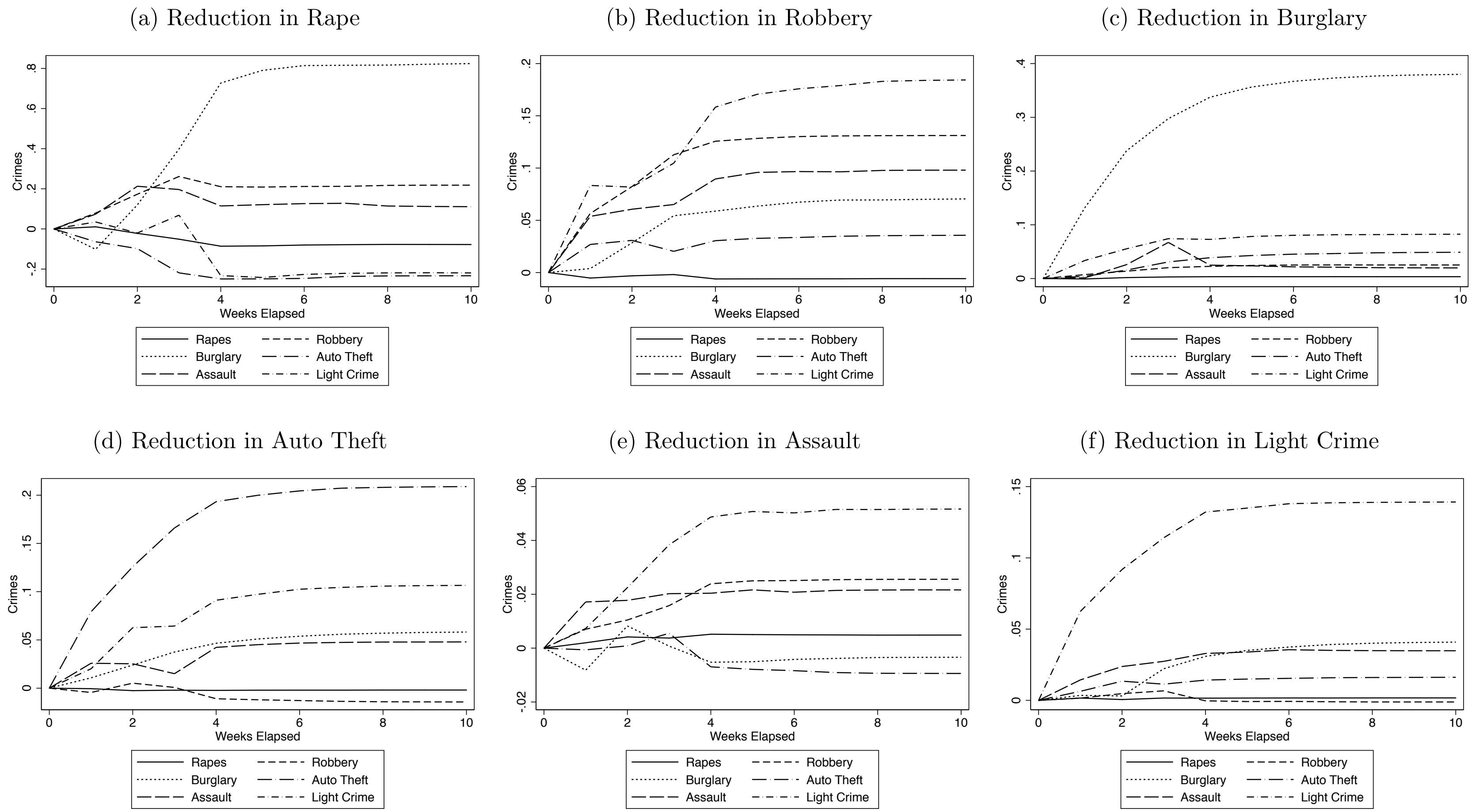
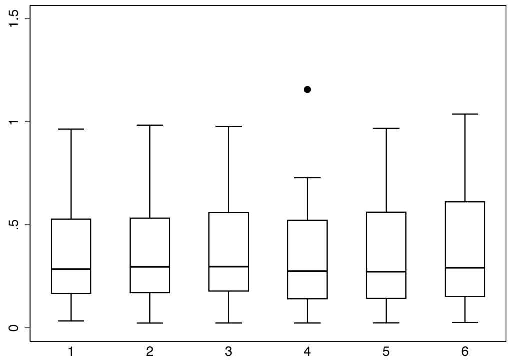


Figure 2: Standard Errors of Elements of $\hat{\Delta}$ for Models (1)-(6), j = Sector and t = Week



Notes: In this figure, we present a box plot of the standard errors of all elements of $\hat{\Delta}$ (the coefficients of the indicator variables reflecting the statistic of the test of exogeneity) for each of the six specifications of fixed effects. These are obtained from the models tested in Table 2 of the paper with j = Sector and t = Week. The box contains the 25th-75th percentile range, and the whiskers correspond to the upper and lower adjacent values. Dots represent outliers from the adjacent values.

Table 1: Standard Error Estimates for Specifications in Table 2 of the Paper at Various Levels of Clustering (1 of 3)

Dep. Var. (t)	RHS Var. ($t-1$)	(1)	(2)	(3)	(4)	(5)	(6)
Rape	Rape	**0.067****	**0.019***	**0.019***	**0.020**	**0.021**	**0.025**
		0.083**	0.020	0.021	0.021	0.021	0.031
		*0.049***	*0.021**	*0.021*	*0.021*	*0.021*	*0.027*
	Robbery	**0.003****	**0.003**	**0.003**	**0.003**	**0.003**	**0.003**
		0.003**	0.003	0.003	0.003	0.003	0.003
		*0.003***	*0.002*	*0.002*	*0.003*	*0.003*	*0.003*
	Burglary	**0.002**	**0.001***	**0.001**	**0.001**	**0.001**	**0.002**
		0.002	0.001*	0.001	0.001	0.001	0.002
		0.001	*0.001**	*0.001*	*0.001*	*0.001*	*0.002*
	Auto Theft	**0.002**	**0.002***	**0.002***	**0.002**	**0.002**	**0.002**
		0.002	0.002	0.002	0.002	0.002	0.001
		0.002	*0.001**	*0.001***	*0.002*	*0.002*	*0.002*
	Assault	**0.001****	**0.001****	**0.001****	**0.001****	**0.001****	**0.001**
		0.001**	0.001**	0.001**	0.001**	0.001**	0.001
		*0.001***	*0.001***	*0.001***	*0.001***	*0.001***	*0.001*
	Light Crime	**0.001****	**0.001****	**0.001****	**0.001**	**0.001**	**0.001**
		0.001**	0.001**	0.001**	0.001	0.001	0.001
		*0.001***	*0.001*	*0.001***	*0.001*	*0.001*	*0.001*
Robbery	Rape	**0.093***	**0.082**	**0.082**	**0.074**	**0.073**	**0.073**
		0.112	0.062*	0.062	0.043	0.046	0.061
		*0.070***	*0.079*	*0.080*	*0.074*	*0.073*	*0.086*
	Robbery	**0.016****	**0.016****	**0.051****	**0.012****	**0.011****	**0.013****
		0.013**	0.013**	0.014**	0.011**	0.011**	0.014**
		*0.010***	*0.010***	*0.010***	*0.010***	*0.010***	*0.013***
	Burglary	**0.007****	**0.007****	**0.007****	**0.005****	**0.006****	**0.006**
		0.008**	0.008**	0.008**	0.005**	0.006**	0.008**
		*0.005***	*0.005***	*0.005***	*0.005***	*0.005***	*0.006*
	Auto Theft	**0.008****	**0.008****	**0.008****	**0.006****	**0.007***	**0.006**
		0.008**	0.008**	0.005**	0.006**	0.006**	0.007**
		*0.006***	*0.006***	*0.006***	*0.006***	*0.006***	*0.008*
	Assault	**0.005****	**0.005****	**0.005****	**0.004****	**0.005****	**0.004***
		0.004**	0.004**	0.004**	0.004**	0.005**	0.004*
		*0.003***	*0.003***	*0.003***	*0.004***	*0.004***	*0.005**
	Light Crime	**0.004**	**0.004****	**0.004***	**0.004****	**0.004****	**0.004**
		0.004*	0.004**	0.004**	0.004**	0.004**	0.005
		*0.003**	*0.003***	*0.003***	*0.003***	*0.004***	*0.004*

Table 1: Standard Error Estimates for Specifications in Table 2 of the Paper at Various Levels of Clustering (2 of 3)

Dep. Var. (t)	RHS Var. ($t-1$)	(1)	(2)	(3)	(4)	(5)	(6)
Burglary	Rape	**0.140**	**0.148**	**0.145**	**0.134**	**0.132**	**0.147**
		0.165	0.153	0.152	0.134	0.133	0.152
		0.110	*0.151*	*0.015*	*0.145*	*0.142*	*0.163*
	Robbery	**0.025****	**0.025****	**0.025****	**0.021****	**0.022****	**0.024**
		0.024**	0.023**	0.024**	0.024**	0.026**	0.031
		*0.019***	*0.019***	*0.019***	*0.019***	*0.019***	*0.023*
	Burglary	**0.019****	**0.019****	**0.017****	**0.018****	**0.020****	**0.013****
		0.020	0.020**	0.018**	0.019**	0.021**	0.017**
		*0.010***	*0.010***	*0.010***	*0.011***	*0.011***	*0.013***
	Auto Theft	**0.015****	**0.015****	**0.015****	**0.013****	**0.014***	**0.013**
		0.020*	0.020**	0.009*	0.016	0.015*	0.017
		*0.006***	*0.011**	*0.011***	*0.012**	*0.012**	*0.014*
	Assault	**0.010****	**0.010****	**0.009****	**0.008****	**0.008***	**0.007**
		0.011**	0.010**	0.010**	0.006**	0.007*	0.008
		*0.006***	*0.006***	*0.006***	*0.008***	*0.008**	*0.010*
	Light Crime	**0.005****	**0.009****	**0.009****	**0.007****	**0.007****	**0.008**
		0.010**	0.011**	0.010**	0.008**	0.007**	0.008
		*0.006***	*0.006***	*0.006***	*0.007***	*0.007***	*0.008*
Auto Theft	Rape	**0.128**	**0.128**	**0.124**	**0.107**	**0.112**	**0.127**
		0.148	0.113	0.110	0.097	0.100	0.118
		0.099	*0.133*	*0.130*	*0.121*	*0.120*	*0.141*
	Robbery	**0.020****	**0.020****	**0.021****	**0.015****	**0.015****	**0.016**
		0.021**	0.021**	0.022**	0.013**	0.013**	0.015
		*0.016***	*0.016***	*0.016***	*0.016***	*0.016***	*0.019*
	Burglary	**0.011****	**0.012****	**0.011****	**0.010****	**0.010****	**0.010**
		0.014**	0.014**	0.013**	0.009**	0.008**	0.012
		*0.007***	*0.007***	*0.007***	*0.008***	*0.008***	*0.010*
	Auto Theft	**0.016****	**0.016****	**0.015****	**0.015****	**0.015****	**0.012****
		0.015**	0.015**	0.015**	0.012**	0.012**	0.014**
		*0.009***	*0.009***	*0.009***	*0.010***	*0.010***	*0.012***
	Assault	**0.008****	**0.008****	**0.008****	**0.006****	**0.007****	**0.007**
		0.009**	0.009**	0.010**	0.007**	0.007**	0.007
		*0.005***	*0.005***	*0.005***	*0.006***	*0.006***	*0.008*
	Light Crime	**0.007****	**0.008****	**0.008****	**0.007****	**0.007****	**0.007**
		0.009**	0.010**	0.009**	0.008**	0.008**	0.008
		*0.005***	*0.005***	*0.005***	*0.006***	*0.006***	*0.007*

Table 1: Standard Error Estimates for Specifications in Table 2 of the Paper at Various Levels of Clustering (3 of 3)

Dep. Var. (t)	RHS Var. ($t-1$)	(1)	(2)	(3)	(4)	(5)	(6)
Assault	Rape	**0.181**	**0.214**	**0.212**	**0.202**	**0.194**	**0.199**
		0.226	0.217	0.210	0.207	0.213	0.232
		0.148	*0.208*	*0.207*	*0.200*	*0.190*	*0.210*
	Robbery	**0.036****	**0.036****	**0.034****	**0.031****	**0.030****	**0.030***
		0.033**	0.033**	0.033**	0.036**	0.036**	0.030
		*0.025***	*0.025***	*0.025***	*0.025***	*0.024***	*0.030**
	Burglary	**0.017****	**0.017****	**0.016****	**0.014****	**0.014****	**0.015**
		0.019**	0.019**	0.015**	0.013**	0.013**	0.012
		*0.012***	*0.012***	*0.012***	*0.013***	*0.012***	*0.015*
	Auto Theft	**0.020****	**0.020****	**0.020**	**0.019****	**0.019****	**0.017**
		0.020**	0.021	0.023	0.018**	0.018**	0.018
		*0.014***	*0.014***	*0.014*	*0.015***	*0.014***	*0.017*
	Assault	**0.017****	**0.017****	**0.015****	**0.014****	**0.015****	**0.012**
		0.027**	0.027**	0.021**	0.018**	0.020**	0.013*
		*0.010***	*0.010***	*0.009***	*0.011***	*0.010***	*0.013*
	Light Crime	**0.012****	**0.012****	**0.012****	**0.011****	**0.011****	**0.010**
		0.010**	0.010**	0.009**	0.010**	0.010**	0.009
		*0.009***	*0.009***	*0.009***	*0.009***	*0.009***	*0.010*
Light Crime	Rape	**0.184****	**0.210**	**0.208**	**0.185**	**0.193**	**0.204**
		0.211**	0.224	0.222	0.207	0.226	0.234
		*0.151***	*0.211*	*0.210*	*0.197*	*0.196*	*0.225*
	Robbery	**0.032****	**0.034****	**0.023****	**0.025****	**0.027****	**0.029****
		0.030**	0.032**	0.031**	0.026*	0.028**	0.029**
		*0.025***	*0.025***	*0.025***	*0.026***	*0.026***	*0.032***
	Burglary	**0.019****	**0.020****	**0.019****	**0.015****	**0.015****	**0.016****
		0.019**	0.021**	0.019**	0.014**	0.013**	0.016**
		*0.012***	*0.012***	*0.012***	*0.013***	*0.014***	*0.017**
	Auto Theft	**0.021****	**0.022****	**0.023****	**0.020****	**0.021****	**0.019**
		0.025**	0.027**	0.026**	0.023**	0.021**	0.026
		*0.015***	*0.015***	*0.015***	*0.016***	*0.016***	*0.020*
	Assault	**0.013****	**0.014****	**0.013****	**0.011****	**0.012****	**0.011**
		0.016**	0.015**	0.015**	0.012**	0.012**	0.010
		*0.008***	*0.008***	*0.009***	*0.010***	*0.011***	*0.013*
	Light Crime	**0.014****	**0.015****	**0.015****	**0.014****	**0.014****	**0.013****
		0.014**	0.015**	0.016**	0.013**	0.013**	0.014**
		*0.009***	*0.009***	*0.009***	*0.010***	*0.010***	*0.013***
Discontinuity test P-value		**0.00****	**0.00****	**0.00****	**0.01****	**0.05**	**0.66**
		0.00**	0.00**	0.00**	0.00**	0.02*	0.08
		*0.00***	*0.00***	*0.00***	*0.02**	*0.06*	*0.85*

Notes: Standard error estimates are presented for models estimated in Table 2 of the paper. The standard errors in **bold** are clustered at the sector-year-crime type level. The standard errors in normal font are clustered at the division-year-crime type level. The standard errors in *italics* are clustered at the division-week-crime type level. *(**): corresponding coefficient (not shown in this Table) is significantly different from zero at 5% (1%) level.