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Does public transit spread crime? Evidence from temporary rail station closures ☆

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ABSTRACT

We test whether public transit access affects crime using a novel identification strategy based on temporary, maintenance-related closures of stations in the Washington, DC rail transit system. The closures generate plausibly exogenous variation in transit access across space and time, allowing us to test the popular notion that crime can be facilitated by public transit. Closing one station reduces crime by 5% in the vicinity of stations on the same train line. Most of this effect remains after controlling for decreased ridership, indicating that a decrease in the availability of victims does not drive most of our results. We find suggestive evidence that crime falls more at stations that tend to import crime, i.e. stations where perpetrators are less likely to live. We also see larger decreases at stations on the same line when the transit authority closes stations that tend to export crime. These heterogeneous effects suggest that the response of perpetrators to increased transportation costs contributes to the decrease in crime.

1. Introduction

Crime rates tend to be higher in urban areas. In the United States, overall rates of violent crime and property crime per person are twice as high in Metropolitan Statistical Areas as in rural areas. In MSAs theft is 135%, murder is 53%, and robbery is 800% more frequent than in rural areas (U.S. Census, 2012). Several theories compete to explain this fact. One leading theory claims that densely populated areas encourage crime by lowering transportation costs to committing crime. Density may bring potential victims and potential perpetrators into close proximity or it may simply crowd together potential victims (Glaeser and Sacerdote, 1999). Public transit may play an important role in both the level and spatial distribution of urban crime by allowing perpetrators to travel to affluent neighborhoods to commit property crimes. Popular opinion and public safety professionals tend to espouse this theory. For instance, District of Columbia Metropolitan Police Chief Cathy Lanier states:

> I can tell you the mobility factor is huge in terms of who your victims are and where they come from. And who your suspects [are], where they come from. And with mass transportation, if you look just at the way the metro lines run around the city, and I can tell you when the metro is down on the weekends for track work and certain lines are down I promise you my robberies go down. Every time they say track work, I'm good. (Lanier, 2013)

However, little rigorous evidence supports the idea that public transit spreads crime. Crime rates closely reflect public transit routes in many cities (e.g. Block and Block, 2000), but rigorous studies examining the effect of public transit on crime generally do not support the idea that public transit either increases crime or transfers crime from poor to rich areas (Billings et al., 2011; Jackson and Owens, 2011; Ihlanfeldt, 2003).

We investigate the effect of public transit on crime using a natural experiment in the Washington, DC metropolitan area. Over the past several years, the Washington Metropolitan Area Transit Authority (WMATA) has engaged in extensive renovation. As a result of the construction and maintenance work, various train stations in the WMATA system have been closed for a series of consecutive days for reasons unrelated to crime in the surrounding neighborhood. This provides a natural opportunity to exploit variation in train service across time and stations to measure the effect of transit service on crime in the vicinity of the train station. While the station closures are selectively targeted

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[1] The research in this paper was undertaken prior to the author's employment at the US Census Bureau. Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the US Census Bureau. The research in this paper does not use any confidential Census Bureau information.

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for weekends and holidays, we demonstrate that conditional on time controls (day of the week–hour fixed effects, month–year fixed effects, and a holiday dummy) and station fixed effects, these closures generate believably exogenous variation in public transit access. For instance, lagged crime rates do not correlate with closures, conditional on our controls. Thus, we use these closures to identify the effect of train service on crime.

We find that closing one station reduces the aggregate level of crime across the rail system within ¼ mile of stations. This effect is concentrated entirely at other stations on the same line as the closed station, where crime falls by 5%. We do not detect a significant change in crime at stations on other lines. We are not able to measure the pure effect of removing public transit on the closed station itself because the closed station potentially experiences multiple confounding effects beside changes in travel time.[2] If we make the conservative assumption that the pure travel time effect on the closed station is zero, then aggregate crime across the entire rail system falls by .14 crimes per hour, or about 2% of the mean crime rate. Dynamic spillovers of crime to nearby time periods compensates for part of this drop, but crime still falls by about 1% even taking into account such dynamic effects.

Station closures change not only the level but also the spatial distribution of crime. We find this on three dimensions. First, the observed effects follow the network structure of the rail system. As noted above, crime only falls at stations on the same line. Also, we find evidence that being disconnected from a larger number of stations on the line leads to larger drops in crime. Second, public transit appears to redistribute crime from neighborhoods with many potential perpetrators to neighborhoods with few potential perpetrators. Crime falls more when WMATA closes a station where more offenders tend to live, presumably "trapping" potential perpetrators who are then unable to commit a crime elsewhere. We also find suggestive evidence that crime falls more at stations where offenders do not tend to live, i.e. neighborhoods that tend to be targets. Third, public transit affects the pattern of crime within neighborhoods. Closures reduce crime most significantly within ¼ mile of the station, though station closures may also decrease crime up to 1 mile from the station. Station closures thus represent a real reduction of crime in the neighborhood rather than a simple local redistribution. This result suggests that the concentrations of crime typically observed at public transit stations are in fact "new" crime in the neighborhood rather than a simply concentration of existing crime.

In principle, the effects we observe could result from changes in victim, perpetrator, or police behavior. The available evidence makes a victim behavior explanation unlikely. We use data on rail ridership to control for changes in the availability of victims caused by station closures. This reduces the observed effect only slightly, suggesting that the main mechanism in not a change in the availability of victims. Additionally, thefts from automobiles account for roughly half of the observed decrease in crime. Since this type of crime does not require a present victim and because park and ride trips are uncommon for the stations we study, a large change in theft from cars points to changes in perpetrator rather than victim behavior. We cannot completely rule out changes in police behavior due to a lack of data, though both this explanation and a victim behavior mechanism are less consistent the observed effects of closures on the spatial distribution of crime. It appears most likely that public transit facilitates crime by decreasing transportation costs for perpetrators.

The implications of these findings apply both to public transit and beyond transit itself. Little existing evidence demonstrates whether criminals travel to commit crimes or just commit crimes in their local areas. This paper shows that a temporary increase in transportation costs changes the amount and spatial distribution of crimes in a pattern that is consistent with criminals traveling to commit crimes. Our results have the most direct implications for police response to a transit policy change such as a temporary increase in service hours. Police should deploy more resources during hours of expanded operation or near newly opening train stations. Permanent changes in transit access, such as the construction of additional stations, may change the spatial distribution of crime. Policymakers should account for such effects on crime while also considering potential feedback of local economic benefits on crime rates. More broadly, we demonstrate that perpetrators travel to commit crimes but that such travel is costly. These facts have implications for public safety and crime control efforts. Local crime prevention efforts in low-income areas of a city may have city-wide effects, since perpetrators do not just commit crimes in their local area. These spillover effects may be positive if police efforts reduce the total number of criminals or negative if the intervention simply displaces crime. Policy changes which would appear to affect crime only in one location can affect the level and distribution of crime throughout a city.

2. Theoretical background and empirical literature

Why are crime rates higher in urban areas? Various theories explain this fact using implications of rational criminal behavior (Becker, 1968). One explanation is that criminals face high transportation costs and the close quarters and transportation infrastructure of cities allow criminals to travel easily to locations where the return to crime is high. Another possibility is that dense crowds increase the return to crime by increasing the rate at which a criminal comes in contact with an attractive target. Glaeser and Sacerdote (1999) summarize these theories succinctly, "A natural explanation for why cities have a high return from crime is that costs of transport for crime are extremely high…Urban density should lower transport costs, increase the returns per crime, and increase the overall crime level." Various literatures indirectly support the theory that transportation costs matter for crime by showing that crime is fundamentally local: house prices respond to local crime rates and crime risk (Gibbons, 2004; Linden and Rockoff, 2008; Pope, 2008; Pope and Pope, 2012; Congdon-Hohman, 2013); high local crime rates reduce the number of retail businesses nearby (Rosenthal and Ross, 2010); residents leave (Cullen and Levitt, 1999; Foote, 2013) and return (Glaeser and Gottlieb, 2006) to cities in response to crime rates; and police presence leads to localized crime reduction (Draca et al., 2011; Klick and Tabarrok, 2005; Di Tella and Schargrodsky, 2004). The results of these different academic literatures on crime all support the conclusion that crime is local. As such, these empirical results indirectly support a theory of crime in which transportation costs affect rational criminal behavior.

If transportation costs matter for crime, then access to public transit should affect both crime rates and the distribution of crime over geographic areas. Public transit stations attract dense crowds of people, which should raise the return to crime. Public transit also reduces transportation costs to people wishing to travel to distant locations to commit crimes. Thus, the reduction in access to public transit that we study should affect observed crime. The effect of scattering crowds of potential victims is clear. Crime should fall near public transit stations that are closed since reduced access to public transit leaves fewer potential victims available.

On the other hand, increasing transportation costs of potential criminals has more complicated effects. As shown by Ihlanfeldt (2003), extending the Becker model of rational criminal behavior to public transit and a spatial environment quickly generates more nuanced predictions. We demonstrate these results formally in an appendix, but we summarize the results here. Reducing public transit access (e.g. by closing a public transit station) at a location has two countervailing effects on crime at that location: decreasing access for outsiders who wish to commit crimes near the station but also "trapping" locals who wish to commit crimes elsewhere and now may commit local crimes. Thus,

[2] For instance, the closures replace trains with buses that bridge passengers through the closed section of rail. The requirement to shift modes increases travel time for all stations on the same line, including the closed station, but crime at the closed station itself may also change as crowds of potential victims move from closed train stations to open bus stations.