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# Do public libraries help mitigate crime? Evidence from Kansas City, MO

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**Abstract**
We examine the relationship between public libraries and local crime rates. Previous studies have looked at different factors that could account for changes in crime, but few have focused on cultural institutions as a primary factor. Using crime data from the Crime Open Database and library data from the Public Library Survey, we leverage the geolocation of crimes and libraries and explore the consequences of opening a new public library branch in Kansas City, MO, through utilization of a difference-in-difference strategy. Our results show that public libraries may reduce crime within its nearby proximity; in particular, we find within the nearby proximity of the library; there is a substantial reduction in frequency of burglaries, vandalism, robberies, fraud, and assaults. However, such effects vanish in the distant proximity of the library.

**Keywords** Crime · Public library · Geolocation · Cultural institutions · Kansas city

## 1 Introduction

Crime rates and their associated expenses, including investigations, prosecutions, and incarcerations, cost the USA over $2.6 trillion in 2017 alone (Miller et al., 2021). From a Beckerian perspective, criminal behavior is influenced by rational

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incentives associated with the costs and benefits of the criminal enterprise (Becker, 1974). In this research, we examine to what extent criminal offenses are affected by urban amenities like public libraries.

Public libraries provide an array of programs to children and adults; as a result, they also assist with literacy and labor market outcomes. In addition, they provide a physical presence of local government in a community to some extent, either through the library building and its staff or through law enforcement officers' presence. Hence, public libraries can potentially affect the costs associated with criminal activity and act as a crime deterrent (Chalfin & McCrary, 2017).

On the one hand, public libraries can be a focal point in the neighborhood by inducing an agglomeration of communal activities, including localized crime (Freeman et al., 1996). A larger number of people in an area can make criminal acts more profitable due to the greater availability of potential targets; furthermore, the presence of crowds increases the probability that deception will go unnoticed. On the other hand, the public library building may be seen as an instance of more "eyes on the street," thereby increasing the costs associated with criminal activity by raising the possibility of being caught. In addition, investments in the library building through its construction or renovation may also reduce local criminal activity through the implementation of additional security (Hui-Wen & Png, 1994) and the revitalization of a previously unused land plot (Spader et al., 2016).

Therefore, the potential effect of public libraries on criminal activity is primarily an empirical question. So far, very few studies have focused on the impact of public libraries on crime rates, and only one paper explicitly focuses on this relationship to the best of our knowledge. Porter (2014) utilizes administrative crime data from the Los Angeles Police Department and explores the changes in operating hours of public libraries. Porter (2014) finds that increases in operating hours negatively affect aggravated assault rates and car burglaries and induce burglary substitution effects as criminals move to farther areas.

To investigate the effect of public libraries on criminal offenses, we focus on Kansas City, MO, and the opening of the Woodneath Public Library Branch. For over 20 years, the Kansas City Public Library System only contained 12 public library branches, but a 13th branch was added in June 2013 with the inauguration of the Woodneath Public Library Branch. We exploit the Woodneath Public Library opening as a unique quasi-natural experiment to examine how its presence affects the frequency of criminal offenses within its proximity.

Using data from the Crime Open Database and the Public Library Survey, we leverage the geolocation of criminal offenses and public library branches, and we explore the local effect of the Woodneath Public Library on criminal offense incidents using a standard difference-in-differences strategy. Our results suggest public libraries may reduce criminal offenses within their nearby proximity. In particular, we find a reduction in burglary, vandalism, robbery, fraud, and assault within the vicinity of the public library building. However, such effects vanish in the distant proximity of the library. Along with the difference-in-differences framework, we also implement two robustness tests: (i) We study the impact of the library on criminal offenses in varying degrees of proximity, and (ii) we develop a placebo effect

distribution to analyze the sensitivity of our results by randomly permuting library locations for 1000 iterations.

We argue that understanding how different factors influence the benefits and costs of criminal enterprises, particularly the opening of cultural and educational centers such as public libraries, becomes essential from both an individual and public perspective. Recent budget cuts to public libraries and other institutions, which were aggravated by the Covid-19 pandemic, have negatively impacted public libraries' services, staffing, and hours of operation, including temporary closures (Foote, 2020; Hunt Institute, 2021). Given the positive spillover effects generated by public libraries, the individual and social benefits (as well as the costs of criminal activities) may currently be underestimated by local governments, and better insight into these issues could lead to different priorities when allocating budgetary funding.

The remainder of the paper is as follows. Section 2 contains our literature review, Sect. 3 describes the data and empirical strategy, and Sect. 4 presents and interprets the results. Section 5 discusses our results by exploring crime and its relationship with public libraries and concludes our study.

## 2 Literature review

From a descriptive perspective, funding public libraries appears to correspond with decreased crime—an Every Library Institute study found that while national funding rates for libraries (per capita) increased from 1995 to 2016, national crime rates dropped by a nearly equivalent percentage (Woodworth & Sweeney, 2019). This trend may be unique to libraries, however, not all publicly funded cultural institutions. Floyd (2016) found negligible effects of public centers on crime statistics, including homicide, assault, robbery, and burglary, but poorly developed or undeveloped public spaces were associated with increased crime. Public libraries are unique institutions that include services available to the public, and therefore the introduction of a new public library branch would create a more developed space for communal consumption. Since people who are more vulnerable to becoming involved in crime (either as a victim or witness) are also more likely to be economically and resource disadvantaged Zickuhr et al. (2013), this financially at-risk population is therefore more likely to utilize and benefit from available institutions, such as public libraries, due to greater access to services such as free internet.

A complementary strand of the literature has focused on the impact of prosocial organizations on neighborhood crime with mixed empirical evidence. For example, Schaible et al. (2021) argue that nonprofits mitigate local criminal activity through increasing collective efficacy and social capital. Their findings suggest both place-based and generic nonprofits do not have a reduced effect on local crime rates. In contrast, nonprofits that explicitly focused on reducing local crime had a significantly negative impact on multiple types of crime rates. Furthermore, Jacoby (2018) finds that an increase in both presence and funding of these organizations negatively affects the criminal activity level, while Wo et al. (2016) report heterogeneous effects of voluntary organizations on crime by organization type and age.

Slocum et al. (2013) show that areas with more organizations have an overall lower crime incidence; in particular, they report that property crime is reduced in regions with organizations promoting family and children's well-being. In contrast, schools and government agencies (including public libraries) are associated with increased crime. These results vary across neighborhood demographic and land use characteristics, however. For instance, organizations are linked to lower levels of property crime in areas that are extensively commercialized, already residential in nature, have high levels of community cohesion, and serve lower rates of high-risk populations. In contrast, less commercialized and nonresidential areas show greater rates of property crime, particularly when the organization primarily serves high-risk, communally disparate populations (Slocum et al., 2013). Peterson et al. (2000) also find that local institutions can mitigate criminal activities, but their results for public libraries are not statistically significant.

Although little attention has been paid to the effect of public libraries on criminal activity, there has been a development of recent literature examining the impact of public libraries on several outcomes, such as education, innovation, and labor market outcomes.[1] For example, Bhatt (2010) uses distance to the closest public library as an instrumental variable and finds positive effects on children reading and completing their homework, as well as an adverse impact on children's propensity to watch television. In contrast, Rodríguez-Lesmes et al. (2014) find no impact of new public libraries on student performance in Bogota, Colombia. Gilpin et al. (2021) find that a greater public library capital investment increases children's usage of library resources, which translates into better reading scores for nearby school districts.

Outside of the education system, public libraries may help local innovation flourish. Berkes and Nencka (2021) use a difference-in-differences approach to show that patenting rates rose in cities that both received Carnegie funding to construct public libraries and proceeded to build them, compared to cities that applied and qualified for the library grant, but ultimately did not build their public libraries. Additionally, Karger (1900) finds a positive effect of public library access during childhood on educational attainment and labor market outcomes. Lastly, using spatial econometric models, Ferreira Neto (2019) finds evidence of both direct and indirect effects of some public library programs on local labor market outcomes. Since prior research has shown that public library programs improve noncriminal expected outcomes, we expect they will also contribute to the reduction of expected benefits from criminal activities.

Public libraries also provide access to materials and programming associated with arts and cultural engagement, which has been shown to have a decreased effect on antisocial and criminal behavior in adolescents (Bone et al., 2022). A study examining at-risk youth participating in the Health, Education, in the Arts, Refining Talented Students (HEARTS) Family Life Center program, a project facilitated by the Office of Minority Health of the U.S. Department of Health and Human Services,

[1] Other recent research on public libraries has focused on its perceived value by society (Aabø, 2005; Fujiwara et al., 2019), determinants of library funding (Ferreira Neto, 2018), and public library efficiency (De Witte and Geys, 2011; Ferreira Neto and Hall, 2019; Hemmeter, 2006).

found that youth engaged in fine arts performed better on metrics of academic achievement and self-esteem, as well as decreased rates of delinquency (Respress & Lutfi, 2006). Student engagement in the arts outside of this program also showed marked academic and nonacademic benefits, an effect realized regardless of whether the arts-based participation occurred within schools, at home, or through community initiatives (Martin et al., 2013). Art-based activities have also been shown to positively impact emotional regulation in adults, with increased prosocial behavior observed in individuals who participated in artistically creative activities (Fan-court and Ali, 2019; Kou et al., 2020). In lower-income New York City neighborhoods, the availability of cultural resources was significantly associated with greater social outcomes within the community, including public health, security, and education (Stern & Seifert, 2017). Arts funding in taxpayer-funded schools has been declining due to public perception of nonessentialism, however, and nonprofit organizations have been encouraged to fill the resulting gap in program availability (Jung, 2018), a function public libraries are able to provide for their local communities.

## 3 Data and empirical strategy

### 3.1 The Woodneath Public Library

Kansas City, MO, provides an excellent case study to examine the effects of a new library opening on criminal offenses. For over 20 years, the public library system in Kansas City, MO, only had 12 public library branches, but in June 2013, the Woodneath Public Library Branch was inaugurated. This particular case creates a quasi-experiment, as the new building with its new programs and resources available to residents can be perceived as an exogenous shock.[2]

The Woodneath Public Library Branch site was originally a 33-acre farmland adjacent to a historic 1850s farmhouse owned by one of the most prominent families in the region. This property was well-maintained, and in 2008 the Mid-Continent Public Library System bought the property for the Woodneath Library construction. The final design incorporates the actual house into the library itself, and the construction of the branch is aimed at accentuating the history of the area and creating a community-based place for storytelling and provision of resources for the local population.[3]

[2] One potential concern is that the new library is only be the first step of a burgeoning gentrification dynamic. However, the Woodneath Public Library Branch is located within a wealthy suburb of Kansas City called Shoal Creek Valley, and the characteristics of this neighborhood mitigate this concern. For instance, as per 2010 Census, the average household income for Shoal Valley Creek was over $93,000 compared to $45,000 for all of Kansas City. Only 5 percent of Shoal Creek Valley population were considered in poverty, compared to 19 percent city-wide in 2010. In addition, the median home values in 2010 further reflect these differences, with the median Shoal Creek Valley home valued at $208,000 compared to the median Kansas City home at $135,000. Lastly, the Shoal Creek Valley is much less racially diverse, with 87 percent of residents identifying as white in 2014 compared to 60 percent city-wide—this is a decrease from 93% of residents identifying as white in 2000.

[3] https://www.visitkc.com/business-detail/woodneath-library-center, https://www.mymcpl.org/story-center/about/historic-home-woodneath-library-center, https://yellow.place/en/woodneath-library-center-kansas-city-usa

We can identify other public library branch openings and closings in the Public Library System (PLS), including cities with data available through the Crime Open Database. The Woodneath Public Library Branch is unique, however, as no other library branches within the PLS opened or closed during the selected time period. This distinctive opportunity and data availability provide a rare case study to plausibly estimate the causal effect of opening a new library on crime.[4]

### 3.2 The Crime Open Database

Our primary dataset is the Crime Open Database (CODE), which provides incident-level criminal offenses for 16 of the 50 largest cities in the USA. The core data from CODE offer the exact location of each criminal offense (longitude and latitude), the type of criminal offense, and precisely when it occurred. We subset only the criminal offense incidents occurring in Kansas City, MO, using CODE from 2010 to 2019.

We divide the different criminal offenses categories available in the CODE dataset into four groups of offenses: property, people, society, and others. Table 1 exhibits total offenses from 2010 to 2019 in the core of Kansas City, MO, by each category. The largest group of crimes is against property, followed by crimes against persons and society. Only four criminal offense types have more than 100,000 incidences: larceny/theft, assault, burglary, and vandalism.

### 3.3 Empirical strategy

We use a standard difference-in-differences design to explore the local effect of the Woodneath Public Library on criminal offense incidents. We argue that the opening of the Woodneath Public Library branch produces a quasi-exogenous treatment effect on its nearby region, plausibly affecting criminal activity (outcome). The availability of criminal activity data by geolocation and pre- and post-branch opening allows us to develop proper treatment and control area groups to examine the impact of the Woodneath Public Library opening on criminal offenses.

Figure 1 exhibits the identification strategy to extract the plausible causal effect of the Woodneath Public Library Branch's opening on various types of criminal offenses. In Fig. 1, we label the 12 different pre-existing libraries in Kansas core. The Woodneath branch, which opened in June 2013, is referred to as the treatment.

The nearest public library from the Woodneath branch is the North Oak library, which is 5.92 miles away. Therefore, to avoid the potential spillover effect from the pre-existing library, we set the bound of the maximum distance for analysis up to $\frac{5.92}{2} = 2.96$ miles in radius. In other words, our unique setting will only allow us to capture the plausible causal effect of the opening of the Woodneath branch up to

[4] If we were to include multiple cities in this study, we would have two different treatments: opening and closing, which are not mutually exclusive. In addition, we would still incur the issue of having very few treated and untreated units, thereby rendering other analyses such as event studies infeasible. Thus, we believe this study case provides us with a precise scenario for our research.

**Table 1** Total incidents of criminal offenses (Kansas City, MO, 2010–2019)

| Offense | Count | Offense | Count |
|---|---|---|---|
| Offense against property | | Offense against society | |
| Larceny/theft offenses | 282,871 | Drug/narcotic offenses | 55,684 |
| Burglary/breaking & entering | 116,706 | Trespass of real property | 30,465 |
| Destruction/damage/vandalism of property (except arson) | 102,111 | Disorderly conduct | 16,483 |
| Motor vehicle theft | 76,320 | Driving under the influence | 9653 |
| Robbery | 52,021 | Weapon law violations | 9513 |
| Fraud offenses (except counterfeiting/forgery and bad checks) | 36,853 | Family offenses, nonviolent | 6186 |
| Counterfeiting/forgery | 10,109 | Prostitution offenses | 3178 |
| Stolen property offenses | 5194 | Liquor law violations (except driving under the influence and drunkenness) | 2408 |
| Arson | 5015 | Drunkenness (except driving under the influence) | 843 |
| Embezzlement | 3817 | Curfew/loitering/vagrancy violations | 764 |
| Bad checks (except counterfeit checks or forged checks) | 290 | Pornography/obscene material | 299 |
| Extortion/blackmail | 107 | Peeping tom | 47 |
| Bribery | 4 | Gambling offenses | 6 |
| Offense against persons | | Offense against other | |
| Assault offenses | 233,870 | All other offenses | 84,536 |
| Sex offenses | 11,550 | | |
| Homicide offenses | 2184 | | |
| Kidnapping/abduction | 1227 | | |
| Sex offenses, nonforcible | 734 | | |
| Human trafficking | 22 | | |

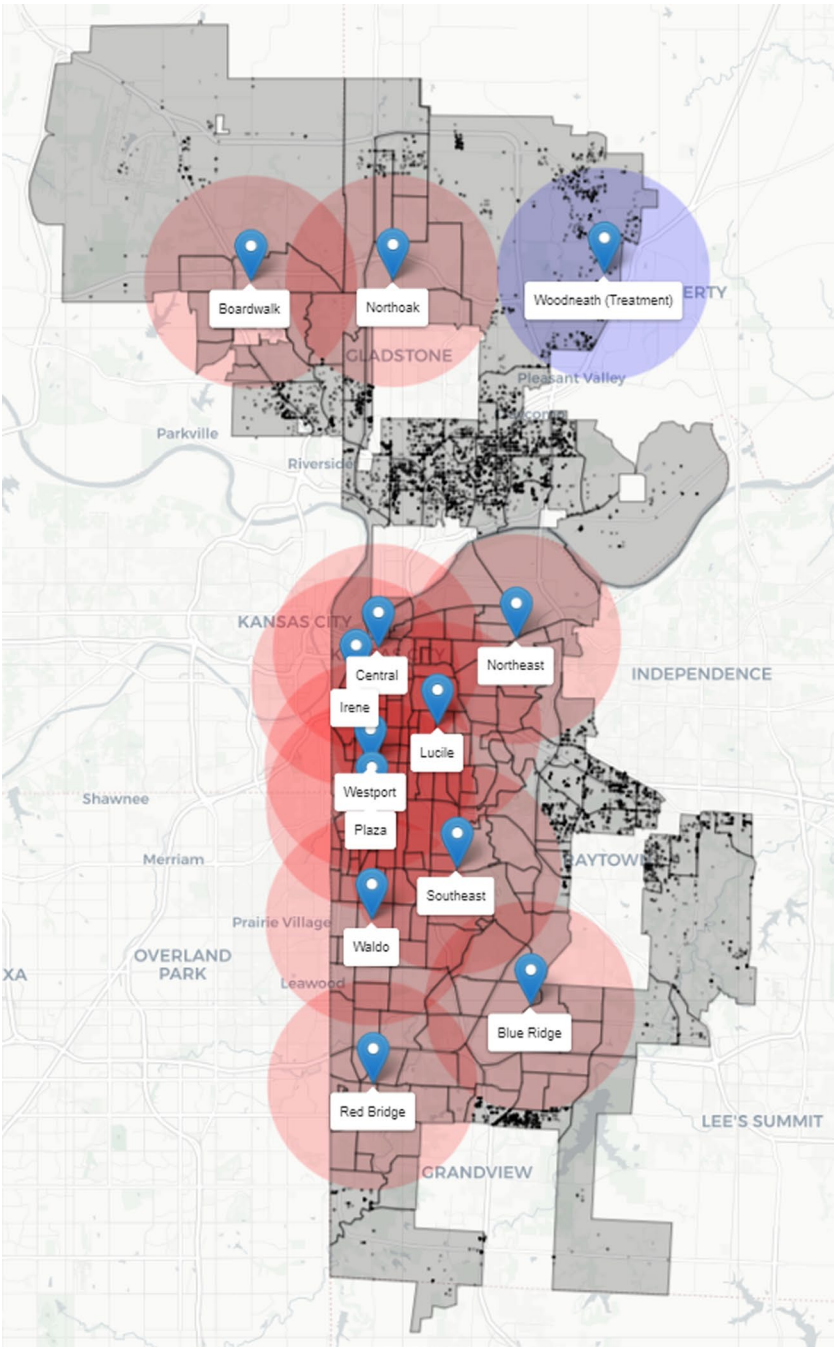


**Fig. 1** Identification strategy utilizing difference-in-difference framework. Criminal offenses within the 2.96 miles in radius of pre-existing public library branches are not shown as they are excluded from our analysis. The black dots represent the location of criminal offenses. For the graphical illustration purpose, we only consider assault offenses

2.96 miles radius proximity, which is colored in blue in Fig. 1. Furthermore, to avoid potential spillover effects from the pre-existing public libraries on various criminal offenses, we exclude the vicinity of up to 2.96 miles radius of the pre-existing public libraries, colored in red.

Finally, any area that excludes the 2.96 miles proximity of Woodneath and the remaining pre-existing library can provide controls or comparison groups ($treat = 0$). We define the proximity of the Woodneath branch as the treatment group ($treat = 1$). We define our treatment time according to the month-year of the Woodneath branch opening. Thus, we define pre-2013 as $post = 0$ and post-2013 as $post = 1$. We average criminal offense incidents in treatment and comparison location proximity over time and define our outcome variable ($Y$) as an average of annual criminal offense. With these settings, we implement a standard difference-in-differences framework.

$$Y_{it} = \alpha + \beta treat_i + \gamma post_t + \delta(treat_i \times post_t) + \omega t + \varepsilon_{it} \tag{1}$$

$Y_{it}$ is the annual average criminal offenses incidents in the treated or control unit $i$ at month-year $t$. Since we have two units (one treatment and one control) and 12 months times 10 years, we have 240 observations. $treat_i$ is a binary indicator that takes a value of 1 for the location where the Woodneath Public Library Branch opens and 0 for the exclusion zone greater than the 2.96 miles radius outside Woodneath to avoid the spillover effects of pre-existing libraries. $post_t$ takes a value of 1 after the June 2013 opening of the Woodneath branch and 0 otherwise. The interaction $treat_i \times post_t$ is the binary treatment indicator, which takes a value of 1 for the Woodneath branch after the June 2013 opening and 0 otherwise. The coefficients $\alpha$, $\beta$, $\gamma$, and $\delta$ are expressed as:

$$\begin{aligned}
\alpha &= E[Y|treat = 0, post = 0] \\
\beta &= (E[Y|treat = 1, post = 0] - E[Y|treat = 0, post = 0]) \\
\gamma &= (E[Y|treat = 0, post = 1] - E[Y|treat = 0, post = 0]) \\
\delta &= (E[Y|treat = 1, post = 1] - E[Y|treat = 1, post = 0]) \\
&\quad - (E[Y|treat = 0, post = 1] - E[Y|treat = 0, post = 0])
\end{aligned}$$

The coefficient $\alpha$ is an *intercept* term that gives the average number of criminal offenses within the area before Woodneath's opening period, i.e., before June 2013. The coefficient of *treat* or $\beta$ provides the difference in average criminal offenses—before June 2013—between the proposed Woodneath location and existing public libraries. In addition, this coefficient captures the systematic differences between the treatment and control groups. The coefficient of *post*, or $\gamma$, shows the difference in average criminal offenses before and after June 2013 and captures the systematic average trend difference between treatment and control groups.

The coefficient $\delta$ is the parameter of interest that quantifies the change in criminal offense incidents in the proximity of the Woodneath branch location, which may indicate a plausibly causal effect of Woodneath on local criminal offenses. Our model also includes linear treatment and captures specific trend $\omega t$, which absorbs differential trends in criminal offenses relative to the comparison location in the

treatment location. In other words, it captures any latent trend in criminal offenses that are not explained by treatment or the opening of the Woodneath branch.

The empirical strategy given in Eq. (1) implements a standard difference-in-differences framework, which hinges on a key identification strategy that treatment location (circled in blue in Fig. 1) and control group locations (remaining locations other than circled in blue and red in Fig. 1) are plausibly similar in both observable and unobservable features. Though these are not directly testable, one way to examine them would be to develop an event study framework. However, as we only have one treatment and one control unit in our panel data, an event study framework cannot produce respective standard errors.

Additionally, controlling for covariates like unemployment, poverty, and other socioeconomic variables seems an obvious step for modeling, as it is plausible that opening a new library could affect them. However, we refrain from controlling covariates in our analysis since the treatment variables affect the potential covariates, and controlling these covariates (or "effect of the cause" or "bad controls") will result in collider bias (Cinelli et al., 2021; Pearl, 2015). Cinelli et al. (2021) provides a detailed explanation of when to include the control variables in the regression equations. A recent innovation in the difference-in-difference method also refrains from controlling for covariates for unbiased estimates (Roth et al., 2022). We acknowledge that not controlling for "good covariates" may increase the standard errors of the estimates, but controlling for "bad covariates" would likely result in biased estimates (Cinelli et al., 2021). Furthermore, since we are relying on non-standard treatment and control units, such covariates do not exist, and approximating them could further bias our results.

## 4 Results

We report the estimates from difference-in-differences in Tables 2, 3, 4. Table 2 shows the effect of the Woodneath branch on the various property-related criminal offenses. Table 3 shows the impact of the Woodneath branch on the different society and person-related criminal offenses. Table 4 shows the implications of the Woodneath branch on total offenses against property, society, persons, all other offenses, and total offenses. In all these tables, the coefficient of interest is $\delta$, which is the interaction between $treat \times post$ and provides a plausibly causal effect of the opening of the Woodneath library branch on several classifications of criminal offenses.

The results in Table 2 show that several types of criminal offenses decrease post-opening of Woodneath library, particularly opportunity-based crimes such as vandalism, burglaries, and robberies. These criminal offenses are more likely to be responsive to some attributes associated with libraries, such as increased security (Chalfin and McCrary, 2017). Motor-based criminal offenses, which are situationally dependent on various location features, such as surveillance cameras and parking lot lighting (Chalfin & McCrary, 2017; Clarke & Harris, 1992), also decrease in frequency. The decrease in fraud can be explained by the increased presence of security as well as the reduction in the cost of accessing information.

**Table 2** Impacts of opening of Woodneath library on various property criminal offenses

| | Criminal offenses counts | | | | | | |
|---|---|---|---|---|---|---|---|
| | Larceny | Burglary | Vandalism | Motor | Robbery | Fraud | Forgery |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| $\alpha$: *intercept* | 401.697*** | 171.800*** | 130.444*** | 82.926*** | 27.266*** | 61.957*** | 14.916*** |
| | (16.428) | (6.365) | (6.328) | (4.342) | (2.397) | (3.407) | (1.255) |
| $\beta$: *treat* | −339.166*** | −163.602*** | −116.955*** | −79.217*** | −26.580*** | −52.230*** | −12.306*** |
| | (16.847) | (6.421) | (6.413) | (4.388) | (2.429) | (3.552) | (1.355) |
| $\gamma$: *post* | 20.273 | 33.721*** | 47.411*** | 13.633 | 11.061** | 38.324*** | 6.826** |
| | (28.016) | (12.802) | (12.448) | (8.344) | (4.715) | (7.688) | (2.745) |
| $\delta$: *treat*×*post* | −22.516 | −31.380** | −41.747*** | −15.733* | −11.475** | −30.921*** | −3.751 |
| | (28.740) | (12.933) | (12.618) | (8.434) | (4.786) | (8.021) | (2.962) |
| Observations | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| $R^2$ | 0.840 | 0.869 | 0.821 | 0.853 | 0.693 | 0.744 | 0.526 |
| Adjusted $R^2$ | 0.837 | 0.866 | 0.817 | 0.850 | 0.687 | 0.739 | 0.516 |

Enclosed in the parenthesis we report robust-to-heteroskedasticity standard errors. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively

**Table 3** Impacts of opening of Woodneath library on society and person-related criminal offenses

| | Criminal offenses counts | | | | | |
|---|---|---|---|---|---|---|
| | Trespass | Disorderly | DUI | Weapon | Assault | Sex |
| | (8) | (9) | (10) | (11) | (12) | (13) |
| $\alpha$: *intercept* | 7.404*** | 9.119*** | 6.150*** | 3.493*** | 184.479*** | 12.791*** |
| | (2.025) | (1.204) | (0.607) | (0.599) | (9.223) | (1.281) |
| $\beta$: *treat* | −6.591*** | −8.389*** | −5.597*** | −3.295*** | −169.743*** | −11.278*** |
| | (2.061) | (1.234) | (0.629) | (0.612) | (9.327) | (1.313) |
| $\gamma$: *post* | −7.692* | 4.800* | 0.079 | −0.533 | 37.474** | 2.296 |
| | (4.193) | (2.469) | (1.111) | (0.997) | (19.044) | (2.216) |
| $\delta$: *treat*×*post* | 6.795 | −4.590* | 0.307 | 0.512 | −41.097** | −1.422 |
| | (4.281) | (2.573) | (1.150) | (1.011) | (19.185) | (2.285) |
| Observations | 240 | 240 | 240 | 240 | 240 | 240 |
| $R^2$ | 0.614 | 0.496 | 0.499 | 0.495 | 0.861 | 0.591 |
| Adjusted $R^2$ | 0.606 | 0.486 | 0.489 | 0.484 | 0.858 | 0.582 |

Enclosed in the parenthesis we report robust-to-heteroskedasticity standard errors. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively

Table 3 demonstrates that criminal offenses not thought to be situationally dependent, such as sexual assault, DUIs, and weapons-based criminal offenses, are not impacted by the opening of the Woodneath library. This result is to be expected as crimes of opportunity are more responsive to situational factors than crimes of passion, such as murder and sexual assault (Becker, 1974); most sexual assaults

**Table 4** Impacts of opening of Woodneath library on total offenses

| | Offenses against counts | | | | |
|---|---|---|---|---|---|
| | Persons | Property | Society | Other | Total |
| | (14) | (15) | (16) | (17) | (18) |
| $\alpha$: *intercept* | 199.176*** | 899.829*** | 88.499*** | 83.631*** | 1,271.134*** |
| | (9.749) | (31.205) | (5.665) | (4.149) | (44.624) |
| $\beta$: *treat* | − 182.754*** | − 797.438*** | − 79.459*** | − 74.941*** | − 1,134.592*** |
| | (9.848) | (31.625) | (5.753) | (4.226) | (45.041) |
| $\gamma$: *post* | 38.931** | 168.668*** | 12.453 | 8.184 | 228.235*** |
| | (19.788) | (56.830) | (11.856) | (6.946) | (85.128) |
| $\delta$: *treat* × *post* | − 41.974** | − 154.473*** | − 9.779 | − 6.772 | − 212.998** |
| | (19.941) | (57.493) | (11.991) | (7.072) | (85.731) |
| Observations | 240 | 240 | 240 | 240 | 240 |
| $R^2$ | 0.867 | 0.886 | 0.782 | 0.823 | 0.890 |
| Adjusted $R^2$ | 0.864 | 0.883 | 0.778 | 0.819 | 0.888 |

Enclosed in the parenthesis we report robust-to-heteroskedasticity standard errors. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively

are perpetrated by an assailant known to the victim, as are the majority of murders. Thus, crimes of passion are not classified as opportunity-based crimes. Similarly, weapons-based crimes require a prior intention to carry a weapon. Therefore, these crimes are less apt to be subjected to opportunity factors that might create a transient increase or decrease in frequency.

Table 4 shows the effect of the opening of the Woodneath branch on total offenses against property, society, persons, all other criminal offenses, and total offenses. The only statistically significant impacts of criminal offenses are those against property and persons. The effect on criminal offenses against society and other criminal offenses is not different from zero; the broader scope of these offenses could reduce the likelihood of being impacted by situationally specific factors.

One potential concern is the time dimension of the effect of the public library opening on crime. The Appendix shows the results of two regressions. The first compared data from 2010–2012 to 2013–2015, while the second compared data from 2010–2012 to 2016–2019. These regressions shed light on the changing patterns of criminality over time. While there were no statistically significant changes in criminal offenses during the period from 2013 to 2015 compared to 2010 to 2012, there was a significant reduction in criminal offenses. Thus, the library's opening did not immediately reduce criminal offenses. Instead, the effect of the library's presence manifested in a delay. This is in line with previous research on public amenities such as green infrastructure and public-housing demolition (Aliprantis & Hartley, 2010; Burley, 2018).

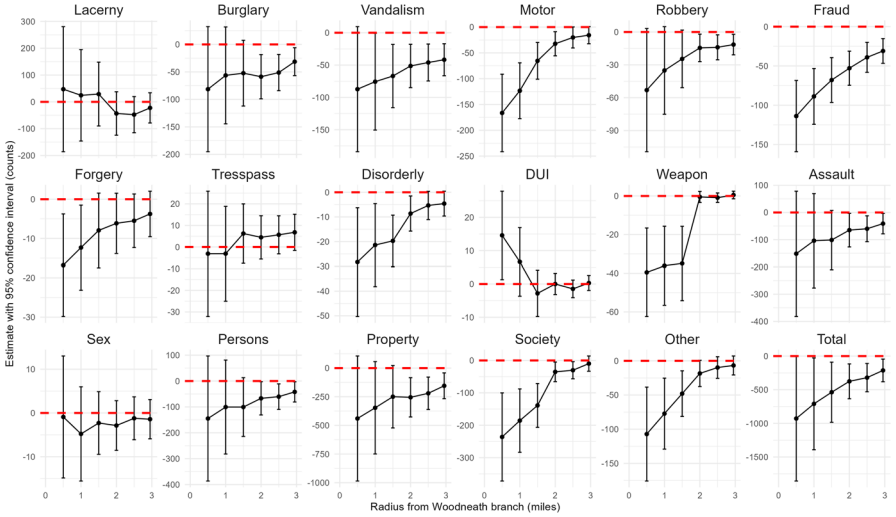


**Fig. 2** Impacts of opening of Woodneath library on various criminal offenses within its proximity. The dotted line horizontal line shows a null effect, bold dots show the average impact of Woodneath branch, and vertical whiskers show 95% confidence interval. This plot shows the distance-based effects of Woodneath branch on various criminal offenses along with 95% confidence interval. The confidence intervals are based on robust-to-heteroskedasticity standard errors

### 4.1 Varying radius of impact

We can identify the causal effect of the opening of the Woodneath branch on various criminal offenses for up to 2.96 miles without any spillover from other pre-existing libraries. We expand our analysis to explore different distances as treatment and perform our analysis for 0.5, 1, 1.5, 2, 2.5, and 2.95 miles of radius. The average treatment effect estimation based on standard difference-in-differences method is exhibited in Fig. 2. The *x*-axis represents the radius from the Woodneath branch, and the *y*-axis is the average treatment effect estimation based on the standard difference-in-differences method with a 95% confidence interval based on robust heteroskedasticity standard errors.

The results in Fig. 2 are similar to the patterns observed in Tables 2, 3, 4. Crimes of opportunity, including vandalism and fraud, negatively correlate with increased proximity to the Woodneath branch. In contrast, crimes largely unaffected by opportunity (sex crimes, DUIs) are also unaffected by proximity to the library.

### 4.2 Randomization inference

Our results in Tables 2, 3, 4, along with Fig. 2, show the impact of the Woodneath branch on various criminal offense-related variables. However, an obvious question is if such effects are plausibly causal or merely due to statistical chance. To answer this question, we randomly permute the treatment location. We develop the

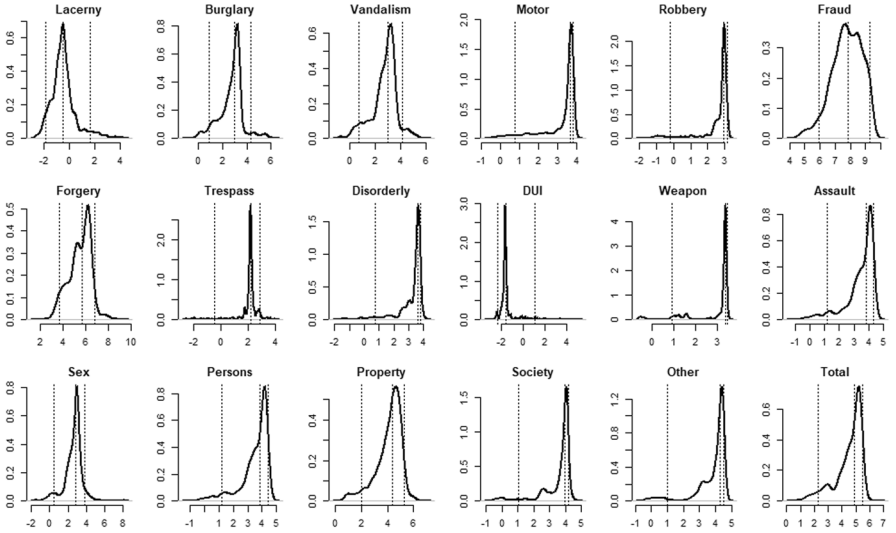


**Fig. 3** Treatment randomization inference distribution. The *Z*-score distribution exhibits the distance of the randomization inference distribution compared to the actual treatment effect. If the mean placebo effect is the same as actual treatment effect, the distribution should center around zero

placebo effect distribution, then custom test how unusual the actual treatment effect is against the mean of the placebo effect distribution.

To examine if the treatment is caused only by the existence of the library, we first exclude the treatment group. We then only consider the control group, which comprises all the gray excluding red and blue colored area in Fig. 1. Finally, we randomly select the placebo treatment location. For such a placebo treatment location, we expect to see no effect of placebo library location on crime. We randomly permute treatment and run the standard difference-in-differences for 1000 iterations. We collect and store the randomly permuted treatment effect value from each iteration. Because we randomize the treatment assignment, we call these estimates the randomization inference. Figure 3 exhibits the custom test of how many standard deviations the mean of the randomization inference distribution is from the actual treatment effect. Actual treatment effects are presented in Tables 2, 3, 4. Hence,

$$Z = \frac{\bar{\delta}_{placebo} - \underline{\delta}}{\sigma_{\bar{\delta}_{placebo}}}$$

where $\bar{\delta}_{placebo}$ is the vector which comprises 1000 values of randomized inference, its respective standard deviation is $\sigma_{\delta_{placebo}}$. The *Z*-score distribution, presented in

Fig. 3, exhibits the randomization inference distribution compared to the actual treatment effect. The distribution should center around zero if the mean randomization inference is the same as the actual treatment effect. If zero is not included within the 2.5% quantile and 97.5% quantile of the *Z*-score distribution, it corroborates that the mean of randomization inference distribution is at a statistically significant distance from the actual treatment effect. Such results suggest that the treatment effects are plausibly causal and not statistical chance.

### 4.3 Criminal offense by squared mile

Lastly, we examine criminal offenses adjusted for each square mile. We use QGIS to calculate the treatment area (15.93 square miles) and control area (149.86 square miles) and adjust the offense counts by each area, creating an intensive measure that allows us to account for the density and potential concentration of criminal offenses. We present the treatment effect that is adjusted per squared mile in Table 5. The treatment effect estimates remain consistent with the main results presented in respective Tables 2, 3, 4.

In particular, while burglary and assault estimates are still negative, they lose statistical significance when scaled by the area. Conversely, the forgery, DUI, and weapon offense estimates become statistically significant and align with other results suggesting that the Woodneath public library branch assists with crime deterrence. Looking at the total offenses by type, person, and property, estimates are negative but not different from zero once we scale them by the area. In contrast, society and other estimates are negative and statistically significant. This is the opposite of the results in Table 4, but not unexpected.

While Table 4 presents results for an extensive measure, Table 5 results are for an intensive measure. This is likely due to the nature of the crimes themselves. Results suggest that public library branch affects the count of personal and property offenses, as these are directed at individual persons/properties. In contrast, the library affects the concentration of societal offenses, as these crimes are considered nondirected and impact the community as a whole.

## 5 Discussion and conclusion

Our paper sets out to understand the effect of public libraries on criminal offense incidents. We focus on Kansas City, MO, and explore the opening of the Woodneath Public Library branch, the first new branch in the city in over 20 years. Using crime-incident-level data from the Crime Open Database, we use the distance to a public library to determine treatment and comparison location areas and employ a classic difference-in-differences strategy. Our results suggest that public libraries can help

**Table 5** Impacts of opening of Woodneath library on various offenses, per squared mile, per month, at Kansas City

| | Offenses counts, per squared mile, per month | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Property-related criminal offenses | | | | | | | Person-related criminal offenses | | | | | | Total offenses | | | | |
| | Larceny | Burglary | Vandalism | Motor | Robbery | Fraud | Forgery | Trespass | Disorderly | DUI | Weapon | Assault | Sex | Persons | Property | Society | Other | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| *α: intercept* | 15.819*** | 8.731*** | 5.530*** | 3.576*** | 2.634*** | 1.785*** | 0.551*** | 1.159*** | 0.749*** | 0.451*** | 0.377*** | 10.387*** | 0.612*** | 11.143*** | 39.178*** | 6.216*** | 4.553*** | 61.090*** |
| | (0.438) | (0.231) | (0.188) | (0.136) | (0.104) | (0.075) | (0.023) | (0.051) | (0.033) | (0.043) | (0.025) | (0.391) | (0.027) | (0.412) | (1.025) | (0.219) | (0.133) | (1.680) |
| *β: treat* | − 15.727*** | − 8.708*** | − 5.497*** | − 3.565*** | − 2.634*** | − 1.779*** | − 0.549*** | − 1.160*** | − 0.750*** | − 0.451*** | − 0.377*** | − 10.370*** | − 0.609*** | − 11.123*** | − 39.011*** | − 6.208*** | − 4.540*** | − 60.883*** |
| | (0.439) | (0.231) | (0.188) | (0.136) | (0.104) | (0.076) | (0.023) | (0.051) | (0.033) | (0.043) | (0.025) | (0.392) | (0.027) | (0.413) | (1.026) | (0.219) | (0.133) | (1.680) |
| *γ: post* | − 0.314 | 0.544 | 0.586* | 1.110*** | 0.354* | 0.762*** | 0.113** | 0.021 | 0.189** | − 0.097** | 0.264*** | 1.016 | 0.006 | 0.969 | 2.942 | 1.574*** | 0.713*** | 6.199* |
| | (0.794) | (0.387) | (0.329) | (0.256) | (0.191) | (0.154) | (0.044) | (0.099) | (0.075) | (0.045) | (0.078) | (0.784) | (0.047) | (0.822) | (1.857) | (0.463) | (0.234) | (3.163) |
| *δ: treat×post* | 0.327 | − 0.541 | − 0.549* | − 1.116*** | − 0.354* | − 0.739*** | − 0.105** | − 0.021 | − 0.189** | 0.097** | − 0.264*** | − 0.989 | − 0.006 | − 0.942 | − 2.868 | − 1.583*** | − 0.726*** | − 6.120* |
| | (0.795) | (0.388) | (0.330) | (0.256) | (0.191) | (0.155) | (0.045) | (0.099) | (0.075) | (0.045) | (0.078) | (0.784) | (0.048) | (0.823) | (1.858) | (0.463) | (0.234) | (3.164) |
| Observations | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| R2 | 0.926 | 0.936 | 0.901 | 0.902 | 0.883 | 0.876 | 0.862 | 0.887 | 0.847 | 0.752 | 0.653 | 0.908 | 0.865 | 0.909 | 0.933 | 0.895 | 0.924 | 0.931 |
| Adjusted $R^2$ | 0.924 | 0.935 | 0.898 | 0.900 | 0.881 | 0.874 | 0.859 | 0.885 | 0.844 | 0.747 | 0.646 | 0.906 | 0.862 | 0.907 | 0.932 | 0.893 | 0.922 | 0.929 |

Enclosed in the parenthesis we report robust-to-heteroskedasticity standard errors. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively

reduce crimes of opportunity and the concentration of societal offenses, thus acting as a crime deterrent.

We discuss several reasons that might refer to why public libraries reduce criminal offenses. A key concept explored by Chalfin and McCrary (2017) is crime risk perception, i.e., how the individual perceives risk and how this perception leads to a change in resulting criminal behavior. For example, a public library on its own would not pose much of a deterrence, but the additional components of a new piece of infrastructure, including increased numbers of pedestrians, security cameras, lighting fixtures, and new law enforcement patrol routes, may create the perception that crime is either easier or more challenging to commit. Street lights, for instance, are widely perceived to be an environmental design that effectively reduces crime (Chalfin et al., 2021; Welsh & Farrington, 2002).

Libraries can act as a safe haven from the dangers inherent in street life—they position themselves as safe places through policies and procedures designed to protect employees, the public, and the building itself in instances such as natural disasters, emergencies, or civil unrest (Graham, 2013; Halsted et al., 2014). Most Americans believe that libraries are a safe place, with 69% agreeing that libraries are safe to hang out in (Horrigan, 2016). The fact that libraries have a widespread reputation as safe places could make them an attractive target for vulnerable individuals to spend time in, thereby reducing their exposure to potentially dangerous street-level activities.

Populations living in poverty can realize outsized impacts from access to public libraries, as access to materials that can boost education and literacy tends to be unequally distributed; Neuman and Celano (2001) report that middle-class neighborhoods enjoy a 13:1 ratio of books to children, but in areas with elevated poverty rates, this ratio decreases to 1:300. Multiple barriers can prevent vulnerable individuals from fully benefiting from public library resources, however, including lack of public transportation to libraries located far away from economically depressed neighborhoods, the amount of time needed to travel to nonlocal public libraries and low-income families' fear of library fines, and late fees (DePrist, 2017).

Policy implications are twofold: While we cannot disentangle the mechanisms driving our results, i.e., the physical presence of the library versus its programmatic activities, theory suggests that both should contribute to criminal activity reduction. The physical presence increases costs of crime by increasing the probability of arrest. Programs should help with educational and creativity outcomes, which in turn increases the likelihood of a successful career, thereby increasing the opportunity cost of pursing a criminal career. In addition, public libraries are one of many cultural urban amenities that provide opportunities for human capital improvement while also creating some police physical presence. Thus, local governments should take these externalities into account when determining how much funding should be allocated for such institutions.

Although our results show that public libraries reduce crimes of opportunity, our study is not without limitations. In previous paragraphs, we discuss some potential mechanisms for crime deterrence. However, we cannot disentangle nor quantify how these mechanisms work in our setting. There are other limitations to consider: first, there is a lack of other local statistics to control for the possible time-varying feature of these communities. Second, all of the city regions have been treated to some extent. Third, the community has access to all public library branches, and the distance may be critical to explaining its intensity. Fourth, the Woodneath public library building was under construction for four years before its inauguration, breaking ground in Fall 2010, which could have induced different criminal offense trends within this area. For example, the introduction of expensive construction equipment and the influx of laborers in the area could have provided new targets for crime proliferation between the Fall of 2010 and the Summer of 2013, thus temporarily increasing crime statistics during that time and possibly biasing our estimates. Lastly, we cannot isolate the role of the cultural nature of the new public library building on crime, which remains a topic for future research.

Another concern is the generalization of results beyond the Woodneath public library case. On one hand, our results are in line with those of Porter (2014), which found that additional hours of operation for public libraries in Los Angeles were negatively associated with aggravated assault rates and car burglaries. On the other hand, while the addition of cities with public library openings and closings could increase the number of observations in our empirical analysis, thus allowing us to leverage broader information, new challenges and limitations would also be imposed, particularly the comparability between treatment and control units and their crime trends. Therefore, focusing on one particular case allows us to perform a more systematic and complete analysis that adds an extra piece of evidence to a growing body of literature.

Future work should focus on addressing some of the concerns raised. Three possible extensions deserve special attention: the first would be using different identification strategies for extra robustness evaluation, such as synthetic controls or different spatial definitions of treatment and comparison groups. The second would explore potential differences across library programs, use, and materials to understand other ways libraries may impact local crime. Lastly, since all city areas are somewhat affected by public library branches in different intensities, spatial spillovers may be essential to explain some of these phenomena.

## Appendix: Timing of effect

One potential concern is the time dimension of the effect of the public library opening on crime. Table 6 presents results for two time periods. Panel A compares 2010–2012 to 2013–2015, while Panel B compares 2010–2012 to 2016–2019. We present results for property-related crimes, person-related crimes, and total offenses (property, person, society, and other). Results show a lagged effect from the opening of Woodneath public library building on crime. In particular, while there are no

**Table 6** Impacts of opening of Woodneath library on various offenses for different time periods

| | Offenses counts | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Property-related criminal offenses | | | | | | Person-related criminal offenses | | | | | | Total offenses | | | | | |
| | Larceny | Burglary | Vandalism | Motor | Robbery | Fraud | Forgery | Trespass | Disorderly | DUI | Weapon | Assault | Sex | Persons | Property | Society | Other | Total |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
| Panel (a) 2010–2012 vs. 2013–15 | | | | | | | | | | | | | | | | | | |
| $\alpha$: | 390.076*** | 149.192*** | 128.747*** | 71.608*** | 23.192*** | 46.311*** | 13.549*** | 18.093*** | 10.397*** | 5.703*** | 3.571*** | 170.109*** | 13.274*** | 185.807*** | 833.621*** | 97.200*** | 78.768*** | 1,195.396*** |
| | (22.294) | (8.899) | (9.433) | (5.820) | (3.036) | (4.707) | (1.765) | (2.581) | (1.862) | (0.944) | (0.916) | (9.645) | (1.959) | (10.509) | (38.241) | (7.685) | (6.318) | (51.475) |
| $\beta$: *treat* | −336.902*** | −143.254*** | −115.454*** | −67.637*** | −23.285*** | −37.677*** | −11.384*** | −17.054*** | −10.294*** | −5.321*** | −3.412*** | −156.669*** | −11.607*** | −170.667*** | −744.954*** | −88.560*** | −70.126*** | −1,074.307*** |
| | (22.884) | (8.971) | (9.617) | (5.878) | (3.066) | (4.926) | (1.936) | (2.625) | (1.894) | (0.975) | (0.932) | (9.808) | (2.032) | (10.657) | (38.864) | (7.828) | (6.446) | (52.102) |
| $\gamma$: *post* | −14.987 | −7.179 | 37.314** | −9.234 | 3.466 | 10.428 | 4.835 | 6.904 | 6.306** | −0.593 | −1.064 | −2.086 | 2.180 | −0.148 | 25.693 | 16.583 | −2.179 | 39.949 |
| | (31.927) | (16.627) | (17.335) | (9.517) | (6.342) | (8.333) | (3.472) | (4.537) | (3.055) | (1.493) | (1.357) | (17.138) | (3.418) | (18.455) | (65.299) | (15.103) | (9.777) | (90.251) |
| $\delta$: *treat* × *post* | −2.148 | 5.684 | −32.259* | 7.632 | −5.649 | −6.661 | −2.191 | −7.247 | −7.177** | 0.667 | 0.969 | −4.072 | −1.281 | −5.586 | −35.835 | −14.629 | 3.016 | −53.034 |
| | (33.142) | (16.799) | (17.562) | (9.679) | (6.430) | (8.605) | (3.803) | (4.667) | (3.263) | (1.529) | (1.373) | (17.385) | (3.499) | (18.722) | (66.364) | (15.290) | (9.958) | (91.187) |
| Observations | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 |
| R2 | 0.923 | 0.899 | 0.860 | 0.907 | 0.729 | 0.789 | 0.552 | 0.534 | 0.479 | 0.526 | 0.477 | 0.919 | 0.605 | 0.924 | 0.952 | 0.821 | 0.872 | 0.957 |
| Adjusted $R^2$ | 0.920 | 0.895 | 0.855 | 0.904 | 0.719 | 0.782 | 0.536 | 0.517 | 0.460 | 0.509 | 0.458 | 0.916 | 0.591 | 0.922 | 0.950 | 0.814 | 0.868 | 0.956 |
| Panel (b) 2010–2012 vs. 2016–19 | | | | | | | | | | | | | | | | | | |
| $\alpha$: | 428.304*** | 176.315*** | 138.076*** | 93.559*** | 28.636*** | 68.946*** | 14.074*** | 11.191*** | 9.675*** | 5.945*** | 4.483*** | 213.198*** | 14.121*** | 229.542*** | 956.205*** | 103.599*** | 86.866*** | 1,376.212*** |
| | (24.389) | (7.672) | (8.179) | (5.831) | (2.937) | (4.192) | (1.435) | (2.543) | (1.565) | (0.754) | (0.799) | (12.890) | (1.631) | (13.427) | (44.300) | (7.436) | (5.491) | (63.491) |
| $\beta$: *treat* | −370.191*** | −167.810*** | −124.319*** | −90.107*** | −26.996*** | −55.634*** | −12.294*** | −10.934*** | −8.980*** | −5.303*** | −4.258*** | −196.993*** | −12.067*** | −211.209*** | −854.446*** | −94.716*** | −77.532*** | −1,237.903*** |
| | (24.778) | (7.744) | (8.348) | (5.881) | (2.998) | (4.398) | (1.549) | (2.584) | (1.594) | (0.787) | (0.811) | (13.000) | (1.680) | (13.530) | (44.787) | (7.560) | (5.590) | (64.001) |
| $\gamma$: *post* | 163.873** | 90.692*** | 107.509*** | 66.299*** | 13.578 | 74.895*** | 5.669 | 4.405 | 6.998 | −1.067 | 4.929** | 182.657*** | 12.807*** | 196.132*** | 516.753*** | 95.279*** | 30.949** | 839.114*** |
| | (78.423) | (21.921) | (24.785) | (19.379) | (9.500) | (10.654) | (4.597) | (8.871) | (4.720) | (1.822) | (2.375) | (43.663) | (4.658) | (44.424) | (139.232) | (24.778) | (14.668) | (203.330) |
| $\delta$: *treat* × *post* | −177.249** | −85.733*** | −102.711*** | −71.251*** | −9.518 | −51.381*** | −5.478 | −8.733 | −5.513 | 1.854 | −4.973** | −182.067*** | −9.974** | −193.384*** | −498.078*** | −94.020*** | −25.548* | −811.030*** |
| | (79.316) | (22.255) | (25.478) | (19.573) | (9.839) | (11.483) | (4.966) | (9.029) | (4.929) | (1.960) | (2.397) | (43.967) | (4.827) | (44.745) | (140.526) | (25.219) | (14.986) | (204.690) |
| Observations | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| R2 | 0.815 | 0.882 | 0.815 | 0.847 | 0.673 | 0.779 | 0.523 | 0.671 | 0.519 | 0.526 | 0.513 | 0.861 | 0.598 | 0.867 | 0.867 | 0.811 | 0.805 | 0.876 |
| Adjusted $R^2$ | 0.810 | 0.879 | 0.809 | 0.842 | 0.663 | 0.773 | 0.508 | 0.661 | 0.504 | 0.512 | 0.498 | 0.856 | 0.585 | 0.863 | 0.863 | 0.805 | 0.799 | 0.873 |

Enclosed in the parenthesis we report robust-to-heteroskedasticity standard errors. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively

statistically significant changes in criminal offenses during the first period, there was a significant reduction in criminal offenses for the later period. This is in line with research on public amenities such as green infrastructure and public-housing demolition (Aliprantis & Hartley, 2010; Burley, 2018).

## Declarations

**Conflict of interest** The authors did not receive funding to conduct this work, and they have no financial interests.

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