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Danger zone: Land use and the geography of neighborhood crime

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ABSTRACT

This paper examines the impact of residential density and mixed land use on crime using a high-resolution dataset from Chicago over the period 2008–2013. I employ a novel instrumental variable strategy based on the city's 1923 zoning code. I find that commercial uses lead to more street crime in their immediate vicinity, particularly in more walkable neighborhoods. However, this effect is strongly offset by population density; dense mixed-use areas are safer than typical residential areas. Additionally, much of the commercial effect is driven by liquor stores and late-hour bars. I discuss the implications for zoning policy.

1. Introduction

Urban crime imposes a considerable economic hardship on city governments, businesses, and residents. In 2013, the City of Chicago spent over $1.3 billion on policing, and robberies alone cost city residents an estimated $500 million.[1] Crime has a substantial impact on neighborhood growth, racial segregation, and property values (Morenoff and Sampson, 1997; Pope and Pope, 2012). Violent crime patterns drive firms' location decisions within cities, affecting employment opportunities and access to amenities for city residents (Rosenthal and Ross, 2010). Crime levels even influence trends in suburbanization and urban revitalization, affecting the long-run growth of cities (Cullen and Levitt, 1999; Schwartz et al., 2003).

Policymakers are eager to combat city crime in an attempt to encourage urban revitalization, boost the tax base, and spur the emergence of neighborhoods attractive to increasingly coveted "creative class" workers. Many cities have embraced the notion that land use regulations can be used to cultivate walkable, vibrant neighborhoods that are naturally self-policing. The idea that urban form can shape pedestrian traffic and the social fabric of neighborhoods in a crime-controlling manner stems from the influential work of Jacobs (1961), which has recently been subject to renewed attention from policymakers, academics, and professional planners.[2] During his term, Mayor Bloomberg presided over the rezoning of 37% of New York City, much of it for dense, mixed-use developments encouraged by the theories of Jane Jacobs (Silverman, 2013). Many other major cities, such as Houston, Texas and Vancouver, British Columbia, have embraced the high-density, mixed-use development trend (Sarnoff and Kaplan, 2007; Punter, 2007). Even smaller cities such as Sarasota, Florida have pursued zoning changes designed to mitigate persistent crime problems (Carter et al., 2003).

While popular in practice, these ideas surrounding the relationship between land use and crime have received insufficient empirical scrutiny. Economists have largely ignored the role of land use patterns in explaining intra-metropolitan variation in crime (O'Flaherty and Sethi, 2014).[3] Criminologists counter Jacobs' theories with the claim that mixed uses and high residential density generate more contact between potential offenders and potential victims. The "routine activities" theory of Cohen and Felson (1979) argues that direct-contact predatory crime requires the "convergence in space and time of *likely offenders, suitable targets* and the *absence of capable guardians*," which is more likely to occur in high-density, mixed-use areas. Stark (1987) argues that mixed

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[1] The budget estimate comes from the City of Chicago's 2014 Budget Overview. McCollister et al. (2010) estimate that the tangible and intangible costs of a robbery to victims and the justice system amount to $42,310; there were 11,780 reported robberies in Chicago in 2013.

[2] See, e.g., Duany et al. (2010) and Glaeser (2011).

[3] Notable exceptions include studies of the impact of housing vacancies and the demolition of high-density public housing, which I discuss in detail below.

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uses and high density result in greater transience, anonymity, and "moral cynicism among residents," reducing neighborhood collective efficacy. Studies from the criminology and sociology literatures are largely descriptive, with limited attention to causal identification.

In this paper, I attempt to mediate this theoretical dispute and document the causal effects of proximate and nearby commercial uses, neighborhood walkability, and residential density on patterns of street crime. I also examine the extent to which these forces interact. To do so, I develop a high-resolution dataset of land use in Chicago using a comprehensive 2005 land use survey supplemented with data from Walkscore.com as well as exact locations of every restaurant, (late-hour) bar, and liquor store in the city. I combine this with detailed, spatially-referenced crime data covering all reported street crime incidents over the period 2008–2013. To address unobserved neighborhood characteristics and reverse causality, I employ an instrumental variables approach, using the city's 1923 zoning code as an instrument for modern land use. I show that historical zoning is a strong predictor of modern land use. I validate the assumption of exogeneity using data on the locations of homicides, gangs, juvenile delinquency cases, and low-income neighborhoods in the 1920s to test for the persistence of historical confounders. To identify the impact of specific commercial uses, I apply a spatial matching approach, examining how the level of crime differs within pairs of street segments that differ in their land use composition but are so proximate spatially that they arguably share similar unobservable neighborhood characteristics.

I find that commercial activity leads to substantially higher street robbery and assault rates, particularly in more walkable neighborhoods. However, this effect decays and then reverses at higher densities, so that dense, mixed-use areas actually exhibit lower crime rates than typical residential areas. Furthermore, crime rates are weakly declining with residential density, a striking finding given that larger cities are known to have higher crime rates (Haynes, 1973; Glaeser and Sacerdote, 1999). My results are strongly consistent across models based on three different identification strategies (selection-on-observables, instrumental variables, and spatial matching). The nonlinear relationship between commercial activity, walkability, and density is a novel finding which has eluded previous research on this topic. I interpret this result as a partial vindication of both Jane Jacobs and the routine activities theory: While commercial activity facilitates crime by generating contact between potential offenders and victims, a critical mass of pedestrian traffic appears to deter crime. I find that the positive effect of commercial uses on street crime is almost totally driven by liquor stores, restaurants, and bars (particularly late-hour bars), with the sizable impact of bars largely concentrated between the hours of 2 a.m. and 6 a.m.; restaurants and liquor stores appear to drive crime throughout the day.

These findings potentially have implications for local government policymaking. My results suggest that zoning which favors higher residential density could improve neighborhood safety. They also suggest that zoning which allows for mixed use structures may be preferable to more restrictive rules that aim for strictly residential or commercial use. These policy prescriptions are consistent with other recommendations advanced by economists, emphasizing how regulations favoring higher densities and mixed uses lead to lower housing costs and lower spatial mismatch between jobs and job seekers (Glaeser and Ward, 2009; Quigley and Raphael, 2005; Gobillon et al., 2007).

In addition to providing new results on the nonlinear relationship between land use and crime, this study also contributes to the research program in criminology which attempts to explain the phenomenon of crime "hot spots." One of the primary motivations for the study of land use and crime is the striking spatial heterogeneity of crime rates, both between and within neighborhoods. Crime is typically concentrated on a very small subset of city blocks and intersections, which have been dubbed "hot spots" (Weisburd et al., 2012).[4] This has prompted many researchers to explore place characteristics that could result in the formation of hot spots. More broadly, my finding that land use is a major determinant of crime patterns further establishes the importance of understanding this relationship.

2. Previous literature

Empirical studies of urban crime by economists have largely focused on explaining temporal and inter-metropolitan variation in crime rates; a smaller literature has analyzed intra-metropolitan variation, which appears to be substantially greater (O'Flaherty and Sethi, 2014). A number of studies analyze crime around foreclosed properties, which may affect crime by altering patterns of street traffic and neighborhood monitoring. Ellen et al. (2013) show that vacancies cause a general increase in crime in their immediate vicinity using microdata and a measurement approach very similar to that employed in this paper. Lacoe and Ellen (2015) show that vacancies may shift crime from the street into residences, consistent with the notion that less pedestrian traffic decreases the returns to street crime. Stucky et al. (2012) and Cui and Walsh (2015) show that residential foreclosures increase violent crime nearby.

A number of studies have documented other spatial determinants of crime patterns. Phillips and Sandler (2015) show that public transit influences the spatial distribution of crime by affecting the transportation costs facing potential offenders; their findings are consistent with the routine activities theory. Aliprantis and Hartley (2015) examine the demolition of high-density public housing and find that it leads to a sizable reduction in nearby violent crime. A number of studies have examined how low-income housing subsidies, which may alter neighborhood composition, affect local crime. Lens (2013) examines housing subsidies in New York City but finds little impact, while Lens (2014) finds a small negative effect in cities but no effect in suburbs. Freedman and Owens (2011) find that investments in low-income housing in poorer neighborhoods lead to declines in robberies and assaults; this may be due to increased development and reduced vacancies resulting in greater neighborhood monitoring.

Also relevant to my study is the (largely descriptive) literature in criminology and sociology on the relationship between crime and land use, most of which focus on neighborhood-level crime rates. Wright and Decker (1997) and Bernasco and Block (2009) find that robbers frequently offend near their homes. Browning et al. (2010) study the relationship between crime and commercial and residential density in a sample of census tracts from Columbus, Ohio. They find that, at low levels, an increase in a variable measuring commercial/residential density is associated with more crimes; at high levels, this relationship becomes negative. In Indianapolis, Stucky and Ottensmann (2009) find that robberies are more common in more commercial neighborhoods. Sampson (1983) argues that high residential densities will lead to more violent crime. Using data from Cleveland, Roncek and Maier (1991) document that city blocks containing bars see substantially more violent and property crime. Teh (2008) uses an event-study methodology to show that the introduction of liquor stores into

[4] Sherman et al. (1989) find that 3% of addresses/intersections in Minneapolis are responsible for 50% of calls to the police. Braga et al. (2010) find a similar result for gun crime in Boston and show that these hot spots are persistent over time. This pattern has been documented in Seattle and Tel Aviv-Jaffa as well, suggesting that this is a general feature of urban areas (Weisburd et al., 2004; Weisburd and Amram, 2014).