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The Joint Determination of Test Scores and School and Neighborhood Crime

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Abstract

We examine some implications of the NLCB provisions regarding the "Unsafe School Choice Option." Specifically, we consider whether in-school crime incidents have a direct impact on academic outcomes. The policy relevance of this issue arises from the potential interdependencies of academic outcomes and both in-school and neighborhood violent crime. We estimate the impact of school violent crimes and neighborhood violent crime on school outcomes based on a five year panel of elementary and middle schools in the City of Atlanta. The empirical work is complicated by the endogeneity of both school crime and neighborhood crime.

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We examine some implications of the NLCB provisions regarding the "Unsafe School Choice Option." Specifically, we consider whether in-school crime incidents have a direct impact on academic outcomes. The policy relevance of this issue arises from the potential interdependencies of academic outcomes and both in-school and neighborhood violent crime. We estimate the impact of school violent crimes and neighborhood violent crime on school outcomes based on a five year panel of elementary and middle schools in the City of Atlanta. The empirical work is complicated by the endogeneity of both school crime and neighborhood crime.

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I. Introduction

This study investigates the links between school outcomes and both school and neighborhood measures of crime. The policy relevance of this research arises from the new funding requirements implemented in No Child Left Behind (NCLB). In addition to measuring academic performance, NCLB sets standards for a safe learning environment, with clear sanctions for schools that fail to meet these requirements. The NCLB is the first federal law that explicitly focuses on student behavior and requires the prevention of criminal acts as a condition of receiving federal funding. An interesting research question is whether efforts towards school crime prevention/enforcement activities could be a successful strategy for improving academic performance.

Clearly, school safety is an important and highly appropriate education policy goal, regardless of any academic outcome. It might be, however, that improved school safety has spillovers into academic performance. If this is the case, stakeholders could benefit from knowing and exploiting these synergies. 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 academic performance.

Measuring causal relationships between measures of crime and school performance is complicated by the difficulty of observing and measuring family and neighborhood characteristics that could be correlated with both educational outcomes and violent crimes. We use several estimation strategies to minimize this specification error, including instrumental variables and fixed effects. Despite our fairly small sample, our

results indicate that both in-school violent crimes and neighborhood violent crimes reduce academic performance.

The next section provides some background, discussing previous studies of possible 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: Safety & School Performance

The mechanism by which school safety influences academic performance is not obvious. Some earlier literature on safety in the school has focused 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). In these cases, the effect of crime is on the victim; a student who is bullied will not score as highly on tests, either through stress or through repeated absences from school. Some studies have found that higher attendance results in higher achievement, and a reduction in grade repeating and dropout rates (Cairns, Cairns, & Neckerman, 1989; Shepard & Smith, 1989).

Perhaps there is a connection between school and neighborhood crime and teacher performance. It is possible that teachers in schools where crimes occur must divert time from instruction into crime prevention. We might also speculate that teacher turnover relates to contextual variables such as crime. Although no direct empirical evidence is yet available for these issues, one might conjecture that the relationship found by Scafidi,

Sjoquist, and Stinebrickner (2007) between teacher turnover and racial composition of the students might in part relate to the incidence of crime.

It is also possible that a link between students' academic performance and crime exists due to the stress of attending a school where crimes, especially violent crimes, occur. A comprehensive study of crime and its influence on educational outcomes focused entirely on in-school crime was done by Grogger (1997). His theoretical model included the influence of neighborhood crime as an independent source of educational stress; however, he was not able to find good measures of neighborhood crime, so this was omitted from his empirical work. His results were based on data compiled in 1980; he found that reducing school violence by about 50 percent would increase college attendance rates by around five percent.

An important addition to this literature comes from Aizer (2008), who examines the impact of neighborhood violence on several child outcomes, including cognitive test scores. She finds that exposure to violence and associating with violent peers has a negative correlation with test scores, even after controlling for family and neighborhood disadvantages such as unemployment and low educational attainment. McGarvey, Walker, and Smith (2008) find some evidence that both school and neighborhood crime affect high school dropout rates. Based on school district data from Georgia, their empirical work suggests that higher in-school crime rates as well as higher crime within the county have positive associations with high school dropout rates.

III. Model and estimation

We adopt the educational production function approach to modeling the effects of in-school and neighborhood violence on primary and middle school students' academic achievement.[1] Schools will choose the optimal input levels to maximize student achievement given a fixed budget. In this framework, school safety (fewer incidents of violence) is a productive input in addition to the more traditional teacher quality variables,[2] and neighborhood safety (lower risk of violent crime) is an additional environmental influence that is outside the school's control. Our goal is to estimate the marginal effects of in-school and neighborhood violence on school performance, conditional on teacher quality, school resources, and neighborhood demographics.

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 use several estimation strategies to minimize this specification error. We control for accumulated school influences by including the school's past attainment, [3] we exploit the panel nature of the data to control for unobserved school-fixed effects and time effects, and we use instruments for in-school and neighborhood violence to identify their marginal effects on school performance. We are primarily interested in school outcomes, so that structural equations for in-school and neighborhood violence are not

[1] See Monk (1992) for a review of the educational productivity literature.
[2] See Nye, et. al. (2004) for a comprehensive review of the literature on teacher effectiveness.
[3] If our dependent variable was individual student test scores then this specification could be interpreted as a generalized value-added model that assesses inputs' contributions to students' achievement gains. Since we do not use individual test scores, we include prior school attainment to account for the effect of omitted school resources.

specified. Instead, we estimate only reduced form equations for these in order to obtain predicted values as instruments for the equation of interest.

The availability of in-school and neighborhood incident-level violent crime data limits the sample to schools in the Atlanta City School District observed over a five year period. The small size of the panel imposes a trade-off between the number of regressors and the flexibility of the functional form in our empirical specification. We choose to estimate a linear approximation to the underlying production function and include the first-order effects of the controls.

$$TEST_{it} = \alpha TEST_{i,t-1} + \beta_0 + x1_{it}'\beta_1 + x2_i'\beta_2 + \sum_{t=2}^{T}\tau_t + \gamma_1 schviol_{it} + \gamma_2 vcrmpc_{it} + u_{it} + \eta_i, \quad (1)$$

where $TEST_{it}$ denotes the test score outcome from school i. $Schviol_{it}$ is the number of reported violent incidents occurring in the school, while $vcrmpc_{it}$ is the number of violent crimes per resident in the neighborhood. The control variables in $x1_{it}$ contain school i 's inputs and student demographics for each year in the sample and those in $x2_i$ contain neighborhood i 's demographic variables measured in the year 2000. The γ parameters measure the effects of violence in school and in the neighborhood and the vectors, β_1 and β_2, measure the impacts of the school and neighborhood control variables. The τ parameters capture unobservable year-specific factors that are common to all schools' test outcomes while $TEST_{i,t-1}$ controls for individual schools' prior attainment.

The school-specific control variables in $x1_{it}$ include the teacher-to-student ratio as a measure of the school's resources, and measures of teacher quality such as the percentage of teachers with less than one year of experience and the average number of

years of experience. We include the percentage of students who are eligible to receive free or reduced price school lunches as one control for the level of poverty in the student population. We also include the percentage of the students who are African-Americans. Interestingly even by school year 2004-2005, which is the last year of our panel, few Hispanic students were enrolled in City of Atlanta public schools.

The variables in $x2_i$ control for demographics of the entire neighborhood and do not vary over the four year sample period.[4] These include the number of public housing units located in the neighborhood, the percentage of the population over 25 years old with less than a high school degree, and the percentage of the labor force that is over 16 years old and is unemployed. These variables help to control for poverty and perhaps account to some extent for attitudes of neighborhood parents towards education.

The idiosyncratic disturbances, $u_{it} + \eta_i$, capture the remaining influences on school attainment after controlling for previous attainment, time effects, and the school and neighborhood characteristics in *x1* and *x2*. 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 error component η_i represents those unobservables that are school-specific and constant over the four-year sample period. Because many factors in the error terms are undoubtedly also correlated with the incidence of crime both in the schools themselves and in the surrounding neighborhood, pooled OLS estimation of the unknown parameters in equation (1) generally will result in inconsistent estimates of the marginal effects of

[4] Although we collected data for a 5 year period, only 4 years are used in estimation because we include the lagged score as an explanatory variable.

violence on school outcomes. We consider two estimation strategies to reduce this specification bias.

One strategy to identify the effects of school and neighborhood violence is to find instruments that are partially correlated with violence (given the outcome equation's control variables) but uncorrelated with the equation's disturbance. We use the number of adults employed in each school (including administrative and support staff, along with teachers) as an instrument for in-school violent incidents. 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.[5] The number of adults in the school will be correlated with in-school violence if either schools with more violent incidents employ more teachers, administrators and support personnel to increase school safety or, if the presence of more adults in the school deters violence in the school. We contend that the number of adults will not be correlated with the equation's disturbance, however, because we already control for classroom instruction personnel by including the teacher-student ratio in *x1*. The presence of additional administrators and staff should not directly affect academic outcomes.

We use two instruments to identify the effect of neighborhood violent crime on school attainment: distance from the neighborhood center to the nearest public transit station, and the neighborhood's total population. Previous work by Bose and Ihlanfeldt (2003) finds that measures of public transportation are correlated with urban crime. We expect that neighborhoods with easier access to public transportation will be more congested with non-residents providing a larger pool of both criminals and potential

[5] School specific data on the presence of these officers is not available.

victims. Given their population and demographics, neighborhoods with shorter distances to transit rails will be plagued with more violent crimes and hence higher violent crime rates. Our second instrument for neighborhood violent crime rates is the total population of the neighborhood. Given the socioeconomic characteristics of the neighborhood, the probability of being victimized by a violent crime should fall as the number of neighborhood residents increases. We argue that both these instrumental variables will affect school outcomes only through their correlation with crime and socioeconomic status; because our equation directly controls for crime and demographics, these are valid instruments.

An alternative to instrumental variables estimation to include school fixed effects to identify the effects of in-school and neighborhood crime on school achievement. If the unobserved heterogeneity across schools, represented by η_i, is correlated with violent incidents in the school or neighborhood, controlling for school fixed effects in the school outcome equation will eliminate this specification bias. Once we include fixed effects, however, we can no longer identify the marginal effects of any of the neighborhood controls in *x2* since they do not vary over time in our sample. The school fixed effects will capture the effects of all variables that differ across schools (and neighborhoods) that are not captured by the school characteristics in *x1*. Because two of our three instruments for in-school and neighborhood crime vary only across schools, we can no longer use these instruments for identification.

IV. Data and Results

In this study, the school's neighborhood is defined as the attendance zone for the school. For middle schools, the attendance zone covers the attendance zones of the elementary schools that feed into it. Because all the schools in the sample are public schools, the large majority of each school's students reside in the school's attendance zone. There are four charter schools in our sample; for these we have defined an attendance zone similar in size to the others. Although children from all over the school district are allowed to enroll in these schools, the schools state that preference in admission is given to children from the neighborhood.

Our source for 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. The panel begins in the 2000-01 school year and extends through the 2004-05 school year. Our data set is an unbalanced panel with information on 61 elementary schools and 17 middle schools.

Neighborhood socio-economic status and demographics such as race, unemployment, and education levels were obtained from the 2000 U.S. Census. These data were obtained at the block group level, then aggregated to correspond to each school's attendance zone. 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. The neighborhood crime data were made available by the Atlanta Police Department, from police reports over the years 2000 to 2005. The data are at the incident level; we have geo-coded these incidents and grouped them first by type, and then summed them by attendance zones.

Table 1 presents descriptive statistics for the school outcome measures, incidents of violent crimes that occurred in each school, student demographics, school input measures, and neighborhood crime measures. Because the unit of observation for the neighborhood is the attendance zone, observations corresponding to middle schools represent the aggregate of several elementary feeder schools.

The academic outcome variables we focus on are based on the Criterion-Referenced Competency Tests, or CRCTs, in reading and math. Promotion decisions for students in Georgia are based on passing a subset of these tests. These particular test scores are perhaps not as useful in comparing individual students, but they provide an excellent way to compare outcomes across schools.[6]

Our dependent variables are computed for elementary schools as the proportion of the school's 4th grade students who met or exceeded state standards on reading and math tests. For the middle schools, we used the proportion of the school's 6th grade students who met or exceeded state standards in these subjects. Note that test results from grade 4 measure attainment in elementary schools (as there are no grade 6 students in these schools) and results from grade 6 measure attainment in middle schools (as there are no grade 4 students in middle schools). All schools show variation in these variables over the time period. The overall average percentage of students meeting or exceeding standards in reading was 73.8%; in math, 63%.

The percentage of black students ranges from seven percent to 100%. On average, 78 percent of students are eligible for free or reduced price school lunch; this percentage ranges from 3.9 to 100 percent across schools and over time.

[6] Individual student records are not available for students in Georgia. Because of changes in the testing instruments over the period of the sample, a consistent series of school averages is not available for other achievement tests.

School inputs and neighborhood characteristics also vary substantially across schools. Teacher/student ratios average about one teacher for every 12 students. We computed the percentage of new teachers; this is the percentage of full-time-equivalent teachers with less than one year of experience. Some schools had no teachers that fell into this category, while one new middle school, the APS-CEP school, reported that all of its teachers were new in 2003-2004.

Although all of the schools and neighborhoods represented in this sample come from a large urban school district, there are substantial variations in neighborhood characteristics. According to the 2000 Census data, the average unemployment rate over the district was about 15 percent, with some school attendance zones showing unemployment rates of under two percent while others had rates of 70 percent. The presence of public housing units in the neighborhood is another contextual variable. Although 32 of the schools in the sample have no public housing units in the school's attendance zone, the number of units varies from three to nearly 1800. We cannot directly measure the education levels of the parents of the children attending the schools, but we include the percentage of adults in the neighborhood who failed to graduate from high school. This variable ranges from just under four percent to nearly 60 percent.

The average number of reported incidents of violent crime within the schools is only .81 over the five school years, with the number of incidents per year varying between zero and 13 across the schools. The incidence of violent crime within each school's neighborhood over the school year is, of course, much higher. The mean violent crime rate across school neighborhoods is 4.5 crimes per 100 residents. Again, this ranges

widely, from about .22 to almost 25 violent crimes per 100 residents within the school year.

The variables used as instruments in the IV models include the total number of adults at the school, the total population in the school's attendance zone, and the distance from the school to the nearest subway station. The total number of adults in the schools averages just over 45. Total population in the attendance zone varies between 1,375 and almost 88,000. The minimum number actually seems quite low for an urban area, but maps indicate that two schools within the school district are located in more commercial areas, hence the low population. Finally, schools are, on average, about 1.7 miles from the nearest public transport train station.

Recall that our goal is to estimate the marginal effects of school violence and neighborhood violence on school outcomes, controlling for school inputs, student characteristics, and school attendance zone characteristics. As outlined in the previous section, we expect that both in-school violence and neighborhood violence are endogenous; our estimation strategy accounts for this endogeneity in two ways. First, we estimate the model using instrumental variables. If the endogeneity results from correlation with unobservables that varies across school attendance zones and over time, we are able to obtain consistent estimates as long as our instruments are valid. A second strategy is to use fixed effects to sweep out the unobservable heterogeneity. This will provide consistent estimates as long as the unobservables are not time-varying.

Table 2 presents three sets of estimates for the school outcome equation. Recall that the dependent variable represents the percent of 4^{th} (for elementary schools) or 6^{th} (for middle schools) grade students meeting or exceeding state standards on the CRCT

tests of reading.[7] The discussion of the results focuses on the point estimates from the IV regression.

The first stage regression results are given in Table 3. Note that the R^2s for each of the first stage regressions are approximately the same, .36 and .40. The F-tests on the excluded instruments indicate marginal significance levels of less than .001. The instrument, total number of adults in the school, is meant to identify school violence. Its partial correlation with school violence is positive and statistically significant. The two instruments used to identify neighborhood violence are both statistically significant and have negative correlations with the violent crime rate. The test for overidentifying restrictions does not reject the null that the instruments are valid.

The coefficients on school incidents of violence indicate that reading test outcomes are negatively associated with in-school violence. One more incident of violence is associated with about a 3 percentage point decline in the proportion of students meeting or exceeding state standards. The point estimates also indicate that as neighborhood crime increases by 1 crime per 100 attendance zone residents, students meeting state standard falls by one third of a percentage point. The standard error for this coefficient is high; an examination of the relationships among the variables indicated a high degree of collinearity with the variable measuring the percent of adults who failed to receive a high school diploma. An F-test rejects the null that these coefficients are jointly zero.[8]

Recall that the lagged score variable is included to account for accumulated school-specific factors. Not surprisingly, the coefficient on this variable reveals

[7] We include the results of the same specifications estimated for the CRCT tests of math in Table 5.
[8] Table 4 includes some alternative specifications, including a simple one that excludes collinear variables.

substantial positive serial correlation in scores. When the different model specifications are estimated excluding the lagged score variable, the point estimates are virtually unchanged. These results suggest that the unobserved school-specific factors have no particular correlation with our measures of violence, however we choose to include the lagged variable to account for the persistence in scores.

The associations between school outcomes and teacher characteristics are somewhat surprising. Several measures relating to teachers and teacher quality were computed, including the percentage of teachers who are new, meaning with less than one year of experience, the teacher/student ratio, the percentage of teachers with advanced degrees, and the average years of experience of the full time teachers. The results were quite robust in suggesting that the percentage of new teachers always has a statistically significant negative impact on the reading test scores. The IV results indicate that a one percentage point increase in the new teacher percentage, say from 16 percent to 17 percent, is associated with a .22 point decline in the percent of students passing the CRCT reading test. This result largely held up, even when other teacher measures were included. The other three measures showed positive and statistically significant impacts when they were included separately in some specifications, with no other teacher measure, but these variables lost magnitude and significance when the new teacher percentage was included.

The coefficient on the racial composition of the student body was small and not statistically significant in most specifications. However, after controlling for the other variables, we find that the percentage of students who qualify for free or reduced price lunches has a negative association with the reading test outcome. If this percentage were

to rise by 10 points, say, the passing rate on the reading test would fall by just over 1 percentage point.

Contextual variables for the school's attendance zone included measures of poverty: the number of public housing units located in the attendance zone and the unemployment rate. Although the public housing measure had virtually no effect on outcomes, the unemployment rate has an unexpected positive coefficient. Moreover, this result was fairly consistent across specifications. We speculate that this might result from the fact that all Census variables are measured at only one point in time, the 2000 Census.[9] A third neighborhood variable is the relative education level of the adults who live there, we used the percent of adults with less than a high school diploma. This variable shows a small negative association with reading test outcomes, but it is only marginally significant.

Finally, the year dummy variables show consistent, positive coefficients, so that the time trend is towards more students meeting or exceeding standards on reading tests. For both OLS and IV regressions, scores in the 2003 – 2004 school year are over three points higher than in the base year, 2001 – 2002. The next school year did not see as large a gain, but scores for the 2004 – 2005 school year jumped another five (OLS) to seven (IV) points over the base year.

A brief look at the fixed effects regression results reveals qualitatively similar results. The loss of degrees of freedom makes it more difficult to estimate coefficients precisely and, of course, it is not possible to use the neighborhood characteristics as they

[9] Another speculation was that perhaps this unemployment rate result really resulted from the fact that the labor market participation rate varied widely across these urban neighborhoods. Other specifications that used the labor market participation rate did not reveal anything, however.

do not vary over time. Still, we see that both school crime incidents and neighborhood crime rates have negative effects on reading outcomes. The effect of the percentage of new teachers is approximately the same as in the previous models. Interestingly, the percentage of students who are black now has a significant positive impact on the percentage of students who meet or exceed state standards. The time variables show a similar pattern to the other results.

The estimates in Table 4 address the issue of whether the effects of violence differ for elementary schools and middle schools. The data indicate that violent crimes are more likely in middle schools and one might expect the environments to differ. The small number of observations on middle schools makes estimation of the full model impractical. Thus we considered several strategies. First, we estimated the full model only on the sample of elementary schools, these results are virtually the same as those using the entire sample. Second, we estimated a restricted model using OLS for the entire sample, and then the divided samples. Those results, also in Table 4, again show that the estimated effect of school violence on school attainment is virtually the same in elementary schools and middle schools. Lastly, we estimated models using a middle school dummy variable and interactions with school violence. These results, not reported, showed no evidence of a difference.[10]

IV. Conclusion

It is well known that schools serving low-income, minority students often have a higher incidence of violent incidents, are located in high crime neighborhoods, and are

[10] These results available from the authors on request.

less likely to meet minimum competency standards. This paper represents a first step in gauging the extent to which these correlations are due to a causal relationship from crime to school outcomes. Using panel data from the Atlanta City Public School district, we found evidence that suggests that crime in school and possibly crime in the neighborhood reduce student achievement, independent of the socio-economic characteristics of the school's student population, the school's neighborhood, and the school's resources. Although we use statistical techniques to isolate crime's effect, the level of data aggregation prevents us from identifying the specific channels of influence, a necessary step to developing effective policies.

In this research, we have chosen the educational production function approach to specify our empirical model by controlling for time-varying school inputs such as measures of teacher quality and socio-economic characteristics of the student population, as well as school resources. We measured the neighborhood violent crime rate as the incidents of violent crime per resident that occurred in the school's attendance zone during the academic year and included in the regression Census block-level demographics aggregated over the attendance zone to control for neighborhood demographics.

Because unobservable factors that affect school performance and remain in the school outcome equation's disturbance are likely correlated with both measures of violent crime, pooled OLS estimation will not identify the marginal effects of crime on school attainment. We employed several estimation strategies to reduce this specification bias. To mitigate the effect of violent crimes' correlation with unobservable, time-varying school resources, we included past school attainment as an

additional regressor. We estimated the model using instrumental variables for in-school and neighborhood crime. Finally, we exploited the panel nature of the data to include school fixed effects to eliminate the bias from school-specific unobservables that were correlated with in-school and neighborhood crime.

We found that one more incident of violence in school was associated with a 3 to 4 point reduction in the percentage of students who passed or exceeded state standards on reading or math tests. Our point estimates indicated that neighborhood violent crime rates were negatively associated with school attainment rates, given in-school crime, and the school and neighborhood controls. The high degree of collinearity between neighborhood socio-economic measures and violent crime rates, however, prevented our obtaining precise estimates of the effect of neighborhood violent crime on school performance.

Despite the small sample size and the lack of individual student level data, the results suggest that it would be worthwhile to investigate these issues further. In particular, due to the obvious policy relevance, it is important to identify the channels through which crime affects student performance.

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TABLE 1
Descriptive Statistics
Atlanta Elementary and Middle Schools 2000-01 to 2004-05
299 observations

	MEAN	STD DEV	MIN	MAX
Reading: Percent students meeting or exceeding standards	73.809	14.26	24	100
Math: Percent students meeting or exceeding standards	62.997	18.61	10	99
Incidents of school violence	0.812	1.739	0	13
Neighborhood violence per capita	0.045	0.029	0.002	0.247
Teacher-student ratio	0.082	0.015	0.002	0.135
Percent of new teachers	16.628	12.66	0	100
Percent black students	87.76	24.222	7	100
Percent students with free or reduced price lunch	77.850	21.69	3.87	99.56
Percent adults with less than high school diploma	31.346	13.042	3.86	59.27
Number of public housing units	347.11	473.68	0	1796
Unemployment rate (percent)	15.5	10.186	1.78	70.73
Total adults in the school	45.524	12.023	3	78.10
Distance to public transportation rail	1.722	1.12	0.041	4.33
Total population	14,336.4	16,831.8	1,375	87,796
Year dummy, 2002-03	0.251	0.434	0	1
Year dummy, 2003-04	0.251	0.434	0	1
Year dummy, 2004-05	0.251	0.434	0	1

TABLE 2
Atlanta Elementary and Middle School Outcome Regressions
OLS and IV Estimation
Dependent Variable: Percent meeting or exceeding standards on CRCT Reading Test
N=299

Dependent variable: CRCT Reading Score			
VARIABLE	**OLS Estimates**	**IV Estimates**	**Fixed effects Estimates**
Lagged reading score	0.389*** (0.05)	0.324*** (0.07)	-0.149** (0.06)
Incidents, school violence	-1.414*** (0.37)	-3.045** (1.47)	-0.774* (0.41)
Neighborhood violence per capita	-29.087 (22.71)	-30.087 (111.97)	-21.838 (33.65)
Teacher-student ratio	-0.010 (0.39)	-0.545 (0.62)	0.409 (0.62)
Percent of new teachers	-0.246*** (0.06)	-0.222*** (0.07)	-0.190** (0.08)
Percent black students	0.012 (0.04)	0.030 (0.05)	0.759** (0.36)
Percent students with free or reduced price lunch	-0.110** (0.05)	-0.122** (0.06)	-0.074 (0.08)
Percent adults with less than high school diploma	-0.133* (0.07)	-0.173 (0.15)	—
Number of public housing units	-0.001 (0.001)	0.000 (0.002)	—
Unemployment rate	0.188*** (0.07)	0.184** (0.7)	—
Year dummy, 2002-03	3.045** (1.55)	3.688* (2.07)	4.390*** (1.38)
Year dummy, 2003-04	0.589 (1.84)	2.003 (2.58)	3.479** (1.74)
Year dummy, 2004-05	5.779*** (1.62)	7.44*** (2.20)	7.728*** (1.57)
Constant	59.497 (5.80)	68.887 (10.03)	21.03 (32.41)
	$R^2 = 0.61$	$R^2 = 0.58$	$R^2 = 0.28$

The * indicates statistical significance at a test size of 10 percent, ** indicates statistical significance at a test size of 5 percent, and *** indicates statistical significance at a test size of 1 percent.

Table 3: First Stage Regression Results

Instruments	School violence, number of incidents	Neighborhood violence, Per capita[11]
Lagged reading score	-0.033*** (0.01)	0.055 (0.11)
Teacher-student ratio	-0.279*** (0.06)	-1.01 (0.99)
Percent of new teachers	0.008 (0.01)	-0.053 (0.16)
Percent black students	0.016** (0.01)	-0.110 (0.11)
Percent students with free or reduced price lunch	-0.007 (0.008)	0.121 (0.13)
Percent adults with less than high school diploma	-0.016 (0.01)	1.118*** (0.18)
Number of public housing units	0.000* (0.000)	0.012*** (0.004)
Unemployment rate	-0.01 (0.01)	-0.01 (0.18)
Total adults in school	0.038*** (0.008)	-0.140 (0.13)
Distance to public transportation rail, miles	-0.037 (0.08)	-3.472*** (1.27)
Total population (in 10,000s)	-0.024 (0.06)	-2.190*** (0.99)
Year dummy, 2002-03	0.285 (0.24)	10.510*** (3.92)
Year dummy, 2003-04	0.840*** (0.28)	7.633* (4.58)
Year dummy, 2004-05	1.002*** (0.26)	1.023 (4.04)
Constant	2.893*** (1.07)	22.640 (17.53)
	$R^2 = 0.36$	$R^2 = 0.40$
F-statistic on excluded instruments	7.57	4.83
J-test statistic for testing overidentifying restrictions	0.688	

[11] The neighborhood crime variable has been scaled up by a factor of 1000 for these first stage results.

Table 4: Alternative specifications

Dependent variable: CRCT Reading Score				
VARIABLE	**Elementary schools only (IV) N=233**	**Simple model (OLS) N=300**	**Elementary schools only (OLS) N=233**	**Middle schools only (OLS) N=66**
Lagged reading score	0.254** (0.12)	0.550*** (0.04)	0.533*** (0.05)	0.70*** (0.07)
Incidents, school violence	-9.96* (5.80)	-1.290*** (0.36)	-1.947*** (0.85)	-0.638* (0.36)
Neighborhood violence per capita	-54.509 (140.32)	-59.858*** (19.89)	-61.750*** (22.33)	-29.670 (38.17)
Teacher-student ratio	0.185 (0.70)	--	--	--
Percent of new teachers	-0.160 (0.11)	--	--	--
Percent black students	0.049 (0.06)	--	--	--
Percent students with free or reduced price lunch	-0.169** (0.08)	--	--	--
Percent adults with less than high school diploma	-0.121 (0.20)	--	--	--
Number of public housing units	-0.002 (0.003)	--	--	--
Unemployment rate	0.232** (0.10)	--	--	--
Year dummy, 2002-03	4.551* (2.73)	2.905* (1.62)	4.242** (1.90)	-4.200* (2.53)
Year dummy, 2003-04	5.916 (4.38)	-4.026** (1.64)	-1.257 (1.98)	-13.883*** (2.54)
Year dummy, 2004-05	12.162*** (3.70)	7.477*** (1.62)	10.430*** (1.93)	-4.867* (2.51)
Constant	67.041 (11.69)	36.886 (3.43)	36.676 (4.15)	32.333 (4.87)
	$R^2 = 0.34$	$R^2 = 0.55$	$R^2 = 0.48$	$R^2 = 0.78$

Table 5: Model results using scores on mathematics test

Dependent variable: CRCT Math Score			
VARIABLE	OLS Estimates	IV Estimates	Fixed effects Estimates
Lagged math score	0.498*** (0.04)	0.426*** (0.07)	-0.034 (0.07)
Incidents, school violence	-1.644*** (0.46)	-4.100** (1.86)	-0.261 (0.56)
Neighborhood violence per capita	-36.549 (28.61)	-41.224 (143.41)	-41.676 (46.33)
Teacher-student ratio	0.514 (0.50)	-0.318 (0.80)	0.808 (0.85)
Percent of new teachers	-0.204*** (0.07)	-0.163* (0.09)	-0.078 (0.11)
Percent black students	-0.056 (0.05)	-0.031 (0.06)	0.436 (0.50)
Percent students with free or reduced price lunch	-0.065 (0.07)	-0.079 (0.07)	0.059 (0.11)
Percent adults with less than high school diploma	-0.10 (0.09)	-0.150 (0.19)	--
Number of public housing units	-0.002 (0.002)	-0.001 (0.00)	--
Unemployment rate	0.218** (0.09)	0.202** (0.09)	--
Year dummy, 2002-03	7.837*** (1.95)	8.551*** (2.58)	7.587*** (1.89)
Year dummy, 2003-04	8.421*** (2.30)	10.414*** (3.26)	10.660*** (2.40)
Year dummy, 2004-05	5.30** (2.08)	8.334*** (3.08)	11.423*** (2.25)
Constant	40.394 (6.41)	51.802 (10.71)	11.484 (44.64)
	$\boldsymbol{R^2 = 0.63}$	$\boldsymbol{R^2 = 0.60}$	$\boldsymbol{R^2 = 0.20}$