

**The Seasons They Are a Changin':
Testing for Seasonal Effects of Potentially Criminogenic Places on Street Robbery**

ONLINE SUPPLEMENTAL MATERIAL

This document contains the results of the sensitivity analyses performed. Additional details on the rationale of the analytical plan are contained in the manuscript, but we provide some context for this material below as well. In short, analyses were performed to assess if the results presented in the main body of the manuscript were sensitive to 1) the method used to account for the spatial structure of the data and 2) the dependent variables' operationalizations.

Spatial Lag Models

While there are theoretical reasons for explaining geographic crime patterns using spatially lagged independent variables, the number of predictor variables and significance tests drastically increase when doing so. Increasing the numbers of predictors in a statistical model potentially increases the likelihood of making a Type I error (Bernasco, Ruiter, & Block, 2017, pg. 258) and can potentially make the results of statistical models more difficult to interpret. Crime and place researchers have long used spatially lagged outcome variables to account for the spatial structure of crime data (Bernasco & Elfers, 2010; Chainey & Ratcliffe, 2005, p. 135-136). Therefore, we re-estimated the three-year sum outcome models with spatially lagged versions of the outcomes rather than spatially lagged predictors. Table 1 shows descriptive statistics for the spatially lagged outcome predictors. Table 2 presents the results of the simultaneously estimated negative binomial regression models estimating only the spatially immediate effect of the potentially criminogenic facilities and spatially lagged outcomes.¹ Table 3 displays the equality of coefficient tests for the models with spatially lagged outcomes.

¹ Bernasco and Elfers (2010: 709-710) provide an overview of the pros and cons of different approaches to modeling spatial data.

Dependent Variable by Year & Season Models

While pooled dependent variables have been common in crime and place research published in top criminology journals (e.g., see Bernasco & Block, 2011; Haberman & Ratcliffe, 2015; Thompson & Gartner, 2014) because they help reduce sparseness/increase the variance of rare count outcomes, the results presented in main body of the manuscript could be sensitive to fluctuations in seasonal robbery counts for only a single year of the study period (i.e., the modifiable temporal unit problem or MTUP).² Therefore, we first discuss the “temporal stability” or dispersion of street robbery counts across years and seasons using Gibbs and Martin’s (1962) heterogeneity index (GMI) (also see Haberman et al., 2017). The GMI was computed using Equation 1:

$$GMI = 1 - \sum_{i=1}^N p_i^2 \quad (1)$$

In this application, p_i is the proportion of a given season’s three-year street robbery sum that occurred within a year (for each census block). The GMI is bounded from 0 to 0.67. Values of/near 0 indicate all street robberies making up a census block’s three-year sum occurred in a single year. Values at/near the maximum indicate a census block’s street robberies were equally dispersed across all years of the season’s three-year sum. If census block street robberies levels were relatively stable across the study period and less susceptible to the MTUP, then higher GMI values would be expected, especially for units with greater 3-year sums.

Figure 1 displays scatterplots of the census blocks’ GMI values (y-axis) versus their three-year street robbery sum (x-axis) by season for all units with at least one street robbery

² We thank an anonymous reviewer for stressing this point and, along with the editor, encouraging the sensitivity analyses.

during a respective season.³ As expected, roughly 75 to 78 percent of census blocks recorded zero street robberies across all three years for a given season (GMI values not calculated or displayed in Figure 1, but they would indicate “equally dispersed” street robbery patterns). Next, roughly 18 to 21 percent of census blocks experienced one or two street robberies during the study period, effectively ruling out the possibility that within-season street robbery levels were equally dispersed across all three years (albeit roughly 2 percent of census blocks experienced one street robbery in two out of three years). These observations are represented by the mass of points along the $Y = 0$ line in each panel of Figure 1. Finally, the remaining census blocks comprising the right-tail of the count distributions suggest relatively equal robbery occurrences across the years of the study period. This is evidenced by the positive relationship between street robbery counts (3 or greater) and GMI values for each panel in Figure 1. Overall, the GMI analysis suggests that some census blocks (with low street robbery counts) experienced street robberies during select years, but units with relatively high street robbery levels experienced relatively stable street robbery levels during all years of the study period.

Next, we specifically examined the robustness of the results in main body of the manuscript to the MTUP by disaggregating the seasonal 3-year street robbery sum outcomes and re-estimating the results (3 years by 4 seasons = 12 models). Table 4 displays the simultaneously estimated negative binomial regression results re-estimated for twelve (3 years by 4 seasons) street robbery outcomes. Table 5 displays the equality of coefficient tests for the single year outcome models. Three tests were performed for the single year models to compare the magnitudes of the coefficients across seasons (our research question) as well as years (the sensitivity test). First, the omnibus test was computed for all predictors with a statistically

³ The scatterplots were created using R's (v.3.3.3) ggplot2 package (v.2.2.1). In order to minimize the overplotting that is common with sparse, discrete counts, jittering and opacity were applied to the points (see Wickham, 2009).

significant effect in at least one model. Second, the magnitudes of the coefficients from the same seasons across years were compared in order to assess the sensitivity of the results across years. Third, the magnitudes of the coefficients across seasons within the same year were compared for all predictors with a significant omnibus test in order to test our primary research question.

Sensitivity Analysis Conclusion

The primary purpose of this study was to test if the effects of potentially criminogenic facilities and illicit markets varied across seasons. With the exception of high schools, the analysis presented in the manuscript's main body mostly found that they did not vary across seasons. The sensitivity analyses presented in this appendix also found potentially criminogenic facilities and illicit markets did not vary across seasons. Further, the statistically significance difference in the effect of high schools did not hold in the models estimated for each year individually. Additionally, the significance patterns of individual predictors changed across single-year the models; however, it is important to remember that differences in statistical significance and non-significance are not inherently meaningful (Gelman & Stern, 2006). Nonetheless, an astute researcher would interpret the individual seasonal models differently depending on which of the 3 years' models were examined. To our knowledge, researchers have not traditionally examined the sensitivity of geographic criminology results across years, and few studies report whether or not the results were sensitive to the year of the dependent variable's measurement. While we would mostly draw the same conclusions about our primary research question from all of the models, the sensitivity analyses emphasize the importance of replicating important crime and place findings, especially when modeling sparse outcomes.

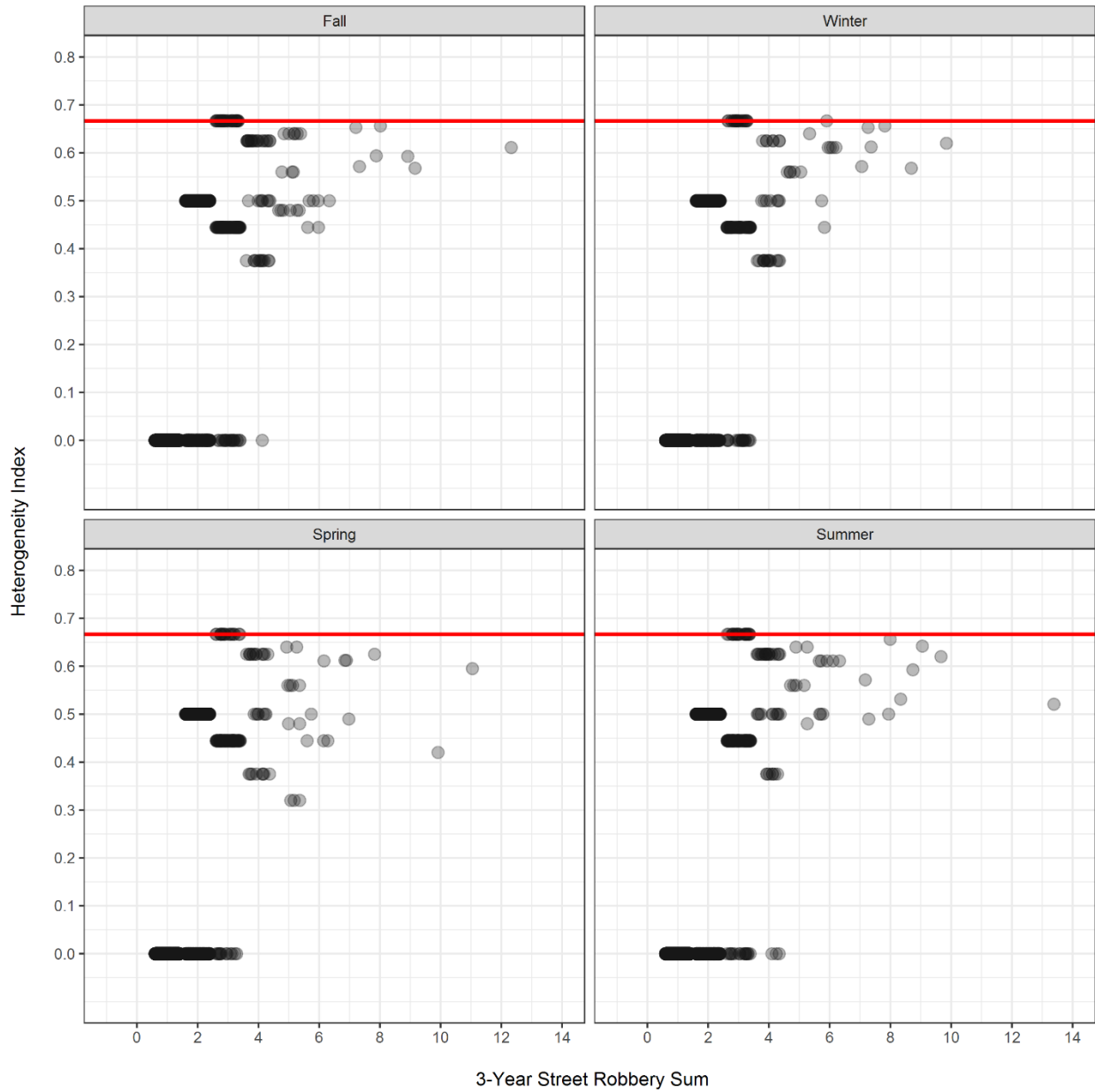


Figure 1. Census Block 3-Year Seasonal Street Robbery Totals vs. Heterogeneity Index

Notes: Census blocks with zero street robberies during the season across all three years excluded (Fall $n = 2,957$; Winter $n = 2,480$; Spring $n = 2,586$; Summer $n = 2,865$). Red line marks theoretical maximum or equal dispersion of seasonal street robbery total across all three years.

Table 1. Descriptive Statistics for Yearly Outcomes & Spatial Lag Variables

Variable	Min	Max	Mean	SD
Street Robbery Counts				
2009 Fall	0.00	5.00	0.10	0.35
2010 Fall	0.00	6.00	0.10	0.35
2011 Fall	0.00	4.00	0.10	0.35
2009 Spring	0.00	5.00	0.10	0.34
2010 Spring	0.00	3.00	0.07	0.29
2011 Spring	0.00	5.00	0.08	0.31
2009 Winter	0.00	4.00	0.09	0.34
2010 Winter	0.00	7.00	0.08	0.32
2011 Winter	0.00	4.00	0.08	0.31
2009 Summer	0.00	4.00	0.10	0.34
2010 Summer	0.00	8.00	0.10	0.34
2011 Summer	0.00	5.00	0.10	0.34
Spatially Lagged Outcomes				
SL Fall	0.00	5.00	0.33	0.37
SL Winter	0.00	4.67	0.27	0.32
SL Spring	0.00	5.67	0.28	0.34
SL Summer	0.00	5.00	0.31	0.34

Notes: Descriptive statistics computed only for census blocks with at least 20 residents (n=13,164). SL = Spatially lagged; Min = Minimum; Max = Maximum; SD = Standard Deviation.

Table 2. Simultaneously Estimated Negative Binomial Regression Results for Spatially Lagged Outcome Specification

Variables	Fall			Winter			Spring			Summer		
	Coef.	S.E.	IRR	Coef.	S.E.	IRR	Coef.	S.E.	IRR	Coef.	S.E.	IRR
ATMs & Banks	0.212***	(0.055)	1.236	0.319***	(0.055)	1.376	0.228***	(0.059)	1.256	0.289***	(0.056)	1.335
Alcohol Stores	-0.122	(0.141)	0.885	0.013	(0.162)	1.013	0.111	(0.136)	1.118	-0.025	(0.159)	0.975
Bars	0.146*	(0.070)	1.157	0.039	(0.086)	1.040	0.117	(0.084)	1.124	0.070	(0.079)	1.072
Check Cashing Stores	0.247*	(0.112)	1.280	-0.088	(0.155)	0.916	0.240*	(0.106)	1.272	0.143	(0.126)	1.154
Corner Stores	0.234***	(0.053)	1.263	0.272***	(0.053)	1.313	0.217***	(0.051)	1.242	0.154**	(0.054)	1.166
Drug Treatment	0.450**	(0.156)	1.568	0.128	(0.128)	1.136	0.370**	(0.132)	1.448	0.333*	(0.147)	1.395
Fast Food Restaurants	0.108***	(0.032)	1.115	0.13***	(0.038)	1.138	0.150***	(0.032)	1.162	0.142***	(0.032)	1.152
High Schools	0.912***	(0.145)	2.489	0.514**	(0.190)	1.672	0.514**	(0.196)	1.671	0.506**	(0.164)	1.658
Higher Education	-0.124	(0.108)	0.884	-0.405**	(0.142)	0.667	-0.209	(0.119)	0.811	-0.266*	(0.125)	0.767
Parks	0.166**	(0.057)	1.181	0.087	(0.062)	1.091	0.191***	(0.060)	1.210	0.226***	(0.060)	1.254
Pawn Shops	0.422	(0.310)	1.525	0.797***	(0.180)	2.220	0.401	(0.213)	1.493	0.656**	(0.210)	1.928
Public Housing	0.108	(0.116)	1.114	0.198	(0.124)	1.219	0.296*	(0.121)	1.345	0.046	(0.137)	1.047
Subway Stations	0.744***	(0.202)	2.103	0.390	(0.256)	1.477	0.639**	(0.205)	1.894	0.785***	(0.212)	2.193
Tourist Sites	0.035	(0.182)	1.036	0.053	(0.215)	1.054	-0.262	(0.194)	0.769	0.164	(0.218)	1.178
Narcotics Markets	0.241***	(0.053)	1.273	0.283***	(0.057)	1.327	0.210***	(0.056)	1.233	0.171***	(0.053)	1.186
Prostitution Markets	0.345***	(0.097)	1.411	0.344***	(0.097)	1.411	0.499***	(0.099)	1.648	0.421***	(0.102)	1.523
Gambling Markets	0.094	(0.101)	1.098	-0.052	(0.122)	0.949	0.038	(0.119)	1.038	0.034	(0.114)	1.035
Population (/1000)	0.607***	(0.187)	1.836	0.813***	(0.249)	2.255	0.387*	(0.188)	1.472	0.533**	(0.206)	1.705
SL Population (/1000)	0.429***	(0.045)	1.536	0.467***	(0.051)	1.596	0.495***	(0.047)	1.641	0.394***	(0.046)	1.482
Disadvantage	0.242***	(0.024)	1.273	0.305***	(0.027)	1.356	0.302***	(0.026)	1.352	0.228***	(0.025)	1.256
Residential Stability	0.135***	(0.030)	1.144	0.152***	(0.034)	1.164	0.174***	(0.032)	1.190	0.172***	(0.031)	1.188
Racial Heterogeneity	0.295***	(0.089)	1.343	0.216*	(0.096)	1.241	0.221*	(0.096)	1.248	0.345***	(0.090)	1.412
SL Outcome	0.684***	(0.045)	1.981	0.78***	(0.053)	2.181	0.708***	(0.055)	2.030	0.656***	(0.049)	1.927
Constant	-2.236	(0.049)	---	-2.481	(0.055)	---	-2.410	(0.052)	---	-2.217	(0.050)	---
Model Components												
Ln(alpha)	-0.307	(0.077)	---	-0.237	(0.093)	---	-0.282	(0.087)	---	-0.218	(0.078)	---
Moran's I of Residuals	-0.011***	---	---	-0.009***	---	---	-0.006***	---	---	-0.008	---	---

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. Models estimated for census blocks with at least 20 residents (n = 13,164). SL = Spatially Lagged; Coef. = Coefficient; SE = Standard Error; IRR = Incident Rate Ratio. Robust standard errors shown (Weesie, 1999). ^aMoran's I values shown were calculated for the standardized Pearson residuals using a first-order Queen spatial weights matrix and 999 permutations. Moran's I results were substantively similar for other spatial weights matrices.

Table 3. Equality of Coefficients Tests Results for Spatially Lagged Outcome Specification

Variables	Omnibus Test	Fall vs. Winter	Fall vs. Spring	Fall vs. Summer	Winter vs. Spring	Winter vs. Summer	Spring vs. Summer
High schools	8.28*	3.85*	n.s.	5.85*	n.s.	n.s.	n.s.

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. n.s. = not statistically significant. All tests are based on models displayed in Table 2. All omnibus tests are based on 3 degrees of freedom. All pairwise tests are based on 1 degree of freedom. Omnibus tests were computed for only predictors statistically significantly linked to street robbery in Table 2. Pairwise tests were only estimated for variables with statistically significant omnibus tests.

Table 4. Simultaneously Estimated Negative Binomial Regression Results for Individual Year Outcomes

Variables	2009 Fall			2010 Fall			2011 Fall		
	Coef.	S.E.	IRR	Coef.	S.E.	IRR	Coef.	S.E.	IRR
ATMs & Banks	0.143	(0.078)	1.153	0.150*	(0.071)	1.161	0.141	(0.080)	1.152
Alcohol Stores	-0.195	(0.269)	0.822	-0.126	(0.222)	0.882	-0.109	(0.230)	0.896
Bars	0.160	(0.115)	1.174	0.167	(0.109)	1.182	0.102	(0.116)	1.107
Check Cashing Stores	0.392*	(0.154)	1.479	0.036	(0.172)	1.036	0.369**	(0.139)	1.447
Corner Stores	0.161*	(0.080)	1.175	0.166*	(0.081)	1.180	0.269***	(0.074)	1.309
Drug Treatment	0.481***	(0.149)	1.618	0.369*	(0.185)	1.446	0.133	(0.322)	1.142
Fast Food Restaurants	0.140**	(0.045)	1.150	0.042	(0.049)	1.043	0.027	(0.046)	1.027
High Schools	0.790***	(0.217)	2.204	0.973***	(0.256)	2.646	0.783**	(0.257)	2.188
Higher Education	-0.047	(0.184)	0.954	-0.058	(0.172)	0.943	-0.120	(0.187)	0.887
Parks	0.211*	(0.090)	1.236	0.251**	(0.088)	1.285	0.193*	(0.092)	1.213
Pawn Shops	0.703	(0.430)	2.020	0.172	(0.387)	1.188	0.139	(0.465)	1.149
Public Housing	0.376*	(0.165)	1.457	0.119	(0.180)	1.126	0.137	(0.193)	1.147
Subway Stations	0.679*	(0.267)	1.972	1.032***	(0.198)	2.808	0.659**	(0.225)	1.933
Tourist Sites	-0.225	(0.288)	0.798	-0.326	(0.281)	0.722	0.108	(0.305)	1.114
Narcotics Markets	0.392***	(0.095)	1.480	0.341***	(0.096)	1.407	0.334***	(0.095)	1.397
Prostitution Markets	0.489***	(0.142)	1.630	0.551***	(0.124)	1.736	0.348*	(0.138)	1.416
Gambling Markets	-0.030	(0.168)	0.971	-0.023	(0.182)	0.978	0.016	(0.159)	1.016
SL ATMs & Banks	0.004	(0.023)	1.004	0.003	(0.024)	1.003	0.007	(0.034)	1.007
SL Alcohol Stores	-0.055	(0.094)	0.946	-0.234*	(0.115)	0.791	-0.031	(0.092)	0.970
SL Bars	0.002	(0.040)	1.002	-0.014	(0.038)	0.986	-0.031	(0.045)	0.969
SL Check Cashing Stores	0.125	(0.078)	1.133	0.176*	(0.069)	1.193	0.194**	(0.073)	1.214
SL Corner Stores	0.047	(0.033)	1.048	0.080*	(0.032)	1.083	0.038	(0.033)	1.039
SL Drug Treatment	-0.105	(0.110)	0.901	-0.011	(0.096)	0.990	0.010	(0.109)	1.010
SL Fast Food Restaurants	0.034*	(0.014)	1.035	0.050***	(0.014)	1.051	0.055***	(0.015)	1.057
SL High Schools	0.191	(0.105)	1.210	0.274**	(0.101)	1.315	0.178	(0.100)	1.195
SL Higher Education	0.136	(0.143)	1.145	0.579***	(0.123)	1.784	0.329*	(0.134)	1.389
SL Parks	0.039	(0.072)	1.040	-0.047	(0.073)	0.954	0.040	(0.072)	1.041
SL Pawn Shops	-0.075	(0.173)	0.927	0.332**	(0.121)	1.393	0.147	(0.142)	1.158
SL Public Housing	0.033	(0.166)	1.034	0.423**	(0.134)	1.527	0.070	(0.152)	1.072
SL Subway Stations	0.378***	(0.116)	1.460	0.234*	(0.111)	1.263	0.364**	(0.117)	1.439
SL Tourist Sites	0.068	(0.092)	1.070	-0.033	(0.082)	0.968	0.016	(0.101)	1.016
SL Narcotics Markets	0.114	(0.086)	1.121	0.181*	(0.087)	1.199	0.147	(0.089)	1.158
SL Prostitution Markets	0.244*	(0.122)	1.276	0.150	(0.116)	1.162	0.099	(0.128)	1.104
SL Gambling Markets	-0.077	(0.161)	0.926	0.285	(0.148)	1.330	0.219	(0.168)	1.245
Population (/1000)	0.548**	(0.211)	1.730	0.482*	(0.197)	1.620	0.54**	(0.193)	1.716
SL Population (/1000)	0.430***	(0.062)	1.537	0.358***	(0.062)	1.430	0.512***	(0.062)	1.669

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Disadvantage	0.289***	(0.042)	1.335	0.248***	(0.043)	1.281	0.252***	(0.044)	1.287
Residential Stability	0.055	(0.051)	1.057	0.134**	(0.048)	1.144	0.075	(0.050)	1.077
Racial Heterogeneity	0.276	(0.148)	1.318	0.588***	(0.148)	1.800	0.486***	(0.148)	1.625
Constant	-3.218***	(0.084)	0.040	-3.361***	(0.086)	0.035	-3.378***	(0.085)	0.034
Model Components									
Ln(alpha)	-0.027	(0.159)	0.974	-0.514*	(0.235)	0.598	-0.238	(0.201)	0.788
Moran's I of Residuals	0.023***	---	---	0.028***	---	---	0.029***	---	---

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. Models estimated for census blocks with at least 20 residents (n = 13,164). SL = Spatially Lagged; Coef. = Coefficient; SE = Standard Error; IRR = Incident Rate Ratio. Robust standard errors shown (Weesie, 1999). ^aMoran's I values shown were calculated for the standardized Pearson residuals using a first-order Queen spatial weights matrix and 999 permutations. Moran's I results were substantively similar for other spatial weights matrices.

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Table 4. Simultaneously Estimated Negative Binomial Regression Results for Individual Year Outcomes Continued

Variables	2009 Winter			2010 Winter			2011 Winter		
	Coef.	S.E.	IRR	Coef.	S.E.	IRR	Coef.	S.E.	IRR
ATMs & Banks	0.306***	(0.077)	1.358	0.114	(0.082)	1.121	0.292***	(0.085)	1.339
Alcohol Stores	-0.391	(0.314)	0.676	0.093	(0.252)	1.097	0.063	(0.237)	1.065
Bars	0.015	(0.132)	1.015	0.109	(0.134)	1.115	0.022	(0.140)	1.023
Check Cashing Stores	-0.071	(0.221)	0.932	0.101	(0.212)	1.106	-0.081	(0.230)	0.922
Corner Stores	0.189*	(0.087)	1.208	0.290***	(0.091)	1.337	0.288***	(0.084)	1.333
Drug Treatment	0.163	(0.169)	1.178	0.096	(0.248)	1.100	0.122	(0.212)	1.129
Fast Food Restaurants	0.105*	(0.053)	1.110	0.125**	(0.049)	1.133	0.005	(0.056)	1.005
High Schools	0.639*	(0.273)	1.894	0.243	(0.356)	1.275	0.060	(0.342)	1.062
Higher Education	-0.689**	(0.229)	0.502	-0.300	(0.213)	0.741	-0.626**	(0.236)	0.535
Parks	0.101	(0.098)	1.106	0.191	(0.108)	1.210	0.168	(0.107)	1.183
Pawn Shops	0.541	(0.409)	1.717	0.806**	(0.269)	2.239	1.020**	(0.361)	2.773
Public Housing	0.67***	(0.157)	1.955	0.157	(0.215)	1.170	0.131	(0.224)	1.140
Subway Stations	0.562*	(0.271)	1.753	0.433	(0.337)	1.542	0.774*	(0.343)	2.169
Tourist Sites	-0.558	(0.385)	0.572	0.017	(0.337)	1.017	0.112	(0.288)	1.118
Narcotics Markets	0.354***	(0.099)	1.424	0.525***	(0.112)	1.691	0.367***	(0.113)	1.444
Prostitution Markets	0.202	(0.150)	1.224	0.351*	(0.169)	1.420	0.542***	(0.161)	1.720
Gambling Markets	-0.353	(0.201)	0.703	-0.234	(0.194)	0.791	0.062	(0.207)	1.064
SL ATMs & Banks	0.026	(0.028)	1.026	0.015	(0.028)	1.015	-0.003	(0.028)	0.997
SL Alcohol Stores	-0.247*	(0.111)	0.781	-0.224	(0.117)	0.800	0.021	(0.117)	1.021
SL Bars	0.028	(0.046)	1.028	-0.005	(0.046)	0.995	-0.034	(0.045)	0.967
SL Check Cashing Stores	0.101	(0.077)	1.106	0.170*	(0.078)	1.186	0.137	(0.094)	1.147
SL Corner Stores	0.057	(0.033)	1.059	0.083*	(0.036)	1.087	0.028	(0.038)	1.029
SL Drug Treatment	0.213*	(0.098)	1.238	0.001	(0.116)	1.001	0.171	(0.104)	1.186
SL Fast Food Restaurants	0.047**	(0.016)	1.049	0.047*	(0.020)	1.048	0.053***	(0.016)	1.054
SL High Schools	0.007	(0.127)	1.007	0.199	(0.126)	1.220	0.197	(0.116)	1.218
SL Higher Education	0.023	(0.162)	1.024	0.042	(0.182)	1.043	0.043	(0.173)	1.044
SL Parks	0.010	(0.075)	1.010	0.146	(0.082)	1.157	-0.047	(0.084)	0.954
SL Pawn Shops	0.152	(0.152)	1.164	0.058	(0.168)	1.060	0.122	(0.153)	1.130
SL Public Housing	0.434**	(0.151)	1.544	-0.022	(0.173)	0.979	0.152	(0.190)	1.165
SL Subway Stations	0.414***	(0.120)	1.512	0.412***	(0.121)	1.510	0.555***	(0.132)	1.741
SL Tourist Sites	0.049	(0.093)	1.051	-0.019	(0.111)	0.981	0.075	(0.088)	1.077
SL Narcotics Markets	0.209*	(0.092)	1.232	0.293**	(0.102)	1.340	0.136	(0.101)	1.145
SL Prostitution Markets	-0.097	(0.143)	0.907	0.309*	(0.134)	1.362	0.289*	(0.146)	1.335
SL Gambling Markets	0.165	(0.159)	1.179	-0.014	(0.188)	0.986	0.261	(0.168)	1.298
Population (/1000)	0.78**	(0.284)	2.182	0.620**	(0.227)	1.859	0.685**	(0.256)	1.984
SL Population (/1000)	0.46***	(0.070)	1.584	0.452***	(0.074)	1.571	0.550***	(0.071)	1.732

RUNNING HEADER: Testing for Seasonal Effects of Potentially Criminogenic Places

Disadvantage	0.375***	(0.046)	1.456	0.261***	(0.053)	1.298	0.271***	(0.050)	1.311
Residential Stability	0.038	(0.054)	1.039	0.120*	(0.061)	1.127	0.149*	(0.059)	1.161
Racial Heterogeneity	0.583***	(0.150)	1.791	0.351*	(0.168)	1.421	0.319	(0.175)	1.376
Constant	-3.494***	(0.091)	0.030	-3.749***	(0.102)	0.024	-3.630***	(0.100)	0.027
Model Components									
Ln(alpha)	-0.244	(0.197)	0.784	-0.210	(0.254)	0.810	0.195	(0.176)	1.216
Moran's I of Residuals	0.027***	---	---	0.024***	---	---	0.031***	---	---

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. Models estimated for census blocks with at least 20 residents (n = 13,164). SL = Spatially Lagged; Coef. = Coefficient; SE = Standard Error; IRR = Incident Rate Ratio. Robust standard errors shown (Weesie, 1999). ^aMoran's I values shown were calculated for the standardized Pearson residuals using a first-order Queen spatial weights matrix and 999 permutations. Moran's I results were substantively similar for other spatial weights matrices.

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Table 4. . Simultaneously Estimated Negative Binomial Regression Results for Individual Year Outcomes Continued

Variables	2009 Spring			2010 Spring			2011 Spring		
	Coef.	S.E.	IRR	Coef.	S.E.	IRR	Coef.	S.E.	IRR
ATMs & Banks	0.245**	(0.083)	1.277	0.189*	(0.084)	1.209	0.081	(0.082)	1.084
Alcohol Stores	0.196	(0.189)	1.217	-0.112	(0.221)	0.894	0.001	(0.228)	1.001
Bars	-0.046	(0.132)	0.955	0.018	(0.142)	1.019	0.257*	(0.126)	1.293
Check Cashing Stores	0.377	(0.194)	1.458	0.241	(0.164)	1.273	0.405**	(0.134)	1.499
Corner Stores	0.178*	(0.086)	1.195	0.180*	(0.086)	1.197	0.175*	(0.080)	1.191
Drug Treatment	0.313	(0.210)	1.367	0.445*	(0.207)	1.560	0.204	(0.183)	1.226
Fast Food Restaurants	0.093	(0.051)	1.098	0.146**	(0.047)	1.157	0.084	(0.047)	1.088
High Schools	0.555*	(0.261)	1.743	0.461	(0.311)	1.586	-0.040	(0.362)	0.961
Higher Education	-0.307	(0.201)	0.735	-0.057	(0.195)	0.944	-0.279	(0.198)	0.757
Parks	0.190	(0.098)	1.209	0.276**	(0.101)	1.317	0.262**	(0.095)	1.300
Pawn Shops	0.157	(0.352)	1.171	0.272	(0.396)	1.312	0.357	(0.393)	1.430
Public Housing	0.579***	(0.170)	1.784	0.516*	(0.202)	1.676	0.221	(0.178)	1.247
Subway Stations	0.849***	(0.245)	2.338	0.890**	(0.307)	2.434	0.522	(0.297)	1.686
Tourist Sites	-0.543	(0.322)	0.581	-0.257	(0.420)	0.774	-0.340	(0.309)	0.712
Narcotics Markets	0.226*	(0.103)	1.254	0.326**	(0.107)	1.386	0.408***	(0.102)	1.504
Prostitution Markets	0.408*	(0.160)	1.504	0.627***	(0.141)	1.871	0.487***	(0.142)	1.627
Gambling Markets	0.032	(0.188)	1.032	-0.134	(0.195)	0.874	-0.391	(0.221)	0.676
SL ATMs & Banks	0.004	(0.029)	1.004	0.004	(0.025)	1.004	0.033	(0.025)	1.034
SL Alcohol Stores	-0.194	(0.112)	0.823	-0.125	(0.106)	0.882	-0.198	(0.106)	0.821
SL Bars	0.054	(0.045)	1.056	0.024	(0.045)	1.025	-0.048	(0.043)	0.953
SL Check Cashing Stores	0.185*	(0.079)	1.203	0.285***	(0.070)	1.329	0.192*	(0.077)	1.212
SL Corner Stores	0.103**	(0.035)	1.108	0.065	(0.034)	1.067	-0.004	(0.034)	0.996
SL Drug Treatment	0.063	(0.109)	1.065	0.127	(0.104)	1.136	0.169	(0.100)	1.184
SL Fast Food Restaurants	0.022	(0.017)	1.022	0.045**	(0.016)	1.047	0.089***	(0.017)	1.094
SL High Schools	0.407***	(0.103)	1.502	0.032	(0.121)	1.033	0.093	(0.123)	1.098
SL Higher Education	0.415**	(0.155)	1.514	0.246	(0.172)	1.279	0.039	(0.158)	1.039
SL Parks	-0.004	(0.077)	0.996	0.031	(0.078)	1.031	-0.042	(0.078)	0.958
SL Pawn Shops	0.231	(0.171)	1.260	0.084	(0.145)	1.088	-0.201	(0.178)	0.818
SL Public Housing	0.158	(0.173)	1.172	0.422**	(0.154)	1.525	0.095	(0.164)	1.099
SL Subway Stations	0.309*	(0.133)	1.362	0.417***	(0.129)	1.518	0.365**	(0.116)	1.441
SL Tourist Sites	0.050	(0.093)	1.051	-0.087	(0.109)	0.917	-0.002	(0.099)	0.998
SL Narcotics Markets	0.092	(0.091)	1.096	0.201*	(0.093)	1.222	0.207*	(0.094)	1.231
SL Prostitution Markets	0.143	(0.134)	1.154	0.145	(0.123)	1.157	0.025	(0.128)	1.025
SL Gambling Markets	-0.262	(0.213)	0.770	-0.276	(0.200)	0.759	-0.119	(0.179)	0.888
Population (/1000)	0.444	(0.232)	1.558	0.419	(0.291)	1.521	0.241	(0.212)	1.273
SL Population (/1000)	0.499***	(0.068)	1.647	0.504***	(0.070)	1.656	0.501***	(0.066)	1.651

RUNNING HEADER: Testing for Seasonal Effects of Potentially Criminogenic Places

Disadvantage	0.276***	(0.046)	1.318	0.365***	(0.048)	1.440	0.367***	(0.047)	1.443
Residential Stability	0.070	(0.052)	1.072	0.173**	(0.056)	1.188	0.128*	(0.054)	1.137
Racial Heterogeneity	0.528***	(0.155)	1.696	0.147	(0.161)	1.158	0.275	(0.161)	1.317
Constant	-3.463***	(0.087)	0.031	-3.598***	(0.095)	0.027	-3.494***	(0.092)	0.030
Model Components									
Ln(alpha)	0.224	(0.146)	1.251	-0.100	(0.201)	0.905	-0.518	(0.276)	0.596
Moran's I of Residuals	0.020***	---	---	0.027***	---	---	0.029***	---	---

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. Models estimated for census blocks with at least 20 residents (n = 13,164). SL = Spatially Lagged; Coef. = Coefficient; SE = Standard Error; IRR = Incident Rate Ratio. Robust standard errors shown (Weesie, 1999). ^aMoran's I values shown were calculated for the standardized Pearson residuals using a first-order Queen spatial weights matrix and 999 permutations. Moran's I results were substantively similar for other spatial weights matrices.

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Table 4. Simultaneously Estimated Negative Binomial Regression Results for Individual Year Outcomes Continued

Variables	2009 Summer			2010 Summer			2011 Summer		
	Coef.	S.E.	IRR	Coef.	S.E.	IRR	Coef.	S.E.	IRR
ATMs & Banks	0.229***	(0.068)	1.258	0.253**	(0.081)	1.288	0.203*	(0.090)	1.225
Alcohol Stores	0.063	(0.226)	1.065	0.028	(0.238)	1.028	-0.185	(0.223)	0.831
Bars	0.006	(0.120)	1.006	-0.040	(0.131)	0.960	0.192	(0.115)	1.212
Check Cashing Stores	0.234	(0.150)	1.263	0.116	(0.176)	1.123	0.099	(0.196)	1.104
Corner Stores	0.169	(0.088)	1.184	0.019	(0.086)	1.019	0.195*	(0.08)	1.215
Drug Treatment	0.101	(0.218)	1.106	0.489**	(0.187)	1.631	0.258	(0.169)	1.294
Fast Food Restaurants	0.105*	(0.045)	1.110	0.064	(0.051)	1.066	0.140**	(0.051)	1.151
High Schools	0.250	(0.299)	1.284	0.417	(0.253)	1.518	0.573*	(0.246)	1.773
Higher Education	-0.321	(0.214)	0.725	-0.150	(0.199)	0.861	-0.463*	(0.200)	0.629
Parks	0.391***	(0.085)	1.478	0.083	(0.101)	1.087	0.333***	(0.09)	1.396
Pawn Shops	0.332	(0.338)	1.393	0.692*	(0.281)	1.998	1.029***	(0.307)	2.797
Public Housing	0.027	(0.200)	1.028	0.194	(0.198)	1.214	0.240	(0.205)	1.272
Subway Stations	0.941***	(0.221)	2.563	0.953***	(0.271)	2.592	0.637**	(0.246)	1.891
Tourist Sites	0.140	(0.351)	1.150	-0.284	(0.310)	0.753	0.108	(0.336)	1.114
Narcotics Markets	0.194*	(0.096)	1.214	0.273**	(0.096)	1.314	0.203*	(0.098)	1.225
Prostitution Markets	0.647***	(0.144)	1.909	0.451**	(0.150)	1.570	0.441**	(0.139)	1.555
Gambling Markets	-0.256	(0.182)	0.774	-0.137	(0.177)	0.872	0.187	(0.181)	1.205
SL ATMs & Banks	0.010	(0.023)	1.010	-0.034	(0.026)	0.967	-0.051*	(0.026)	0.951
SL Alcohol Stores	-0.059	(0.099)	0.942	0.053	(0.097)	1.054	0.166	(0.087)	1.181
SL Bars	0.002	(0.038)	1.002	0.004	(0.042)	1.004	-0.007	(0.040)	0.993
SL Check Cashing Stores	0.228**	(0.077)	1.257	0.187*	(0.078)	1.206	0.205**	(0.079)	1.228
SL Corner Stores	0.077*	(0.033)	1.080	0.072*	(0.034)	1.074	0.033	(0.033)	1.034
SL Drug Treatment	0.040	(0.103)	1.041	-0.045	(0.111)	0.956	0.141	(0.091)	1.151
SL Fast Food Restaurants	0.044**	(0.014)	1.044	0.062***	(0.018)	1.064	0.04*	(0.017)	1.040
SL High Schools	0.132	(0.113)	1.142	-0.064	(0.121)	0.938	0.179	(0.108)	1.196
SL Higher Education	0.419***	(0.129)	1.521	0.035	(0.161)	1.035	0.160	(0.149)	1.173
SL Parks	-0.011	(0.076)	0.989	0.046	(0.074)	1.047	0.075	(0.074)	1.078
SL Pawn Shops	-0.159	(0.179)	0.853	0.170	(0.171)	1.185	0.103	(0.142)	1.109
SL Public Housing	0.152	(0.165)	1.164	0.249	(0.160)	1.282	0.338*	(0.148)	1.402
SL Subway Stations	0.202	(0.121)	1.224	0.421***	(0.120)	1.523	0.31**	(0.120)	1.363
SL Tourist Sites	-0.243*	(0.114)	0.784	0.091	(0.088)	1.095	0.123	(0.081)	1.130
SL Narcotics Markets	-0.008	(0.088)	0.992	0.136	(0.089)	1.145	0.033	(0.091)	1.033
SL Prostitution Markets	0.092	(0.130)	1.096	0.261*	(0.121)	1.298	0.319**	(0.122)	1.376
SL Gambling Markets	-0.208	(0.174)	0.812	0.309*	(0.155)	1.362	0.220	(0.156)	1.246
Population (/1000)	0.418	(0.217)	1.519	0.695*	(0.281)	2.003	0.396	(0.210)	1.486
SL Population (/1000)	0.313***	(0.066)	1.367	0.312***	(0.071)	1.366	0.511***	(0.069)	1.666

RUNNING HEADER: Testing for Seasonal Effects of Potentially Criminogenic Places

Disadvantage	0.282***	(0.045)	1.326	0.264***	(0.044)	1.302	0.183***	(0.046)	1.201
Residential Stability	0.084	(0.051)	1.088	0.107*	(0.054)	1.113	0.205***	(0.052)	1.227
Racial Heterogeneity	0.565***	(0.150)	1.760	0.222	(0.152)	1.249	0.678***	(0.149)	1.970
Constant	-3.200***	(0.087)	0.041	-3.184***	(0.087)	0.041	-3.488***	(0.090)	0.031
Model Components									
Ln(alpha)	-0.177	(0.190)	0.838	0.143	(0.151)	1.154	-0.207	(0.203)	0.813
Moran's I of Residuals	0.020***	---	---	0.037***	---	---	0.029***	---	---

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. Models estimated for census blocks with at least 20 residents (n = 13,164). SL = Spatially Lagged; Coef. = Coefficient; SE = Standard Error; IRR = Incident Rate Ratio. Robust standard errors shown (Weesie, 1999). ^aMoran's I values shown were calculated for the standardized Pearson residuals using a first-order Queen spatial weights matrix and 999 permutations. Moran's I results were substantively similar for other spatial weights matrices.

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Table 5. Equality of Coefficients Tests Results for Individual Year Outcomes

	Pawn Shops	Public Housing	SL Alcohol Stores	SL High Schools
Omnibus Test	83.22***	20.35*	25.30**	22.22*
Between Year Tests				
2009 Fall vs. 2010 Fall	n.s.	n.s.	n.s.	n.s.
2009 Fall vs. 2011 Fall	5.54*	n.s.	n.s.	n.s.
2010 Fall vs. 2011 Fall	n.s.	n.s.	n.s.	n.s.
2009 Winter vs. 2010 Winter	n.s.	4.34*	n.s.	n.s.
2009 Winter vs. 2011 Winter	n.s.	4.89*	n.s.	n.s.
2010 Winter vs. 2011 Winter	n.s.	n.s.	n.s.	n.s.
2009 Spring vs. 2010 Spring	n.s.	n.s.	n.s.	n.s.
2009 Spring vs. 2011 Spring	n.s.	n.s.	n.s.	n.s.
2010 Spring vs. 2011 Spring	n.s.	n.s.	n.s.	n.s.
2009 Summer vs. 2010 Summer	n.s.	n.s.	n.s.	5.48*
2009 Summer vs. 2011 Summer	6.49**	n.s.	n.s.	3.81*
2010 Summer vs. 2011 Summer	n.s.	n.s.	n.s.	n.s.
Within Year Tests				
2009 Fall vs. 2009 Winter	n.s.	n.s.	n.s.	n.s.
2009 Fall vs. 2009 Spring	n.s.	n.s.	n.s.	n.s.
2009 Fall vs 2009 Summer	n.s.	n.s.	n.s.	n.s.
2009 Winter vs. 2009 Spring	n.s.	n.s.	n.s.	n.s.
2009 Winter vs. 2009 Summer	n.s.	8.56**	n.s.	n.s.
2009 Spring vs. 2009 Summer	n.s.	5.71*	n.s.	n.s.
2010 Fall vs. 2010 Winter	n.s.	n.s.	n.s.	n.s.
2010 Fall vs. 2010 Spring	n.s.	n.s.	n.s.	5.93*
2010 Fall vs 2010 Summer	n.s.	n.s.	5.42*	n.s.
2010 Winter vs. 2010 Spring	n.s.	n.s.	n.s.	n.s.
2010 Winter vs. 2010 Summer	n.s.	n.s.	n.s.	n.s.
2010 Spring vs. 2010 Summer	n.s.	n.s.	n.s.	5.82*
2011 Fall vs. 2011 Winter	4.53*	n.s.	n.s.	n.s.
2011 Fall vs. 2011 Spring	n.s.	n.s.	n.s.	n.s.
2011 Fall vs 2011 Summer	6.76**	n.s.	n.s.	n.s.
2011 Winter vs. 2011 Spring	n.s.	n.s.	n.s.	n.s.
2011 Winter vs. 2011 Summer	n.s.	n.s.	n.s.	n.s.
2011 Spring vs. 2011 Summer	8.53**	n.s.	7.74**	n.s.

Notes: ***p-value < .001; **p-value < .01; *p-value < .05. n.s. = not statistically significant. All tests are based on models displayed in Table 4. All omnibus tests are based on 11 degrees of freedom. All pairwise tests are based on 1 degree of freedom. Omnibus tests were computed for only predictors statistically significantly linked to street robbery in Table 4. Pairwise tests were only estimated for variables with statistically significant omnibus tests.

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