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The Interdependence of School Outcomes and School and Neighborhood Crime

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Abstract

In this paper, we estimate the effects of neighborhood crime and in-school crime on educational outcomes for elementary and secondary schools in the city of Atlanta over the period 1999 to 2002. We specify a model that accounts for the joint determination of both types of crime along with school outcomes. Despite the large empirical literature on both education production functions and crime incidence, there has been little empirical work on crime's effect on school outcomes. One exception is Grogger (1997) who used individual data from the High School and Beyond study to estimate the effect of school violence on measures of individual student performance. After controlling for individual and school characteristics, he found that moderate and severe levels of school violence had substantial negative consequences for school outcomes. Our study both updates and expands on his work, using current data and better measures of neighborhood violence.

Keywords: educational economics, educational finance, resource allocation

I. Introduction

This study investigates the link between school outcomes and both school and neighborhood measures of crime. This study's policy relevance arises from the new funding requirements implemented in No Child Left Behind (NCLB). The passage of NCLB in 2002 led to substantive changes in the provision of public education. In addition to measuring academic performance, NCLB set standards for a safe learning environment, with clear sanctions for schools that failed to meet these requirements. Thus, NCLB made in-school law enforcement part of the federal formula for funding education. Failing to meet either academic or safety standards or make adequate improvement could now result in loss of federal dollars and potentially lead to a mass exodus of students from the failing school.

The following is an excerpt from the NCLB Act that outlines actions that are triggered as a result of failing to meet federally mandated requirements on violence prevention:

SEC. 9532. UNSAFE SCHOOL CHOICE OPTION.

(a) UNSAFE SCHOOL CHOICE POLICY- Each State receiving funds under this Act shall establish and implement a statewide policy requiring that a student attending a persistently dangerous public elementary school or secondary school, as determined by the State in consultation with a representative sample of local educational agencies, or who becomes a victim of a violent criminal offense, as determined by State law, while in or on the grounds of a public elementary school or secondary school that the student attends, be allowed to attend a safe public elementary school or secondary school within the local educational agency, including a public charter school.

(b) CERTIFICATION- As a condition of receiving funds under this Act, a State shall certify in writing to the Secretary that the State is in compliance with this section.

The NCLB is the first federal law that explicitly focuses on student behavior and requires the prevention of violent criminal behavior as a condition of receiving federal funding. Under Section 9532, any student attending a “persistently violent” school or any student who has been a victim of a violent criminal offense on school grounds is entitled to transfer from their current school to any other school within the school district or “local educational agency.”

Tying federal funding to both academic performance and to school safety puts educators in the position of allocating scarce resources between classroom instruction and crime prevention/enforcement. An interesting research question is whether diverting funding from instruction into school crime prevention/enforcement activities is the optimal strategy for increasing academic performance. Although there is substantial empirical work that has focused on the link between school funding and educational outcomes, there is little current evidence on the link between enforcement/prevention and educational outcomes.

Clearly, school safety is an important and highly appropriate education policy goal, regardless of any academic outcome. However, when different school functions draw funding from the same source, a clear understanding of the marginal benefits arising from funding each function is important.

This paper focuses on the potential academic effect of the funding tradeoffs mandated under NCLB. We use school-level data from a large urban school district, along with controls for neighborhood characteristics, to estimate the effects of both neighborhood and school crime on student performance on standardized tests. Our estimates are obtained using instrumental variable methods due to the endogeneity of the

crime measures. Our results indicate that both in-school violent crimes and the neighborhood violent crime rate have strong negative effects of school performance. Statistical tests support the instruments chosen for the estimation.

The next section provides some background, discussing previous studies of school outcomes and the links between crime and school outcomes. Section III outlines the basic model and estimation issues. The subsequent section describes the data used and presents the empirical results. Conclusions follow.

II. Background

Educational Resources & School Performance

Multiple studies attempt to relate educational outcomes to educational resources. Typically, the findings indicate that the amount of money spent per pupil has very little impact on the performance of students as measured by standardized tests or other metrics (Burtless, 1996; Clotfelter, 1998; Hanushek, 1989). There is some evidence that funds spent on higher quality teachers and better teaching technologies can yield positive performance effects (Hanushek, 1994, 1996; Ladd, 1996).

Even when the research finds no substantive effects of resources on outcomes, the studies do not suggest that spending, in total, has no effect or that positive educational benefits cannot be obtained with additional or better quality resources. The issue that concerns us here, however, focuses not on the level of education funding, but rather on the marginal benefits of dollars spent. In light of the provisions of NCLB, this means deciding whether to spend the extra dollar in funding on safety or other education-related activities.

Safety & School Performance

Much of the literature on safety in the school focuses on precursors of violent crime (e.g., bullying and delinquency). These results tend to support the idea that a lower level of violence improves attendance among likely victims (Gottfredson, 2001; Pearson & Jackson, 1991). Furthermore, these results are often viewed in light of other studies, which find that higher attendance results in higher achievement, and a reduction in grade repeating and dropout rates (Cairns, Cairns, & Neckerman, 1989; Shepard & Smith, 1989). Although greater attendance and lower dropout rates would be positive effects of reduced school violence, these results are indirect evidence of the connection between school performance and school violence.

Grogger (1997) provides a more comprehensive study of crime and its influence on educational outcomes; however, he focuses entirely on in-school crime and does not empirically account for the influence of neighborhood crime as an independent source of educational stress (Grogger, 1997). This study, using data compiled in 1980, found that reducing school violence by about 50 percent would increase college attendance rates by around five percent.

III. Model and estimation

Causal relationships between measures of crime and school performance are difficult to identify due primarily to unobservable or unmeasured neighborhood and family characteristics that are correlated with both educational outcomes and violent crimes. We are primarily interested in school outcomes, so that structural equations for

in-school and neighborhood violence are not specified. Instead, we estimate only reduced form equations for these in order to obtain predicted values as instruments for the equation of interest.

School performance is measured by the proportion of students at each school (in either grades four and six, or grades four and eight) who meet or exceed state standards on standardized tests.¹

$$CRCT46_{it} = \beta_0 + \gamma_1 schcrm_{it} + \gamma_2 ncrm_{it} + x_{it}' \beta_1 + u_{it}, \quad (1)$$

where $CRCT46_{it}$ denotes the proportion of students meeting or exceeding standards in grades four and six. This is measured for school i at time t . $Schcrm_{it}$ is a measure of crimes occurring in the schools, while $ncrm_{it}$ is a measure of crimes occurring in the neighborhood, x_{it} is a vector of control variables that includes school level and neighborhood demographic variables. The γ parameters measure the effects of crime and the vector, β , measures the impact of the control variables. The idiosyncratic disturbances are given by u_{it} . These include unobservable or unmeasured factors such as parental interest in children's education and their involvement in the community, as well as purely random fluctuations.

The control variables used in this study include several measures specific to the school. We include the teacher to student ratio as an indicator of the school's resources. We include the percentage of students who receive free or reduced price school lunches to control for the level of poverty in the neighborhood. The percentage of students enrolled in English as a second language classes is included based on the notion that

¹ Individual student performance measures are not yet available in the State of Georgia.

children struggling with English are more likely to have trouble with written achievement tests. The percentage of African-Americans is also included.

The neighborhood characteristics included are the proportion of adults in the Census block group who did not graduate from high school and the number of public housing units. These variables help to control for poverty and perhaps account to some extent for attitudes of neighborhood parents towards education.

Despite the use of these neighborhood control variables, it is unlikely that all of the influences on school outcomes are perfectly captured by observable characteristics, thus these unobservable influences remain in the equation's error terms. Because these influences are undoubtedly also correlated with the incidence of crime both in the schools and in the surrounding neighborhood, consistent estimation of the unknown parameters in equation (1) requires instruments for both types of crime.

Based on previous findings in the literature, we consider the following set of instruments: total number of adults in the school (including administrative and support staff, along with teachers), distance from school to the nearest public housing, miles of public bus routes in the neighborhood, number of rail transit stations, and distance to rail transit stations. It is important to note that the total number of adults includes teachers, administrators, and staff personnel; it does not include special safety officers that might be hired in response to perceived school needs. These special support officers, present in some Atlanta City Schools, are paid for with non school funds.² We believe that, because the equation of interest already controls for classroom personnel, the presence of additional administrators and staff does not directly affect academic outcomes.

² School specific data on the presence of these officers is not available.

The other instruments, various measures of public transportation and the distance from the school to public housing units, have previously been shown to be correlated with crime, see, for example, Ihlanfeldt (2003). We argue that these variables will affect school outcomes only through their correlation with crime and socioeconomic status; because our equation directly controls for crime and demographics, these variables are appropriate as instruments.

Finally, note that the number of public housing units is included in the school outcome equation. This is appropriate because many urban children live in these units and their socioeconomic status seems systematically different from that of other low-income children who qualify for free and reduced price lunch programs.

IV. Data and results

For this analysis, the school's neighborhood is defined as the census block in which the school is located. Our source of school characteristics is the School Report Card data from the Georgia Department of Education. These data include several measures of student outcomes. Other measures of education inputs, student demographics and school crime incidents for each school are also obtained from this data base. We use data from both the 2000-2001 and 2001-2002 school years as these are the first years for which incidents of school crime are available and can be matched with the available crime data. Our data set contains complete information on 61 elementary schools and 13 middle schools. Two of the elementary schools are located in the same neighborhood and another neighborhood contains both an elementary and middle school. Our sample of schools thus contains 74 schools and corresponds to 72 census blocks.

Neighborhood education levels were obtained from the 2000 U.S. Census; we used the proportion of adults in the block group who did not complete high school. Data on the public transportation variables came from the Atlanta Regional Commission, and the public housing data were obtained from the Department of Housing and Urban Development's R-maps.

Table 1 presents descriptive statistics for the school outcome measures, incidents of violent crimes, drug crimes and sex crimes that occurred in each school, student demographics, school input measures, and neighborhood crime measures. Because the unit of observation is the Census block group and two pairs of schools are in the same block groups, two observations on neighborhood crime are double counted in the neighborhood crime statistics.

The school outcome variables are computed based on 4th, 6th and 8th grade measures of the proportion of the school's students who met or exceeded state standards on reading, language and math tests. These tests are called Criterion-Referenced Competency Tests, or CRCT. Although these particular test scores are not as informative to individual students as other achievement tests, it is worth noting that promotional decisions in Georgia are based on passing a subset of these tests. Overall, the tests provide an excellent way to compare outcomes across schools. Because of changes in the testing instrument over the 2000-01 and 2001-02 school years, we are not able to present results based on other achievement tests.

The percentage of black students, BLKPCT, ranges from about 10 to 100 percent as does FRLPCT, the percentage of students who qualify for free or reduced price lunch. On average, 2 percent of students are enrolled in at least one hour of English to Speakers

of Other Languages (ESOL) course, where this percentage ranges from zero to 45 percent across schools. These descriptive statistics show that there is considerable variation in both performance measures and student demographics across schools in the sample. Teacher/student ratios vary from about 1 / 20 to 1 / 10, with the average about 1 teacher to every 14 students.

Turning to the crime statistics, we see that the average number of reported incidents of crime within the schools is relatively small over the two school years included here. The average number of incidents of violent crime per school is .58. Although the focus for this study is violent crime, we also note that the average number of drug crimes is only .15, and there are no reports of sex crimes. However, each of the 13 middle schools experienced at least one incident of crime during the year, with 10 of these schools experiencing at least 2 incidents of violent crimes.

The incidence of crime within each school's neighborhood over the school year is, of course, much higher. These data were obtained from the Atlanta Police Department. The distribution of violent crimes for the 2000-2001 school year is displayed in Map 1; there is clearly some clustering in the southern and central parts of the city. If we scale the number of violent crimes by the neighborhood's population, we see that the average violent crime rate across school neighborhoods is 5 crimes per 100 residents. Again, the range is substantial, from zero to about 29 crimes per 100 residents.

Our main purpose is to estimate the marginal effects of school violence and neighborhood violence on school outcomes, controlling for school inputs and student characteristics. As explained above, we expect that both types of violence are endogenous

and our estimation strategy is to estimate the school outcome model using instrumental variables.

We present both OLS estimation results and IV estimation results for the school outcome equation. Table 2 presents model estimates using percent of 4th or 6th grade students meeting or exceeding state standards on the CRCT tests as the school outcome measure. Because the results are qualitatively very similar, we do not report estimation results using scores from 4th or 8th grade students. For virtually all coefficients, the OLS and IV estimates are similar in magnitude. Not surprisingly, the IV standard errors tend to be larger.

The most important school characteristic is clearly the teacher/student ratio; our OLS results indicate that an increase in the ratio from about 1/14 to 1/10 would increase the average pass rates by about 13 percentage points. The IV estimate for this coefficient is also large and positive, but the estimated standard error is much larger. The estimated coefficients on the proportion of black students, the proportion of students receiving free or reduced price school lunches, and the proportion of students taking ESL classes are negative and represent substantial effects. The t-statistics, however, indicate that these coefficients are not individually statistically significantly different from zero. There is a fair degree of correlation among these variables, though, so we computed an F-test on the joint significance of the three coefficients. This test statistic value is 8.89, which easily rejects the null of no joint effect.

The variable POPLTHS, the proportion of the neighborhood population with less than a high school degree, measures parent education or socioeconomic background of the school's students. Both OLS and IV point estimates suggest that a school in a

neighborhood whose proportion of high school graduates is .10 greater than another neighborhood's will have a pass rate on the CRCT that is about 4.5 percentage points higher than the school in the less educated neighborhood. A second measure of neighborhood socioeconomics is the number of public housing units in the block group. This coefficient is negative and statistically significant in both models, but the effect is small; an increase of say 10 units in a neighborhood will lower pass rates by .1 percentage points.³

Finally, given the school and neighborhood controls, both sets of results suggest that school violence and neighborhood violence have separate negative effects on school outcomes. The results indicate that one more violent incident in a school is associated with either a 2.5 percentage point decline in its pass rate (OLS) or a 4 percentage point decline (IV). Recall that the measure of neighborhood crime is computed as violent crimes per 100 neighborhood residents; the results indicate that an increase of 10 crimes per 100 residents is associated with a decrease in the neighborhood school's pass rate of 3.4 or 6.4 percentage points.

First stage regression results indicate that school crime is statistically significantly correlated with the number of adults in the school but only weakly correlated with the other instruments. The R^2 for this equation was 0.33. Neighborhood crime is statistically significantly correlated with the distance to public housing, the number of transit stations and the distance from the school to those transit stations, but not significantly related to either number of adults or busmiles. This first stage equation had

³ The public housing units variable is nonzero for about one third of our observations, and some of the values are quite large. As a check on outliers, we also created a dummy variable that equaled 1 if the number of units was nonzero. The models run with this dummy variable gave very similar results. These estimates are available upon request.

an R^2 of 0.34. A Hausman test of the overidentifying restrictions has a value of 1.58 (χ^2 distributed under the null, with three degrees of freedom), so that we do not reject the set of instruments.⁴

V. Conclusion

This paper examines the interrelationships among school academic outcomes and school and neighborhood violent crime. The research is motivated by the requirements in NCLB that explicitly tie school funding to measures of school safety. We find that, after controlling for school and neighborhood characteristics, both school and neighborhood violent crime have separate negative and statistically significant impacts on school outcomes. The empirical results for the control variables are fairly consistent with expectations and with previous literature. Moreover, the empirical results are qualitatively similar with both OLS and IV estimators.

Interestingly, our paper is one of few finding that, at the school level, the student/teacher ratio has a substantive impact on academic outcomes. Taken together, these two findings, the negative effects of in-school crime and the positive effects of a lower student/teacher ratio, have interesting policy implications. Both provide a policy lever that local voters or local education policy makers have under their direct control: improving test scores involves a substantive tradeoff between spending on in-school safety and spending on class size reduction.

⁴ First stage regression results are available upon request.

The separate negative effect of neighborhood crime on educational outcomes also raises some interesting policy issues. Since local jurisdictions may be able to improve their schools' performance on standardized tests by increasing jurisdiction-wide local enforcement efforts, this poses another potential funding tradeoff between using local tax dollars for education or for local law enforcement.

. The chief limitation of this analysis is that the sample size available is quite small and limited to only a single urban school district in Atlanta, Georgia. Clearly, finding similar results for a large, national sample would provide stronger evidence to policy makers, though it would be quite difficult to find comparable outcome measures across states and incident level neighborhood crime data are not readily available.

There is clearly more work to be done, especially in expanding the sample size and in looking to other areas of the country for validation of these results. Although a national-level study may be infeasible because of the lack of a single standardized test (or any other measured outcome) taken across all states, a multi-city study using states with comparable testing instruments and cities with incident-level crime data may provide a viable next step. Furthermore, because our results suggest there are multiple ways in which a community might improve its schools' test scores, an analysis of both the costs of each approach along with the achievement benefits from each approach would provide important insights for policy makers and educators alike on where they might spend the marginal tax dollar.

References:

- Burtless, G., ed. (1996). *Does money matter? The effect of school resources on student achievement and adult success*. Washington, D.C.: Brookings Institution Press.
- Bose, D. and K. Ihlandfeldt (2003) Rail Transit and Neighborhood Crime: The Case of Atlanta, Georgia. *Southern Economic Journal* 70(2), 273-394.
- Cairns, R. B., Cairns, B. D., & Neckerman, H. J. (1989). Early School Dropout: Configurations and Determinants. *Child Development* *Child Development* *Child Development* 60(6), 1437-1452.
- Clotfelter, C. T. (1998). Does money matter? The effect of school resources on student achievement and adult success. *Journal of Economic Literature*, 36(1), 258-259.
- Glaeser, E. L., Sacerdote, B., & Scheinkman, J. A. (1996). Crime and Social Interactions. *Quarterly Journal of Economics*, 111(2), 507-548.
- Gottfredson, D. C. (2001). *Schools and Delinquency*. Cambridge Criminology Series.
- Grogger, J. (1997). Local Violence and Educational Attainment. *Journal of Human Resources*, 32(4), 659-682.
- Hanushek, E. A. (1989). The Impact of Differential Expenditures on School Performance. *Educational Researcher*, 18(4), 45.
- Hanushek, E. A. (1994). Money Might Matter Somewhere: A Response to Hedges, Laine, and Greenwald. *Educational Researcher*, 23(4), 5-8.
- Hanushek, E. A. (1996). School Resources and Student Performance, *Does money matter? The effect of school resources on student achievement and adult success* (pp. 43-73). Washington, D.C.: Brookings Institution Press.
- Kelejian, H. H., & Prucha, I. R. (1997). Estimation of Spatial Regression Models with Autoregressive Errors by Two-Stage Least Squares Procedures: A Serious Problem. *International Regional Science Review*, 20(1-2), 103-111.

- Ladd, H. F. (1996). Holding Schools Accountable: Performance-Based Reform in Education: Introduction, *Holding schools accountable: Performance-based reform in education* (pp. 1-19). Washington, D.C.: Brookings Institution.
- Liu, H., & Brown, D. E. (2003). Criminal Incident Prediction Using a Point-Pattern-Based Density Model. *International Journal of Forecasting*, 19(4), 603-622.
- Pearson, F. S., & Jackson, T. (1991). Fear of School-Related Predatory Crime. *Social Science Research*(75), 117-125.
- Shepard, L. A., Ed., & Smith, M. L., Ed. (1989). Flunking Grades: Research and Policies on Retention. Education Policy Perspectives.

Map 1: Violent Crimes Per Capita for the 2000-2001 School Year

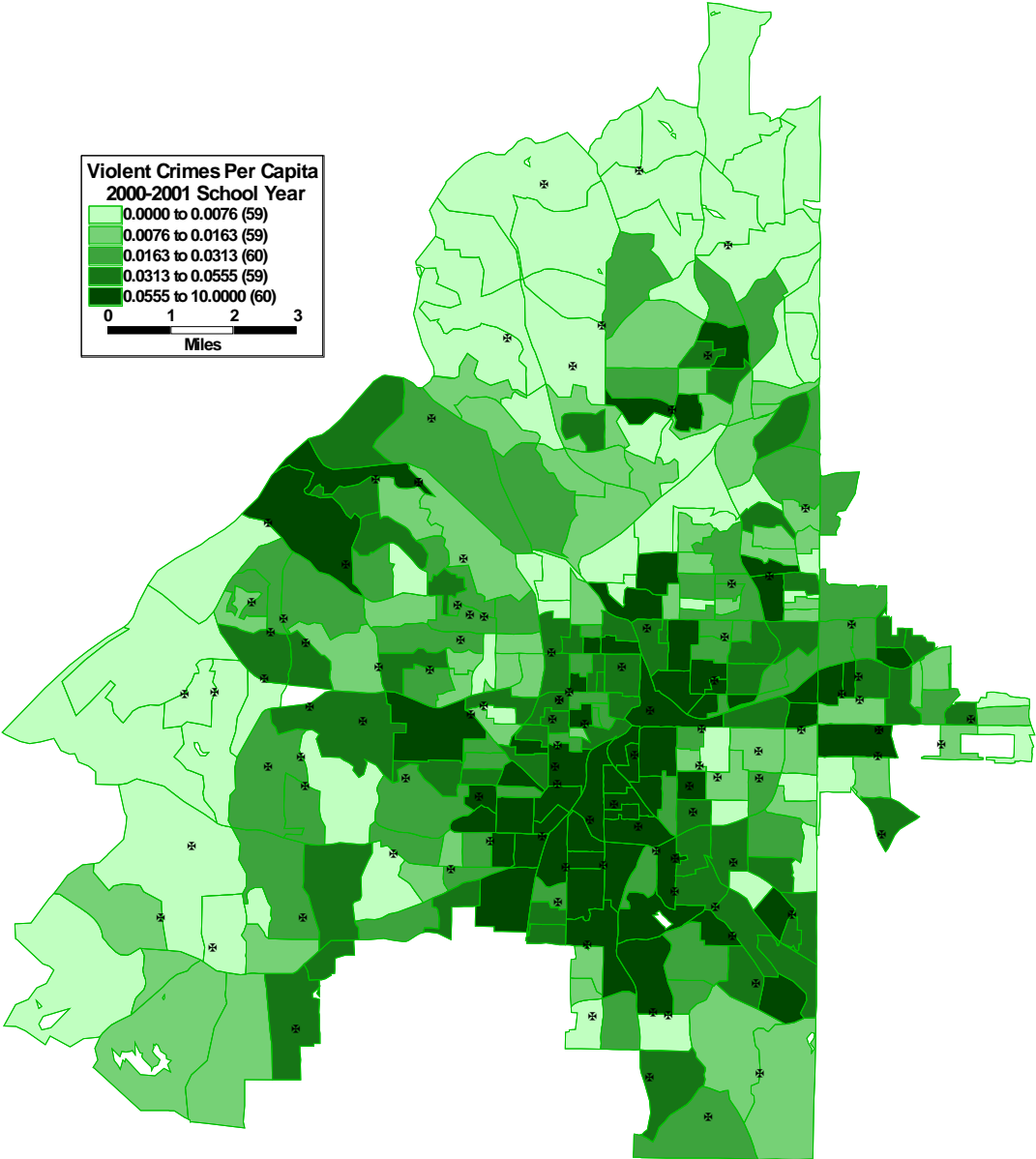


TABLE 1
Descriptive Statistics
Atlanta Elementary and Middle Schools 2000-01, 2001-02

NAME	N	MEAN	ST.DEV.	MINIMUM	MAXIMUM
CRCT46	148	64.72	16.99	32	100
CRCT48	148	64.88	16.60	32	100
BLKPCT	148	0.88	0.23	0.09	1.00
FRLPCT	148	0.81	0.21	0.04	1.00
ESOLPCT	148	0.03	0.06	0	0.45
TCHSTUD	148	0.07	0.01	0.05	0.10
POPLTHS	148	0.102	0.07	0	0.37
SCHVIOL	148	0.49	1.36	0	6.00
SCHDRUGS	148	0.155	0.56	0	3.0
SCHSEX	148	0.0	0.0	0.0	0.0
VIOLCRRT	148	0.05	0.05	0	0.29
BUSMILES	148	2.56	2.40	0.13	12.77
MARTAST	148	0.11	0.51	0	4
STATDIST	148	1.78	1.25	0.20	5.34
PH_UNITS	148	82.00	213.0	0	990
PH_DIST	148	0.97	0.63	0.07	3.04

TABLE 2
Atlanta Elementary and Middle School Outcome Regressions
OLS and IV Estimation
Dependent Variable: 4RD or 6TH CRCT Scores
N=148

VARIABLE	OLS Estimates		IV Estimates	
	Coefficient	Standard Errors	Coefficient	Standard Errors
SCHVIOL0	-2.513**	0.90	-3.992*	2.22
VIOLCRRT	-33.566*	20.81	-64.151*	38.61
BLKPCT	-13.983	11.73	-11.621	12.25
FRLPCT	-19.010	12.48	-18.746	12.80
POPLTHS	-43.512**	21.88	-45.109**	22.74
ESOLPCT	-23.311	24.06	-18.508	25.12
PH_UNITS	-0.012**	0.006	-0.012**	0.006
TCH_STUDS	217.924**	104.34	142.470	138.73
CONSTANT	85.472**	9.03	91.031**	11.03
R^2	0.413		0.391	

The * indicates statistical significance at a test size of 10 percent and ** indicates statistical significance at a test size of 5 percent.