SSM - Population Health 25 (2024) 101537

Contents lists available at ScienceDirect

SSM - Population Health

journal homepage: www.elsevier.com/locate/ssmph

Association between property investments and crime on commercial and residential streets: Implications for maximizing public safety benefits

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ARTICLE INFO

Keywords:
Violent and property crime
Public safety
Physical property investments

ABSTRACT

Physical property investments enhance public safety in communities while alleviating the need for criminal justice system responses. Policy makers and local government officials must allocate scare resources for community and economic development activities. Understanding where physical property investments have the greatest crime reducing benefits can inform decision making to maximize economic, safety, and health outcomes. This study uses Spatial Durbin models with street segment and census tract by year fixed effects to examine the impact of physical property investments on changes in property and violent crime over an 11-year period (2008–2018) in six large U.S. cities. The units of analysis are commercial and residential street segments. Street segments are classified into low, medium, and high crime terciles defined by initial crime levels (2008–2010). Difference of coefficients tests identify significant differences in building permit effects across crime terciles. The findings reveal there is a significant negative relationship between physical property investments and changes in property and violent crime on commercial and residential street segments in all cities. Investments have the greatest public safety benefit where initial crime levels are the highest. The decrease in violent crime is larger on commercial street segments, while the decrease in property crime is larger on residential street segments. Targeting the highest crime street segments (i.e., 90th percentile) for property improvements will maximize public safety benefits.

1. Introduction

Vacant land, abandoned structures, and dilapidated properties in urban areas negatively impact public health (Branas et al., 2013; Garvin et al., 2013; Sivak et al., 2021; South et al., 2015) and generate opportunities for crime (Skogan et al., 2012). These elements in the built environment shape potential offenders' perceptions of the effort, risk, and rewards associated with crime (Brantingham & Brantingham, 1981; Cozens et al., 2008; Jeffery, 1971; Newman, 1972). Improvements to the built environment through urban blight remediation can remove these opportunities and make the area less attractive for criminal offending, thus reducing crime (Kondo et al., 2015; Spader et al., 2016; Wheeler et al., 2018) and improving public safety and health (Branas et al., 2011, 2016, 2018; Hohl et al., 2019; Kondo, Andreyeva, et al., 2018). Physical property investments have the potential to remediate the structural precursors of crime by increasing social ties and informal social control, thus improving the health and safety of communities (Sampson et al., 1997; Velez et al., 2007a). By enhancing the economic viability of the area, residents may be more likely to mobilize and take collective action to solve problems, including threats to public safety. Investments can also create incentives for property owners to protect their capital investments by addressing the underlying criminogenic conditions of their properties and the surrounding area, such as improved security and design features that better control access, enforce rules regulating conduct, facilitate surveillance, and generally increase the risks of criminal behavior (Eck, 2018; Linning & Eck, 2021; Madensen, 2007). In sum, improvements to the built environment have the potential to produce public safety benefits while lessening the reliance on criminal justice system responses and other ongoing interventions (Krivo, 2014; MacDonald, 2015; MacDonald et al., 2019; Tillyer et al., 2021). Moreover, a growing body of research has documented crime's association with deleterious physical and mental health outcomes for residents,

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https://doi.org/10.1016/j.ssmph.2023.101537
Received 8 June 2023; Received in revised form 14 September 2023; Accepted 13 October 2023
Available online 30 November 2023

(Baranyi et al., 2021; Dong et al., 2020; Weisburd et al., 2018; Weisburd & White, 2019) thus highlighting additional risks of leaving crime problems and the conditions that create them unaddressed.

Research confirms physical property investments in the form of new construction, renovation, demolition, and mortgage lending are associated with crime reduction (Saporu et al., 2011; South et al., 2023; Velez et al., 2007b; Velez & Richardson, 2012). While much of this research has been conducted at the meso-level using census tracts to approximate neighborhoods, studies documenting spatiotemporal crime patterns reveal crime tends to concentrate at small spatial scales (e.g., addresses or street segments) within cities, with considerable street-to-street variability within neighborhoods (Gill et al., 2017; Groff et al., 2010; Lee et al., 2017; O'Brien, 2019; Sherman et al., 1989; Tillyer & Walter, 2019; Walter et al., 2022; Wheeler et al., 2016). This spatial clustering suggests that at least some of the processes that produce crime operate at smaller spatial scales, and that changes in crime at a small proportion of locations can have a sizable impact on public safety in a city (Braga et al., 2011; Weisburd et al., 2004). A microscale focus that measures *where* within communities investments and crimes occur is needed to observe whether physical property investments are spatially aligned with crime reductions.

Due to recent advancements in technology and data management practices, public administrative datasets available at small spatial scales (i.e., properties, street segments, and blocks) have allowed researchers to document a strong negative relationship between property investments and crimes at the microscale, (South et al., 2021; Tillyer et al., 2022) hinting at the potential public safety benefits of community and economic development efforts. Cities have historically planned for and managed urban growth using neighborhood-based interventions (Chaskin, 1997, 1998). Yet, there are benefits to developing a more nuanced approach that also embraces microscale intervention in development activities for the efficient and effective allocation of scarce resources (Walter et al., 2023). Given public resource constraints, understanding *where* investments yield the greatest crime reduction returns is an important policy question that has implications for public health due to the physical, physiological, and psychological health impacts associated with crime (Ahern et al., 2018; Beck et al., 2016; Cooley Quille et al., 2001; Galea et al., 2005; Landeo-Gutierrez et al., 2019; Laurito et al., 2022; Ramey & Harrington, 2019; Shannon et al., 2020; Sundquist et al., 2006; Theall et al., 2017).

The main objective of this study is to determine where physical property investments, measured in the form of building permit activity, have the greatest public safety benefit. We hypothesize that investments will be the most impactful on street segments where initial crime levels are the highest. Such locations are more likely to suffer from historic disinvestment, such that even modest investments may be particularly transformative. Conversely, crimes occurring at locations that already enjoy relatively low levels of crime may be somewhat immutable to the effects of investments, in that they may not be a function of the physical environment given that the location is not producing a high volume of incidents. Beyond this, we choose initial crime levels to distinguish among locations because crime data are relatively accessible in most jurisdictions. Using initial crime levels as part of a resource allocation plan for community economic develop planning would be relatively easy for any city to implement. We test this hypothesis on both commercial and residential street segments and for property and violent crime. Knowing where investments generate the maximum return allows local jurisdictions to strategically allocate scarce resources to places that will have the greatest impact on health and safety for communities.

2. Methods

The study area includes six large U.S. cities (Chicago, Los Angeles, New York City, Philadelphia, San Antonio, and Seattle) over an 11-year period (2008–2018). The one exception is San Antonio, where the period is 2008–2016 because 2017 and 2018 crime incident data were under review with the Texas Office of the Attorney General when data were obtained. The six cities were selected based on data availability and to examine these relationships in a large city in each of the U.S. regions. The use of multiple municipalities allows for cross-city comparisons to determine if the results can be generalized to large cities with different housing markets, economic dynamics, sociodemographics, topography, and urban form. The dependent variables are the number of property crime incidents (i.e., arson, burglary, larceny-theft, and motor vehicle theft) and violent crime incidents (i.e., assault, homicide, human trafficking, kidnapping, robbery, and sexual offenses) collected from each city's police department. The independent variable is the number of building permits in the previous year obtained from each city's building department. Building permits are a direct measure of physical property investment (O'Brien & Montgomery, 2015) and include new construction, rehabilitation, alterations, and demolition development activities. This study estimates city-specific effects because there are likely unmeasured differences across cities, including differences in permitting requirements, that may produce differential effects.

Crime incidents and building permits are aggregated annually to street segments. A street segment is the length of the street until it intersects another street and includes properties and the events (i.e., crimes and building permits) that occur on those properties on both sides of the street. Street segments are classified by land use into commercial (i.e., at least one property on either side of the street is designated as commercial, including mixed-use segments with both commercial and residential uses) or residential (all properties along both sides of the street are residential). The land use classification for all cities is based on the Property Use Classification System, a uniform classification system used in real estate. The street segments are classified into crime type-specific terciles defined by the first three years (2008–2010) of crime data by arranging the population of street segments in each city from lowest to highest based on crime, with the street segments divided into three equal groups. Because this study examines changes over time, segments with no change in crime and building permits over the study period are not included in the analytic sample because there is no variation to measure.

The building permit and crime data are positively skewed due to no building permits or crime incidents in a given year on a large number of street segments. Therefore, we transform the variables using the inverse hyperbolic sine (IHS), expressed as follows:

$$IHS(x) = \log\left(\sqrt{x^2+1} + x\right)$$

The IHS transformation is like a log transformation in adjusting for the skewness of the distribution but allows for zeros. Given concerns about the potential for the data transformation to affect estimates (Aihounton & Henningsen, 2021), estimates with untransformed data and log $(x + 1)$ transformations were produced to examine the robustness of the results and reported in Appendix Table A. The robustness testing indicated qualitatively similar results; in particular, the log $(x+1)$ estimates are very similar to the IHS estimates.

To estimate the effects of building permits on property and violent crime over time in low, medium, and high crime terciles, Spatial Durbin models with street segment and census tract by year fixed effects are used to control for time and neighborhood variant characteristics (Ellen et al., 2013; Lacoe et al., 2018). This model allows for a spatiotemporal difference-in-difference approach with spatial lags for the dependent and independent variables on neighboring adjacent segments. The spatial lags account for spatial spillover (i.e., displacement of crime *or* diffusion of crime prevention benefits to nearby segments). The spatial weights matrix for the spatial lags was created by identifying all intersecting streets with each street segment.

The Spatial Durbin models are estimated as follows:

$$crime_{st} = \beta_0 + \beta_1 crime_{st-1} + \beta_2 permits_{st-1} + \beta_3 neighcrime_{st-1} + \beta_4 neighpermits_{st-1} + \gamma_s + \delta_t + \varepsilon_{st}$$

$crime_{st}$ is the IHS of property or violent crimes on a street segment *s* in census-tract*year *t*. The lag of property or violent crime is controlled for by $crime_{st-1}$. The IHS of the number of permits on that street segment in the previous year is represented by $permits_{st-1}$. For crime and building permits, the value of neighboring street segments in the previous year is denoted by $neighcrime_{st-1}$ and $neighpermits_{st-1}$. The street segment fixed effect is represented by γ_s, and δ_t is the census tract by year fixed effect. The standard errors are clustered at the census tract by year level. The inclusion of fixed effects accounts for some variance explained and increases the adjusted R^2. Therefore, the adjusted *within* R^2 is also computed and included in the tables to demonstrate that the variables of interest explain a substantial proportion of the variance, particularly in the highest crime terciles.

This model is estimated for each land use (commercial and residential), crime type (property and violent), and crime tercile (low, middle, and high) for each of the six cities. Sample sizes vary across terciles since tercile classification is defined by the population of street segments in each city, not the analytic sample. This is done to avoid artificially inflating the crime levels in the lowest tercile, given that segments from the lowest tercile are most likely to be excluded from the analytic sample due to the absence of crime. Similar to a log-log model, the Spatial Durbin model coefficients reported in Table 2 represent the elasticity of property or violent crime with respect to building permit activity. They are therefore a proportional representation of the estimated percent change in crime for a percent increase in permit activity. To estimate the crime reduction benefits of increasing investments in areas with different absolute crime levels, we multiply the model coefficients by the mean crime value in a given crime tercile. The estimates reported in Table 3 therefore represent the relationship between a one percent increase in building permits and changes in the *number* of crimes instead of the percent reduction as highlighted in the Spatial Durbin models. Difference of coefficients tests identify significant differences in building permit effects across crime terciles in each city (Paternoster et al., 1998).

3. Results

Table 1 contains the descriptive statistics for the analytic samples of commercial and residential street segments that experienced changes in either property or violent crime and building permits over the 11-year study period in the six cities. Segments that experience no change in crime and building permits in the study period were dropped from the analytic sample as part of the estimation because there is no variation to measure over time. The number of commercial street segments included ranges from 4,909 (Seattle) to 28,040 (New York City); the number of residential street segments included ranges from 12,376 (Seattle) to 46,067 (Los Angeles). The average number of property crimes per segment is higher than violent crimes in every city. With the exception of Chicago, there are more residential street segments than commercial. The average number of crime incidents per segment varies by city, land use, and crime type.

Table 2 reports the estimated coefficients of the Spatial Durbin models for the relationship between crime (violent or property) on the street segment in *t* as the dependent variable and building permits on the street segment in *t-1* as the independent variable (controlling for lags of crime and building permits on surrounding street segments and for street-segment and census-tract*year fixed effects). Coefficients are reported for each of the crime terciles in each city (based on crime activity between 2008 and 2010). The results of the Spatial Durbin models indicate that in every city and every crime tercile, permit activity is significantly and negatively related to property and violent crime on both commercial and residential street segments. This relationship is observed across six cities in different regions in the U.S. with diverse demographics, socioeconomics, and urban form. The elasticities in the highest crime terciles on commercial street segments are between −0.07 for property crime in Los Angeles to −0.25 for violent crime in San Antonio (Table 2). This means for street segments in the highest crime tercile for a given crime type (property or violent), a 1 percent increase in building permit activity on a street segment is associated with a 0.07 to 0.25 percent decrease in that crime type on that street segment the following year.

The spatial lag coefficients are not included in the tables because there was no evidence of spatial displacement of crime to nearby segments. Coefficients that reached statistical significance were negative, though consistently smaller than the effects presented in Table 2, indicating a modest degree of spatial diffusion of crime prevention benefits from investments to nearby street segments; the coefficients for building permits on neighboring blocks were generally larger for property crimes. Additional two- and three-year lags for building permits were also

Table 1
Descriptive statistics of sample street segments by land use, crime type, and city (2008–2018).

	Chicago		Los Angeles		New York City		Philadelphia		San Antonio		Seattle	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Commercial Street Segments												
# of Property Crimes (IHS)	1.7	1.2	3.4	1.6	1.9	1.6	2.8	1.4	1.6	1.6	1.6	1.6
Untransformed	*2.6*	*1.6*	*14.3*	*2.4*	*3.3*	*2.3*	*8.6*	*1.9*	*2.3*	*2.5*	*2.5*	*2.5*
# of Building Permits *t*-1 (IHS)	0.6	0.9	0.6	1.0	1.3	1.5	0.7	1.0	0.2	0.6	1.0	1.2
Untransformed	*0.7*	*1.0*	*0.7*	*1.2*	*1.7*	*2.0*	*0.8*	*1.2*	*0.2*	*0.6*	*1.2*	*1.5*
N = Street Segments	22,438		17,461		28,040		13,360		12,552		4,912	
# of Violent Crimes (IHS)	1.2	1.2	2.6	1.7	1.7	1.6	2.2	1.5	0.7	1.2	0.6	1.1
Untransformed	*1.6*	*1.5*	*6.6*	*2.7*	*2.7*	*2.4*	*4.6*	*2.2*	*0.8*	*1.5*	*0.6*	*1.3*
# of Building Permits *t*-1 (IHS)	0.6	0.9	0.6	1.0	1.3	1.5	0.7	1.0	0.2	0.6	1.0	1.2
Untransformed	*0.7*	*1.0*	*0.7*	*1.2*	*1.7*	*2.0*	*0.8*	*1.2*	*0.2*	*0.6*	*1.2*	*1.5*
N = Street Segments	22,413		17,428		28,040		13,346		12,530		4,909	
Residential Street Segments												
# of Property Crimes (IHS)	1.3	1.1	2.4	1.6	1.0	1.3	2.2	1.3	0.8	1.1	0.5	1.0
Untransformed	*1.8*	*1.3*	*5.3*	*2.3*	*1.2*	*1.8*	*4.7*	*1.7*	*0.9*	*1.3*	*0.5*	*1.2*
# of Building Permits *t*-1 (IHS)	0.5	0.7	0.5	0.9	0.6	1.1	0.5	0.8	0.1	0.4	0.9	0.9
Untransformed	*0.5*	*0.8*	*0.5*	*1.0*	*0.7*	*1.3*	*0.5*	*0.9*	*0.1*	*0.4*	*1.0*	*1.1*
N = Street Segments	16,183		46,067		32,036		21,349		27,696		12,382	
# of Violent Crimes (IHS)	0.8	1.0	1.3	1.6	0.8	1.3	1.6	1.4	0.4	0.8	0.1	0.5
Untransformed	*1.0*	*1.1*	*1.7*	*2.3*	*0.9*	*1.6*	*2.5*	*2.0*	*0.4*	*0.8*	*0.1*	*0.6*
# of Building Permits *t*-1 (IHS)	0.5	0.7	0.5	0.9	0.6	1.1	0.5	0.8	0.1	0.4	0.9	0.9
Untransformed	*0.5*	*0.8*	*0.5*	*1.0*	*0.7*	*1.3*	*0.5*	*0.9*	*0.1*	*0.4*	*1.0*	*1.1*
N = Street Segments	16,164		46,035		32,035		21,310		27,696		12,376	

Table 2
Effects of building permits on crime by tercile, Spatial Durbin models, IHS transformation.

	Chicago Crime Terciles			Los Angeles Crime Terciles			New York City Crime Terciles			Philadelphia Crime Terciles			San Antonio Crime Terciles			Seattle Crime Terciles		
Commercial Street Segments	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest
Property Crime																		
# of Property Crimes *t*-1 (IHS)	0.784***	0.622***	0.827***	0.541***	0.763***	0.951***	0.189***	0.266***	0.675***	0.589***	0.633***	0.894***	0.651***	0.689***	0.872***	0.234***	0.259***	0.667***
	(0.0089)	(0.0030)	(0.0016)	(0.0199)	(0.0038)	(0.0009)	(0.0074)	(0.0037)	(0.0023)	(0.0269)	(0.0040)	(0.0016)	(0.0072)	(0.0064)	(0.0023)	(0.0128)	(0.0108)	(0.0054)
# of Building Permits *t*-1 (IHS)	−0.235***	−0.259***	−0.129***	−0.479***	−0.329***	−0.066***	−0.122***	−0.230***	−0.176***	−0.317***	−0.263***	−0.094***	−0.385***	−0.330***	−0.237***	−0.206***	−0.278***	−0.199***
	(0.0071)	(0.0041)	(0.0028)	(0.0215)	(0.0069)	(0.0023)	(0.0044)	(0.0037)	(0.0030)	(0.0238)	(0.0060)	(0.0034)	(0.0108)	(0.0112)	(0.0059)	(0.0086)	(0.0102)	(0.0076)
N	30,215	79,923	114,235	4,751	40,135	129,721	50,593	88,532	141,275	1,947	45,992	85,657	40,514	22,004	37,899	11,257	12,802	25,059
Adj. R-sq	0.70	0.61	0.86	0.51	0.76	0.96	0.29	0.39	0.74	0.57	0.64	0.90	0.64	0.60	0.85	0.25	0.33	0.76
Adj. Within R-sq	0.61	0.49	0.77	0.43	0.67	0.93	0.07	0.15	0.53	0.45	0.49	0.84	0.52	0.50	0.78	0.11	0.15	0.50
Violent Crime																		
# of Violent Crimes *t*-1 (IHS)	0.333***	0.343***	0.764***	0.399***	0.495***	0.897***	0.130***	0.166***	0.667***	0.191***	0.411***	0.837***	0.390***	0.478***	0.622***	0.061***	0.056***	0.351***
	(0.0072)	(0.0038)	(0.0020)	(0.0116)	(0.0052)	(0.0015)	(0.0058)	(0.0041)	(0.0024)	(0.0137)	(0.0048)	(0.0022)	(0.0060)	(0.0072)	(0.0043)	(0.0076)	(0.0138)	(0.0098)
# of Building Permits *t*-1 (IHS)	−0.113***	−0.181***	−0.151***	−0.200***	−0.274***	−0.094***	−0.094***	−0.206***	−0.178***	−0.103***	−0.206***	−0.127***	−0.165***	−0.197***	−0.252***	−0.065***	−0.153***	−0.206***
	(0.0039)	(0.0035)	(0.0032)	(0.0095)	(0.0070)	(0.0033)	(0.0032)	(0.0038)	(0.0031)	(0.0083)	(0.0058)	(0.0044)	(0.0048)	(0.0098)	(0.0082)	(0.0035)	(0.0108)	(0.0112)
N	11,997	87,896	124,229	14,430	42,612	117,237	33,113	103,973	143,305	8,968	47,844	76,643	16,844	20,932	62,460	28,402	8,316	12,367
Adj. R-sq	0.24	0.35	0.80	0.28	0.45	0.89	0.27	0.32	0.73	0.21	0.41	0.83	0.27	0.39	0.60	0.14	0.25	0.55
Adj. Within R-sq	0.15	0.19	0.67	0.18	0.32	0.84	0.04	0.09	0.52	0.06	0.22	0.75	0.18	0.26	0.48	0.02	0.04	0.17
Residential Street Segments	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest
Property Crime																		
# of Property Crimes *t*-1 (IHS)	0.594***	0.610***	0.801***	0.684***	0.742***	0.926***	0.177***	0.282***	0.641***	0.534***	0.688***	0.879***	0.529***	0.660***	0.820***	0.146***	0.188***	0.583***
	(0.0122)	(0.0030)	(0.0024)	(0.0057)	(0.0016)	(0.00086)	(0.0040)	(0.0029)	(0.0036)	(0.0180)	(0.0023)	(0.0017)	(0.0054)	(0.0031)	(0.0024)	(0.0049)	(0.0071)	(0.0078)
# of Building Permits *t*-1 (IHS)	−0.352***	−0.293***	−0.138***	−0.492***	−0.388***	−0.102***	−0.095***	−0.230***	−0.187***	−0.410***	−0.259***	−0.106***	−0.336***	−0.300***	−0.243***	−0.133***	−0.259***	−0.247***
	(0.0113)	(0.0045)	(0.0042)	(0.0066)	(0.0027)	(0.0023)	(0.0022)	(0.0030)	(0.0051)	(0.0151)	(0.0041)	(0.0038)	(0.0041)	(0.0039)	(0.0056)	(0.0026)	(0.0064)	(0.0113)
N	11,030	82,764	68,036	128,272	191,790	140,603	102,105	150,530	67,719	27,783	106,248	79,452	44,665	98,274	78,626	78,542	30,774	14,504
Adj. R-sq	0.39	0.59	0.82	0.63	0.73	0.92	0.16	0.36	0.70	0.47	0.65	0.87	0.49	0.50	0.72	0.14	0.22	0.63
Adj. Within R-sq	0.33	0.49	0.74	0.59	0.66	0.89	0.06	0.15	0.49	0.40	0.54	0.82	0.44	0.45	0.68	0.06	0.11	0.40
Violent Crime																		
# of Violent Crimes *t*-1 (IHS)	0.228***	0.325***	0.721***	0.248***	0.358***	0.840***	0.117***	0.203***	0.629***	0.205***	0.459***	0.809***	0.424***	0.492***	0.613***	0.023***	0.054***	0.274***
	(0.0073)	(0.0040)	(0.0031)	(0.0035)	(0.0024)	(0.0016)	(0.0034)	(0.0033)	(0.0036)	(0.0074)	(0.0030)	(0.0022)	(0.0036)	(0.0042)	(0.0047)	(0.0040)	(0.0114)	(0.0151)
# of Building Permits *t*-1 (IHS)	−0.102***	−0.183***	−0.158***	−0.127***	−0.259***	−0.156***	−0.072***	−0.189***	−0.193***	−0.111***	−0.218***	−0.148***	−0.072***	−0.152***	−0.184***	−0.028***	−0.103***	−0.154***
	(0.0041)	(0.0038)	(0.0052)	(0.0024)	(0.0031)	(0.0039)	(0.0016)	(0.0031)	(0.0052)	(0.0051)	(0.0043)	(0.0049)	(0.0018)	(0.0053)	(0.0103)	(0.0011)	(0.0080)	(0.0159)
N	33,050	72,390	56,191	29,782	222,258	208,306	133,880	120,429	66,038	5,138	120,402	87,560	124,432	60,672	36,463	107,099	11,258	5,399
Adj. R-sq	0.14	0.30	0.75	0.15	0.32	0.82	0.17	0.29	0.68	0.14	0.42	0.79	0.14	0.29	0.48	0.06	0.14	0.40
Adj. Within R-sq	0.08	0.17	0.62	0.08	0.19	0.76	0.03	0.10	0.48	0.06	0.27	0.71	0.14	0.26	0.40	0.01	0.03	0.11

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Notes: The crime terciles are different in size because tercile classification is based on the population of street segments, and not the analytic sample (refer to the methods section). Standard errors are reported in parentheses.

Table 3
Relationship between 1% increase in permit activity and number of crimes.

	Property Crime Terciles			Violent Crime Terciles		
Commercial Street Segments	Lowest	Middle	Highest	Lowest	Middle	Highest
Chicago	−0.02	−0.03	−0.08	−0.01	−0.03	−0.15
	(0.15)	(0.87)	(6.28)	(0.24)	(1.50)	(9.68)
Los Angeles	−0.06	−0.12	−0.19	−0.02	−0.16	−0.42
	(0.57)	(3.45)	(28.73)	(0.47)	(5.67)	(45.30)
New York City	−0.01	−0.06	−0.28	−0.01	−0.07	−0.31
	(0.52)	(2.62)	(15.72)	(0.80)	(3.39)	(17.50)
Philadelphia	−0.04	−0.10	−0.17	−0.02	−0.12	−0.35
	(0.51)	(3.58)	(18.50)	(1.60)	(5.78)	(27.25)
San Antonio	−0.04	−0.05	−0.12	−0.03	−0.05	−0.33
	(0.45)	(1.30)	(4.86)	(1.50)	(2.49)	(13.07)
Seattle	−0.02	−0.04	−0.11	−0.01	−0.04	−0.35
	(0.32)	(1.25)	(5.61)	(0.54)	(2.12)	16.74)
Residential Street Segments	Lowest	Middle	Highest	Lowest	Middle	Highest
Chicago	−0.04	−0.06	−0.23	−0.01	−0.03	−0.10
	(0.64)	(1.75)	(16.37)	(0.15)	(1.30)	(6.04)
Los Angeles	−0.05	−0.21	−0.52	−0.01	−0.12	−0.40
	(0.46)	(5.21)	(51.16)	(0.48)	(4.37)	(25.45)
New York City	−0.01	−0.08	−0.38	−0.01	−0.05	−0.21
	(0.63)	(3.38)	(20.55)	(0.34)	(2.32)	(10.61)
Philadelphia	−0.06	−0.14	−0.45	−0.01	−0.10	−0.25
	(1.13)	(5.12)	(42.67)	(0.74)	(4.67)	(16.87)
San Antonio	−0.06	−0.10	−0.38	−0.01	−0.02	−0.07
	(1.54)	(3.05)	(15.74)	(0.51)	(1.02)	(3.39)
Seattle	−0.01	−0.06	−0.47	0.00	−0.02	−0.14
	(0.42)	(2.12)	(19.15)	(0.31)	(1.35)	(9.17)

Note: The mean crime level for each tercile is reported in parentheses.

examined, with the effects showing some persistence but diminishing in magnitude over time (see Appendix Table B). Nearly all two-year lag estimates were statistically significant, while many of the three-year lags were not. We also explored effects for mixed-use and purely commercial street segments, with these two categories exhibiting very similar results (see Appendix Table C).

Table 3 reports the estimated reduction in crime associated with a one percent increase in building permit activity based on the estimates reported in Table 2, with mean crime levels in parentheses to show the magnitude of the estimated effect sizes. This is different than the percent reduction displayed in the Spatial Durbin models in Table 2 since the estimates represent the relationship between a one percent increase in building permits and changes in the *number* of crimes. Reporting the relationship in terms of the reduction in the number of crimes is a clear way public officials can convey the public safety benefits of property improvements to constituents. Physical property investments have the greatest impact on the number of crime incidents in the highest crime tercile. In the highest crime tercile, a one percent increase in building permit activity is estimated to be associated with a decrease in the number of property crimes on residential street segments ranging from −0.23 in Chicago to −0.52 in Los Angeles. This means, for example, for every one percent increase in permit activity, the number of property crime incidents in Los Angeles is reduced by 0.52 on residential street segments in the highest crime tercile. On commercial street segments, the reduction in the number of property crime incidents is not as large and ranges from −0.08 in Chicago to −0.28 in New York City. However, the decrease in the number of violent crimes is larger on commercial rather than residential street segments. In the highest crime tercile, a one percent increase in building permit activity is estimated to be associated with a decrease in the number of violent crimes on commercial street segments ranging from −0.15 in Chicago to −0.42 in Los Angeles compared to −0.07 in San Antonio to −0.40 in Los Angeles on residential street segments. Difference of coefficients tests confirm that the effects of building permits on violent and property crimes are significantly greater in the highest crime terciles relative to the middle and lowest terciles ($p < 0.001$) across all study cities in both commercial and residential areas.

On both commercial and residential streets, physical property investments have the greatest impact on the *number* of crime incidents where initial crime levels are the highest. It is impractical though for local governments to prioritize scarce resources for property improvement initiatives to one-third of places in a city. What are the public safety benefits to the community if investments are prioritized in places with the highest (90th percentile) crime levels?

Table 4 reports the estimated coefficients from the Spatial Durbin models for the relationship between crime (violent or property) on the street segment in *t* as the dependent variable and building permits on the street segment in *t-1* as the independent variable (controlling for lags of crime and building permits on surrounding street segments and for street segment and census-tract*year fixed effects). The estimates are based on data from commercial and residential street segments in the 90th percentile of crime activity only. Based on the results from the original Spatial Durbin models, it is no surprise that in every city, there is a significant negative relationship between permit activity and property and violent crime on commercial and residential street segments at places with the highest crime levels. What is notable is the effect size is over 0.8 for property crime on both commercial and residential street segments in every city. Although not as strong, the effect size is still large and over 0.8 in four of the six cities for violent crime, with moderate effect sizes in San Antonio and Seattle.

4. Discussion

There is a significant negative relationship between building permit activity and changes in property and violent crime in all crime cohorts. Given the relative regularity in estimated elasticities, we would expect to find a significant negative relationship between building permit activity and changes in property and violent crime on commercial and residential street segments in most large U.S. cities. Investments have the greatest public safety benefit on residential street segments where initial property crime levels are the highest and commercial street segments where initial violent crime levels are the highest. These findings align with the call for focusing attention on the locations with the highest crime rates (Weisburd, 2011, 2015; Weisburd et al., 2014). Targeting investments in places with the highest crime can maximize public safety benefits for communities, potentially also improving

Table 4
Potential public safety benefits of prioritizing investments in high crime (90th percentile) street segments.

	Chicago	Los Angeles	New York City	Philadelphia	San Antonio	Seattle
Commercial Street Segments	90th Percentile	90th Percentile	90th Percentile	90th Percentile	90th Percentile	90th Percentile
# of Property Crimes *t*-1 (IHS)	0.894***	0.971***	0.835***	0.953***	0.899***	0.763***
	(0.0024)	(0.0010)	(0.0030)	(0.0020)	(0.0028)	(0.0057)
# of Building Permits *t*-1 (IHS)	−0.867***	−0.362***	−0.0994***	−0.427***	−0.210***	−0.152***
	(0.0423)	(0.0266)	(0.0041)	(0.044)	(0.0076)	(0.0088)
N	38,463	53,458	51,896	25,508	34,246	16,019
Adj. R-sq	0.923	0.978	0.870	0.964	0.884	0.835
Adj. Within R-sq	0.863	0.967	0.754	0.940	0.831	0.633
# of Violent Crimes *t*-1 (IHS)	0.873***	0.957***	0.842***	0.931***	0.647***	0.351***
	(0.0026)	(0.0014)	(0.0028)	(0.0025)	(0.0048)	(0.0098)
# of Building Permits *t*-1 (IHS)	−0.0918***	−0.420***	−0.0970***	−0.574***	−0.255***	−0.206***
	(0.0046)	(0.035)	(0.0040)	(0.0600)	(0.0098)	(0.0112)
N	40,230	53,721	56,224	24,113	28,513	12,367
Adj. R-sq	0.893	0.958	0.860	0.934	0.635	0.552
Adj. Within R-sq	0.832	0.938	0.755	0.903	0.515	0.170
Residential Street Segments	90th Percentile	90th Percentile	90th Percentile	90th Percentile	90th Percentile	90th Percentile
# of Property Crimes *t*-1 (IHS)	0.888***	0.971***	0.811***	0.954***	0.885***	0.748***
	(0.0054)	(0.0012)	(0.0069)	(0.0032)	(0.0047)	(0.0101)
# of Building Permits *t*-1 (IHS)	−0.718***	−0.292***	−0.106***	−0.229**	−0.140***	−0.159***
	(0.0966)	(0.0371)	(0.0113)	(0.0735)	(0.0119)	(0.0167)
N	8,983	39,370	11,480	10,845	14,975	5,627
Adj. R-sq	0.909	0.976	0.867	0.959	0.834	0.801
Adj. Within R-sq	0.861	0.967	0.732	0.938	0.793	0.609
# of Violent Crimes *t*-1 (IHS)	0.852***	0.951***	0.819***	0.929***	0.663***	0.274***
	(0.0054)	(0.0017)	(0.0064)	(0.0033)	(0.0061)	(0.0151)
# of Building Permits *t*-1 (IHS)	−0.104***	−0.482***	−0.111***	−0.780***	−0.132***	−0.154***
	(0.0099)	(0.0509)	(0.0103)	(0.0866)	(0.0148)	(0.0159)
N	11,009	39,248	12,909	13,784	19,741	5,399
Adj. R-sq	0.871	0.948	0.844	0.930	0.539	0.397
Adj. Within R-sq	0.815	0.931	0.738	0.904	0.464	0.111

*p < 0.05; **p < 0.01; ***p < 0.001. Note: Standard errors are reported in parentheses.

health outcomes associated with crime hot spots (Dong et al., 2020; Weisburd et al., 2018; Weisburd & White, 2019). The physical deterioration of the urban landscape increases the opportunity to commit crime and limits informal social controls (Kawachi et al., 1999). Neighborhood disorder has been shown to be associated with social isolation, anxiety, and fear, thus producing a variety of poor mental health outcomes such as depression and stress (Diez Roux, 2010; Hill et al., 2005; Lorenc et al., 2012; O'Brien et al., 2019).

Creating safer communities through improvements to the built environment can be an effective urban planning mechanism for generating public health benefits (Branas & MacDonald, 2014; Cozens, 2017; Kondo, Morrison, et al., 2018). Rehabilitation and development activities have the potential to reduce property and violent crime and can improve health outcomes. Yet it is not often that transdisciplinary groups of academic and local jurisdiction officials with expertise in disciplines like public health, criminology, community and economic development, land use, and epidemiology come together (Dannenberg et al., 2003). There is an opportunity for future research to bring these disciplines together to study the impact of property improvement strategies on crime reduction and public health benefits.

However, using initial crime levels for implementing such strategies and evaluating the impact of property improvements can be implemented now. Through collaboration between local police departments and municipal economic development agencies, local officials can move away from neighborhood-based interventions and use initial crime levels at the block, street, or property level to identify places to allocate resources for development initiatives that maximize public safety benefits. For example, instead of directing resources for home improvement programs in the most under-resourced residential neighborhoods, or physical improvement remediation programs on the most distressed commercial corridors, resources can be strategically directed to blocks within those locations with the highest crime levels. Change in crime over time on identified blocks is easy to capture in program evaluation, though city officials may seek to engage research partners to study other indirect outcomes from these interventions such as the physical, physiological, and psychological health impacts on residents.

Studying the impact of physical property investments on a range of potential outcomes is worthy of further investigation. As demonstrated in this study, there are benefits to evaluating new and existing programs at smaller spatial scales to prioritize efforts to maximize crime prevention. Incentives that promote development can be evaluated on both crime reduction and subsequent public health outcomes. For example, outcome metrics may include resident physical activity, social interactions, and mental health since potential victimization can discourage physical activity, limit social interactions, and generate fear, thus elevating levels of stress and anxiety. It is also important to monitor unintended negative consequences of property investments, such as creating barriers for underrepresented business owners or displacement of residents (Worrall & Wheeler, 2019).

This study's design and microlevel administrative data have many strengths but one notable limitation is the attributes attached to the building permits. Each city captures diverse attributes, which means details on building activity (e.g., types of permits, dollar value of improvement) are often hard to obtain reliably across cities. Since different types of development activity (e.g., new construction, façade upgrading, minor interior improvements) may have varying degrees of impact on crime, (Kim & Wo, 2021) more precise measures may uncover the degrees of this variation. Indeed, cross-city differences in permitting requirements is one possible explanation for differences in coefficient sizes observed across cities. In addition, it would be valuable to further examine whether the association between investments and crime varies based on more detailed land use and street segment characteristics (business types, share owner or renter occupied). Furthermore, all cities in this study are situated in large metropolitan areas. It is unclear if the findings would be the same in mid-size or small cities. Similarly, the study period covered an extraordinary time of substantial economic growth; other market periods need to be tested to determine if the findings are replicated across different economic conditions.

Finally, although the study provides evidence of a strong association between physical property investments and crime reduction, it does not disentangle the mechanisms that explain the association. While improvements to the built environment represent one plausible mechanism linking investments to crime reduction, there are other processes that may operate separately or in combination to reduce crime. For example, new development may be accompanied by advanced security systems and technologies and increase the presence of 'eyes on the street.' Investments in an area may prompt property owners and managers to address criminogenic conditions and increase informal social control. Building permit activity may increase property values and cause displacement of existing residents by politically influential residents that demand more public services that deter criminogenic activity. All these potential mechanisms should be explored in future research with alternative research designs to inform the interpretation of the association between physical property investments and crime reduction observed in the present study. Indeed, supplementary analyses examining 2- and 3-year lag structures suggest that while these effects are not transient, they do diminish over time. More work is needed to better understand and amplify the public safety benefits of investment.

5. Conclusions

Physical property investments can augment and even alleviate reliance on criminal justice system intervention and enhance health and public safety in high crime areas. The findings of this study reveal community and economic development incentives that encourage physical property investments in the highest crime places will yield the greatest returns in public safety. This provides guidance to local jurisdictions with limited resources on how to prioritize investment incentives.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This material is based upon work supported by the U.S. Department of Homeland Security under Grant Award Number 17STCIN00001-05-00. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security. Partial support for this research came from a Eunice Kennedy Shriver National Institute of Child Health and Human Development research infrastructure grant, P2C HD042828, to the Center for Studies in Demography & Ecology at the University of Washington. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2023.101537.

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