The Effect of Violent Crime on Economic Mobility

Patrick Sharkey and Gerard Torrats-Espinosa

New York University

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Abstract

Recent evidence has demonstrated substantial geographic variation in the level of upward economic mobility across US states, metropolitan areas, and commuting zones. However, there has been minimal progress made in identifying the key mechanisms that help explain why some urban areas have low rates of upward mobility while others have rates of upward mobility that resemble the most mobile nations in the developed world. In this article we focus attention on one specific dimension of urban areas, the level of violent crime. Using cross-sectional and longitudinal evidence and an array of empirical approaches, we find strong evidence that the level of violent crime in a commuting zone has a causal effect on the level of upward economic mobility.

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Until the last few years, virtually all research on intergenerational economic mobility in the United States had focused on the persistence of economic advantage and disadvantage in the nation as a whole. Although substantial progress has been made in measuring levels and changes in economic mobility in the US, this research literature has ignored the tremendous heterogeneity in levels of economic mobility across regions of the country, states, and cities (Chetty et al. 2014a; Economic Mobility Project 2012; Graham and Sharkey 2014). Chetty et al. (2014a) find that some commuting zones in the US have levels of mobility equal to the most mobile nations in Western Europe, and others have levels of mobility lower than any of the nations in the developed world. Further, this geographic variation in economic mobility appears to be a function of places themselves, rather than the people within them. Exploiting variation in the geographic locations of movers and across siblings, Chetty and Hendren (2015) find that "spending more of one's childhood in an area with higher rates of upward mobility…leads to higher earnings in adulthood."[1]

Although this evidence suggests a causal effect of places on economic mobility, minimal progress has been made in explaining what it is about those places that increases or reduces the chances for residents to move upward in the income distribution. Chetty et al. (2014a) examine several different characteristics of commuting zones in an initial attempt to shed light on the mechanisms for upward mobility, but they are clear in acknowledging that these associations they document should not be thought of as causal.

[1] Quotation is from Chetty (in press, p. 25).

In this article we attempt to push this literature forward by focusing our attention on one specific dimension of urban areas, the level of violent crime. Our focus on violent crime is driven by converging evidence from ethnographic, quantitative, and experimental research showing that exposure to violence may be a central mechanism by which growing up in areas of concentrated disadvantage affects the life chances of children (Burdick-Will et al. 2010; Harding 2009; 2011; Sharkey 2010). This argument is consistent with preliminary evidence reported in Chetty et al. (2014a), who document a strong association between violent crime and upward mobility measured at the level of commuting zones. In this study, we push further to assess the robustness of the relationship between violent crime and upward economic mobility and to examine whether this relationship is causal.

Violence and the life chances of children

There are strong theoretical reasons to hypothesize that violent crime may play a central role in affecting the chances that young people move upward in the income distribution. One reason is that, unlike other major public health problems, interpersonal violence is most prevalent among young people. Even after two decades of decades of declining violent crime, homicide remains among the leading causes of death for all 15-24 year-olds. However, the burden of community violence is felt most acutely by young people from disadvantaged families, most notably low-income black American males. Homicide is the leading cause of death among African Americans in the age ranges spanning from 15-34 (Heron 2012).

The uneven distribution of violent victimization across subgroups of the population reflects the uneven spatial distribution of violence. Violent crime is concentrated in pockets of urban areas that frequently are characterized by poverty, joblessness, institutional decay, and

racial and ethnic segregation. The spatial concentration of violence means that the impact of violent crime must be thought of not only at the individual level, but also at the community and city levels.

The consequences of spatially concentrated violence are demonstrated in an extensive ethnographic and quantitative literature on urban poverty. Ethnographic research focusing on the lives of young people within highly disadvantaged settings demonstrates the ways that youths are forced to navigate strategically through public spaces, shifting their schedules, their networks, and their routines in efforts to minimize the threat of victimization (Anderson 1999; Harding 2010; Jones 2010; Rosenblatt, Edin and Zhu 2015). Parents and their children develop creative ways to manage the threat of violence, but they do so in ways that may limit their children's capacity to engage in public life within their communities and schools (Jarrett 1999; Furstenberg 1993). Instead of taking advantage of resources and activities that may be available in local schools or community centers, parents and children expend a great deal of energy on the more basic challenge of avoiding victimization. Research on low-income families participating in housing mobility programs has shown that parents often make choices about important aspects of their children's lives, such as which school the child will attend, based on concerns about safety rather than concerns about school quality (MTO). Concerns about violence, drugs, and gangs are consistently found to be the primary reasons why low-income families choose to take part in residential mobility programs designed to offer families the chance to move out of public housing located in areas of concentrated poverty (Wilson and Mast 2012).

The ethnographic literature is supported by a growing base of evidence demonstrating that stress and fear associated with community violence have substantial consequences for children's developmental and academic trajectories. Several studies have found that when

children are given assessments of cognitive skills or school-based standardized tests in the immediate aftermath of extreme local violence, their performance declines relative to other children assessed at a time when no recent violence has taken place (Gershenson and Tekin 2015; Sharkey 2010; Sharkey et al. 2012; Sharkey et al. 2014). Separate studies find that academic performance declines during periods of time when incidents of violence occur within the school and when students report feeling unsafe within the school setting (Lacoe 2014; Burdick-Will 2013).

The findings from research focusing on the acute effects of violence are consistent with a larger literature linking extended exposure to community violence with the development of cognitive skills, academic performance, attendance, and educational attainment (Bowen and Bowen 1999; Delaney-Black 2002; Grogger 1997; Harding 2009; Hurt et al. 2001). All of these developmental indicators are highly predictive of later economic outcomes. Despite these connections, the literature on exposure to violence has not been extended to consider effects on economic mobility. In this article, we take the next step and examine the relationship between violent crime, at the level of commuting zones, and upward economic mobility.

Data and Analytic Approach

We use data on intergenerational economic mobility made available through the Equality of Opportunity project (Chetty et. al 2014a, 2014b) to construct measures of absolute income upward mobility for birth cohorts 1980-1986 in each commuting zone. Commuting zones (CZs) are geographical aggregations of counties that were developed in the 1980s to capture the local economy and labor markets where residents live (Tolbert and Sizer, 1996). They are similar to metropolitan areas but have the advantage of covering the entire US territory. Following Chetty

et al. (2014a), we distinguish between urban and rural CZs, considering a CZ urban if it overlaps with a metropolitan statistical area and rural otherwise. There are 741 CZs in total, 325 of which are urban and 416 rural. Our sample includes the 287 urban CZs for which we have non-missing data on crime and economic mobility.

Measures of Intergenerational Economic Mobility

The measures of intergenerational economic mobility were constructed from administrative tax records of more than 40 million children and their parents (Chetty et al. 2014a). The metric of absolute upward income mobility characterizes a child's expected rank in the national income distribution at age 26, conditioning on parents' rank in the income distribution when the child was approximately 16 years old. The measure is constructed with an intercept that measures the expected rank for children whose families were at the bottom of the income distribution and a slope that measures the relative upward mobility within the CZ. The analyses that we present combine the slope and the intercept such that our measure represents the absolute upward mobility of children conditional on parents being at the bottom 25th percentile of the income distribution. The measure of relative mobility could be also used to examine trends in intergenerational income mobility; however, Chetty et al. (2014a) argue that its interpretation could be misleading. The authors point out that "increases in relative mobility could be undesirable if they are caused by worse outcomes for the rich. In contrast, increases in absolute mobility at a given income level, holding fixed absolute mobility at other income levels, unambiguously increase welfare." Given our focus on violent crime, which is disproportionately concentrated in low-income communities, we argue that a focus on absolute upward mobility is appropriate.

In the first set of analyses, for each CZ, we construct measures of economic mobility for the seven birth cohorts from 1980 to 1986 using the slope and intercept that Chetty et al. (2014a) estimate from the individual-level tax data. Measures beyond the 1986 birth cohort are not available because children's income distribution is constructed when the birth cohort was 26 years old. For the youngest cohort, 1986, this means that income was measured in 2012.

Measures of violent crime

We use FBI's Uniform Crime Reports (UCR) to construct the average crime rate in the CZ when children were between 14 and 17 years old. The National Archive of Criminal Justice Data (NACJD) creates a county-level record of arrests and reported crimes based on agency records. We use these county aggregates to construct the CZ crime rates for each birth cohort. We restrict our analysis to violent crimes (homicides, aggravated assaults, and robberies). Because the reporting patterns of the different agencies vary across time and counties, some have cautioned against the use of UCR data in longitudinal analyses (Maltz and Targonski, 2002). In the appendix we describe our approach to missing data and how the final sample has been constructed. Although we have been systematic in dealing with missing data, our measures of crime are not free of measurement error. If missing data are from relatively low-crime jurisdictions (relative to the rest of the CZ), the CZ-level crime rates would be upwardly biased. Conversely, if missing data are from relatively low-crime jurisdictions, the CZ-level crime rates would be biased downwards. Our instrumental variables approach will mitigate the bias associated with measurement error in the crime rates.

Demographic variables

We control for the following CZ demographics: proportion of non-Hispanic African-American residents, proportion of Hispanic residents, proportion of non-Hispanic White residents, proportion of foreign-born residents, proportion of families living in poverty, proportion of unemployed residents, proportion of female-headed households, proportion of residents without high-school diploma, proportion of residents with more than college degree, and proportion of residents employed in manufacturing jobs. We use data from the 1980 Census, 1990 Census, 2000 Census, and the 2006-2010 American Community Survey to construct average demographic controls for each birth cohort when children were 14-17 years old. We use linear interpolation to impute data between decades. Table 1 shows the mean and standard deviation of absolute upward mobility, crime rates, and demographic controls for the 1980 and 1986 birth cohorts in our sample of 287 urban CZs.

Table 1: Descriptive statistics birth cohorts 1980 and 1986
(N = 287 urban CZs)

	Cohort 1980		Cohort 1986	
Variable	Mean	SD	Mean	SD
Absolute income upward mobility	43.658	3.950	44.203	3.574
Violent crime rate per 100,000	451.600	263.598	369.021	202.022
Murder rate per 100,000	5.886	4.139	4.496	2.837
% Non-Hispanic White	78.262	15.812	75.684	16.371
% Hispanic	7.424	12.531	8.915	13.209
% Non-Hispanic Black	11.097	11.827	11.268	11.928
% Foreign born	4.909	5.507	5.927	6.065
% Poor	13.707	4.678	13.526	4.225
% More than college	29.242	6.879	21.204	6.231
% Less than high school	22.874	6.537	19.275	5.903
% Female-headed households	7.929	2.007	8.301	2.051
% Unemployed	3.760	0.818	3.916	0.794
% Employed in manufacturing	16.975	7.603	15.007	6.996

Statistical Models

We first exploit variation in levels of crime across CZs by specifying a cross-sectional OLS model. For each CZ, we construct measures of absolute upward mobility, crime rates, and demographics averaged over the 1980-1986 birth cohorts. We then regress average absolute upward mobility on the log of average crime rate, controlling for CZ demographics. More formally, the cross-sectional OLS model takes the following form:

$$Y_i = \alpha + \delta(Crime)_i + \boldsymbol{X'_i\beta} + e_i \qquad (1)$$

In equation (1), Y_i is the average absolute income upward mobility in CZ i; $Crime_i$ is the log of the average crime rate in CZ i when children were 14-17 years old; $\boldsymbol{X_i}$ is a vector of demographic covariates in CZ i; and e_i is an idiosyncratic error term for CZ i.

In the second set of analyses, we specify OLS models with two-way fixed effects. We regress the measure of absolute upward income mobility on the log of average violent crime rate at age 14-17, controlling for demographics at age 14-17 and including a set of CZ fixed effects and a set of cohort fixed effects. This two-way fixed effects specification exploits variation within commuting zones in birth cohorts' exposure to violent crime over the course of childhood and controls for common trends across time. More formally, the OLS models with two-way fixed effects take the following form:

$$Y_{it} = \alpha + \delta(Crime)_{it} + \boldsymbol{X'_{it}\beta} + \boldsymbol{Z'_i\gamma} + \boldsymbol{W'_t\theta} + e_{it} \qquad (2)$$

In equation (2), Y_{it} is the absolute income upward mobility in CZ i for cohort t; $Crime_{it}$ is the log of the average crime rate in CZ i for cohort t measured when children were 14-17 years old; $\boldsymbol{X_{it}}$ is a vector of demographic covariates that vary over time within CZs; $\boldsymbol{Z_i}$ is a vector of dummy indicators for each CZ**;** $\boldsymbol{W_t}$ is a vector of dummy indicators for each birth cohort; and e_{it}

is an idiosyncratic error term for CZ i and cohort t. δ is the parameter of interest and provides an estimate of the effect of violent crime on income upward mobility.

In a third set of analyses, we employ a two-stage least squares strategy to estimate the causal effect of exposure to crime during adolescence on upward income mobility. The 2SLS specifications address the possibility that the association between within-commuting zone change in violent crime and change in economic mobility may be driven by unobserved characteristics of the commuting zone or its population. We propose four instrumental variables for changes in violent crime within commuting zones.

The first instrumental variable captures the change in the proportion of the population that is female and age 15-24. This instrument is designed to capture fluctuations in the age distribution of a CZ that occur over time and lead to higher-crime individuals in the 15-24 year-old age group being over-represented relative to the rest of the population (Steffensmeier et al. 1989). Although males in this age range have the highest rates of violent crime, the relative presence of males in this age range is affected by endogenous factors like the incarceration rate and homicide rate. Because young women are rarely the victims of homicides and have an extremely low rate of incarceration, the focus on females rather than males addresses potential concerns about violations of the exclusion restriction. We show that changes in the proportion of females 15-24 years old in the CZ is positively correlated with changes in violent crime rate in the CZ. We use data from the decennial censuses and the American Community Survey to compute the average proportion of females between 15-24 years old in the CZ when children were 14-17 years old.

A second instrument is the number of police officers that were hired using federal grants administered through the Community Oriented Policing (COPS) office that was established as

part of the 1994 Violent Crime Control and Law Enforcement Act. Although the receipt of COPS grants was associated with the level of crime in local jurisdictions, Evans and Owen (2007) show that the timing of when COPS grants were received was not related to trends in crime within local jurisdictions. Evans and Owen (2007) also show that the receipt of COPS grants led to declines in crime arising from the hiring of additional police officers. We argue that the receipt of COPS grants can be used to instrument for changes in crime in the context of the fixed effects specification that we have described previously. We construct the instrument by averaging the number of officers hired through the COPS grants when children were 13-15 years old, thus allowing for a lagged relationship between receipt of COPS grants and the subsequent effect on crime rates.

A third instrument is the intensity with which the crack cocaine epidemic hit a particular state. We use the index that Fryer at al. (2006) constructed to capture the severity of the crack epidemic during the years 1980-2000. The index is based on a number of proxies that capture the intensity of crack use in the population (cocaine arrests, cocaine-related emergency room visits, cocaine-induced drug deaths, crack mentions in newspapers, and DEA drug busts). The measure captures variation over time within states. We show that the intensity of the crack epidemic is positively correlated with violent crime and argue that it is not associated with levels of economic mobility except through its impact on crime rates. We operationalize the severity of the crack epidemic with a dummy indicator that captures whether the crack index peaked during the years when children were 14-17 years old.

Our last instrumental variable is the level of lead in the air. There is extensive evidence showing that long-term trends in paint and gasoline lead exposure are strongly correlated with trends in violent crime and murder rates (Nevin 2000; Reyes 2007). We use state-level measures

of air lead in 1985 to predict levels of crime experienced over age 14-17 by the individuals in birth cohorts 1980-1986. Because of data limitations, we are not able to use lead levels in our longitudinal analyses. As described below, we limit the use of air lead measures to the cross-sectional analyses.

Results

Does the level of violent crime in commuting zones affect the level of upward mobility?

Figures 1 and 2 show the cross-sectional association between upward mobility in urban commuting zones (averaged over seven birth cohorts) and violent crime and murder rates, respectively. The population-weighted scatterplots reveal a strong bivariate relationship between both measures of violence and upward mobility, consistent with the findings presented in Chetty et al. (2014a). This association is examined in greater detail in regression results presented in Table 2. From Column 1 in Table 2, which controls for a set of economic and demographic characteristics of the commuting zone, we find that a 1 percent increase in the violent crime rate is associated with a .02 point decline in the expected income rank for a child beginning at the 25^{th} percentile. For a 1 standard deviation (55 percent) increase in violent crime, this translates to a 1.28 point decline in the expected income rank. Cross-sectional results using the murder rate instead of the violent crime rate produce similar results. From Column 2, a 1 percent increase in the murder rate is associated with a .02 point decline in expected rank in the income distribution as an adult. A one standard deviation increase in the murder rate (16 percent) is associated with a .33 point decline in the expected income rank in adulthood.

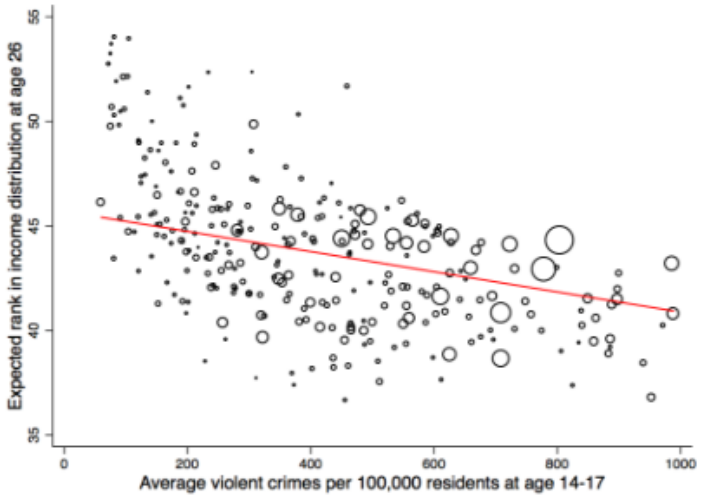

Figure 1: Cross-sectional association upward mobility & violent crime rate (1980-1986 cohorts)

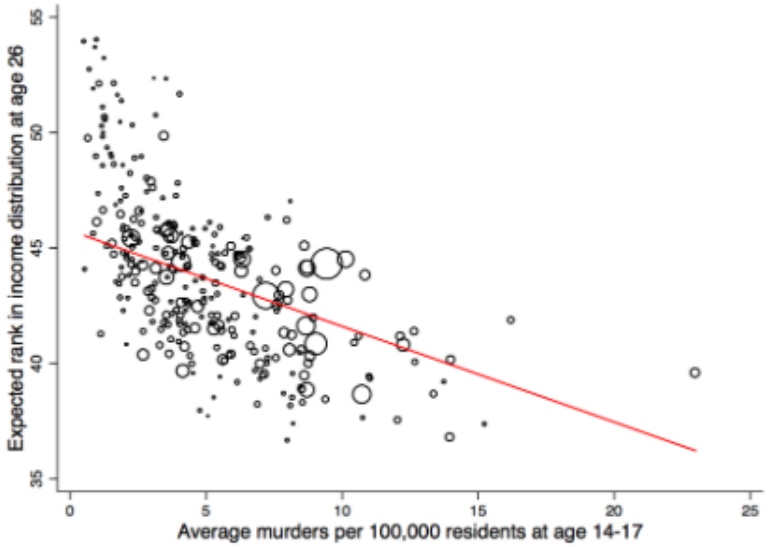

Figure 2: Cross-sectional association upward mobility & murder rate (1980-1986 cohorts)

Table 2: Cross-sectional analyses income upward mobility
Cohorts 1980-1986

	OLS		2SLS (IV: Lead)	
	(1)	(2)	(3)	(4)
Log violent crime rate 14-17y	-2.103***		-4.763***	
	(0.351)		(1.750)	
Log murder rate 14-17y		-1.711*		-12.227**
		(0.979)		(5.357)
Observations	287	287	286	286
R^2	0.690	0.636		
Population weights	Yes	Yes	Yes	Yes
CZ demographic controls [1]	Yes	Yes	Yes	Yes

[1] Demographic controls include CZ measures of: % non-Hispanic black, % non-Hispanic white, % Hispanic, % poor, % foreign born, % college degree, % less than HS, % unemployed, % manufacturing, % female-headed households.
Heteroskedasticity-robust standard errors in parentheses $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

In an effort to move closer toward causal inference, we first assessed the strength of the relationships between each of the instruments described in the previous section and the rates of violent crime and murder. Of the possible instruments, only the measure of air lead levels is strongly associated with violent crime and murder rates in the cross-sectional analyses. We acknowledge that the level of lead in the air may affect economic mobility through its impact on cognitive skills and academic achievement, and thus one might question whether it is a valid instrument. To address this critique we include controls for educational attainment in the 2SLS specifications, which controls for the primary "backdoor path" linking air lead levels with economic mobility.

Columns 3 and 4 in Table 2 show the 2SLS estimates when we use air lead levels to instrument for the rates of violent crime and murder. Results show that a 1 percent change in violent crime and murder rates, respectively, reduce the expected rank in the adult income distribution by .05 points and .12 points. A one standard deviation increase in violent crime thus translates to a 2.90 point decline in expected income rank, and a 1 standard deviation decline in

murder rate translates to a 2.38 point decline in expected income rank. To provide a reference point, a 3 point decline in income rank corresponds to the difference between the level of upward mobility in Portland, OR compared New Orleans, LA.

Do changes in violent crime within commuting zones lead to changes in upward mobility?

The next set of analyses use data on birth cohorts from 1980 to 1986 to assess whether changes in rates of violent crimes and murders, as experienced over the period of late adolescence from age 14-17, are associated with changes in upward economic mobility. The longitudinal analysis is less vulnerable than the cross-sectional analysis to unobserved confounders that might affect the level of violent crime and also affect the level of economic mobility across commuting zones. Although there are only seven birth cohorts available to study income mobility, individuals in these seven birth cohorts lived through a period when the level of violent crime was changing beginning to decline. There were 450 violent crimes for every 100,000 Americans when the 1980 birth cohort was 14-17 years old, and 370 violent crimes per 100,000 Americans when the 1986 birth cohort was the same age. Although these changes in exposure to violent crime are not particularly large, within specific urban areas there were more substantial changes that we exploit in the following set of analyses.

The first set of results in Column 1 of Table 3 shows no association between change in violent crime within commuting zones and change in upward mobility. The slope of this relationship is weakly positive and not close to statistically significant. There is, however, a strong, statistically significant relationship between changes in upward mobility and changes in the murder rate within a commuting zone. From Column 2, we find that a 1 percent increase in the murder rate is associated with a .02 point reduction in expected income rank after controlling

for observed time-varying characteristics of commuting zones. A one standard deviation increase in the natural logarithm of the murder rate experienced in the commuting zone from ages 14-17 is associated with a .24 point decline in expected rank in adulthood.

Table 3: Longitudinal analyses income upward mobility
Cohorts 1980-1986

	OLS	
	(1)	(2)
Log violent crime rate 14-17y	0.184	
	(0.312)	
Log murder rate 14-17y		-2.224***
		(0.693)
Observations	2009	2009
R^2	0.942	0.943
Population weights	Yes	Yes
CZ time-varying controls [1]	Yes	Yes
CZ Fixed Effects	Yes	Yes
Cohort Fixed Effects	Yes	Yes

[1] Demographic controls include CZ measures of: % non-Hispanic black, % non-Hispanic white, % Hispanic, % poor, % foreign born, % college degree, % less than HS, % unemployed, % manufacturing, % female-headed households.
Heteroskedasticity-robust standard errors in parentheses
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

To push the analysis further we used several different instruments for changes in violent crime and homicide rates. Results are summarized in Table 4, and full results are shown in Appendix Tables A1 to A3. All of the instrumental variables are associated with changes in violent crime across birth cohorts, although the strength of these first-stage relationships varies across the different instrumental variables. The measure indicating whether the peak of the crack epidemic occurred during the time when the birth cohort was between 14 and 17 years old has the weakest association with violent crime and murder rates, meaning results using this instrument should be interpreted with the most caution. With this caveat in mind, all of the instrumental variable analyses indicate that exposure to higher levels of violent crime leads to

lower levels of upward mobility. The weakest effects are present in the analysis using the COPS instrument. In this specification, a 1 percent increase in violent crime leads to a reduction of .08 points in expected income rank. The strongest effects are present in the analysis using the population age instrument. In this specification, a 1 percent increase in violent crime leads to a reduction of .18 points in expected income rank. On the basis of these estimates, a 1 standard deviation increase in the natural logarithm of the violent crime in the CZ reduces expected income rank in adulthood by between 2.19 and 4.58 points.

Table 4: Longitudinal analyses income upward mobility
Cohorts 1980-1986

Panel A: Estimated effects of violent crime rate

	OLS	2SLS Females	2SLS COPS	2SLS Crack
F-statistic 1st stage	N/A	12.81	11.71	7.77
Point-estimate 2nd stage	0.184	-17.677***	-8.452	-9.665*
	(0.312)	(5.028)	(5.349)	(4.930)

Panel B: Estimated effects of murder rate

	OLS	2SLS Females	2SLS COPS	2SLS Crack
F-statistic 1st stage	N/A	9.18	10.88	3.44
Point-estimate 2nd stage	-2.224***	-34.939***	-8.631**	-20.876*
	(0.693)	(11.179)	(4.335)	(11.654)

All models include CZ fixed effects, cohort fixed effects, and demographic controls for % non-Hispanic black, % non-Hispanic white, % Hispanic, % poor, % foreign born, % college degree, % less than HS, % unemployed, % manufacturing, % female-headed households.
Heteroskedasticity-robust standard errors in parentheses $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Estimates using the murder rate produce similarly strong results (Panel B in Table 4). The weakest effects are again present in the analysis using the COPS instrument, in which a 1 percent increase in the murder rate leads to a reduction of .09 points in expected income rank. The strongest effects are present in the analysis using the population age instrument, in which a 1 percent increase in murder rate leads to a reduction of .35 points in expected income rank. From the results in Table 4, a 1 standard deviation increase in the murder rate within a CZ reduces expected income rank in adulthood by between 0.91 and 9.05 points. Although these analyses do not provide definitive information about the magnitude of the effect of violent crime on upward mobility, results using all of the instruments suggest that increases in violent crime have a substantively meaningful, negative effect on upward mobility.

Violent Crime and Economic Mobility

Recent research documenting variation in economic mobility within the United States opens up the possibility for major advances in understanding the mechanisms for upward mobility. Although preliminary evidence points to specific features of commuting zones that are correlated with upward mobility, such as residential segregation, social capital, and family structure, minimal progress has been made in identifying the causal effects of different features of commuting zones. This article represents an attempt to push the literature forward by investigating one particularly salient dimension of commuting zones, the level of violent crime, and attempting to determine whether this dimension of commuting zones has a causal effect on upward mobility.

Our focus on violent crime is motivated by several different strands of evidence suggesting that community violence has damaging effects on children's academic and

developmental trajectories and is a central reason why growing up in disadvantaged residential environments has such substantial effects on the life chances of children. We examine the relationship between violent crime and upward mobility using a number of different analytic approaches, exploiting variation in violent crime across commuting zones, variation in violent crime within commuting zones over time, and variation in violent crime arising from shocks such as changes in the age distribution of a commuting zone, the intensity and timing of the crack epidemic in local areas, the timing of federal policing grants, and exposure to air lead. Although all of these instrumental variables are subject to critique, we argue that the consistency of results across these different analytic approaches makes the findings particularly compelling.

Our preferred specifications, which are based on within-CZ change using plausibly exogenous changes in violent crime arising from several different instruments, indicate that a one standard deviation decline in violent crime as experienced during late adolescence increases the expected income rank in adulthood by at least 2 points, and a one standard deviation decline in the murder rate increases the expected income rank by roughly 1 point. These effect sizes are statistically significant and substantively meaningful.

The findings take on added importance when one considers the decline in violence that has occurred in the United States over the past two decades. Since the early 1990s, when violent crime reached its most recent peak, the national homicide rate and violent crime rate have been cut roughly in half. The cities and neighborhoods where violence was most severe in the 1990s have experienced the greatest changes since then (Friedson and Sharkey 2015). In many urban areas where crime has declined, being poor no longer means living in an intensely violent residential environment.

Our analysis includes cohorts of children born from 1980 through 1986, and thus extends over a period during which violence began to decline rapidly. The 1980 birth cohort lived through an extremely violent period of the nation's history, while the 1986 cohort reached early adulthood at a time when violence had begun to decline quickly. Results from the analysis indicate that these differences in the experiences of successive birth cohorts have led to meaningful differences in upward mobility. The drop in violence is an important trend in its own right, but the findings in this article suggest that this trend has substantially improved the economic outcomes of children beginning near the bottom of the income distribution.

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Appendix

Processing UCR crime data

In 1994, NACJD implemented a new imputation algorithm for missing data, making pre-1994 and post-1994 crime reports non-comparable. Because our measures of exposure to crime at age 14-17 start in 1994 (when the 1980 birth cohort was 14 years old), we can rely on NACJD's imputation algorithm. If reporting agencies (ORI) report crimes for the 12 months of the year, the reported crimes are used to compute the year aggregates for the county. If ORIs report crimes between 3 and 11 months, NACDJ imputes crime data for the missing months and provides the proportion of the county population for which crime data have been imputed. If ORIs report crimes for two months or less, crime data are not imputed and the county gets a missing value.

Knowing this, we examine what proportion of the total CZ population has non-missing crime reports during the corresponding period. If the agencies that did not report crime represent 25 percent or more of the CZ population in a given year, we flag that year as missing. We then look at how many years of missing crime data we have for each birth cohort. If the number of missing years represents more than half of the years that we need to construct the average crime rate for a given birth cohort in a CZ, we drop the CZ from our sample. Similarly, if we have more than two consecutive years with missing crime data right at the start or right at the end of the period when we measure of exposure to crime, we drop the CZ from our sample.

The procedure becomes clearer when we illustrate it the following examples. We can think of three missing data scenarios when we construct, for example, measures of exposure to crime for the 1980 birth cohort at age 14-17 (i.e.: crime in years 1994-1997). In scenario 1, the CZ has missing data for more than 25 percent of its population in each of the 4 years that we use to construct the 1994-1997 average crime rate; we drop this CZ from our sample. In scenario 2,

the CZ has missing data for more than 25 percent of its population just for year 1995; we keep the CZ and construct the 1994-1997 average crime rate with the three years with non-missing data. In scenario 3, the CZ has missing data for more than 25 percent of its population for years 1996 and 1997; we drop the CZ from our sample because the missing years are consecutive and concentrated at the end of the 1994-1997 period.

Additional Tables

Table A1: 2SLS longitudinal analyses income upward mobility
IV: % Females 15-24y

	Violent crime rate		Murder rate	
	1st stage	2nd stage	1st stage	2nd stage
	Log violent	Income mob.	Log murder	Income mob.
1st Stage				
% Females 15-24y at age 14-17y	0.058***		0.031***	
	(0.016)		(0.010)	
F-test	12.81		9.18	
R^2	0.980		0.967	
2nd Stage				
Log violent crime rate 14-17y		-17.677***		
		(5.028)		
Log murder rate 14-17y				-34.939***
				(11.179)
Observations		2002		2002
Population weights		Yes		Yes
CZ time-varying controls [(1)]		Yes		Yes
CZ Fixed Effects		Yes		Yes
Cohort Fixed Effects		Yes		Yes

[(1)] Demographic controls include CZ measures of: % non-Hispanic black, % non-Hispanic white, % Hispanic, % poor, % foreign born, % college degree, % less than HS, % unemployed, % manufacturing, % female-headed households.
Heteroskedasticity-robust standard errors in parentheses $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table A2: 2SLS longitudinal analyses income upward mobility
IV: Officers hired at age 13-15

	Violent crime rate		Murder rate	
	1st stage	2nd stage	1st stage	2nd stage
	Log violent	Income mob.	Log murder	Income mob.
1st Stage				
Log COPS at age 13-15	-0.097***		-0.080***	
	(0.028)		(0.024)	
F-test	11.71		10.88	
R^2	0.980		0.968	
2nd Stage				
Log violent crime rate 14-17y		-8.452		
		(5.349)		
Log murder rate 14-17y				-8.631**
				(4.335)
Observations	2002		2002	
Population weights	Yes		Yes	
CZ time-varying controls [(1)]	Yes		Yes	
CZ Fixed Effects	Yes		Yes	
Cohort Fixed Effects	Yes		Yes	

[(1)] Demographic controls include CZ measures of: % non-Hispanic black, % non-Hispanic white, % Hispanic, % poor, % foreign born, % college degree, % less than HS, % unemployed, % manufacturing, % female-headed households.
Heteroskedasticity-robust standard errors in parentheses $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table A3: 2SLS longitudinal analyses income upward mobility
IV: Crack peaked at age 14-17

	Violent crime rate		Murder rate	
	1st stage	2nd stage	1st stage	2nd stage
	Log violent	Income mob.	Log murder	Income mob.
1st Stage				
Crack use peaked at age 14-17	0.023***		0.010*	
	(0.008)		(0.006)	
F-test	7.77		3.44	
R^2	0.980		0.967	
2nd Stage				
Log violent crime rate 14-17y		-9.665*		
		(4.930)		
Log murder rate 14-17y				-20.876*
				(11.654)
Observations		2002		2002
Population weights		Yes		Yes
CZ time-varying controls [(1)]		Yes		Yes
CZ Fixed Effects		Yes		Yes
Cohort Fixed Effects		Yes		Yes

[(1)] Demographic controls include CZ measures of: % non-Hispanic black, % non-Hispanic white, % Hispanic, % poor, % foreign born, % college degree, % less than HS, % unemployed, % manufacturing, % female-headed households.
Heteroskedasticity-robust standard errors in parentheses $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$