WHEN THE SAINTS COME MARCHING IN: EFFECTS OF HURRICANES KATRINA AND RITA ON STUDENT EVACUEES*

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Abstract

I examine academic performance and college going for public school students affected by Hurricanes Katrina and Rita. Students who are forced to switch schools due to the hurricanes experience sharp declines in test scores in the first year following the hurricane. However, by the second and third years after the disaster, Katrina evacuees displaced from Orleans Parish appear to benefit from the displacement, experiencing a .15 standard deviation improvement in scores. The test score gains are concentrated among students whose initial schools were in the lowest quintile of the test score distribution and among students who leave the New Orleans MSA. Katrina evacuees from suburban areas and Rita evacuees (from the Lake Charles area) eventually recover most of the ground lost during 05-06 but do not experience long term gains relative to their pre-Katrina test scores. High school age Orleans evacuees have higher college enrollment rates than their predecessors from the same high schools. Meanwhile, Katrina evacuees from the suburbs experience a 3.5 percentage point drop in their rate of enrollment in four year colleges. Those evacuees do not to make up for the decline in the subsequent two years. Later cohorts of suburban New Orleans evacuees are unaffected. The results suggest that for students in the lowest performing schools, the long term gains to achievement from switching schools can more than offset even substantial costs of disruption.

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I. Introduction

One of the many effects of Hurricane Katrina was to close temporarily and later to force the reconstitution of schools in one of the nation's worst performing urban school districts. Many have speculated that there may be a silver lining to the disaster in that adults were forced to exit a poor labor market and students were forced to exit a poor performing school system.[1] A central question in today's debate over the future of public education is whether failing schools should be shuttered and their students enrolled elsewhere. But as of the time of this writing, few states and school districts have taken such extreme measures. Hurricane Katrina may provide some insight into how student outcomes evolve when schools are shut down and students are sent to different and in most cases better performing schools. Obviously the analogy is not a perfect one since Katrina evacuees faced more sources of disruption than a simple school change. But in a sense, the estimates provided here may be a lower bound on the positive effects that would be observed if Orleans students were merely moved to different schools without all the other associated shocks. Additionally, one of the motivations for the Moving to Opportunity experiments (Katz Kling and Liebman [2001] and Ludwig, Duncan and Hirschfield [2001]) is that students may benefit from a change in neighborhood and schools. And the experience of Katrina provides another shock that we can contrast and compare to the experience of MTO movers.

Hurricane Katrina was one of the worst natural disasters in United States history. Roughly 1900 deaths are blamed on Katrina and estimates of the damage to homes and infrastructure are roughly $80 billion. In addition, as of 2008, roughly $60 billion in Federal money has been

[1] Vigdor [2007] finds little support for the former hypothesis.

allocated for disaster relief and recovery[2]. Because Katrina destroyed so many homes and flooded 80% of New Orleans, nearly 1 million people were displaced from their homes. Thirty five thousand Katrina evacuees relocated to Houston, Texas while 24,000 relocated to Mobile, Alabama and 15,000 people moved to Baton Rouge. Rand Corporation estimates that of Louisiana's 760,000 public school students (pre-Katrina and Rita), 196,000 were displaced from their schools (Pane et al. 2006).

This paper is a first attempt at analyzing the long term effects of dislocation from Katrina and Rita on student achievement and college going.[3] The data are provided by the Louisiana Department of Education and include reading and math test scores, basic student demographics, school and school district for each student in each year and whether or not the student was displaced by Hurricane Katrina or Rita. Data from the National Student Clearinghouse are used to track four cohorts of high school students who reached high school graduation age pre-and post Katrina.

The existing literature suggests at least two different effects that may be at work. First, the literature on the disruptive effects of moving schools (e.g. Hanushek, Kain and Rivkin [2004], Alexander Norc and Entwistle [1996]) would suggest modest sized negative effects from switching schools. Having one's family displaced by a hurricane is likely far more disruptive than a conventional move between schools. Vigdor [2007] estimates that evacuees on average lost three weeks of work and that evacuees who do not return home lost closer to ten weeks of work. Pane et

[2] CNN, 2008. Department of Homeland Security web page: http://www.dhs.gov/xprepresp/programs/gc_1157649340100.shtm

[3] After starting this research, I learned of Pane at al [2008], part of which looks at the effects on test scores in the first year following the hurricanes. Results on peer effects on non-movers in Lousiana and Houston, Texas will be forthcoming in joint work by Scott Imberman , Adriana Kugler and me.

al [2006] finds that the median student evacuee missed five weeks of school. Second, the literature on school quality and teacher quality (for example Rivkin Kain and Hanushek [2005], Kane, Staiger Rockoff [2006]) would suggest that some New Orleans natives could actually benefit from being forced to move out of their low performing schools. The motivating question for this paper is whether the severe costs imposed by moving students from low performing to different schools can be offset by any gains.[4]

I attempt to look this question by using disruption by Katrina and Rita as the key source of variation. On average, Katrina evacuees from Orleans Parish experience many sources of disruption and a large increase in school quality as measured by average test scores. Rita evacuees and Katrina from New Orleans suburbs (Jefferson, Saint Bernard, Saint Tammany, Plaquemines Parishes) experience similar disruptions without large changes in average school quality.

In the spring of 2006, following the hurricanes, I find reasonably large (.10 to .25 standard deviation) declines in test scores for all students who are displaced by the hurricanes.[5] These declines are relative to all other Louisiana students in the same grade and are consistent with Pane at al [2008]. For students from suburban New Orleans (Jefferson Parish) and Lake Charles (in Calcasieu Parish), the negative effect moderates gradually during 2007 and 2008.

In contrast, students from Orleans Parish see the negative effect of the hurricane disappear fully by 2007. And by 2008 these students are experiencing gains of .10-.20 standard deviations

[4] Of course these hurricanes were such massive events that studying the impacts may be interesting in its own right whether or not we can use the impacts from the hurricanes to inform the educational literature more broadly.
[5] This effect is roughly 1-2x the size of being assigned a teach with test score value added that is one standard deviation below the mean of all teachers in a state. (Kane, Staiger Rockoff [2008] and Hanushek Kain O'Brien and Rivkin [2005]).

relative to their pre-Hurricane test score. This suggests that long run academic achievement for Orleans students might have been improved by the closing of their schools and the forced move that this implied. Presumably any improvement in achievement comes on top of all the challenges that evacuees and their families faced.

College enrollment was disrupted for evacuees in graduating classes just prior and just after the hurricanes, i.e. the classes of 2005 and 2006. Evacuees from suburban New Orleans see a reduction of 3.5 percentage points in their rate of college going.[6] And the negative effect for these cohorts appears to be permanent rather than temporary in nature. But the subsequent cohort, ie the class of 2007, does not show signs of the same effect. Evacuees from Orleans parish (i.e. the City of New Orleans) see very small negative effects, and when measured relative to other Lousiana students, the Orleans evacuees actually have statistically significant gains in college enrollment.

The Existing Literature on Hurricane Katrina

Several papers have examined labor market effects from Hurricane Katrina. One of the most in depth of these is Vigdor [2007] which asks whether evacuees benefit in the medium run from being forced out of New Orleans which was high in poverty and unemployment and had lower income than other cities in the South. This hypothesis is similar in spirit to the investigations of the Moving to Opportunity Program (Katz Kling and Liebman [2001]) and the demolitions of public housing in Chicago (Jacob [2004]). Vigdor [2007] finds that evacuees are hurt by the

[6] This is for enrollment in four year colleges.

dislocation, both in terms of income and weeks worked. McIntosh [2007] finds that the in migration of evacuees hurt native wages and employment in Houston, Texas.

Several studies including Paxson and Rouse [2008], Groen and Polivka [2008], and Sastry [2007] investigate patterns of population movement caused by Katrina. Katrina has reduced the size of New Orleans proper from roughly 480,000 to about 255,000 (as of the 2006 American Community Survey). Paxson and Rouse find that whites and homeowners were the most likely to return. Those whose homes faced the worst flooding were the least likely to return.

Most relevant for this paper are Rand Corporation studies by Pane at al (2006 and 2008) that document the number of displaced students, where they went, and how many days of schools were lost. The first study finds that 196,000 public school students in Louisiana were displaced. This represents roughly one quarter of Louisiana's total enrollment. About 81 percent of the evacuees came from just three parishes (Orleans, Jefferson and Calcasieu.). Orleans is coterminous with the city of New Orleans. Jefferson contains much of the suburban portion of the New Orleans metro area and includes 21 cities, towns and unincorporated areas. Calcasieu contains the city of Lake Charles and is in the southwest corner of New Orleans which was devastated by Hurricane Rita.

Pane et al [2006] shows that the median evacuee missed five weeks of school. Thirty eight percent of evacuees were out of school and then returned to their original school. Thirty one percent relocated to another Louisiana school while another 31 percent disappeared from the data set. The second paper studies one year effects on attendance, mental health and test

scores. They find one year effects from disruption similar to the effects I find and they find that those negative effects are smaller for those evacuees who enter better schools.

II. Data Description

The main data set consists of student level test scores and demographics for Louisiana public school students during 2004-2007. Under Louisiana's accountability program, students in grades 4, 8, and 10 are tested in March of each year. These tests are known as the LEAP or Louisiana Educational Assessment Program (grades 4 and 8) and the GEE or Graduation Exit Examination. The subjects tested include math and english language arts (ELA) for grades 4, 8 and 10. Science and social studies are tested in grades 4,8 and 11. For brevity I do not report results for science and social studies tests below.

The LEAP and GEE tests are high stakes tests with the following set of rules: To be promoted to the next grade, students in grades 4 and 8 must score "Basic" on at least one of the math and ELA tests and at least "Approaching Basic" on the other exam. In order to be eligible for a standard high school diploma, high school students must receive "Approaching Basic" or better on both the ELA and math exams and "Approaching Basic" or better on either of the science or social studies exams. High stakes testing policies were suspended for all 4th and 8th grade students during the 05-06 school year due to the hurricanes.

In spring 2006 tests known as the ILEAP (Integrated Louisiana Educational Assessment of Progress) were added for grades 3, 5, 6, 7, and 9. (The Iowa Test of Basic Skills was previously used for these students. I do not have the Iowa test scores.) Students in these five grades are tested in both math and english language arts. Students in grades 3,5,6, and 7 are tested in science and social studies. The tests in the ILEAP grades do not have a high stakes component at the student level.

Appendix Table I shows the number of student level observations I have for each year. I only observe students if they take a LEAP, ILEAP or GEE exam. Thus in 2005, I observe most students in grades 4, 8, 10 and 11. I observe a small number of students in grade 12 who re-took various exams. I observe a total of 210,755 students for all of Louisiana for 2004. If I inflate this number by 13/4 to account for the fact that I am only observing 4 grades of the possible 13 grades in the k-12 system, I infer that there were roughly 685,000 public school students Louisiana in 2004. Starting in 2006, the data add students in grades 3, 5, 6, 7, and 9 (because of the ILEAP testing) making the dataset much more complete.

Since I do not observe all students in all years, one of the challenges of the data analysis is making the tradeoff between running specifications that control for a student's lagged test score and running specifications that make use of all of the observations. Below I try several different approaches. But my most robust specification is one in which I follow two separate cohorts that I observe both pre-Katrina (2004 or 2005) and in each of the post Katrina years (2006-2008).

I have a randomly generated ID number which allows me to link a given student across years in the data set. For the spring of 2006, I also have a field which tells me which students are evacuees and whether they were displaced from a public school or private school and whether they were displaced by Katrina or Rita. This was collected by teachers and principals and then reported to the state at the time the exams were taken. For each year, I know a student's school and district, race, gender, and free lunch status.

My analysis sample is constructed by taking all students in Appendix Table I and then limiting the data to students observed in 2006 since that is the year during which the Louisiana required schools to provide information on a student's evacuee status. Student evacuees are classified as displaced by Katrina or Rita and also as displaced from a public or private school or out of state school. This reduces the number of observations from 1.3 million to 1.0 million. My results are robust to other approaches including inferring a student's evacuee status from her 2004 or 2005 location. Fundamentally I can only study test score outcomes for students who remain in Louisiana, meaning that there is unobserved selection that creates the sample. My analysis of college going outcomes does not suffer from this bias since I follow entire cohorts of students who were in 10th grade prior to Katrina.

In all cases in the tables and text, when I refer to a single year, I mean March of that year. Hence "2005" refers to March 2005 which is the spring of the 04-05 school year. Thus any references to 2005 test score data are pre-hurricanes.

The parishes most affected by Hurricane Katrina are Orleans, Jefferson, Plaquemines, and Saint Bernard. These parishes comprise most of the Greater New Orleans Metropolitan Statistical Area. Appendix Table II shows a frequency tabulation of students in grades 4, 8 and 10 in 2005 tabulated by their eventual (2006) evacuee status. There are 135,316 students in these three grades in the analysis sample, 14,400 of whom were in one of the affected parishes in 2005. Ninety percent of the students in the affected parishes become evacuees. And, of the Katrina evacuees, ninety-three percent come from the most affected parishes.

Even after the hurricanes, the bulk of Katrina evacuees who remain in Louisiana remain in a school in one of the four most affected parishes. Appendix Table III shows, by year, the percentage of eventual evacuees who attend school in one of the affected parishes. This percentage is 93 percent in 2004 and 2005 (again the spring of these years which is pre-hurricane). This dips to 68% in the spring following Katrina but rises back to 76% by 2007. Many of the evacuees move from Orleans Parish to Jefferson.

Appendix Tables IV and V document the fact that Katrina evacuees are more likely to disappear from the Louisiana public school sample relative to non-evacuees. In Appendix Table IV I take the set of evacuees from Orleans Parish who were in the 8th grade in 2005. I ask whether they are still in the sample in 2007. Roughly 50% of the evacuees remain in the sample versus roughly 80% for all other students. Obviously selection out of the sample makes it more difficult to estimate the effect of the hurricanes on student achievement.

Appendix Table VI shows which school districts are sending and receiving evacuees after Katrina.[7] I show the number of eventual evacuees located in each parish by year. (In other words I classify students by their eventual (2006) evacuee status.) I limit the table to students in grades 4, 8, and 10 since those three grades are tested consistently throughout 2004-2007. Pre-hurricane, the vast majority of these evacuees are located in Jefferson and Orleans Parishes, with an additional 700-800 evacuees in each of St. Tammany, Plaquemines, and St. Bernard in 2005.

Post-hurricane, the count of evacuees (in grades 4,8,10) in Jefferson Parish grows by about 1200 evacuees and East Baton Rouge School District gains about 1,000 of these evacuees. Since I am counting only three grades, this implies that East Baton Rouge gained roughly 3300 student evacuees in all grades. The remaining school districts in the state each gain 0-150 evacuees. The number of evacuees in Orleans itself shrinks dramatically post-Katrina. The Recovery School District (RSD) in Orleans was set up to administer most of the schools in the former Orleans Parish School District. The RSD has roughly 1100 4th ,8th ,and 10th graders by 2007.

In Table I, I show the summary statistics at the student level for the year 2006 (as opposed to the student*year level). And I show summary statistics separately for the Katrina and Rita evacuees. Ten and one half percent or roughly 45,400 of the students are Katrina evacuees. Thirty percent of those evacuees are originally from Orleans Parish. Five point four percent or roughly 23,000 students are Rita evacuees. Since I only observe students in grades 3-11 and since I only observe students who remain in Louisiana public schools, the actual number of evacuees is higher.

[7] For many parishes the school district and the parish coincide, but this is not always the case. Orleans now has the Orleans Parish School District and the Recovery School District and several academy and charter districts.

Forty four percent of all students are black, while 56 percent of the Katrina evacuees are black and 31 percent of the Rita evacuees are black.

I standardized math and ELA scores to be mean zero standard deviation one within each year and grade level (for the entire state). This standardization is apparent in the average math and ELA scores for all observations in Table I. Overall, the Katrina evacuees have math scores that are .268 standard deviations below the state average and ELA scores that are .222 standard deviations below. The Rita evacuees have math scores that are .108 standard deviations above and ELA scores that are .140 standard deviations above the state average. Appendix Table VI has more detail about how average test scores vary by school district over time. Pre-Katrina the Orleans Parish School district is among the worst performing in the state with the *average* student scoring a half standard deviation below the state average. Pre-hurricane, Jefferson is.18 standard deviations below while Plaquemines and St. Tammany are substantially above the state averages. Figure I shows the estimated 2005 (pre-Hurricane) math test score distribution for Orleans evacuees versus all of the non-evacuees in 2005.

As mentioned above, I also have data on college enrollments and degrees for a sample of 32,000 Louisiana students. The data are from the Student Loan Clearinghouse database and were created in an a collaboration between myself, the State of Louisiana's Department of Education's Office of Assessment and Accountability, Data Recognition Corp which organizes and warehouses certain portions of the student level data, and the Clearinghouse.

Thus far we have pulled Clearinghouse data for a random sample of 8,000 students from the parishes of Orleans, St. Bernard, Jefferson, Plaquemines, East Baton Rouge, and Iberia. The first four parishes are the Katrina affected ones and the latter two are intended to serve as controls. Our sample is roughly a 50% sample of all students who took GEE exams in 2002-2005. Most students take the exams in their 10th grade. The first two cohorts graduated prior to the hurricanes and the second two were entering 11th and 12th grade at the time the hurricanes struck. One advantage of the Clearinghouse data is that it allows me to track students across state lines and to obtain fairly clean measures of college going for an entire sample, whether or not a student moves or fails to graduate from high school.

For the analysis, I consider whether or not a given student enrolled in a college or a four year college. (In the long run there exists the potential to study college retention, college selectivity, and graduation rates.) Appendix Table X shows a breakdown of the raw data by cohort and by 2,4, less than 2 year college or no enrollment. Technically the "no-enrollment" students are the ones that cannot be found in the Clearinghouse database using various combinations of social security number, date of birth, and last name. Appendix Table X implies that more recent cohorts have fewer enrollments. Most of this difference appears to an age effect: as the cohort ages, additional students enroll for the first time each year. To control for the age effect, I look at college enrollments within the first twelve months from the implied year of high school graduation.[8]

Using this measure, the mean enrollment rate for any college is 41 percent and the mean enrollment rate for a four year college is 30 percent. Prior to the hurricanes, Orleans had a four year college enrollment rate of 26 percent versus 36 percent and 37 percent for East Baton Rouge

[8] I infer high school class year by assuming that students are taking the GEE exam in their 10th grade.

and Iberia respectively. Interesting, despite having significantly lower test scores, Orleans and all of the greater New Orleans parishes had an overall college going rate *higher* than that of Iberia or East Baton Rouge. Orleans was at 44 percent and Jefferson at 51 percent relative to Iberia's 41 percent. This may reflect the greater supply of two year colleges in the New Orleans metro area.

III. Empirical Framework

My main interest is estimating the effect of the hurricanes on the academic performance of the evacuees. And I ask how this effect varied for different types of evacuees and by the average achievement of the school the evacuee left. The structure of the data set presents several challenges. First, because I do not observe every student both before and after the hurricanes, I do not necessarily want to limit myself to models in which I control for a student's lagged test score on the right hand side. Thus in addition to test score growth regressions, I also run simpler models in which I simply ask how test score levels change for the eventual evacuees over time.

Second, large numbers of students leave the State as a result of the hurricanes. In theory I could bring in Houston test score data for the students who go to Houston, but it is not clear how I would scale the Texas scores before merging them with Louisiana scores in a regression. My preferred solution is to also use college going as the outcome rather than just test scores. As noted above, the Clearinghouse data allow me to track students who leave Louisiana both before and after the hurricanes.

Third, the hurricanes did not hit a random set of students but instead Katrina affected a group of students who were disproportionately poor and low scoring while Rita affected a group of

students who were disproportionately richer and higher scoring. In most specifications my control for this selection into evacuee status is to follow a fixed cohort of evacuees both before and after the hurricanes. Thus the evacuees provide their own control group by using their relative performance before the hurricane. Any grade effects or year effects are estimated including all the non-evacuees.

My preferred specification is a difference in difference approach in which I examine how performance for the evacuees changed from a base year (2004 or 2005) to each post-Hurricane year (2006, 2007,2008) all relative to the performance change for non-evacuees. For most students I have only a single year of pre-hurricane data. For this reason, I can run a difference in difference or I can include lagged (pre-hurricane) test score on the right hand side but I can not combine these two strategies.

My simplest OLS specification asks how the test scores of the eventual evacuees varies over time. I run the following regression for each year in the dataset:

(1) Math Score$_{it}$ = α + $\boldsymbol{\beta 1}$*Katrina Evacuee Status$_i$ + $\boldsymbol{\beta 2}$*Rita Evacuee Status$_i$ + $\boldsymbol{\gamma}$*$\mathbf{X}_i$ + $\boldsymbol{\lambda}$*Grade Effects + ε_{it}

This is for student i in year t. Standard errors are clustered at the level of the current school, but my results are robust to clustering at the level of the pre-hurricane school. I also include grade effects and dummies for race, gender, and free lunch status with the latter three effects represented by $\boldsymbol{\gamma}$*$\mathbf{X}_i$.

β1 and **β2** tell me the relative position of the Katrina and Rita evacuees within the test score distribution in a given year. I then look across the four regressions and examine the pattern in coefficients. One advantage of this approach is that I can use every observation in the analysis sample, rather than limiting myself to observations with both pre- and post hurricane test scores. I use this same specification when considering the college enrollment rate as the outcome.

A more sophisticated version of the above specification is to pool all five years and introduce a dummy for post-hurricane and the interaction of evacuee status and each post-hurricane year. This is the difference in difference approach in which I ask how the relative position of the evacuees in the test score distribution has changed from before the hurricanes to each year after.

(2) $\text{Math Score}_{it} = \alpha + \boldsymbol{\beta 3}*\text{Year is 2006}*\text{Katrina Evacuee Status}_i + \boldsymbol{\beta 4}*\text{Year is 2007}*\text{Katrina Evacuee Status}_i + \boldsymbol{\beta 5}*\text{Year is 2008}*\text{Katrina Evacuee Status}_i + \boldsymbol{\beta 6}*\text{Year is 2006}*\text{Rita Evacuee Status}_i + \boldsymbol{\beta 7}*\text{Year is 2007}*\text{Rita Evacuee Status}_i + \boldsymbol{\beta 8}*\text{Year is 2008}*\text{Rita Evacuee Status}_i + \boldsymbol{\beta 1}*\text{Katrina Evacuee Status}_i + \boldsymbol{\beta 2}*\text{Rita Evacuee Status}_i + \boldsymbol{\xi}*\text{ initial school effects} + \boldsymbol{\rho}*\text{Year Effects} + \boldsymbol{\gamma}*\mathbf{X}_i + \boldsymbol{\lambda}*\text{Grade Effects} + \varepsilon_{it}$

This estimates the effect of being an evacuee (**β3**) as the difference in evacuee test scores from pre-hurricane to 2006 relative to the difference in test scores for non evacuees for the same two years.[9] The inclusion of initial school effects adds precision to the estimates and has only a small effect on the point estimates.

[9] The inclusion of year effects and grade effects is not essential since the data are already demeaned at this level. But I demeaned at the level of the whole data set while I run the regression for a specific cohort within the data set. In the tables below I also split the Katrina evacuees into those from Orleans Parish (City of New Orleans) and all others which refers mostly to those from the New Orleans suburbs.

For ease of interpretation, I run equation (2) for a fixed cohort of students over time. My three cohorts are 1.) the students who were fourth graders in 2004, 2.) the students who were fourth graders in 2005 and 3.) the students who were eighth graders in 2005. The latter group can only be followed reliably for two years post-hurricane, namely their ninth and tenth grade years in 2007 and 2008. Some fraction of the eighth grade cohort is still taking the Graduate Exit Exam in their 11th grade, but this is a non-random subset and I exclude the coefficients based on this group.[10]

I include fixed effects for initial school. In the case of the Orleans Parish schools, there is perfect collinearity between evacuee status and the school effect and so I drop the evacuee status dummy for those schools. This is fine because the object of interest is not the level effect of evacuee status (or of individual schools) but rather the interaction of evacuee status and the post-hurricane years (i.e. . $\beta 3$-$\beta 7$).

A third approach is to run a more standard growth in test scores regression in which I control for the student's pre-Katrina test score.

$$\text{(3) Math Score}_{it} = \alpha + \beta 6 * \text{Pre-Katrina Math Score}_i + \beta 3 * \text{Year is 2006} * \text{Katrina Evacuee Status}_i + \beta 4 * \text{Year is 2007} * \text{Katrina Evacuee Status}_i + \beta 5 * \text{Year is 2008} * \text{Katrina Evacuee Status}_i + \beta 6 * \text{Year is 2006} * \text{Rita Evacuee Status}_i + \beta 7 * \text{Year is 2007} * \text{Rita Evacuee Status}_i + \beta 8 * \text{Year is 2008} * \text{Rita Evacuee Status}_i + \rho * \text{Year Effects} + \gamma * \mathbf{X}_i + \lambda * \text{Grade Effects} + \varepsilon_{it}$$

[10] For the sake of brevity I calculated but did not report in tables the results for students who were in 8th grade in 2004. Most students who were in 10th grade in 2004 and 2005 have aged out of test taking post-hurricane. The above list is the full set of students for whom I have pre-hurricane scores.

I estimate equation (3) for the same three cohorts as above. I include only post-Katrina observations since the one pre-Katrina observation for each student is needed as the pre-Katrina score on the right hand side. This eliminates my ability to include fixed effects for initial school.

My final technique to estimate the effect of the hurricanes on the evacuees is to use propensity score matching (Rosenbaum and Rubin). I estimate the propensity to be treated (an evacuee) using demographics and pre-hurricane test scores. I then match each evacuee observation to the non-evacuee observation with the closest estimated propensity score. I estimate the treatment effect as the difference in outcomes between the treatment (evacuee) group and the matched control group.

IV. Results

Table II displays the results from estimating equation (1) for math test scores, i.e. the repeated cross sections with Katrina and Rita evacuee status on the right hand side. I separate out Katrina evacuees who are initially from the City of New Orleans (i.e. Orleans Parish) from all other evacuees. In 2004 and 2005, *controlling for demographics*, eventual Orleans evacuees have math test scores that are .18 to .20 standard deviations below the math scores of other Louisiana students. After the hurricanes this gap widens to -.30 standard deviations in 2006. The gap then narrows dramatically by 2007 to -.13 and to -.10 by 2008. This suggests that the Orleans evacuees saw an initial decline of .13 standard deviations immediately following the hurricane. However, these same students then made gains so that they ended the period only -.10 standard deviations behind other Louisiana students and thereby cut their pre-hurricane disadvantage (of -.20) in half.

The Rita evacuees and the Katrina evacuees from the suburbs see a different pattern. Controlling for demographics, the suburban Katrina evacuees have pre-hurricane test scores that are roughly in line with the rest of Louisiana students. Much like the Orleans evacuees, they experience a drop of -.12 standard deviations in the year immediately following the hurricane.[11] This decline persists into 2007 and then largely disappears by 2008. The Rita evacuees begin the period at .09 standard deviations above the state average. They then experience the same initial (2006) drop as the other two groups of evacuees and then do not recover much of the loss by 2007 or 2008.

Table III repeats this exercise using the English Language Arts scores. The pattern is quite similar to that observed for Math scores. Before the hurricane, the Orleans evacuees are about -.25 standard deviations below the state average and experience a drop of .10 standard deviations in 2006. By 2007, the Orleans evacuees are already ahead of where they started and they make further gains in 2008. The Orleans evacuees end the period -.15 standard deviations below the state average which means they have made up about half of the pre-hurricane gap. The Rita evacuees again start the period significantly above the state average and lose a portion of their advantage. And they do no appear to make it back. Pre-hurricane the Rita evacuees are .09-.10 standard deviations above the state average and fall to being .05 standard deviations below by 2008. The non-Orleans Katrina evacuees have ELA test scores that are in line with the state average. They experience a decline of -.09 standard deviations in 2006. 2007 brings a further decline, but by 2008 the non-Orleans Katrina evacuees are nearly back to where they started.

[11] The size of the 2006 decline for all three groups of evacuees is consistent with Pane et al's [2008] finding of a decline of -.09 to -.20 standard deviations.

The effects over time are graphed for both groups of evacuees in Figures II-V. Figures II and III compare the Rita evacuees to all Katrina Evacuees (coefficients for the latter combination not shown in the tables) while Figures IV and V graph the effects for Orleans versus non-Orleans Katrina evacuees.

Certainly one possible interpretation of these facts is that the new schools for the New Orleans evacuees have such higher value added relative to the old schools that within two years the evacuees have more than made up for the large costs of the dislocation imposed by the hurricane. The Jefferson students do not see an increase possibly because they receive no benefits from the disruption and possibly because there are negative externalities from the large numbers of Orleans students who arrive at their schools.

Table IV proceeds to the estimation of equation (2) in which I limit the sample to a specific cohort and identify the effects of evacuee status for each of the three post-hurricane years. Table IV is for math scores. These effects are estimated relative to the base year of 2004 or 2005. All regressions include initial school, year and grade effects. (The non-evacuees in the sample are included to identify these latter effects as well as to identify the coefficients on the demographic variables.) Column (1) contains results for students who were fourth graders in 2004. In 2006, i.e. immediately following the hurricane, the Orleans evacuees from this cohort are -.174 standard deviations behind where they started. By 2007, the Orleans evacuees are back to their original position in the test score distribution and by 2008 the Orleans evacuees are .11 standard deviations above where they started.

Column (2) repeats this for the cohort of fourth graders in 2005. Orleans evacuees in the 2005 cohort lose .25 standard deviations in 2006 relative to their initial position in the test score distribution. Like the earlier cohort, these evacuees then catch back up in 2007 and move ahead of their initial position by 2008. Finally in column (3) I examine math scores for students who were eighth graders in 2005. The Orleans students among them experience a drop of .114 standard deviations in 2006 but gain enough in 2007 to be .14 standard deviations above their initial position. I do not follow the eighth grade cohort into 2008 since most of the students are 11 graders by that year and have placed out of the testing requirements.

Table IV also contains separate coefficients for each post-hurricane year for the Rita evacuees and the non-Orleans Katrina evacuees within the three cohorts. The message is quite similar to the simple cross sections in Tables II and III. The fourth grade non-Orleans evacuees experience a big decline in scores in 2006. This decline is -.18 for the 2004 cohort and -.11 for the 2005 cohort. The 2004 cohort then gains back about half the decline by 2007 and makes further progress by 2008 to end the period with a statistically insignificant loss of -.032 standard deviations. The 2005 fourth grade cohort of non-Orleans evacuees fares a bit worse. They experience further declines in 2007 but then rally in 2008 to end the period about -.07 standard deviations lower than when they started. The eighth graders from 2005 who are non-Orleans evacuees are a bit different. The eighth graders experience a small initial decline in 2006 of -.03 which increases to a decline of -.052 by 2007.

All three cohorts of Rita evacuees have initial declines in 2006 which become gradually smaller over the subsequent years. For example, the Rita evacuees who are fourth graders in 2004

have a decline of .12 standard deviations in the first year after the hurricane. This falls to -.09 in 2007 and a statistically insignificant -.04 by 2008.

Table V performs the exact same analysis but using ELA scores as the outcome. The pattern in coefficients is nearly identical to that of Table IV. Orleans evacuees experience large test score declines in 2006. For the fourth graders of 2004, these amount to -.21. This disadvantage is whittled to -.05 by 2007 and by 2008 the Orleans evacuees in this cohort have ELA scores that are .11 standard deviations above their pre-hurricane scores. Non-Orleans Katrina evacuees from the same cohort (2004 fourth graders) have a 2006 decline of -.10 standard deviations. They do not make much progress on this gap in 2007 but they eliminate the gap (between their current and their 2004 relative performance) by 2008. Rita evacuees among the 2004 fourth graders see an initial decline of .11 standard deviations. This decline persists into both 2007 and 2008.

A slightly different way to estimate the effects of the hurricanes over time is to use equation (3) which uses initial/ baseline test score on the right hand side. The disadvantage of this strategy is that due to the limited length of my panel, adding initial test score eliminates my ability to include pre-treatment observations and school effects. Table VI is for math scores and contains the estimates from equation (3) for the same three cohorts, namely fourth graders in 2004, fourth graders in 2005 and eighth graders in 2005. The coefficient on baseline (pre-hurricane) test score is .76-.84 which is consistent with test score growth regressions such as those in Kane, Staiger, Rockoff [forthcoming]. The pattern of coefficients for the Orleans evacuees is the same as that found in the earlier tables: In 2006, the fourth graders from Orleans experience a large negative effect from the hurricane equal to -.20 to -.25 standard deviations. By 2007 they have eliminated

much of this disadvantage and by 2008 the estimated effects of displacement by the hurricane are positive. The positive effects of the hurricane are smaller than the effects estimate with equation (2) and are not statistically significant. However, the eighth grade cohort from 2005 does show statistically significant positive effects of the hurricane by 2007. The effect of displacement for the Orleans evacuees in that cohort is estimated to be +.13 standard deviations.

Effects on math scores for Rita and non-Orleans evacuees from Katrina generally show an initial negative effect in 2006 followed by recovery back to the baseline level of performance by 2008. In column (1) the non-Orleans evacuees have an effect of -.15 standard deviations in 2007 which lessens to -.07 in 2007 and becomes a statistically insignificant -.02 by 2008. For the non-Orleans evacuees who were in fourth grade in 2005, the effect of the hurricanes becomes more negative from 2006 to 2007, but again becomes small, negative and insignificant by 2008.

Table VII shows coefficients from equation (3) for English Language Arts scores. The results are much the same as with the math scores. The Orleans from the fourth grade cohorts start out with a large decline in 2006 followed by rapid growth in 2007 and 2008. The net increase by 2008 from the baseline is positive but not statistically significant. The eighth graders from Orleans have an effect of +.16 standard deviations in 2007 and this effect is statistically significant.

My final strategy for estimating the effects of the hurricane is using propensity score matching. I take the sample of fourth graders from 2005. I estimate the propensity to be an Orleans evacuee and the propensity to be a non-Orleans Katrina evacuee (relative to non-evacuees). Coefficients are in Appendix Table VIII. The only observables on which I can match are 2005 test

scores, race, and free lunch status. I can't include school effects since the treatment generally occurs at the school level.[12] I use the Becker and Ichino matching algorithm to perform nearest neighbor matching on the propensity score and to calculate the estimate treatment effects of being and evacuee on math scores in 2006-2008.

The results (shown in Appendix Table IX) are quite similar to those found using the test score growth regression of equation (3). Specifically, the fourth grade Orleans evacuees experience a large negative effect in 2006 of -.12 standard deviations. They then recover in 2007 and show positive but statistically insignificant effects by 2008. The non-Orleans evacuees have a negative effect of -.08 standard deviations in 2006. They then recover slowly over the next two years and finish 2008 with an effect of -.016.

In Table VIII, I attempt to provide more detailed results on *which* evacuees showed the largest effects from the hurricanes. In columns (1) and (2) I re-run equation (2) for math scores. I divide the sample by schools that are initially in the bottom quintile of average math scores in 2005 (column 1) versus all other schools (column 2). I show this for the students who were fourth graders in 2005, but results are similar for the 2004 cohort of fourth graders. The Orleans evacuees from schools in the bottom quintile of Louisiana schools (based on average math scores) have a negative impact from the hurricane on math scores of -.19 in 2006. And by 2008 these students (Orleans evacuees from the worst schools) show strong growth of .14 standard deviations relative to their baseline. In contrast, Orleans evacuees from all other schools (schools in the upper 4 quintiles) show larger negative effects in 2006 and show no positive effects stemming from the hurricanes. Non-orleans Katrina evacuees from the worst quintile of schools have no negative

[12] For this reason, I actually prefer the within school estimates from equation (2).

effects by 2008. In contrast, the non-Orleans Katrina evacuees from the other quintiles show statistically significantly negative effects in 2008.

In column (3), I control directly for the average test score in the student's current school. I cluster at the level of the current school (by means of the initial school fixed effects which are always included). The goal is to ask whether students who move to higher scoring schools show better performance, controlling for the student's initial school. I include both current school's average 2005 math score and this variable interacted with Orleans evacuee status. For the whole sample, there is a very strong association between the current school's average 2005 score and the student's score. The coefficient is .48. The interaction of current school average and Orleans evacuee status is small, positive and insignificant. This indicates that the association between current school performance and own performance is just as strong for the Orleans evacuees as for non-evacuees. That means either that current school "quality" helps the evacuees as much as everyone, or evacuees sort as strongly based on school quality as everyone else, or both. Furthermore, the addition of current school's 2005 math average reduces the large positive coefficient usually found for Orleans evacuees in 2008 (e.g. Table IV). This suggests that current school quality can in some sense account for the positive effects on achievement that Orleans evacuees experience.

Effects on College Going

In addition to test scores, I also consider whether college enrollment rates for the evacuees are affected. Table IX shows the enrollment rate in four year colleges by school district and cohort.

As mentioned above, I limit enrollments to those that take place within one year following implied high school graduation year, i.e. within three years after taking the GEE exam. I do this to make enrollment rates for all four cohorts comparable to the enrollment rate for the most recent (2007) cohort.

East Baton Rouge and Iberia are intended to be my "control" districts since students in these districts experience the statewide effects of the hurricanes but are not themselves displaced. In 2004, 2006, and 2007 East Baton Rouge students had a .351 to .358 four year college enrollment rate. Those numbers imply a fair amount of stability across the hurricane years. However, 2005 East Baton Rouge students had what looks like an anomalously high enrollment rate of .390.

In contrast, students in Jefferson experience drops in enrollment rates for the 2005 and 2006 cohorts followed by recovery by the 2007 cohort. Jefferson has a four year enrollment rate of .304. This falls to .262 for both the 2005 and 2006 cohorts and then the enrollment rate rises back to .304. This is shown graphically in Figure VI.[13]

This suggests two hypotheses. First, the hurricane affected college enrollment both for students entering their senior year of high school AND for students who had recently graduated. There are significant effects in Jefferson for the 2005 cohort. While some students in that group may be misclassified in my data they all were scheduled to graduate prior to the hurricane. They are either from the 2005 or 2004 high school classes (not the 2006 or 2007 high school class.)

[13] While Orleans students appear to experience a drop in enrollment rates (in the raw data) this turns out to be a compositional effect driven by the changing weighting of high schools within my random sample of Orleans students. This "drop" disappears when I add school fixed effects.

Second, while the hurricane impacted both the 2005 and 2006 graduating classes, there are no effects observed for the 2007 class. In Jefferson, Plaquemines, and Orleans, the four year college enrollment rates for the class of 2007 all achieved the same level as the 2004 class.

Neither of these conjectures can be accepted with absolute certainty. There are significant difficulties in deciding upon an appropriate control group against which the Katrina evacuees should be measured. Certainly having a longer time series and students from more districts would be useful.

It does appear that the negative effects experienced by the Jefferson cohorts right around the hurricanes are permanent rather than temporary effects. I say this because I have also investigated the time path of cumulative enrollment as the cohorts age. In Figure VII, I display cumulative four year college enrollment over time for four cohorts from suburban New Orleans. The 2004 and 2007 cohorts appear to be on similar paths. Immediately after graduation, the college enrollment rate is roughly 28 percent and this rises to roughly 30 percent one year after graduation. (These effects are cumulative so that this is the percent *ever* enrolled). In contrast the time paths for suburban New Orleans students from the classes of 2005 and 2006 start from a lower base of less than 26 percent enrolled and the cumulative enrollment rate stays low.

Table X shows the effects in a regression setting. I run a panel at the individual student level and I include initial high school fixed effects in each regression. I identify the coefficients on the interactions between the parishes directly affected by Katrina and the graduation years of 2005, 2006 and 2007. In columns (1) and (2) the outcome of interest is a dummy for enrolling in a four

year college. In column (3) the outcomes is enrollment in a four year college ranked by US News and in column (4) the outcomes is the 75th percentile of SAT scores for the student's college.[14]

In column (1), inclusion of school fixed effects shows the strong negative effects among the students who attended tenth grade in Jefferson, St. Bernard and Plaquemines. The 2005 cohort from these parishes has an enrollment rate in four year colleges that is 3.2 percentage points behind the rate for the 2004 cohort. The 2006 cohort for these parishes is 3.5 percentage points lower. The negative effect disappears by the 2007 cohort. In column (2), I add year effects and the negative effects of Katrina remain for the students originating in Jefferson/St. Bernard/ Plaquemines. The effect for the class of 2005 becomes -5.7 percentage points and the effect for the class of 2006 becomes a statistically insignificant -1.4 percentage points. For the class of 2007, the effect turns positive and statistically significant.

In contrast, once I control for the initial high school and year effects, the Orleans students show positive effects from the hurricanes. Among students who originated in Orleans, the class of 2006 has a college enrollment rate that is 4.2 percentage points higher than the base year class of 2004. And the class of 2007 has a college enrollment rate that is 4.5 percentage points higher.

In column (3), I switch the outcome from attending any four year college to attending a four year college that is ranked by US News in 2008. This variable has a mean of about 17 percent in

[14] In column (1) I am not including year effects. Thus the effect on college going rate for students is being identified from the within school differences in outcomes between the classes of 2005-2007 relative to the base year of 2004. Columns (2)-(4) add year effects and thus identify the coefficients of interest as the difference in outcomes within schools in the hurricane affected districts relative to the difference in outcomes for the unaffected (or at least not directly affected) districts. The year effects pick up the negative time trend in college going in the "control" parishes. There is also a strong negative time trend in enrollment in US News ranked colleges in all parishes (column 4).

the sample. Controlling for initial school effects and year effects, the hurricane has a strong positive effect on the likelihood of attending a US News ranked school for students in Orleans. Students who were in 10th grade in Orleans in 2004 (labeled as the class of 2006) are 2.8 percentage points more likely to attend a US News ranked college relative to their peers in the classes of 2004. Again students from the other Katrina affected parishes show negative effects for the class of 2005 and these negative effects disappear.

To summarize the results, there is a negative effect on college going for students the suburban parishes among the cohorts who graduate immediately before the hurricanes. There is actually a large and statistically significant positive effect for the students from Orleans parish who graduate in 2006 and 2007. The size and timing of the positive effect for Orleans Parish students depends on whether or not I include year dummies, which are themselves estimated from the inclusion of data from two relatively unaffected parishes. One reasonable interpretation of the results are that Orleans evacuees are greatly helped in their college going decision by their relocation to schools with a different set of peers, guidance counselors, and teachers than they would have in the absence of the hurricane. But given the large magnitude of the effect sizes and the sensitivity to year effects/ choice of controls, I am somewhat cautious in pushing this interpretation.

Effects on Crime in Receiving Communities

During 2005 and 2006, the US media gave a great deal of attention to the alleged increases in crime in the communities where the evacuees relocated. Both the *New York Times* and *Washington Post* ran stories about evacuee related crime increases in Houston. One *Washington*

Post story was titled, "After Welcoming Evacuees, Houston Handles Spike in Crime Population Swell Fills Apartments and Strains Police Force." One of the key statistics cited in several stories was that in the six months following Katrina, evacuees were involved in 17% of Houston's 153 murders during that period. This figure is not as shocking when one realizes that evacuees comprised nearly 10 percent of Houston's population at the time. And evacuees were likely a larger fraction of Houston's lowest income citizens.

My objective is to ask whether crime and crime per capita in Houston actually spiked following the hurricanes. I perform two sets of analysis. First, I compare monthly crime rates in Houston to monthly crime rates in Texas' other large cities. Second, I look at crime rates within 65 Houston zip codes and ask whether zip codes with more Katrina evacuees experienced greater increases in crime.

The first data set consists of monthly data from the Uniform Crime Reports Return A Master File. I use monthly data from January 2004 through December 2006. (A longer time series is probably desirable but it was necessary to read in and reshape the data for each year separately.) My comparison cities in Texas are Arlington, Austin, Dallas, El Paso, Fort Worth, Harris, Montgomery, and San Antonio. These are all of the cities with more than 300,000 people in 2000. The mean monthly crime rates per 10,000 people are shown in Table Ib.

Figures Ib, IIb, and IIIb plot the time series of the monthly numbers of burglaries, murders and robberies. The most striking fact is shown in Figure Ib. There is a large increase in the number of burglaries in Houston in the month that the evacuees arrive (September 2005).

Burglaries jump from 2400 per month to 2900 per month. However, that increase disappears by October 2005 and does not return. One story is that a number of evacuees arrived in Houston and either temporarily became professional burglars or temporarily continued their former profession in Louisiana. But these evacuee burglars either quickly were caught or found other employment. Note that 30-50 productive burglars could produce an extra 500 burglaries in a month.

In Figure IIb, murders do appear to experience a level shift up that lasts through September 2006. The number of murders falls by October 2006. (Looking separately at the block level data from the Houston Police, I found that the decline in murders in October 2006 was temporary and murders again hit 37 per month in April 2007.) The picture for robberies is muddled (Figure IIIb). Robberies appear to trend up before the hurricanes and remain high throughout the post-hurricane period.

Table IIIb shows two different specifications using monthly UCR data across large Texas cities. In all cases the dependent variable is monthly crimes per 10,000 people. In columns (1), (3), (5) and (7) the right hand side includes a dummy for "After August 2005" and the interaction of that dummy with a dummy for Houston. In the even numbered columns I include a dummy for "Month Equals September 2005" and interact that dummy with the Houston dummy. In all cases I include city effects and month effects.

The evidence is mixed. Murders and robberies per 10,000 people are statistically significantly higher following September 2005. The coefficient for murders is .039 which represents a 40 percent increase relative to the mean for the whole period. The coefficient for

robberies is roughly 17% of the mean value. But violent crime appeared to be trending upwards in Houston (both absolutely and relative to the rest of Texas) before the hurricanes. Burglaries show no evidence of a long run increase following the hurricanes.

To learn more about this issue, I also obtained the monthly block level crime data from the Houston Police Department.[15] I know the location of student evacuees, or at least the location of their schools from the Houston Independent School District Data. I aggregated both data sets to the zip code level since that appeared to be the smallest common geographic unit across the two data sets. The means for my zip code level data set are shown in Table IVb. For each zip code, I calculate percentage of students who are evacuees. The mean "percent katrina" is 7 percent, with a range from 0 percent to 50 percent. There are 65 zip codes and the data cover January 2005-September 2007.

In Table Vb, I report regressions of monthly crimes per 10,000 people on the "percent katrina" among students in the zip code. I include zip code fixed effects and a dummy for September 2005 or later. This enables me to identify the coefficient on "After August 2005"*"Percent Katrina." Looking across five different types of crimes, I found no evidence that crime was differentially higher in zip codes with a higher fraction of Katrina evacuees.

V. Discussion and Conclusion

Hurricanes Katrina and Rita had significant impacts on the academic performance of evacuees. In the first year following the hurricanes, evacuee math scores dropped between .10 and

[15] http://www.houstontx.gov/police/cs/stats2.htm

.25 standard deviations relative to other Louisiana students. This is not terribly surprising given the massive disruptions caused by the hurricanes and the fact that the median student lost around five weeks of school.

Perhaps what is more surprising is how quickly the Orleans Parish evacuees recovered from the experience and actually began to experience gains. In most of my specifications, by 2007, the Orleans evacuees are doing as well academically as they were in 2004 and 2005. And by 2008 the Orleans evacuees were about .10 standard deviations ahead of their 2004 position in the test score distribution. While not every specification shows statistically significant gains for every single cohort, my preferred specification which uses school fixed effects and has the most precision always shows large and significant gains. And in results not reported, I obtain the same finding if I included student fixed effects in the panel rather than initial school fixed effects. Conversely Rita evacuees from Lake Charles and Katrina evacuees from Jefferson experience test score drops that persist into 2007 and show signs of recovery by 2008. For example, looking at fourth graders from 2005, Katrina evacuees not from Orleans scored .11 standard deviations worse in math in 2006 relative to baseline. They scored .17 standard deviations worse in 2007, and .07 standard deviations worse in 2008.

One natural explanation is that the New Orleans schools were so deficient, that in the medium run the New Orleans evacuees have seen increased academic achievement as a result of being kicked out of their original schools. The averages for the New Orleans evacuees actually include those evacuees who have enrolled in the Recovery School District in New Orleans which by many accounts has struggled and which according to the data has low levels of average

achievement. In contrast, Jefferson and Lake Charles evacuees experienced only the massive disruption of the hurricanes without any benefit. In particular the increased presence of the Orleans evacuees in the Jefferson schools could provide negative class size externalities and negative peer effects.

The Katrina evacuees from Orleans also appear to benefit in terms of college enrollment rates. The 2006 and 2007 graduating classes experience a 4 percentage point increase in four year enrollments. The evacuees from suburban New Orleans Parishes show a negative effect on college enrollments for the class of 2005, but this negative effect disappears by the class of 2006 or 2007 depending on the specification.

One frequently repeated fact about the evacuees is that they brought crime to the receiving cities and towns. I investigated this using both city level UCR data and zip code level data within Houston. Its clear that robberies and murders are higher in Houston 2006 than in 2004 and early 2005. But is not clear how much of this trend predates the hurricanes. The big spike in burglaries in Houston in September 2005 faded within one month, leaving the number of burglaries per capita lower (since population rose by 10 percent.)

Overall these results provide one of the first looks at how students were affected by one of the largest relocations in recent US history. The test score and college enrollment results suggest that for students in particular poor performing schools, the cost to achievement from relocating can be fairly quickly be made up for by the benefits from being in a different school.

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Table I
Student Level Summary Statistics for 2006

This table shows the means for all student level observations in the analysis sample for 2006. To determine whether an evacuee is originally from New Orleans, I need additionally to observe the student in 2004 or 2005. I show means and sample sizes separately for Katrina and Rita Evacuees.

	Entire State			Katrina Evacuees		Rita Evacuees	
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Obs	Mean
Katrina Evacuee in Public School	431,996	0.105	0.307	45,412	1.000	23,136	0.000
Katrina Evacuee Who Left Affected Parishes	431,996	0.033	0.178	45,412	0.311	23,136	0.000
Katrina Evacuee from New Orleans in 04 or 05	213,272	0.035	0.184	21,882	0.303	11,959	0.006
Katrina Evacuee Not from New Orleans in 04 or 05	213,272	0.071	0.258	21,882	0.697	11,959	0.000
Katrina Evacuee Temporarily Was in Private School	431,996	0.004	0.063	45,412	0.000	23,136	0.000
Katrina Evacuee Temporarily Was Out of State	431,996	0.004	0.066	45,412	0.000	23,136	0.000
Rita Evacuee in Public School	431,996	0.054	0.225	45,412	0.000	23,136	1.000
Rita Evacuee in Private School	431,996	0.000	0.008	45,412	0.000	23,136	0.000
Rita Evacuee Temporarily Out of State	431,996	0.000	0.022	45,412	0.000	23,136	0.000
Free Lunch Eligible	431,995	0.561	0.496	45,412	0.637	23,136	0.528
Male	431,996	0.508	0.500	45,412	0.511	23,136	0.513
Student is Black	431,996	0.440	0.496	45,412	0.560	23,136	0.308
Student is Hispanic	431,996	0.020	0.139	45,412	0.060	23,136	0.008
Student is Asian	431,996	0.013	0.113	45,412	0.036	23,136	0.008
Math Score (Standardized)	362,200	0.000	-1.000	34,702	-0.268	19,801	0.108
English Language Arts Score (Standardized)	362,751	0.000	-1.000	34,611	-0.222	19,824	0.140

Table II
Effects of Katrina or Rita Displacement on Math scores
Repeated Cross Sections

I regress test scores on dummies for ever being a Rita or a Katrina evacuee in a public school. Standard errors are clustered at the school level. Test scores are standardized to be mean zero variance 1 at the year*grade level. Exams are taken in March of each year. In March 2004 and March 2005, tests were administered to 4th, 8th, and 10th graders. In 2006 through 2008 the exams were administered to all grades 3-10. Students labeled as "New Orleans" Evacuees are from Orleans Parish while the Non-New Orleans Evacuees are mainly from the suburban part of the New Orleans MSA including Jefferson, St Bernard, Plaquemines Parishes.

	(1) Standardized Value of Math Score (2004)	(2) Standardized Value of Math Score (2005)	(3) Standardized Value of Math Score (2006)	(4) Standardized Value of Math Score (2007)	(5) Standardized Value of Math Score (2008)
New Orleans Evacuee In Public School	-0.197	-0.175	-0.302	-0.131	-0.101
	(0.052)**	(0.064)**	(0.033)**	(0.049)**	(0.051)*
Non New Orleans Evacuee In Public School	-0.002	-0.041	-0.157	-0.146	-0.053
	(0.027)	(0.028)	(0.025)**	(0.040)**	(0.047)
Rita Evacuee in Public School	0.091	0.083	-0.026	-0.000	0.005
	(0.035)*	(0.029)**	(0.029)	(0.033)	(0.030)
Student is Black	-0.591	-0.557	-0.605	-0.533	-0.502
	(0.015)**	(0.013)**	(0.014)**	(0.015)**	(0.019)**
Student is Asian	0.325	0.396	0.429	0.471	0.493
	(0.044)**	(0.046)**	(0.042)**	(0.045)**	(0.055)**
Student is Hispanic	-0.193	-0.162	-0.142	-0.096	-0.043
	(0.036)**	(0.036)**	(0.025)**	(0.034)**	(0.034)
Student is Male	-0.033	0.005	0.013	0.025	0.074
	(0.008)**	(0.007)	(0.006)*	(0.006)**	(0.008)**
Free/Reduced Lunch Eligible	0.000	0.000	-0.316	-0.376	-0.409
	(0.000)	(0.000)	(0.016)**	(0.017)**	(0.020)**
Constant	0.566	0.584	-0.343	0.443	0.610
	(0.144)**	(0.231)*	(0.030)**	(.)	(.)
Observations	54787	73630	163897	118626	80528
R-squared	0.0980	0.0898	0.1814	0.1991	0.2201

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table III

Effects of Katrina or Rita Displacement on English Language Arts scores: Repeated Cross Sections

I regress test scores on dummies for ever being a Rita or a Katrina evacuee in a public school. Standard errors are clustered at the school level. Test scores are standardized to be mean zero variance 1 at the year*grade level. Exams are taken in March of each year. In March 2004 and March 2005, tests were administered to 4th, 8th, and 10th graders. In 2006 through 2008 the exams were administered to all students in grades 3-10.

	(1) Standardized Value of ELA Score (2004)	(2) Standardized Value of ELA Score (2005)	(3) Standardized Value of ELA Score (2006)	(4) Standardized Value of ELA Score (2007)	(5) Standardized Value of ELA Score (2008)
New Orleans Evacuee In Public School	-0.287 (0.058)**	-0.245 (0.063)**	-0.346 (0.040)**	-0.182 (0.053)**	-0.147 (0.051)**
Non New Orleans Evacuee In Public School	0.019 (0.029)	0.003 (0.026)	-0.086 (0.023)**	-0.120 (0.036)**	-0.048 (0.043)
Rita Evacuee In Public School	0.097 (0.040)*	0.090 (0.031)**	0.016 (0.028)	-0.027 (0.032)	-0.032 (0.033)
Student is Black	-0.405 (0.016)**	-0.435 (0.013)**	-0.505 (0.015)**	-0.440 (0.016)**	-0.392 (0.020)**
Student is Asian	0.138 (0.054)*	0.127 (0.047)**	0.276 (0.041)**	0.338 (0.041)**	0.336 (0.056)**
Student is Hispanic	-0.086 (0.045)	-0.158 (0.041)**	-0.133 (0.024)**	-0.093 (0.032)**	-0.009 (0.033)
Student is Male	-0.381 (0.009)**	-0.308 (0.008)**	-0.278 (0.006)**	-0.285 (0.006)**	-0.284 (0.008)**
Free/Reduced Lunch Eligible	0.000 (0.000)	0.000 (0.000)	-0.360 (0.017)**	-0.410 (0.017)**	-0.454 (0.020)**
Constant	0.145 (2,546.476)	0.708 (0.215)**	0.743 (0.050)**	1.370 (0.224)**	0.148 (0.086)
Observations	53639	72637	164317	118476	79833
R-squared	0.0831	0.0756	0.1832	0.2005	0.2177

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table IV
Effects of Katrina or Rita Displacement on Math scores
Analysis of Three Different Cohorts Before and After Katrina

I follow a fixed cohort of students over time from 2004 or 2005 through 2008. I distinguish between Katrina evacuees from Orleans Parish School District and Katrina evacuees from all other districts. I include fixed effects for initial school, year effects and grade effects in each regression. I identify the coefficients on the interaction terms between evacuee status and each of the post-Katrina years. Column (1) is for students who were fourth graders in 2004. Column (2) is for students who were fourth graders in 2005 and Column (3) is for eighth graders in 2005. The final group can only be followed reliably through 2007 since many students pass out of the math and ELA testing requirements during 10th grade.

	(1) Standardized Value of Math Score (4th Graders in 2004)	(2) Standardized Value of Math Score (4th Graders in 2005)	(3) Standardized Value of Math Score (8th Graders in 2005)
Orleans Evacuee* Year is 2006	-0.174	-0.242	-0.114
	(0.039)**	(0.040)**	(0.048)*
Orleans Evacuee* Year is 2007	0.005	-0.041	0.136
	(0.039)	(0.040)	(0.048)**
Orleans Evacuee* Year is 2008	0.111	0.101	
	(0.039)**	(0.040)*	
Non Orleans Katrina Evacuee* Year is 2006	-0.175	-0.107	-0.034
	(0.025)**	(0.024)**	(0.026)
Non Orleans Katrina Evacuee* Year is 2007	-0.086	-0.165	-0.052
	(0.025)**	(0.024)**	(0.026)*
Non Orleans Katrina Evacuee* Year is 2008	-0.032	-0.069	
	(0.025)	(0.024)**	
Rita Evacuee* Year is 2006	-0.124	-0.097	-0.065
	(0.028)**	(0.027)**	(0.033)*
Rita Evacuee* Year is 2007	-0.091	-0.083	-0.041
	(0.028)**	(0.027)**	(0.033)
Rita Evacuee* Year is 2008	-0.040	-0.047	
	(0.028)	(0.027)+	
Free/Reduced Lunch Eligible	-0.302	-0.322	-0.221
	(0.006)**	(0.006)**	(0.007)**
Student is Male	0.044	0.036	0.065
	(0.005)**	(0.005)**	(0.006)**
Student is Black	-0.460	-0.454	-0.530
	(0.007)**	(0.007)**	(0.008)**
Student is Hispanic	-0.053	-0.052	-0.289
	(0.020)**	(0.019)**	(0.023)**
Student is Asian	0.432	0.408	0.375
	(0.024)**	(0.024)**	(0.025)**
Constant	0.352	0.039	-1.770
	(0.143)*	(12,110.935)	(21,638.051)
Observations	127981	141288	83752
R-squared	0.2608	0.2530	0.2674

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table V
Effects of Katrina or Rita Displacement on ELA scores
Analysis of Three Different Cohorts Before and After Katrina

I follow a fixed cohort of students over time from 2004 or 2005 through 2008. I distinguish between Katrina evacuees from Orleans Parish School District and Katrina evacuees from all other districts. I include fixed effects for initial school, year effects and grade effects in each regression. I identify the coefficients on the interaction terms between evacuee status and each of the post-Katrina years. Column (1) is for students who were fourth graders in 2004. Column (2) is for fourth graders in 2005 and Column (3) is for eigth graders in 2005. The final group can only be followed reliably through 2007 since many students pass out of the math and ELA testing requirements during 10th grade.

	(1) Standardized Value of ELA Score (4th Graders in 2004)	(2) Standardized Value of ELA Score (4th Graders in 2005)	(3) Standardized Value of ELA Score (8th Graders in 2005)
Orleans Evacuee* Year is 2006	-0.212	-0.265	-0.090
	(0.039)**	(0.040)**	(0.048)+
Orleans Evacuee* Year is 2007	-0.050	-0.083	0.189
	(0.039)	(0.040)*	(0.048)**
Orleans Evacuee* Year is 2008	0.110	0.082	
	(0.039)**	(0.040)*	
Non Orleans Katrina Evacuee* Year is 2006	-0.095	-0.010	-0.079
	(0.024)**	(0.024)	(0.026)**
Non Orleans Katrina Evacuee* Year is 2007	-0.085	-0.116	-0.049
	(0.024)**	(0.024)**	(0.026)+
Non Orleans Katrina Evacuee* Year is 2008	0.020	-0.073	
	(0.024)	(0.024)**	
Rita Evacuee* Year is 2006	-0.111	-0.056	-0.063
	(0.028)**	(0.027)*	(0.033)+
Rita Evacuee* Year is 2007	-0.141	-0.193	-0.036
	(0.028)**	(0.027)**	(0.033)
Rita Evacuee* Year is 2008	-0.112	-0.161	
	(0.028)**	(0.027)**	
Free/Reduced Lunch Eligible	-0.338	-0.371	-0.248
	(0.006)**	(0.006)**	(0.007)**
Student is Male	-0.271	-0.261	-0.220
	(0.005)**	(0.005)**	(0.006)**
Student is Black	-0.328	-0.324	-0.434
	(0.007)**	(0.007)**	(0.008)**
Student is Hispanic	0.020	-0.068	-0.245
	(0.020)	(0.019)**	(0.024)**
Student is Asian	0.328	0.316	0.142
	(0.024)**	(0.023)**	(0.025)**
Constant	-0.237	-1.429	0.104
	(0.257)	(18,556.399)	(17,873.761)
Observations	128621	141333	86622
R-squared	0.2593	0.2528	0.2585

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table VI
Effects of Katrina or Rita Displacement on Math scores
Growth from 04/05 Baseline: Orleans vs Non-Orleans Evacuees

I follow a fixed cohort of students over time from 2006 through 2008. I distinguish between Katrina evacuees from Orleans Parish School District and evacuees from all other districts. I include pre-Katrina test score, year effects and grade effects in each regression. (I cannot include school fixed effects due to the perfect collinearity between initial school being in Orleans and the school effects combined with the fact that I am only including post Katrina observations.) I identify the coefficients on evacuee status for each of the post-Katrina years. In each column I follow a different cohort of students. Column (1) is for students who were fourth graders in 2004. Column (2) is for fourth graders in 2005 and Column (3) is for eigth graders in 2005. The final group can only be followed reliably through 2007 since many students pass out of the math and ELA testing requirements during 10th grade. Standard errors are clustered at the level of the initial school.

	(1) Standardized Value of Math Score (4th Grade in 2004)	(2) Standardized Value of Math Score (4th Grade in 2005)	(3) Standardized Value of Math Score (8th Grade in 2005)
Initial Test Score (2004 or 2005)	0.763	0.744	0.848
	(0.007)**	(0.007)**	(0.006)**
Orleans Evacuee* Year is 2006	-0.199	-0.250	-0.026
	(0.042)**	(0.040)**	(0.031)
Orleans Evacuee* Year is 2007	-0.048	-0.093	0.134
	(0.041)	(0.045)*	(0.045)**
Orleans Evacuee* Year is 2008	0.040	0.036	
	(0.041)	(0.041)	
Non Orleans Katrina Evacuee* Year is 2006	-0.152	-0.050	0.001
	(0.024)**	(0.021)*	(0.025)
Non Orleans Katrina Evacuee* Year is 2007	-0.068	-0.117	-0.020
	(0.025)**	(0.026)**	(0.033)
Non Orleans Katrina Evacuee* Year is 2008	-0.016	-0.040	
	(0.024)	(0.028)	
Rita Evacuee* Year is 2006	-0.052	-0.049	-0.024
	(0.026)*	(0.028)+	(0.023)
Rita Evacuee* Year is 2007	-0.013	-0.017	0.003
	(0.030)	(0.030)	(0.036)
Rita Evacuee* Year is 2008	0.033	0.003	
	(0.024)	(0.031)	
Free/Reduced Lunch Eligible	-0.173	-0.180	-0.084
	(0.009)**	(0.010)**	(0.009)**
Student is Male	-0.009	-0.001	0.002
	(0.006)	(0.006)	(0.006)
Student is Black	-0.195	-0.216	-0.097
	(0.013)**	(0.013)**	(0.011)**
Student is Hispanic	0.088	0.042	0.008
	(0.030)**	(0.027)	(0.022)
Student is Asian	0.305	0.247	0.151
	(0.033)**	(0.030)**	(0.027)**
Observations	100359	110508	64248
R-squared	0.5640	0.5673	0.6903

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table VII
Effects of Katrina or Rita Displacement on ELA scores
Growth from Baseline: Orleans vs Non-Orleans Evacuees

I follow a fixed cohort of students over time from 2006 through 2008. I distinguish between Katrina evacuees from Orleans Parish School District and evacuees from all other districts. I include pre-Katrina test score, year effects and grade effects in each regression. (I cannot include school fixed effects due to the collinearity between initial school being in Orleans and the school effects combined with the fact that I am only including post Katrina observations.) I identify the coefficients on evacuee status for each of the post-Katrina years. In each column I follow a different cohort of students. Column (1) is for students who were fourth graders in 2004. Column (2) is for fourth graders in 2005 and Column (3) is for eigth graders in 2005. The final group can only be followed reliably through 2007 since many students pass out of the math and ELA testing requirements during 10th grade. Standard errors are clustered at the level of the initial school.

	(1) Standardized Value of ELA Score (LEAP or ILEAP)	(2) Standardized Value of ELA Score (LEAP or ILEAP)	(3) Standardized Value of ELA Score (LEAP or ILEAP)
Initial Test Score (2004 or 2005)	0.722	0.750	0.791
	(0.007)**	(0.006)**	(0.007)**
Orleans Evacuee* Year is 2006	-0.225	-0.251	-0.026
	(0.046)**	(0.044)**	(0.049)
Orleans Evacuee* Year is 2007	-0.099	-0.120	0.162
	(0.048)*	(0.041)**	(0.053)**
Orleans Evacuee* Year is 2008	0.042	0.032	
	(0.047)	(0.044)	
Non Orleans Katrina Evacuee* Year is 2006	-0.065	-0.003	-0.046
	(0.022)**	(0.021)	(0.024)+
Non Orleans Katrina Evacuee* Year is 2007	-0.059	-0.113	-0.017
	(0.022)**	(0.021)**	(0.022)
Non Orleans Katrina Evacuee* Year is 2008	0.044	-0.089	
	(0.018)*	(0.023)**	
Rita Evacuee* Year is 2006	-0.070	0.001	-0.012
	(0.023)**	(0.029)	(0.033)
Rita Evacuee* Year is 2007	-0.092	-0.115	0.029
	(0.025)**	(0.027)**	(0.028)
Rita Evacuee* Year is 2008	-0.068	-0.099	
	(0.023)**	(0.027)**	
Free/Reduced Lunch Eligible	-0.171	-0.194	-0.102
	(0.008)**	(0.009)**	(0.009)**
Student is Male	-0.127	-0.110	-0.049
	(0.006)**	(0.006)**	(0.006)**
Student is Black	-0.228	-0.212	-0.111
	(0.012)**	(0.011)**	(0.010)**
Student is Hispanic	0.037	0.029	-0.001
	(0.027)	(0.024)	(0.026)
Student is Asian	0.260	0.232	0.167
	(0.027)**	(0.027)**	(0.024)**
Observations	100854	110577	66286
R-squared	0.5516	0.5750	0.6124

Robust standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table VIII
Effects of Katrina or Rita Displacement on Math scores
Split By Initial Schools Quintile of 2005 Math Scores

I follow a fixed cohort of students over time from 2006 through 2008, specifically those who were in 4th grade in 2005. I distinguish between Katrina evacuees from Orleans Parish School District and evacuees from all other districts. I include fixed effects for initial school, year effects and grade effects in each regression. I identify the coefficients on the interaction terms between evacuee status and each of the post-Katrina years. Column (1) is for students whose initial (2005) school was in the bottom quintile of the distribution of average math scores. Column (2) is for all other schools. Column (3) is for all schools and adds controls for the current school's average math scores and that variable interacted with Orleans evacuee status.

	(1) Standardized Value of Math Score Sample: Initial School in Bottom of 2005 Distribution	(2) Standardized Value of Math Score Sample: Initial School in Quintile 2-5 of 2005 Distribution	(3) Standardized Value of Math Score (LEAP or ILEAP) All
Orleans Evacuee* Year is 2006	-0.195	-0.401	-0.314
	(0.050)**	(0.067)**	(0.056)**
Orleans Evacuee* Year is 2007	-0.007	-0.187	-0.108
	(0.050)	(0.067)**	(0.057)+
Orleans Evacuee* Year is 2008	0.139	-0.089	0.049
	(0.050)**	(0.067)	(0.060)
Non Orleans Katrina Evacuee* Year is 2006	-0.107	-0.111	-0.101
	(0.046)*	(0.028)**	(0.032)**
Non Orleans Katrina Evacuee* Year is 2007	-0.113	-0.184	-0.178
	(0.046)*	(0.028)**	(0.033)**
Non Orleans Katrina Evacuee* Year is 2008	-0.001	-0.094	-0.075
	(0.046)	(0.028)**	(0.037)*
Rita Evacuee* Year is 2006	-0.150	-0.087	-0.117
	(0.070)*	(0.030)**	(0.034)**
Rita Evacuee* Year is 2007	-0.126	-0.078	-0.119
	(0.070)+	(0.030)**	(0.041)**
Rita Evacuee* Year is 2008	0.007	-0.047	-0.079
	(0.070)	(0.030)	(0.036)*
Current School's 2005 Math Distribution			0.468
			(0.042)**
Orleans Evacuee*Current School's Average 2005 Math Score			0.046
			(0.091)
Constant	-0.006	0.562	-0.187
	(25,542.133)	(11,626.295)	(0.106)+
Observations	33523	107765	136514
R-squared	0.134	0.217	0.262

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table IX

Four Year College Going Rate By Graduation Cohort and School District

I take a random sample (roughly 50%) of 10th graders who take LEAP exams during 2002-2005 in six different districts. (I infer their senior based on the year the student takes the LEAP exam). I use Student Clearinghouse data matched to the students (regardless of post-Katrina location) to determine whether or not the student enrolled in a 4 year college within 3 years after taking the LEAP exam. The table shows the percent enrolled in a four year college and the number of students.

	Cohort			
District	2004	2005	2006	2007
East Baton Rouge	0.358	0.39	0.353	0.351
	2,332	2,318	2,363	1,984
Iberia	0.366	0.335	0.299	0.291
	544	543	662	584
Jefferson	0.304	0.262	0.262	0.304
	1,870	2,057	2,309	2,062
Orleans	0.26	0.259	0.218	0.258
	2,667	2,466	1,981	2,733
Plaquemines	0.321	0.295	0.34	0.322
	246	237	247	233
St. Bernard	0.317	0.34	0.269	0.282
	341	379	438	404

Table X
Effects on College Going Outcomes

The data set includes four cohorts of 10th graders including two that were scheduled to graduate before the hurricane and two scheduled to graduate after. (2004 and 2005). I regress three different college going outcomes on a full set of school effects and the interaction between dummies for hurricane affected parishes and post-hurricane years. In columns (1), (2), and (4) the coefficients are identified strictly off within school changes in the outcomes, before and after the hurricanes. In column (2) I also include year effects and thus am identifying the difference in outcomes for students originating in hurricane affected schools relative to the difference in outcomes for students in East Baton Rouge and Iberia Parishes.

	(1) Enrolled in a 4 Year College	(2) Enrolled in a 4 Year College	(3) Attends A College Ranked By US News	(4) College's 75 Percentile of SAT Distribution for Incoming Class
In Orleans Parish in 10th Grade * 2003	0.042	0.017	-0.002	38.456
	(0.012)**	(0.016)	(0.013)	(27.025)
In Orleans Parish in 10th Grade * 2004	0.021	0.042	0.028	-18.372
	(0.013)+	(0.017)*	(0.014)*	(31.274)
In Orleans Parish in 10th Grade * 2005	0.005	0.045	0.004	-37.906
	(0.012)	(0.017)**	(0.014)	(29.446)
In Jefferson/St. Bernard/Plaquemines in 10th Grade * 2003	-0.032	-0.057	-0.042	18.954
	(0.012)**	(0.016)**	(0.013)**	(25.807)
In Jefferson/St. Bernard/Plaquemines in 10th Grade * 2004	-0.035	-0.014	0.003	16.938
	(0.012)**	(0.016)	(0.013)	(26.619)
In Jefferson/St. Bernard/Plaquemines in 10th Grade * 2005	-0.005	0.035	0.009	-3.242
	(0.012)	(0.017)*	(0.014)	(27.514)
year== 2003.0000		0.026	-0.034	7.212
		(0.011)*	(0.009)**	(16.853)
year== 2004.0000		-0.021	-0.091	11.432
		(0.011)+	(0.009)**	(18.206)
year== 2005.0000		-0.040	-0.094	20.949
		(0.012)**	(0.010)**	(18.880)
Constant	0.301	0.304	0.225	1,134.772
	(0.004)**	(0.005)**	(0.004)**	(7.167)**
Observations	32000	32000	32000	5420
R-squared	0.140	0.141	0.147	0.085

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Appendix Table I
Structure of the Uncut Dataset

The data contain four years worth of test scores (2004-2007). In 2004-2005 for Math and English Language Arts, students are tested in grades 4,8,10 under the LEAP (Louisiana Education Assessment Program). These are all high stakes test. Grade 4 and 8 students need to score "Approaching Basic" in both reading and math in order to progress to the next grade level. Grade 10 students need to score "Approaching Basic" in order to be eligible for a regular high school diploma. The high stakes policies were suspended for one year during 05-06 due to the Hurricanes. (Additionally Students are tested in Social Science and Science in grade 11. In 2006 and 2007, ILEAP tests are added for grades 3, 5, 6, 7, 9.

These are the raw data. The analysis sample limits the data to those students I observe in 2006 since that is the year for which I have an indicator of evacuee status. Note that for 2006-2007 I have 9 grades of students, adding up to about 450,000. I am missing grades 1,2, 12. If we multiply the 450k*12/9 we get 600,000 which is roughly the total number of public school students in Louisiana.

	year				
grade	2004	2005	2006	2007	Total
3	0	0	48,074	51,057	99,131
4	59,171	61,346	52,412	51,773	224,702
5	0	0	46,732	49,829	96,561
6	0	0	47,859	51,655	99,514
7	0	0	50,393	50,971	101,364
8	58,356	58,592	50,113	50,130	217,191
9	0	0	56,837	61,280	118,117
10	46,562	46,291	41,745	43,877	178,475
11	40,000	39,590	36,082	37,498	153,170
12	6,644	1,674	1,747	1,752	11,817
HS	22	14	2	152	190
Total	210,755	207,507	431,996	449,974	1,300,232

Appendix Table II

Frequency Tabulation of Lousiana Students Observed in 2005 (Grades 4,8,10) By Their Future Evacuee Status And Whether They Attend School In One of the Four Heavily Affected Parishes

I take pre-Hurricane data in Spring 2005. This is observed for students in grades 4,8,10. I then limit the data to those students I observe in 2006 (grades 3-11) since 2006 is the year in which I have an accurate indicator of evacuee status. I cut the data by being in one of the most affected parishes and being an evacuee in 2006. The most affected parishes are Orleans, Jefferson, Plaquemines, and St. Bernard. Ninety three percent of Katrina evacuees come from these parishes. And 90 percent of the students in these affected parishes are evacuees.

Displaced from Public School Due to Katrina	In A Katrina District in 2005		
	No	Yes	Total
No	119,928	1,379	121,307
Yes	988	13,021	14,009
Total	120,916	14,400	135,316

Frequency Tabulation of Lousiana Students Observed in 2006 (Grades 3-11) By Evacuee Status And Whether They Attend School In One of the Four Heavily Affected Parishes

For 2006, I observe all students in grades 3-11 and their evacuee status that Spring. Sixty nine percent of evacuees remain in one of the four affected Parishes.

Displaced from Public School Due to Katrina	In A Katrina District in 2006		
	No	Yes	Total
No	383,836	2,748	386,584
Yes	14,115	31,298	45,413
Total	397,951	34,046	431,997

Appendix Table III
Percent of Eventual Evacuees Attending School In One of Most Affected Parishes

I take all students who are evacuees in 2006. I calculate the fraction living in the affected parishes (Orleans, Jefferson, Plaquemines, and St. Bernard) by year.

Year	Fraction In Affected Parishes	N
2004	0.931	9,743
2005	0.929	14,009
2006	0.689	45,413
2007	0.759	35,325

Appendix Table IV

Evacuees Highly Likely To Be Missing From Sample Relative to Other Students (8th Graders in 2005)

I take the set of 8th graders observed during 2005 and ask whether they are in the sample in 2007. I cut the data by evacuee versus not.

	Orleans	Evacuee	
Drop from Sample 05 to 07	No	Yes	Total
No	42,107	2,719	44,826
Yes	10,884	2,883	13,767
Total	52,991	5,602	58,593

Appendix Table V

Orleans Students More Likely to Disappear From Dataset Relative to Other Louisiana Students

I identify all eighth graders in 2005. I check to see whether they disappear from the data set by 2007. I run an OLS regression of dropping from the sample on student characteristics.

	(1) Eigth Graders in 2005 Who Disappear From Sample By 2007 (All Students)	(2) Eigth Graders in 2005 Who Disappear From Sample By 2007 (Orleans Students)
Attends School in Orleans in 2005	0.308	
	(0.006)**	
Math Score 2005	-0.072	-0.050
	(0.002)**	(0.008)**
Black (0-1)	-0.028	0.045
	(0.004)**	(0.047)
Male	0.028	0.020
	(0.003)**	(0.014)
Hispanic (0-1)	0.079	0.097
	(0.013)**	(0.086)
Asian (0-1)	0.025	-0.063
	(0.014)	(0.072)
Constant	0.158	0.414
	(0.003)**	(0.046)**
Observations	52274	4969
R-squared	0.094	0.012

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Appendix Table VI
Where Evacuees Come From and Go To

I classify students by their eventual status as an evacuee. I count only the 4th, 8th, 10th graders since these are the only grades tested in all years of the dataset (2004-2007). I limit the sample to students observed in 2006 which is the year for which I know evacuee status. I only show districts with 30 or more evacuees in some year. Districts are sorted by the number of evacuees in 2006, except for the Recover School District in New Orleans.

	Number of Eventual Evacuees				Average Standardized Math Score			
district_name	2004	2005	2006	2007	2004	2005	2006	2007
Jefferson Parish	4755	6965	8219	6750	-0.13	-0.188	-0.28	-0.225
Orleans Parish	3297	4004	1252	849	-0.532	-0.519	-0.783	-0.041
Recovery School Districts				1074				-0.5409
East Baton Rouge Parish	22	35	1026	645	-0.293	-0.277	-0.29	-0.264
St. Tammany Parish	425	677	967	861	0.401	0.392	0.316	0.346
Plaquemines Parish	453	738	596	631	0.179	0.225	0.261	0.233
Tangipahoa Parish	22	27	210	143	-0.048	-0.093	-0.194	-0.198
Lafayette Parish	3	2	198	118	0.201	0.232	0.2	0.162
Caddo Parish	4	6	166	81	-0.111	-0.143	-0.043	-0.136
Rapides Parish	4	2	163	72	0.063	0.058	0.043	0.099
Ascension Parish	6	7	158	109	0.26	0.296	0.27	0.295
St. Bernard Parish	495	781	158	360	0.241	0.245	0.081	0.059
St. John The Baptist Parish	26	28	138	111	-0.257	-0.293	-0.317	-0.171
St. Landry Parish	5	2	108	32	-0.007	0.013	0.058	0.042
Terrebonne Parish	6	14	103	55	-0.02	-0.07	-0.123	-0.144
St. Charles Parish	28	39	93	78	0.372	0.305	0.214	0.256
City Of Baker School District	1	0	88	28	-0.455	-0.637	-0.659	-0.754
Belle Chasse Academy, Inc.	18	54	85	65	-0.006	0.061	-0.016	0.329
Ouachita Parish	1	2	84	39	0.287	0.336	0.322	0.293
Livingston Parish	7	9	80	102	0.325	0.248	0.228	0.254
St. Mary Parish	10	5	79	30	-0.039	0.072	-0.012	0.039
Bossier Parish	1	1	73	35	0.166	0.101	0.145	0.058
Lafourche Parish	20	15	68	48	-0.101	-0.048	0.018	0.058
Washington Parish	9	21	65	52	-0.02	-0.115	-0.173	-0.156
Iberia Parish	2	2	47	32	-0.009	0.021	0.052	0.115
City Of Monroe School District		2	45	15		-0.226	-0.067	-0.113
Milestone Sabis Academy Of New Orleans	16	25	45	33	-1.247	-0.345	-0.794	-0.469
Natchitoches Parish	0	1	44	20	-0.195	-0.184	-0.229	-0.251
West Baton Rouge Parish	2	2	44	21	-0.168	-0.136	-0.023	-0.1
Avoyelles Parish	2	2	43	21	-0.037	-0.006	-0.144	-0.074
Concordia Parish	1	0	41	24	-0.28	-0.254	-0.233	-0.291
St. Martin Parish	2	0	40	16	-0.093	-0.144	-0.031	-0.091

Iberville Parish	3	6	38	26	-0.235	-0.251	-0.278	-0.37
St. James Parish	2	2	35	16	-0.096	0.102	0.058	0.099
Vermilion Parish	2	3	31	7	0.156	0.1	0.132	0.058
Acadia Parish	0	0	30	11	0.109	0.032	0.095	0.024
Lincoln Parish	0	0	30	14	0.045	0.135	0.11	0.068
City Of Bogalusa School District		33	28	32		-0.343	-0.428	-0.456

Appendix Table VII
Effects of Katrina on Orleans and Non Orleans Evacuees: Breakdown By Current Location

	(1) Standardized Value of Math Score (2008)
Initial Math Score (04 or 05)	0.738
	(0.009)**
Orleans Evacuee Currently In Orleans Parish District	0.141
	(0.109)
Orleans Evacuee Currently In Recovery District	-0.104
	(0.081)
Orleans Evacuee Currently Outside N.O. MSA	0.130
	(0.032)**
Orleans Evacuee Currently in N.O. Suburban Districts	-0.023
	(0.088)
Non Orleans Evacuee Currently In Orleans Parish District	0.264
	(0.054)**
Non Orleans Evacuee Currently In Recovery District	0.121
	(0.132)
Non Orleans Evacuee Currently Outside N.O. MSA	-0.004
	(0.035)
Non Orleans Evacuee Currently in N.O. Suburban Districts	-0.049
	(0.036)
Free/Reduced Lunch Eligible	-0.196
	(0.011)**
Student is Male	0.024
	(0.006)**
Student is Black	-0.187
	(0.015)**
Student is Hispanic	0.075
	(0.023)**
Student is Asian	0.336
	(0.031)**
Constant	0.566
	(0.092)**
Observations	69466
R-squared	0.545

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Appendix Table VIII
Estimates of Propensity Score For Being an Orleans Parish or other Katrina Evacuee

I use the 2005 data to estimate the propensity to be an evacuee. The right hand side variables include test scores and demographics but not school dummies since in many cases the treatment occurs at the school level. I run probit regressions and report dy/dx.

	(1) New Orleans Evacuee In Public School	(2) Non New Orleans Evacuee In Public School
Standardized Value of Math Score	-0.000	-0.006
	(0.001)	(0.001)**
Standardized Value of ELA Score	-0.007	0.005
	(0.001)**	(0.001)**
Student is Male	-0.002	0.001
	(0.001)**	(0.002)
Student is Black	0.076	-0.015
	(0.001)**	(0.002)**
Student is Hispanic	0.207	0.272
	(0.020)**	(0.011)**
Student is Asian	0.385	0.246
	(0.024)**	(0.014)**
grade==04	-0.040	0.022
	(0.026)	(0.015)
grade==08	-0.036	0.025
	(0.019)+	(0.016)
grade==10	-0.024	0.023
	(0.009)*	(0.018)
grade==12		0.016
		(0.089)
grade==11	-0.005	
	(0.019)	
Observations	110361	114210

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Appendix Table IX

Estimated Effects of Hurricane Katrina on Math Scores Using Propensity Score Matching

I use the estimated propensity scores in Appendix Table IX and the algorithm by Becker and Ichino to perform nearest neighbor matching of each treatment observation to one or more control observations. Standard errors in parentheses. Sample sizes for the [treatment,control] groups are in square brackets.

	(1) Orleans Parish Evacuees	(2) Other Katrina Evacuees
Math Score in 2006	-0.115	-0.078
	(0.016)**	(0.013)**
	[5323, 8899]	[9247, 14420]
Math Score in 2007	-0.024	-0.071
	(0.019)	(0.015)**
	[4033, 6390]	[7317, 10678]
Math Score in 2008	0.017	-0.016
	(0.022)	(0.018)
	[3248, 4886]	[5561, 8014]

Appendix Table X
Student Clearinghouse Data: College Type By High School Class Year

I start with a random sample of Louisiana High School students who took the LEAP exams prior to the hurricanes. I infer high school class year from the year the exam was taken. I use the Clearinghouse Data to ask whether these students are enrolled in college and type of college.

high_schoo	college_type			
l_cohort	2	4	L	None	Total
2004	1,340	3,097	36	3,527	8,000
2005	1,142	2,680	30	4,148	8,000
2006	1,055	2,367	25	4,553	8,000
2007	988	2,387	24	4,601	8,000
Total	4,525	10,531	115	16,829	32,000

Appendix Table XI
New Enrollments Over Time in Most Popular Four Year Colleges in The Sample

I show enrollments by year in the most popular four year colleges for the sample. I also show total enrollments and enrollments in a few selective schools and a few Texas universities.

		high_sch	ool_cohort		
College_Name	**2004**	**2005**	**2006**	**2007**	**Total**
Louisiana State Unive	512	496	390	361	1759
University Of New Orl	630	266	241	282	1,419
Southeastern Louisian	272	296	341	335	1,244
Southern University A	0	341	333	300	974
University Of Louisia	204	220	216	189	829
Nicholls State Univer	118	96	65	72	351
Northwestern State Un	102	80	49	41	272
Dillard University	87	33	26	69	215
Xavier University Of	0	16	48	148	212
Grambling State Unive	39	44	53	56	192
Louisiana Tech Univer	57	55	36	42	190
Tulane University	67	38	33	46	184
Loyola University In	42	24	30	56	152
The University Of Lou	29	42	30	28	129
Texas Southern Univer	10	42	35	21	108
Mcneese State Univers	25	28	20	13	86
Rice University	4	3	1	3	11
Texas A&M University	1	4	3	3	11
University Of Texas A	0	6	3	1	10
University Of Houston	1	0	1	6	8
Boston College	2	1	1	0	4
George Washington Uni	2	2	0	0	4
Boston University	2	0	1	0	3
Georgetown University	1	1	0	1	3
Harvard University	2	1	0	0	3
Lehigh University	3	0	0	0	3
New York University	0	2	0	1	3
Princeton University	3	0	0	0	3
Stanford University	0	0	2	0	2
Yale University	0	1	1	0	2
Cornell University	0	1	0	0	1
Dartmouth College	0	0	0	1	1
Total	2,483	2,461	2,270	2,387	9,601

Table Ib

Means for Uniform Crime Reports Data

These are monthly crime rates for cities in Texas with more than 300,000 people. The data are for January 2004-December 2006. The cities are listed below.

Variable	Obs	Mean	Std. Dev.	Min	Max
Murders Per 10,000	324	0.06	0.06	0.00	0.24
Burglaries Per 10,000	324	9.03	3.81	2.26	19.03
Robberies Per 10,000	324	2.07	1.59	0.12	6.39
Larcenies Per 10,000	324	29.20	10.15	8.82	51.93

Table IIb

City	Population in 2000
Arlington	366,479
Austin	681,406
Dallas	1,162,522
El Paso	603,772
Fort Worth	615,709
Harris	1,246,814
Houston	2,013,461
Montgomery	311,858
San Antonio	1,261,276

Table IIIb
Did Houston Crime Rates Rise After Katrina?

Data are from the Uniform Crime Reports. The unit of analysis is monthly crime rates for cities in Texas with more than 300,000 people. The data are for January 2004-December 2006. All regressions include city fixed effects and month effects. "After Sept 05" includes the month of September 2005.

	(1) Murders Per 10000 People	(2) Murders Per 10000 People	(3) Robberies Per 10000 People	(4) Robberies Per 10000 People	(5) Burglaries Per 10000 People	(6) Burglaries Per 10000 People	(7) Larcenies Per 10000 People	(8) Larcenies Per 10000 People
Houston*After Sept 05	0.039		0.351		-0.008		1.581	
	(0.011)**		(0.119)**		(0.319)		(0.819)	
After September 2005	-0.003		-0.000		-0.032		-2.455	
	(0.004)		(0.042)		(0.111)		(0.286)**	
Houston*Month is Sept 05		-0.009		-0.063		2.594		-4.220
		(0.032)		(0.367)		(0.941)**		(2.751)
Month is Sept 05		0.007		0.007		0.694		-0.273
		(0.013)		(0.145)		(0.372)		(1.088)
Constant	0.060	0.066	2.124	2.028	9.190	9.168	31.370	29.008
	(0.006)**	(0.006)**	(0.070)**	(0.066)**	(0.186)**	(0.168)**	(0.452)**	(0.492)**
Observations	324	324	324	324	324	324	324	324
R-squared	0.733	0.721	0.958	0.957	0.948	0.951	0.952	0.941

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Table IVb
Means for Houston Zip Code Level Crime Data

I take monthly block level crime data from the Houston Police Department and aggregate to the zip code level. Below are the means for the month of September 2005. The data set runs from January 2005 through September of 2007. The percent of students who are Katrina evacuees is calculated using data from the Houston Independent School District. I aggregate the data to the zip code level using the zip code of the school that the student attends. The percent Katrina evacuees is measured in the Spring of 2006.

Variable	Obs	Mean	Std. Dev.	Min	Max
Percent Students Katrina Evacuees in Zip Code	65	0.070	0.082	0.000	0.500
Burglaries Per 10,000 People	65	17.230	12.090	0.000	51.921
Assaults Per 10,000 People	65	5.633	5.299	0.000	31.788
Murders Per 10,000 People	65	0.165	0.393	0.000	2.668
Auto Thefts Per 10,000 People	65	10.032	7.530	0.000	33.907
Narcotics Crimes Per 10,000 People	65	4.395	5.213	0.000	26.445
Population in Zip Code	65	28,535.91	13,256.32	7,496.00	76,146.00

Table Vb

Regression of Zip Code Level Crime Rates on Percent Katrina

I take monthly block level crime data from the Houston Police Department and aggregate to the zip code level. The number of crimes is divided by the population in the zip code*10000. The data set runs from January 2005 through September of 2007. The percent of students who are Katrina evacuees is calculated using data from the Houston Independent School District. I aggregate the data to the zip code level using the zip code of the school that the student attends. The percent Katrina evacuees is measured in the Spring of 2006.

The percent of students who are evacuees is held constant for a given zip code throughout the time series. All regressions include zip code fixed effects and I identify the coefficient on "after Sept 2005"*"percent Katrina students" in the zip code.

	(1) Burglaries Per 10,000 People	(2) Assaults Per 10,000 People	(3) Murders Per 10,000 People	(4) Auto Thefts Per 10,000 People	(5) Narcotics Violations Per 10,000 People
After Sept 05* Fraction of Students in Zip Code Who Are Evacuees	-11.306	-0.142	-0.130	-2.258	-1.026
	(6.575)	(3.884)	(0.256)	(5.275)	(7.747)
After September 2005	1.575	0.036	0.037	0.769	1.600
	(0.706)*	(0.417)	(0.027)	(0.566)	(0.832)
Constant	13.226	6.052	0.164	10.237	5.637
	(0.465)**	(0.275)**	(0.018)**	(0.373)**	(0.548)**
Observations	2137	2137	2137	2137	2137
R-squared	0.452	0.432	0.123	0.460	0.344

Standard errors in parentheses. All regressions include zip code fixed effects. Data consist of 65 zip codes in Houston * 33 months
* significant at 5%; ** significant at 1%

Figure I
Distribution of Math Scores (2005) For Eventual Evacuees From New Orleans Versus All Non-Evacuees

Math scores are standardized at the grade*year level. The red line is the distribution for those New Orleans students who become evacuees in 2006. The blue line is for Louisiana students who do not become evacuees. The mean difference between the two groups is roughly .5 standard deviations.

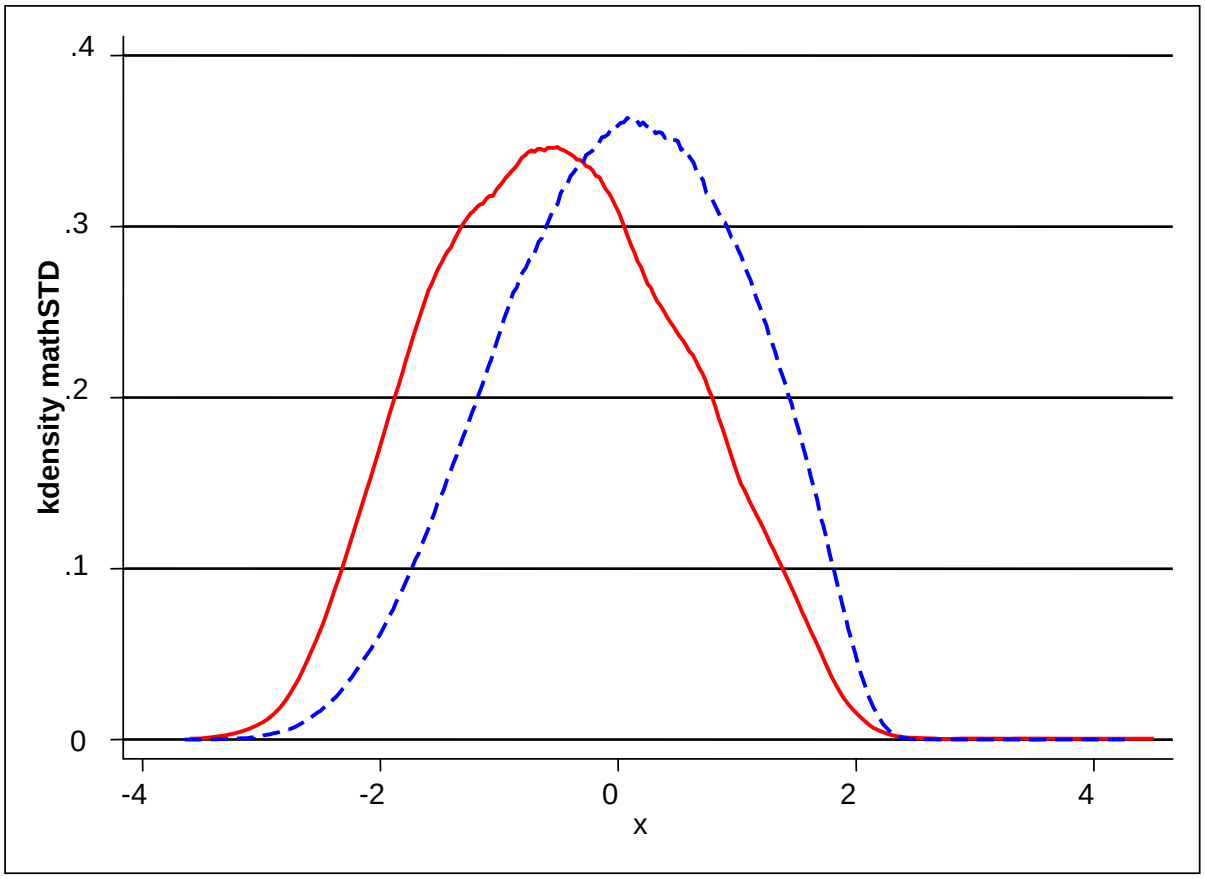


Figure II

Repeated Cross Sectional "Effects" on Math Scores For Katrina and Rita Evacuees

I regress math scores (all grades) on dummies for eventual Katrina or Rita Evacuee Status. The 2006 and 2007 scores are post hurricane. Students are tested in March of each year.

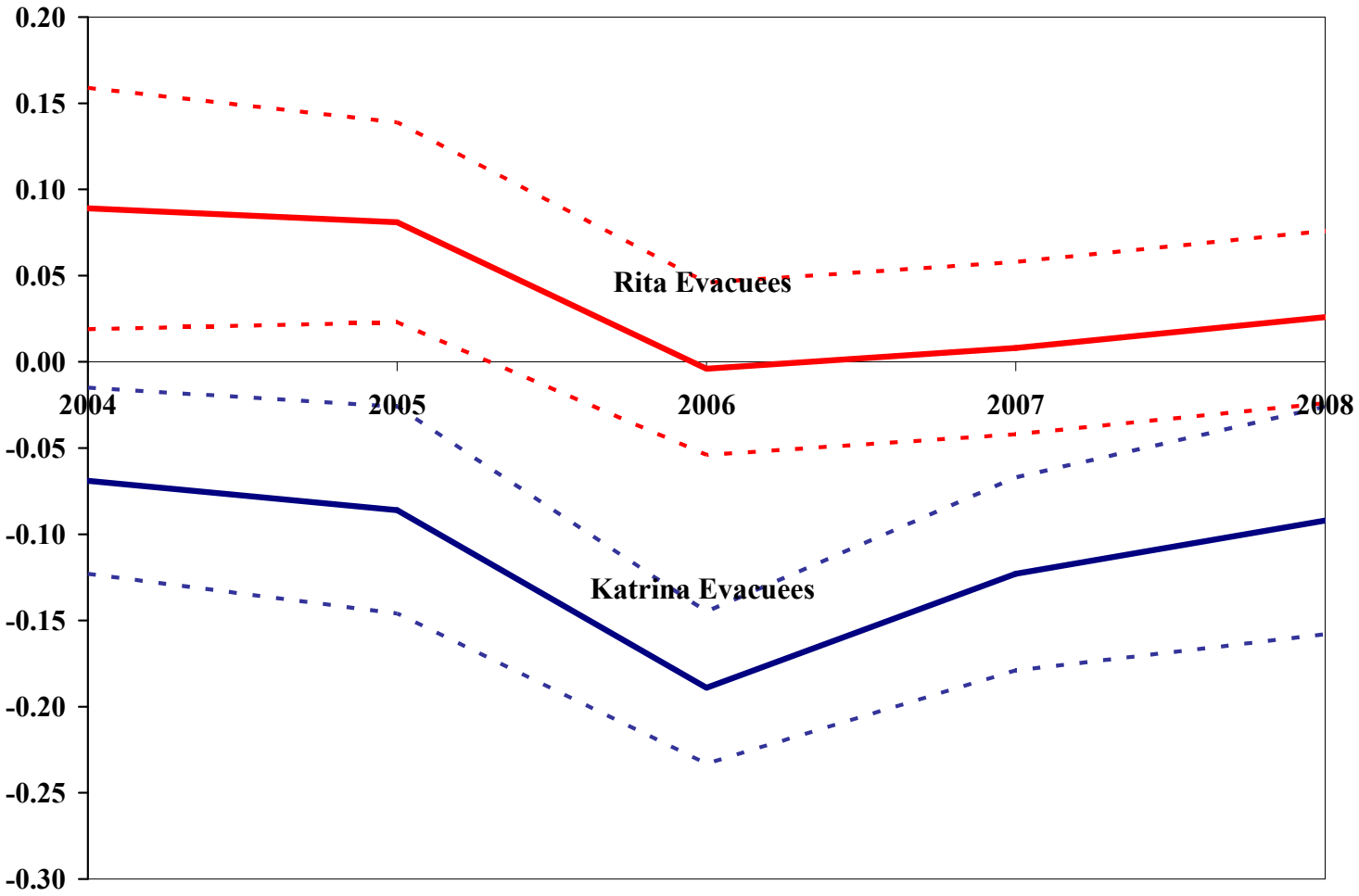


Figure III

Repeated Cross Sectional "Effects" on ELA Scores For Katrina and Rita Evacuees

I regress ELA scores (all grades) on dummies for eventual Katrina or Rita Evacuee Status. The 2006 and 2007 scores are post hurricane. Students are tested in March of each year.

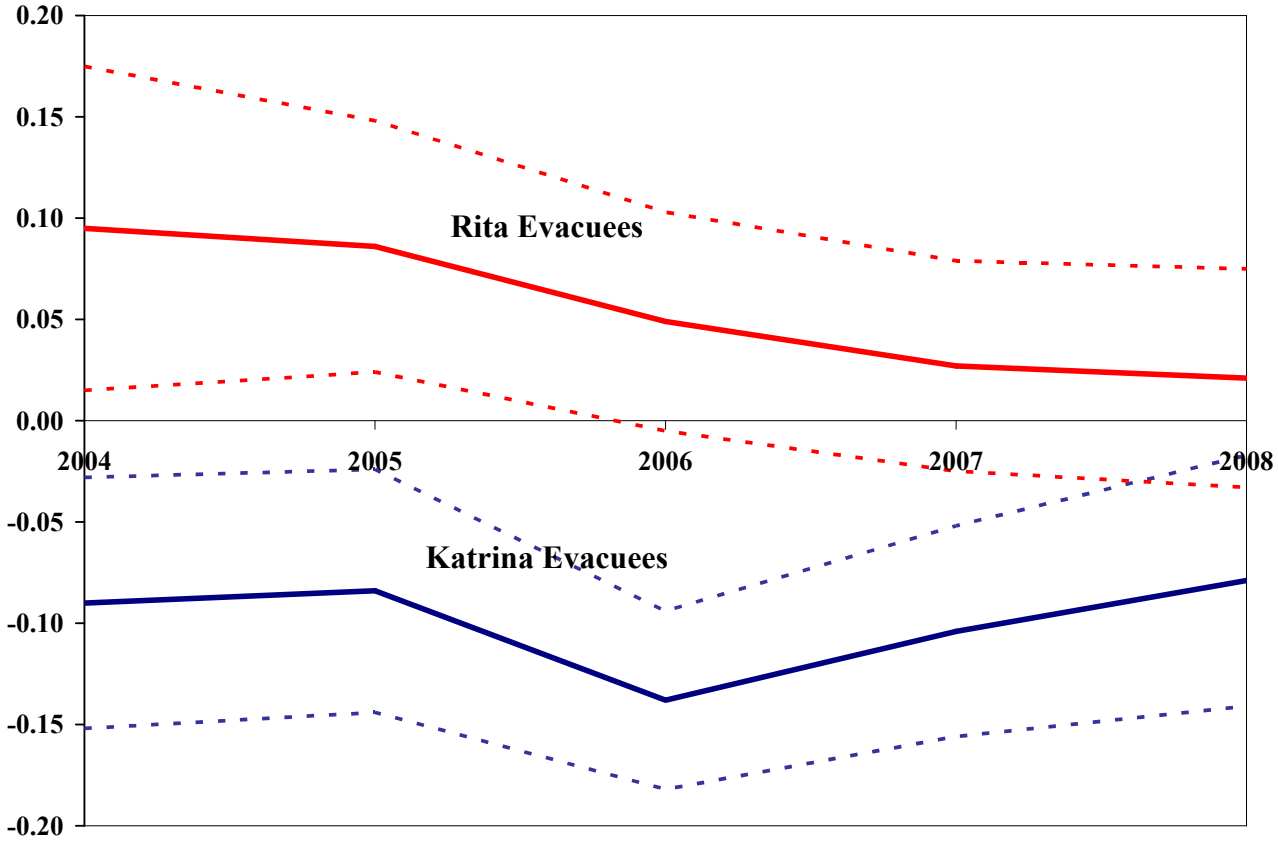


Figure IV

Repeated Cross Sectional "Effects" on Math Scores
New Orleans Versus Non New Orleans Evacuees

I regress math scores (all grades) on dummies for eventual Katrina Evacuee Status. The latter is split by evacuees who are in Orleans Parish in 2004 or 2005 versus all others. The 2006 and 2007 scores are post hurricane. Students are tested in March of each year.

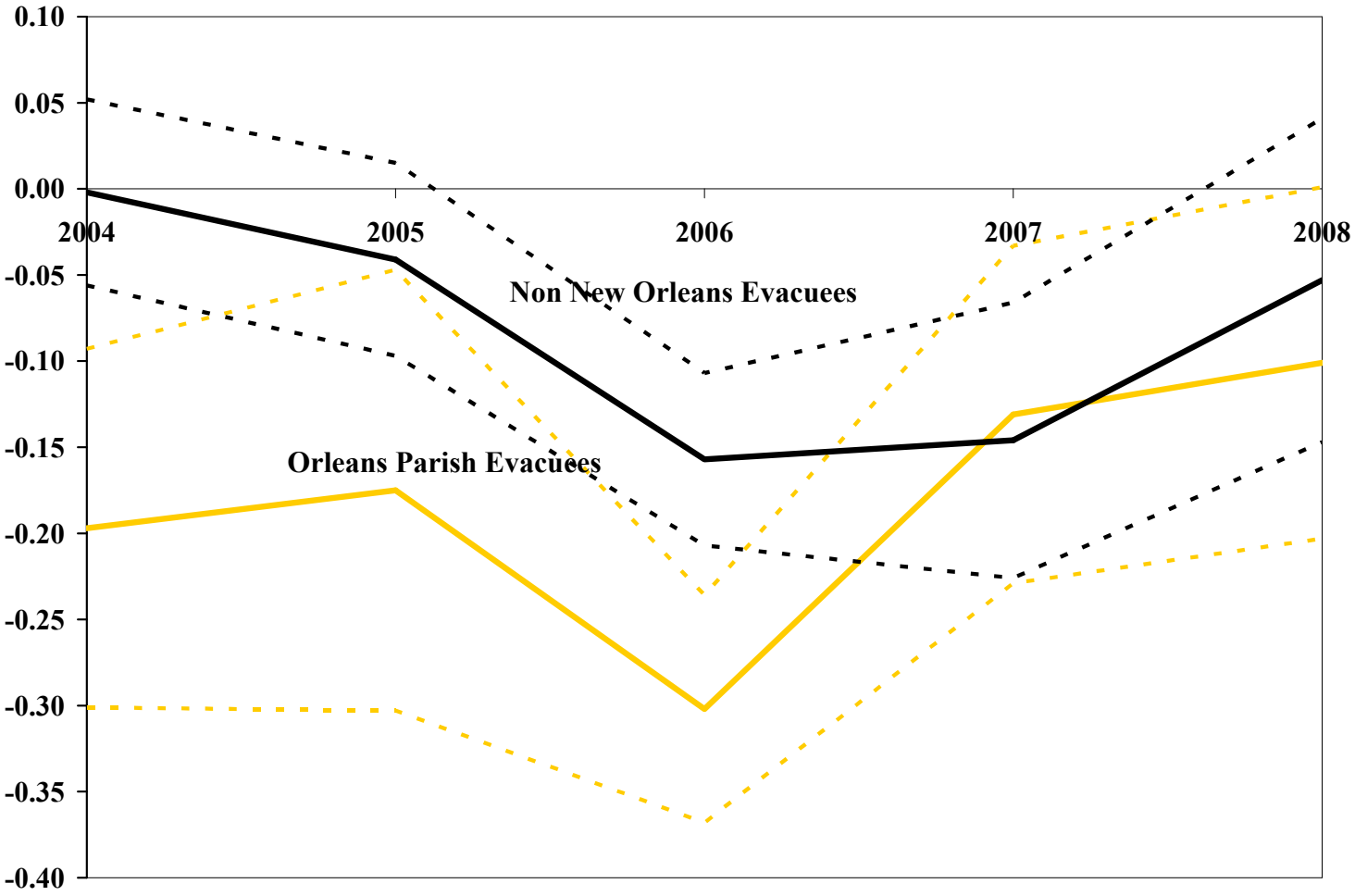


Figure V

Repeated Cross Sectional "Effects" on ELA Scores
New Orleans Versus Non New Orleans Evacuees

I regress English Language Arts scores (all grades) on dummies for eventual Katrina Evacuee Status. The latter is split by evacuees who are in Orleans Parish in 2004 or 2005 versus all others. The 2006 and 2007 scores are post hurricane. Students are tested in March of each year.

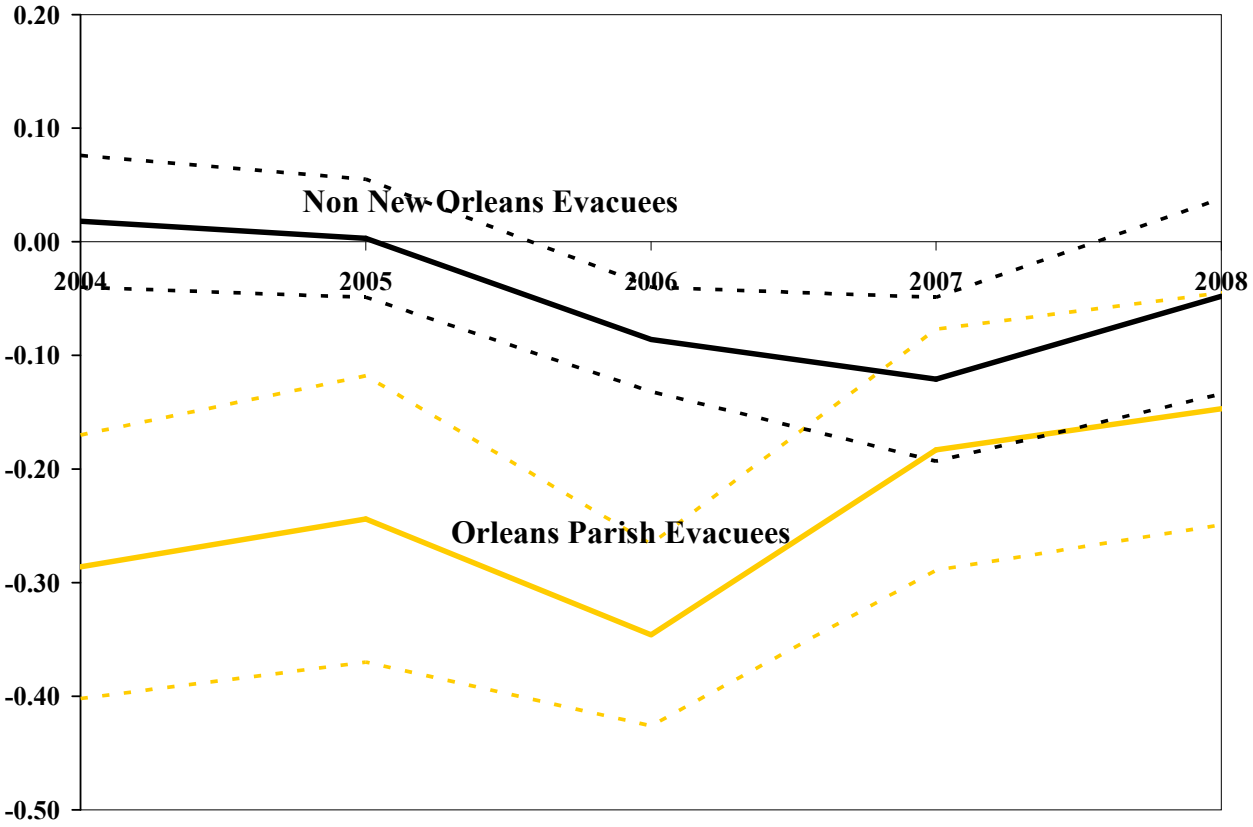
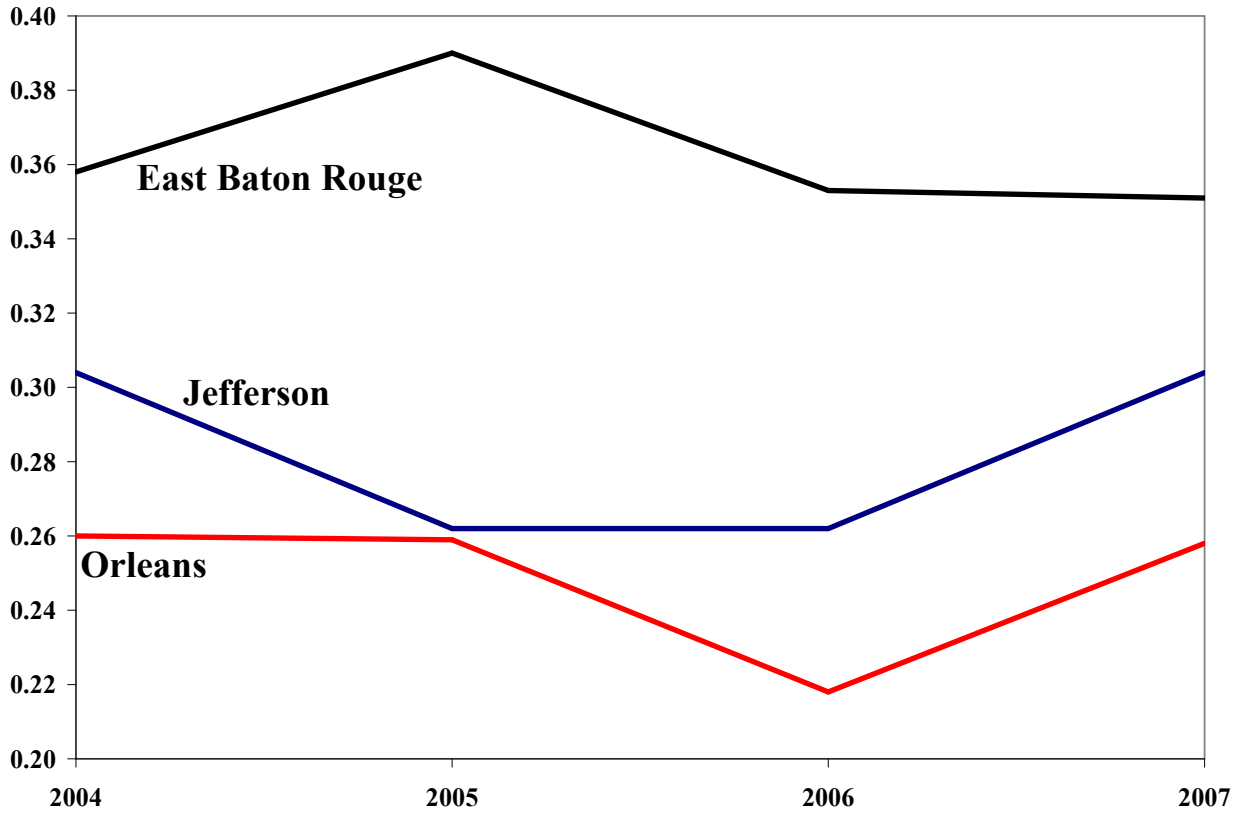


Figure VI

Four Year College Going Rate For Three Large Districts

The sample is drawn from 10th graders who took the LEAP exam. This is their pre-Katrina district. High school cohort is simply test year+ 2.



Implied Year of High School Graduation

Figure VII

Cumulative Four College Enrollement Rate
Four Suburban New Orleans Cohorts Over Time

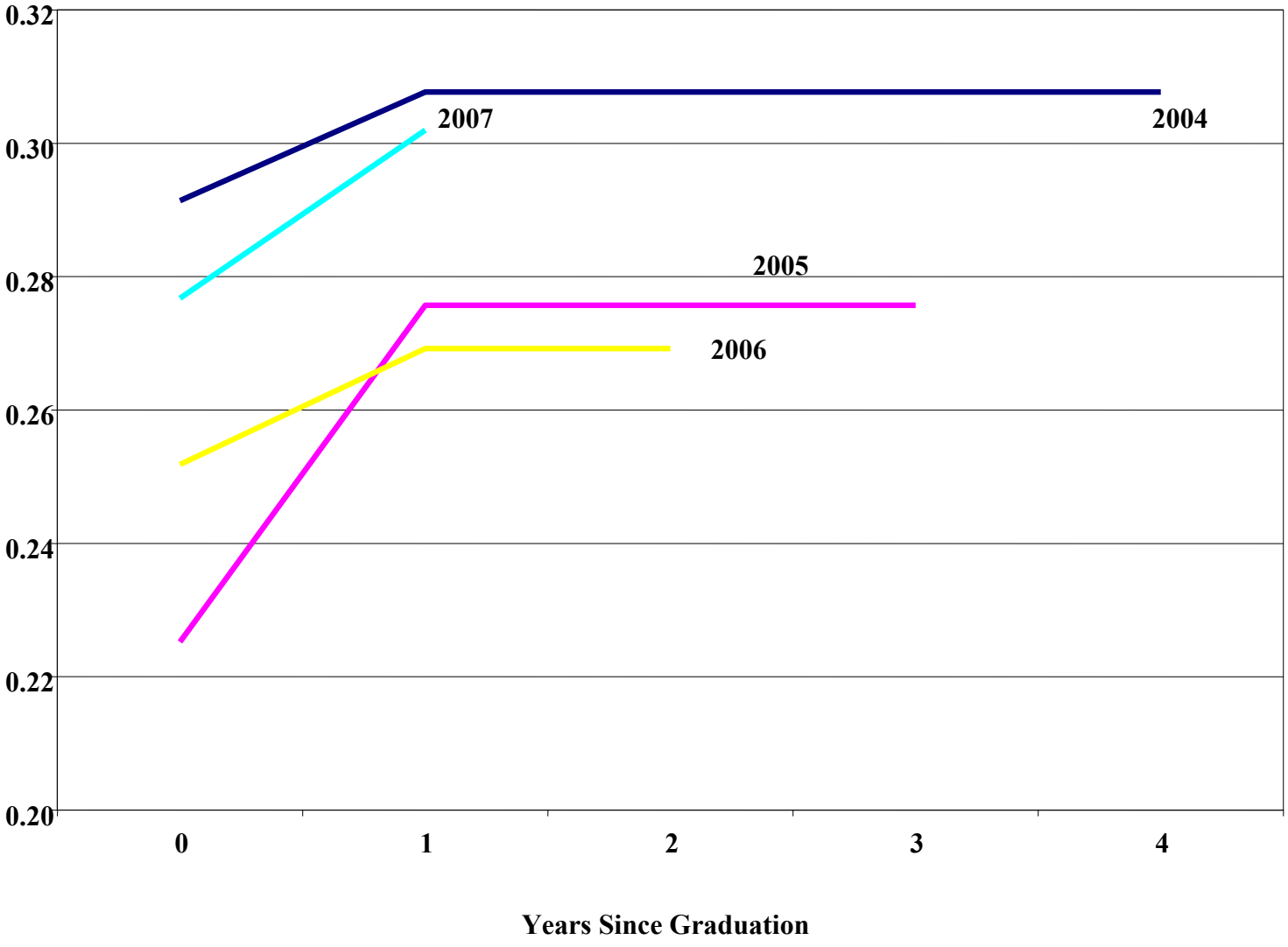


Figure Ib
Number of Burglaries in Houston

Data are from the Uniform Crime Reports and run from January 2004 to December 2006.

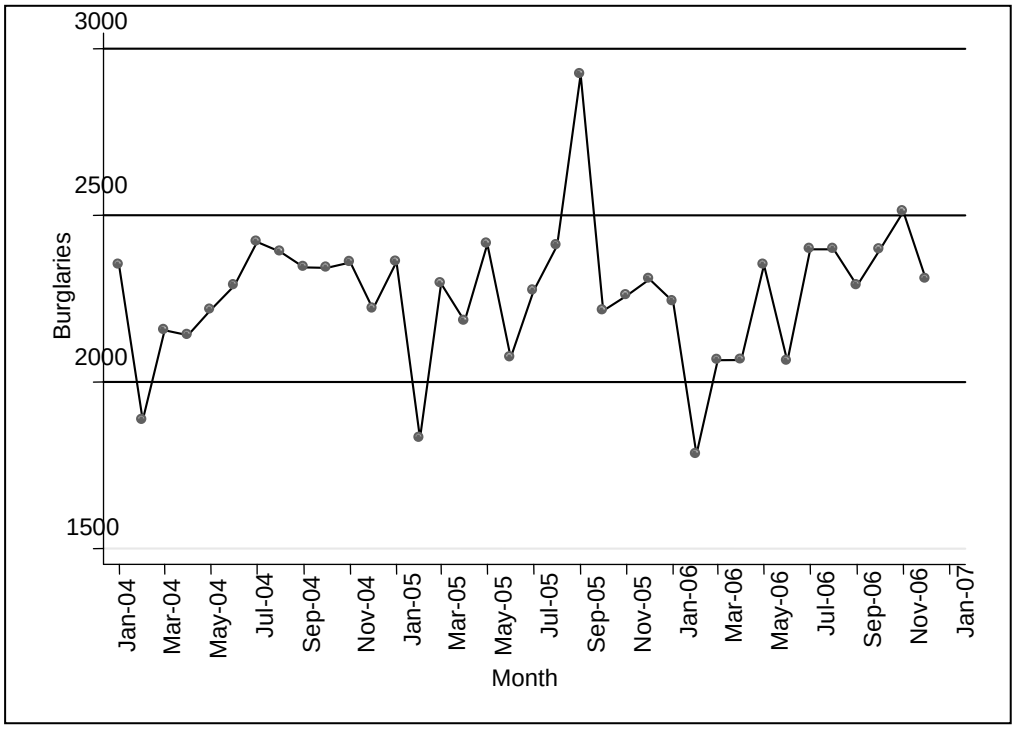


Figure IIb
Number of Murders in Houston

Data are from the Uniform Crime Reports and run from January 2004 to December 2006.

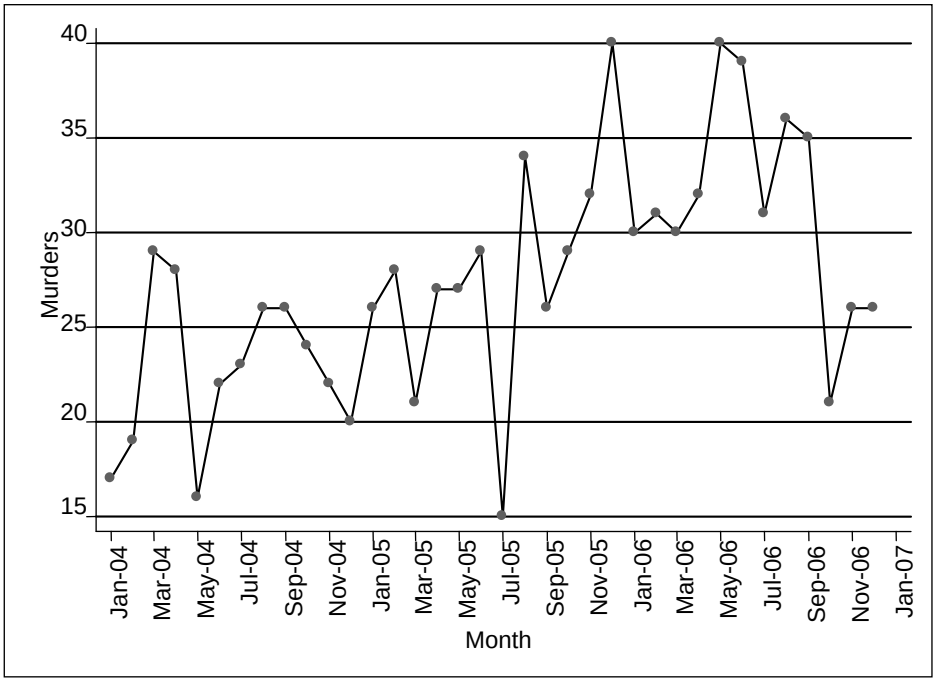


Figure IIIb
Number of Robberies in Houston

Data are from the Uniform Crime Reports and run from January 2004 to December 2006.