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Abstract

We examine the housing market, residential mobility, and academic performance changes that occur soon after a school fails to achieve Adequate Yearly Progress (AYP) (for the second time) in the Charlotte, NC school district. Charlotte is a school district with substantial opportunities for school choice and a number of oversubscribed, high quality schools. To comply with the 2002 No Child Left Behind (NCLB) Act, students within the attendance zone of Title 1 schools that fail to meet AYP are given an advantage in the lotteries for oversubscribed schools. That advantage may create an incentive for households with strong preferences for school choice and/or school quality to move into the attendance zones of failing schools in order to improve their likelihood of being admitted into high performing, oversubscribed schools. Consistent with that notion, we find that housing prices and the incomes of new homebuyers rise in the highest quality neighborhoods within attendance zones of failing schools in comparison to trends in nearby neighborhoods just outside of the attendance zone. We also find that residential mobility decreases while the probability of attending a non-assigned traditional school or magnet school increases in these high quality neighborhoods. Further analysis reveals that the effect of failing designation on non-assigned school attendance is driven largely by the school choice decisions of new residents who are most likely to exploit the school choice advantages offered by a second failure to achieve AYP.

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I. **Introduction**

The 2002 No Child Left Behind (NCLB) Act required states to administer standardized tests to students in all schools and identify schools that fail to meet state established standards overall or in any specified subgroup. Schools that fail to meet standards are monitored in order to establish whether they achieve "Adequate Yearly Progress" (AYP) towards the state standards. For districts and schools that receive Title 1 funds, a significant sanction associated with failure to achieve AYP for two consecutive years is that students attending these low performing schools must be provided the opportunity to attend a non-failing school. In school districts that have extensive school choice opportunities and many oversubscribed schools, the school choice sanction is often implemented in part by providing students at failing schools with improved odds in lotteries for spots at oversubscribed schools.[1]

A large and growing literature finds that state and federal accountability policies such as NCLB may have positive effects on student achievement [Carnoy and Loeb, 2002; Hanushek and Raymond, 2005; Jacob, 2005; Figlio and Rouse, 2006; West and Peterson, 2006; Reback, 2008; Rockoff and Turner, 2010; Dee and Jacob, 2011; Chakrabarti, 2013]. At the same time, however, a parallel literature documents the many unintended consequences of school accountability policies on the behavior of school administrators and teachers. For example, Cullen and Reback (2006), Jacob (2005) and Figlio and Getzler (2006) find that schools attempt to strategically manipulate the composition of the test-taking pool by reclassifying students into exempt categories when faced with accountability mandates.[2] Similarly, Figlio (2006) finds that schools in Florida threatened with accountability sanctions were more likely to suspend low-performing students during testing windows while Figlio and Winicki (2005) find that schools in Virginia threatened with accountability sanctions increased the caloric content of school lunches on testing days. Finally, Jacob (2005) finds that accountability systems induce teachers to focus more heavily on tested subjects, such as math and reading, at the expense of other subjects while Jacob and Levitt (2003) find that accountability systems increase the prevalence of teacher cheating.

A common feature of studies that examine the unintended consequences of state and federal accountability policies is that they tend to focus on how those policies affect the behavior of school

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[1] Examples of districts that provide students at NCLB failing schools with priority at gaining access to schools of choice include Charlotte-Mecklenburg, NC, Portland, OR and Albuquerque, NM to name a few. In addition, in California students attending a program improvement school ranked in the first decile on the Annual Performance Index (API) are given priority in the school choice lottery. Similarly, in Florida and Oregon, charter schools "may use an admissions lottery that gives extra weight to students seeking to change schools under the Title I public school choice requirements."

[2] Reback (2008) documents that schools facing accountability ratings in Texas focused on improving the performance of students on the margin of meeting accountability ratings at the expense of higher achieving students. Similarly, Neal and Schanzenhach (2010) document that accountability standards induce teachers to focus on students near the current proficiency standard while providing no extra help to students that were already proficient or students that were unlikely to meet the proficiency standard in the near future.

administrators and teachers. What has largely been overlooked in the literature is how accountability mandates may affect the residential location decisions of families. Specifically, an unintended consequence of the NCLB school choice provisions and other large scale accountability programs with significant school choice provisions is that they may create an incentive for households with strong preferences for school choice and/or school quality to move into the attendance zones of failing schools in order to improve their likelihood of being admitted into high performing schools.

The purpose of this paper is to provide the first direct empirical evidence on how NCLB school choice provisions affect housing markets and the residential location decisions of families. Specifically, we hypothesize that households with strong tastes for school quality may strategically move into the best neighborhoods in attendance zones of schools that fail to meet AYP standards for two consecutive years in order to improve their likelihood of being admitted into high-performing, over-subscribed schools. To test that hypothesis, we use data from the Charlotte-Mecklenburg county school district in North Carolina to examine how failure to meet AYP standards affects housing prices, the income of individuals buying homes and the school choice decisions and educational outcomes of students.[3]

To identify the effect of school failure, we focus on neighborhoods (proxied by Census block groups) that cross school attendance zone boundaries and compare the outcome changes that occur on the side of an attendance zone boundary where a second failure to meet AYP standards occurs, to the outcome changes that occur on the other side of the attendance zone boundary where a second failure did not take place. We examine these changes by pre-NCLB housing value neighborhood terciles in order to focus on the effect in the highest priced neighborhoods, where households with strong tastes for amenities, such as school or neighborhood quality, are likely to locate. It is important to note that the mobility rates in our sample are relatively high so that our results do not require that a substantial number of households choose to move residence in order to take advantage of enhanced school choice options, but simply as households move their residence for a variety of reasons, location and school choices appear to be affected by the school choice provisions of NCLB.

Our identification strategy effectively conducts separate difference-in-differences boundary analyses for high, medium and low price/quality neighborhoods on the boundary between school attendance zones

[3] In Charlotte NC, a school is subject to NCLB sanctions if it fails to meet AYP standards for two consecutive years and it is classified as a Tile 1 school (defined as a school where 75% or more of the students qualify for federal lunch subsidies). These schools are commonly referred to as "Title 1 Choice Schools." Students within the attendance zones of these schools are given priority in lotteries to attend schools that are not Title I Choice Schools (both magnet schools and traditional non-assigned schools). In addition, students who do not gain admission to a school of their choice through the lottery process are guaranteed admission to another non-Title I Choice School. Students enrolled in a non-assigned school can remain in that school through the last grade offered by the school without participating in the lottery. Beginning in 2006-07, students enrolled in magnet schools can remain in the school through the last grade offered by the school and then feed to another magnet school without participating in the lottery.

where one school fails AYP during our sample period. We control for neighborhood-by-year fixed effects allowing for non-parametric trends in neighborhood and student outcomes and school fixed effects to control both for the direct effect of school quality on student outcomes and for the potential long-run sorting of students across attendance zones into schools. Our model is therefore identified by comparing deviations from neighborhood trends on either side of a school attendance zone boundary after one school fails to meet AYP standards. To further support the exogeneity of exposure to AYP failure, in our main specifications we assign every home and student to their original 2002-2003 residential location and school attendance zone, which is the first year after redistricting following the end of court enforced busing in Charlotte.[4] Balancing tests verify that student attributes on either side of attendance zone boundaries cannot explain which schools experience an AYP failure.

While our use of 2002-2003 residential locations helps mitigate concerns over the impact of non-random sorting and mobility on student outcomes, it also impedes our ability to examine an outcome of primary interest, namely the impact of failure to meet AYP standards on residential mobility and the school choice decisions of families. Thus, we also estimate student level specifications that utilize contemporaneous residential locations and include student fixed effects in these specifications to mitigate concerns over the potential correlation between student unobervables and the movement into (or out of) the attendance zones of schools that fail to meet AYP. To further support the claim that estimates from these alternative specifications have a causal interpretation we conduct a series of falsification tests where we assign each school's failure to arise two years earlier than it actually occurred. Results from these falsification tests provide no evidence of a correlation between our key outcomes and assigned failure.

In specifications where we assign every home and student to their original 2002-2003 residential location, we find that relatively high quality neighborhoods in the attendance zones of schools that fail to meet AYP experience increasing housing prices and homebuyer income relative to neighborhoods on the other side of the attendance zone boundaries. We also find that student mobility falls while the probability of attending a non-assigned magnet school rises in the highest quality neighborhoods in failing school attendance zones in comparison to locations on the other side of the attendance zone boundary. Finally, we find no evidence that the AYP failure affects student test scores although our standard errors are too large to rule out relatively large positive effects on reading scores.

In specifications where we utilize contemporaneous residential locations, we once again find that, for original residents (i.e. students that never moved), the probability of attending a non-assigned magnet school rises in the highest quality neighborhoods in failing school attendance zones. For new entrants (i.e. students that moved to a new school attendance zone after 2002-03) however, we find that failure to

[4] See Billings, Deming and Rockoff (2014) for a discussion of the exogeneity of redistricting boundaries at this time.

meet AYP standards has little effect on the probability of attending a non-assigned magnet school. In contrast, we find a large, positive and statistically significant effect of failure to meet AYP on the probability of attending a non-assigned, *non-magnet* school for new entrants located in the highest quality neighborhoods of failing schools, an effect that is absent for original residents. Specifically, we find that new residents that move into the nicest neighborhoods with failing schools are approximately 65 percentage points more likely to attend a non-assigned school. The results for new entrants are robust to both dropping all students that moved prior to the fail and coding new entrants that remained in their old assigned school (even after changing their residential location) as attending an assigned school. While a substantial number of movers to zones assigned to a failing school leave their child at the originally assigned school, new residents to the nicest neighborhoods with a failing school are 28 percentage points more likely to attend a new, non-assigned school. Thus, the school choice effects we identify appear to be being driven predominantly by individuals who exercised choice after moving into the neighborhood.

Finally, we also find that a school's AYP failure affects location decisions among movers to the same neighborhood. In the lowest price neighborhoods, school failure lowers the likelihood of moving to the failing school's attendance zone relative to other locations in the neighborhood. In contrast, in the highest price neighborhoods school failure increases the likelihood of moving to the attendance zone of the failing school relative to other locations in the same neighborhood. In addition, results from a series of falsification tests reveal that in the two years prior to the failure the exact opposite pattern occurs: in the lowest price neighborhoods, the likelihood of moving into the attendance zone of the school that is "soon to fail" increases relative to other locations in the same neighborhood and in the highest price neighborhoods the likelihood of moving into the "soon to fail" school attendance zone declines relative to other locations in the same neighborhood.

In addition to contributing to the literature on the unintended consequences of large-scale accountability policies and how those policies affect student achievement, our work also contributes to a growing literature on how households respond and benefit from school choice programs. Hastings, Kane, and Staiger (2008) find that low income families place less weight on academics when selecting schools.[5] They also find that students whose parents place the highest weight on academic performance tend to experience increases in test scores when granted access to their first choice school.[6] Similarly, Hastings and Weinstein (2008) find that the provision of NCLB mandated information increases the fraction of

[5] In Chicago Public Schools, Cullen, Jacob, and Levitt (2006) and Cullen and Jacob (2008) find that winning the lottery to attend a first choice school has little impact on the average test score of the school attended and school choice has no impact on student performance. On related topics, Jacob and Lefgren (2007) find that low income and minority parents are less likely to actively select a teacher, and Hastings, Kane, and Staiger (2008) find that low income families exert less pressure on low performing schools to improve performance.

[6] Also see Deming, Hastings, Kane, and Staiger (2014) who find evidence of an effect on high school graduation, college attendance and college completion.

parents that select high-performing schools and that proximity to a high scoring alternative school is a major predictor for choosing a school that yields improvements in test scores.[7] Consistent with these studies, our results suggest that families in the nicest neighborhoods, likely those with the highest income and strongest taste for amenities, are more likely than families in lower price neighborhoods to take advantage of the school choice provisions associated with NCLB and to strategically move into the attendance area of failing schools in order to gain access to enhanced school choice options.

II. Methodology

Our analyses use difference-in-differences across attendance zone boundaries and over time to identify the effect of the preferential choice provisions associated with failure to achieve annual yearly progress under NCLB in the Charlotte-Mecklenburg school district. The 2001-2002 redistricting of attendance zones for Charlotte-Mecklenburg schools following the end of court ordered desegregation efforts created a relatively exogenous distribution of individuals and housing stock across attendance zones. Our key identification strategy examines changes in the housing market and student choices and outcomes over time, compares differences in these changes across attendance zones, and tests whether the across attendance zone differences vary with neighborhood quality (proxied by pre-NCLB housing values). Specifically, we test whether the relationship between changes in student or housing market outcomes and failure to achieve annual progress varies by neighborhood quality controlling for both school assignment based on attendance zone and neighborhood-by-year fixed effects where neighborhoods typically cross attendance zone boundaries.[8]

Two concerns exist with establishing a causal relationship between a school's failure to meet AYP standards and housing market and student outcomes. First, since families may sort in response to failing designation, it is problematic to use contemporaneous addresses to determine a student's school assignment. Second, even though school assignment boundaries were relatively stable after 2002-2003, approximately 12 percent of parcels were re-assigned to at least one new school between 2004 and 2011. Some of this re-assignment was due to the introduction of new schools, but one may be concerned that failing schools may be subject to a larger amount of boundary changes due to the loss of students under

[7] In a charter school context, Angrist, Dynarski, Kane, Pathak, and Walters (2012) and Angrist, Pathak, and Walters (2013) find that low income, lower scoring, and urban school students benefit most from selecting out of public schools.

[8] This difference-in-differences strategy is very similar to the strategy used in Dhar and Ross (2012) except that in our case the across time variation is driven by a specific event, the second failure under NCLB. Further, most of Dhar and Ross's (2012) boundaries had been stable for several years, while Charlotte-Mecklenburg boundaries were redistricted just prior to our sample period and so there was little time for systematic residential sorting across boundaries prior the implementation of NCLB. Consistent with that notion, Billings, Deming and Rockoff (2014) find no evidence of residential relocation in 2001-02 or 2002-03 in response to redistricting.

the public school choice provisions of NCLB. Since most boundary changes are related to school capacity issues, the re-drawing of school attendance boundaries may be related to failing designation.

To address these issues, in our primary specification we assign every parcel and student to their 2002-2003 school attendance zone. The 2002-2003 school year represents the first year after the school attendance boundaries were redrawn in response to a court order to cease busing for racial integration.[9] It also represents the first school-year after CMS allowed for district-wide school choice following redistricting and thus allows very little time for students to sort into new neighborhoods. Fixing parcels and students to their assigned school attendance zones just after those reorganizations but prior to NCLB implementation also allows us to incorporate school assignment prior to any effect from NCLB.[10]

The resulting empirical model for our key housing transaction and student outcomes is:

$$y_{ijst} = \gamma_1 F_{ts} + \gamma_2 F_{ts} * Z_j + \beta X_{st-1} + \delta_{jt} + \theta_s + \varepsilon_{ijst} \text{ ,} \qquad (1)$$

where y_{ijst} represents an outcome of interest for observation i (housing unit or student) in neighborhood j, school assignment s, and year t, F_{ts} is an indicator variable for whether one of the schools (elementary or middle) to which the housing unit or student was assigned in 2002-2003 (base year) failed to achieve NCLB annual yearly progress in both years t-1 and t-2,[11] Z_j is a vector of two indicator variables that take the value of unity if a neighborhood is in the second or third tercile of district-wide pre-NCLB housing values among block groups that contain at least one attendance zone that experienced two consecutive NCLB failures, X_{st-1} is a vector of lagged school test score outcomes based on assignment to school s in 2002-2003,[12] δ_{jt} is a vector of 2002-2003 neighborhood-by-year fixed effects allowing for non-parametric trends in neighborhood circumstances over time, θ_s is a vector of fixed effects associated with the geographically assigned school in 2002-2003, and ε_{ijst} is a random disturbance term. While our identification strategy is designed to avoid sorting on unobservables, schools may directly impact student

[9] See Billings, Deming and Rockoff (2014) for details on the effects of the court-ordered end to desegregation policies in CMS on a variety of student outcomes.
[10] This approach minimizes potential sorting bias, but does increase measurement error since some students and parcels were re-assigned to a new school after 2003 and other students changed residence and moved to an alternative school assignment zone. Alternatively, the estimates of γ_1 and γ_2 from equation (1) can be thought of as intention-to-treat effects.
[11] The vast majority of schools that fail for a second time continue to fail annual yearly progress in the following years of our sample. Our analyses are robust to dropping schools from the sample that fail a second time and then subsequently pass at a later date. Further, once a student is admitted to a lottery school, the student can remain at this school even if their assigned school passes AYP at a later date.
[12] These controls include the lagged test scores of the assigned elementary, middle and high school. Given that annual yearly progress is based in part on school test scores, these controls can be viewed informally as the running variable usually incorporated in a regression discontinuity analysis relative to the temporal discontinuity created by AYP failure.

choice beyond the effect of the AYP failure. Therefore, school fixed effects are included to capture time invariant differences across schools and lagged test scores are included to address trends in school quality.

The coefficients of primary interest in equation (1) are γ_1 and γ_2, the coefficients on the indicator for whether a school fails to meet AYP standards and the interaction between that indicator and the neighborhood quality tercile indicators. The estimated coefficient on the indicator variable for failure to meet AYP standards, γ_1, represents the average effect of failure to meet AYP standards (treatment) among the lowest income neighborhoods for housing units and students located within the attendance zones of failing schools relative to other units and students in the non-failing school zones (control) within the neighborhood, while γ_2 represents the difference between γ_1 and the effect for neighborhoods located in either the 2nd or 3rd tercile of pre-NCLB neighborhood quality. Thus, γ_1 is a standard difference-in-differences (DD) estimate of the effect of treatment (failure to meet AYP standards) on our outcomes of interest, while γ_2 represents the difference between the difference-in-differences effect of failure to meet AYP for the lowest income neighborhoods and the effect of failure to meet AYP for other terciles of neighborhood quality.

We also conduct a balancing test to provide further evidence that the estimates from equation (1) have a causal interpretation. Specifically, using the cross-sectional variation in the sample, we regress an indicator variable for whether a school ever had a second consecutive failure during our sample period (i.e. the treatment) on predetermined student attributes W_{ijs}:

$$F^E_{ijs} = \lambda W_{ijs} + \delta_j + \varepsilon_{ijs} \;, \qquad (2)$$

where F^E_{ijs} equals 1 if $F_{ts} = 1$ for any $t \geq t_0$ and equals 0 otherwise and δ_j is a set of block group fixed effects. Our balancing test is designed to examine whether predetermined student attributes appear to "cause" the treatment conditional on the controls that should render the treatment exogenous (i.e. block group fixed effects). Note however, that the identification strategy outlined in equation (1) includes both block group and school attendance zone fixed effects. The latter set of fixed effects cannot be included in our balancing test since the unit of observation is a school. However, to provide a balancing test that more closely resembles our identification strategy we also estimate models of the form:

$$F^E_{ijs} = \lambda W_{ijs} + \delta_j + \tau S_s + \varepsilon_{ijs} \;, \qquad (3)$$

where S_s is a vector of observable pre-NCLB school characteristics and is used as a substitute for the school fixed effects. We should note that equations (2) and (3) provide different tests of balance. Specifically, equation (2) tests for whether students are randomly assigned on either side of every block group while equation (3) tests for balance after controlling for differences within each school attendance zone. The first test provides a very strong test for the exogeneity of residential location to assigned school as of 2002-2003 and so provides the best evidence of quasi-randomness on school assignment. The second test follows our model specification more closely in that it allows students to have sorted into attendance zones at least based on observables, but tests whether students have sorted systematically into specific regions of the attendance zone. This second test is sufficient for our difference-in-differences strategy because that strategy removes attendance zone fixed effects prior to making comparisons across boundaries over time.

While the use of student assignment in 2002-2003 avoids the impact of non-random sorting and mobility on student outcomes, we are also directly interested in whether failure to meet AYP standards causes some families to move into the neighborhoods of failing schools in order to take advantage of the school choice preferences provided by the second failure on AYP. Thus, we examine the outcomes for all students residing in a neighborhood after a failure using a model that exploits information on the student's current neighborhood *k* and current school attendance zone *n* at time *t* and controls for student fixed effects.[13] Specifically,

$$y_{iknt} = \gamma_1 F_{tn} + \gamma_2 F_{tn} * Z_k + \beta X_{nt-1} + \delta_{kt} + \theta_n + \pi_i + \varepsilon_{iknt} \,, \qquad (4)$$

where student fixed effects π_i assure that the model is identified by observing changes in outcomes for students who currently live in an attendance zone where a school fails to meet AYP standards twice. Note that in these specifications, a student's assigned school is not held constant and may change due to residential mobility or redistricting. The resulting analysis retains the difference-in-difference structure, but now the differences across boundaries do not have the exogeneity provided by using the residential locations immediately following the post-busing redistricting, which is why we add student fixed effects to these specifications. These models are also estimated separately for movers and stayers in each attendance zone.

Finally, we examine how AYP failure affects residential location choice by using a sample of movers to each particular neighborhood and examining the likelihood of choosing the side of the neighborhood assigned to the failing school. The intuition behind this analysis is that within neighborhood the choice provisions of failure may make the attendance zone where the school fails more attractive among movers. Specifically, for a sample of residential moves *i* at time *t* to block group *j* within our sample of students, we create a variable $\tilde{y}_{isjt}$ that equals 1 if the student moves to an attendance zone of a failing school (i.e. ever failed to meet AYP standards for two consecutive years) and 0 if the selected attendance zone is for a

[13] Because changes in school attendance zone boundaries are potentially endogenous, we use 2002-03 boundaries in all of our models. Thus, in equation (4), a student's current school attendance zone is defined in terms of the boundaries that existed in 2002-03.

non-failing school (i.e. never failed to meet AYP standards for two consecutive years) regardless of whether the move occurred before or after the AYP failure. This location choice variable is regressed on an indicator variable for whether one of the schools s (elementary or middle) in block group j failed to achieve NCLB annual yearly progress in both years *u-1* and *u-2* for $u \leq t$ ($\tilde{F}_{tsj}$) in order to test whether the likelihood of choosing the failing side of the block group changes immediately after the AYP failure occurs. The estimating equation is:

$$\tilde{y}_{isjt} = \gamma_1 \tilde{F}_{tsj} + \gamma_2 \tilde{F}_{tsj} * Z_j + \beta \tilde{X}_{ij} + \delta_j + \varepsilon_{isjt} , \qquad (5)$$

where Z_j is a vector of two indicator variables that take the value of unity if a neighborhood is in the second or third tercile of district-wide pre-NCLB housing values among block groups that contain at least one attendance zone that experienced two consecutive NCLB failures, $\tilde{X}_{ij}$ is vector that contains the individual's first test score observed in the school district plus an indicator for whether no test score was observed prior to the move, δ_j is a vector of neighborhood fixed effects, and ε_{isjt} is a random disturbance term.

III. Data

We combine a number of administrative databases in order to track students as well as property values and homebuyer income for our study area of Charlotte. All of our datasets are assigned to individual addresses thus allowing us to define neighborhoods and outcomes based on small spatial units as well as school attendance boundaries. We obtained parcel-level data on the structural characteristics of properties as well as complete records of any sales transaction for all parcels located in Mecklenburg County from 1994 through 2010 from the Mecklenburg County assessor's office. We limit our analysis of property valuation to single-family homes and include 106,736 transacted sales of single-family homes between 2003 and 2010.

In order to examine neighborhood income and price trends, we acquired the population of mortgage deeds of trust in Mecklenburg County from 2004-2010. The mortgage deeds data provides parcel-level information on every homebuyer that acquired a mortgage in the purchase of a home, including the homebuyer's name, the mortgage amounts (including the loan amount), the name of mortgage lender and the exact address of each parcel. These mortgage deeds are then subsequently linked to Home Mortgage Disclosure Act (HMDA) data in order to assign individual mortgages to a homebuyer's mortgage application stated income. The HMDA data provide information on a homebuyer's income as well as information on the mortgage loan amount, the name of the mortgage lender, and the census tract of the purchased home. To merge the mortgage deeds data with the HMDA data, we first geocoded the address of each home in the mortgage deeds data to obtain the census tract within which each home was located. We then merged the two datasets based on: 1) mortgage loan amount, 2) mortgage lender name and 3) census tract. Based on this matching process, we were able to successfully match approximately 80 percent of the mortgage originations that occurred between 2004 and 2010. To limit the influence of rental properties, we further restricted the matched data in three ways. First, we dropped parcels for which the property address did not match the owner's mailing address and second, we exclude mortgages with stated annual income of more than $250,000, and finally we drop mortgages that are not described in HMDA as owner-occupied. These restrictions left us with 58,558 parcel-level observations on homebuyer incomes.

To examine residential mobility, school choice, and student achievement trends, we use administrative records from Charlotte-Mecklenburg Schools (CMS) for all individual students that attended public school for any school year between 2002-2003 and 2010-2011 and enrolled in grade 8 or lower. This unbalanced panel allows us to characterize initial entry into the school system as well as transfers among schools within CMS.[14] Student data includes information on gender, race and yearly end-of-grade (EOG) test scores for grades 3 through 8 in math and reading. All EOG tests were standardized and administered across the state of North Carolina and corresponding test scores are normalized to mean zero with standard deviation of one for the entire state. We also create variables for whether the student attends a non-magnet school to which they are not assigned or attends a magnet school. The student-level administrative records also include the exact address of residence in every year for every student in CMS. Of our initial sample, two percent have missing or invalid address information, which leaves us with 88,984 unique students in CMS during the 2002-2003 school year. We observe these students for an average of 3.5 years during our study time period. Student level geographical information allows us to determine a student's assigned school for each year and match each student to a unique neighborhood.

We focus on the 2002-2003 through 2010-2011 school years given the introduction of NCLB in 2003 and associated designation of failing schools beginning in the 2004-2005 academic school year. As noted previously, in Charlotte NC a school is subject to NCLB sanctions if it fails to meet AYP standards for two consecutive years and it is classified as a Tile 1 school (defined as a school where 75% or more of the students qualify for federal lunch subsidies). Thus, we define failing schools as Tile 1 schools that failed to meet AYP standards for two consecutive years. In North Carolina these schools are commonly referred to as Title 1 Choice Schools. To meet AYP standards, a school must satisfy statewide proficiency goals in math and reading for ten subgroups of students. If a school misses the proficiency

[14] We are limited in our ability to track private school students, but are able to observe a homebuyer's purchase of a home in a neighborhood prior to entry into CMS.

goal for just one subgroup, it does not make AYP. Of the 116 elementary and 48 middle schools in operation between 2003 and 2011,[15] a total of 24 elementary schools and 9 middle schools received a failing designation over this time period and no high schools were designated as failing.

Table 1 provides descriptive statistics across our sample of 367 block groups or neighborhoods. The first column of Table 1 presents means and standard deviations based on the entire sample of block groups. Columns 2, 3 and 4 present summary statistics based on terciles of mean block group housing prices where mean housing prices are based on the pre-NCLB transaction sale price of homes between 1998 and 2002. The house price terciles were constructed using all the block groups where the mean housing price is at or below the highest mean housing price observed for the subsample of block groups that contain an attendance zone boundary associated with a failing school sometime during our sample period.[16] The header row of Table 1 gives the minimum and maximum average housing price for each tercile. Finally, column 5 presents summary statistics for the subsample of the highest housing price block groups (those with average housing prices of $390,000 or more) that do not contain an attendance zone associated with a failing school and thus provide no information on the effect of AYP failure. The table shows that the number of failing schools decreases in higher quality neighborhoods. Most school choice is associated with non-magnet schools and while selection into magnet schools is positively associated with neighborhood income, selection into non-magnet schools actually decreases with neighborhood income. As expected, sales price, mortgage stated income and assigned school test scores increase with neighborhood quality.

Before proceeding there are several important issues worthy of further discussion. First, although we present summary statistics in Table 1 for block groups with pre NCLB sale prices of $390,000 or more for comparison purposes, our sample excludes these block groups since they do not contain an attendance zone associated with a failing school. Second our housing price terciles are absolute in nature based on the entire sample rather than relative to other neighborhoods along the same attendance zone boundary. Finally, the number of failures in the highest price tercile is relatively low and so our parameter of interest, which is the difference between the effect of failure in the highest and lowest price terciles, is based on 14 top tercile block groups with a failure as compared to 39 and 62 block groups with a failure for the middle and lowest price terciles. The distribution of failing block groups by pre NCLB sale prices is show in Figure 1. The distribution of block groups is quite skewed and additional block groups cannot

[15] These numbers include magnet schools and schools that opened after 2003. Excluding magnet and other special education facilities, there were 94 elementary and 30 middle schools in operation between 2003 and 2011. In 2003, there were77 elementary and 23 middle schools in operation.
[16] In creating terciles, we weight by the number of students in a block group so that each tercile has an equal number of students.

be incorporated into the top price subsample without adding block groups that have substantially lower price levels than the subsample as a whole.

While Table 1 indicates that overall use of school choice actually falls with neighborhood quality, Figure 2 provides some initial evidence consistent with the notion that choice is primarily exercised in higher quality neighborhoods following an AYP failure. The top panel of Figure 2 plots the distribution of the portion of students that opt-out of assigned schools for each residential high-quality neighborhood while the bottom panel of Figure 2 plots the same information for low-quality neighborhoods. Consistent with our empirical specifications, we define neighborhood in this context as census block groups and 2002-2003 school attendance zones for elementary and middle school. This allows us to compare across neighborhoods defined by both parcel characteristics as well as school assignment. Figure 2 provides evidence that failing designation leads to greater opt-out of assigned schools only in higher quality neighborhoods. Specifically, the top panel of Figure 2 shows clear evidence of a rightward shift in the distribution of students that take advantage of school choice options in higher-quality neighborhoods. In contrast, the bottom panel of Figure 2 shows no such evidence of a rightward shift in the distribution of students that take advantage of school choice options in lower-quality neighborhoods.

With that in mind, we now turn to the results from the balancing tests specified in equations (2) and (3). Recall that our balancing tests are designed to examine whether predetermined housing and student attributes appear to "cause" the treatment conditional on the controls that should render the treatment exogenous. Thus, to implement our test, we regress an indicator variable for whether a school ever failed to meet AYP standards during our sample time frame on predetermined student attributes. We then test whether any of the predetermined attributes have a statistically significant effect on the probability of failure and whether all the estimated coefficients are jointly equal to zero. The estimates reported in Table 2 are linear probability model estimates with standard errors clustered at the census block group.

In column 1 of Table 2, which provides estimates based on equation (2), the only coefficient that is statistically significant is the estimated coefficient on reading test scores and that coefficient is only significant at the 10 percent level. Furthermore, as shown in the lower panel of column 1, based on an F-test, we fail to reject the null hypothesis that all the estimated coefficients are jointly equal to zero. Recall that the specification presented in column 1 is designed to provide the best evidence of quasi-randomness on school assignment since it provides a very strong test for the exogeneity of residential location to assigned school as of 2002-2003. Thus, the fact that we fail to reject the null hypothesis that all the estimated coefficients are jointly equal to zero is quite encouraging. In column 2, which provides estimates based on equation (3), none of the estimated coefficients are statistically significant, the coefficient on reading test scores has fallen significantly and we once again fail to reject the null hypothesis that all the estimated coefficients are jointly equal to zero. Thus, the results reported in Table

2 provide greater confidence that estimates based on our identification strategy are unlikely to be driven by a correlation between failure to meet AYP standards and neighborhood and school unobservables.

Before presenting our key findings regarding the effect of failure to meet AYP standards on housing market and student outcomes, it is instructive to first examine how average student attributes differ depending on whether or not a block group is located within the attendance zone of a school that ever experienced an AYP failure. Table 3 provides that information. Specifically, the table shows average student attributes by block group neighborhood quality terciles by whether or not the block group contains a school that ever failed to meet AYP standards. As the table reveals, there are rather large differences in the characteristics of block groups that do and do not contain a school that ever failed to meet AYP standards, particularly in the highest quality neighborhoods (NBHD3).[17] As columns 6 and 7 reveal, block groups that contain a failing school tend to have substantially higher concentrations of Black and Hispanic students and substantially lower individual-level and school-level test scores. Furthermore, as expected, in block groups that contain a failing school a significantly higher proportion of students attend a non-assigned school or a magnet school, particularly in the highest quality neighborhoods. It is important to note that Table 3 is not a balancing test; rather it is designed to provide context on the generalizability and interpretation of our subsequent results. In particular, recall that our model is identified by block groups that cross school attendance zone boundaries and contain at least one school that failed to meet AYP standards during our sample timeframe. What Table 3 makes clear is that when interpreting our subsequent results it is important to note that the high price/quality neighborhoods that identify our model contain substantially higher concentrations of minority students and lower test score students than a "typical" high quality neighborhood.

IV. Results

A. Effects of Failure using 2002-03 Residential Location

Having provided some preliminary evidence that estimates based on our identification strategy have a causal interpretation, we now turn to presenting our key findings regarding the effect of failure to meet AYP standards on housing market and student outcomes. Results based on the estimation of equation (1) for our key housing transaction outcomes are presented in Table 4. The standard errors reported in Table 4 and all subsequent tables are clustered at the block group level to allow for within-neighborhood autocorrelation of the disturbance term. In the interest of brevity we report only the estimated coefficients

[17] These differences are not particularly surprising given that NCLB sanctions are only imposed on school that both fail to meet AYP standards for two consecutive years and are Title 1 schools and 75% or more of the students at Title 1 schools are eligible for federal lunch subsidies.

on the indicator variable for failing schools and the interaction terms between that indicator and the neighborhood quality tercile indicators.

Column 1 presents results where the dependent variable is the natural log of the sale price of residential homes. We begin by noting that the estimated coefficient on the indicator for failing designation (i.e. failed to meet AYP for two consecutive years) is negative in column 1 but statistically insignificant. Specifically, our difference-in-differences results suggest that in the lowest quality neighborhoods (first tercile of neighborhood quality) failure to meet AYP standards reduces property values by approximately 5 percent relative to housing located in non-failing school zones in the same neighborhood, but the estimate lacks statistical precision. Our finding that failing designation reduces home values is consistent with the results of Figlio and Lucas (2004) who find that housing markets respond to the assignment of letter grades for school quality even after controlling for test scores.

Turning to the estimated coefficients on the interaction terms between the indicator for failure to meet AYP and the neighborhood quality tercile indicators, we note that the estimated coefficients on the interaction terms for the higher quality neighborhoods (T2 and T3) are positive and statistically significant. In terms of magnitude, our estimates imply that the highest quality neighborhoods within the attendance zones of schools that fail to meet AYP experience between 11.7% (0.171-0.054 for T2) and 8.4% (0.138-0.054 for T3) increases in housing values relative to neighborhoods on the other side of the attendance zone boundary. Thus, the results reported in Table 4 are consistent with the notion that relative housing demand increases in the best neighborhoods in attendance zones of failing schools potentially in response to the improved likelihood of being admitted into higher performing, over-subscribed schools or in response to neighborhood quality changes that may arise in response to the improved school choice options.

Columns 2, 3 and 4 of Table 4 present results where the dependent variable is the natural log of homebuyer income. Column 2 is for the full Transaction-HMDA match sample, column 3 restricts the sample to owner-occupied transactions from the HMDA data, and column 4 restricts the sample to mortgages with stated incomes less than or equal to $250,000.[18] Similar to the housing value results, the estimated coefficients on the indicator for failing designation is negative in columns 2-4 but statistically insignificant. However, for the highest quality neighborhoods (i.e. the interactions with T3), income increases by between 21 and 26 percent: the nicest neighborhoods attract higher income borrowers after the NCLB failure occurs as compared to the housing in the same neighborhood, but in the attendance zone for a non-failing school.

[18] Note that in addition to the neighborhood-by-year fixed effects and school attendance zone fixed effects that are included in all specification, the sale price specification also includes 47 indicators for unique structural attributes and measures of proximity to the downtown Charlotte and the Interstate.

In Table 5 we turn our attention from housing transaction outcomes to student outcomes and ask how failure to meet AYP standards affects residential mobility. The dependent variable in these specifications is an indicator variable that takes the value of unity for the year a student left their original (2002-2003) neighborhood and a value of zero for all years prior to such a move or if a student never left their original neighborhood. The first panel of Table 5 reports estimates based on the specification given by equation (1). The second panel of Table 5 includes student fixed effects, implying the estimated effects are identified by the decision of an individual student's family to move following a failure relative to moving before the failure occurs. In both column 1 (no neighborhood quality interactions) and column 2 (with neighborhood quality interactions) the estimated coefficient on the indicator for failing designation is negative, but small in magnitude and statistically insignificant. However, for the highest quality neighborhoods, residential mobility declines in the highest price neighborhoods by between 2.4 and 5.5 percentage points. The estimates, however, are only statistically significant in the student fixed effect model reported in the second panel.

In Table 6 we examine how failure to meet AYP standards affects student participation in choice programs and student performance as measured by standardized test scores in the sample of original residents. Columns 1- 3 of Table 6 present results based on school choice. The dependent variables in these specifications are indicator variables that take the value of unity if a student attends a non-assigned school, a non-assigned, non-magnet school or a magnet school respectively. The equation (1) estimates in Panel 1 show that among original residents the use of non-magnet school choice increases for all neighborhoods, but for magnet schools the likelihood of a student attending such a school only increases in the highest quality neighborhoods. Panel 2 replicates the analysis in Panel 1 after including student fixed effects. All results are robust, and if anything the inclusion of student fixed effects leads to a moderate increase in the magnitude of the effects of failure on the use of choice.

Our finding that student mobility declines and use of magnet schools increases in the highest quality neighborhoods after a school receives a failing designation suggests that households located in these neighborhoods value the expanded school choice options that come with a failing designation. Specifically, while a failing designation provides information to parents that their child's assigned school is in need of improvement, it also provides those same parents with increased odds of gaining admission to an over-subscribed, high-performing school if they remain in their current school attendance zone. The fact that only parents located in the highest quality neighborhoods within a failing school zone appear to respond to the choice options that become available to them by reducing their residential mobility and enrolling in magnet schools at higher frequencies suggests that it is higher income/higher taste households that are most likely to take advantage of the NCLB choice options. That interpretation is consistent with the results of Hasting, Kane and Staiger (2008) who find that higher-SES parents are more likely to utilize school choice options to send their children to higher performing schools.

Columns 4 and 5 of Table 6 present the estimates for reading and math test scores, respectively. In both panels 1 and 2 all of the estimated coefficients are statistically insignificant suggesting that failure does not appear to have any effect on the test scores of original residents. We note however that our standard errors are too large to rule out relatively large positive effects on reading scores. Furthermore, the positive effects of failure on reading scores tend to be largest in the highest quality neighborhoods, which as discussed above, are also the neighborhoods where students are most likely to attend a non-assigned school, particularly a magnet school. Thus, the reading test score results reported in Table 6 provide suggestive evidence that gaining access to a non-assigned school, particularly a magnet school, may improve reading performance. Once again, we note however that our standard errors are too large to rule out no effect or even a negative effect on test scores.[19]

B. Effects of Failure using Current Residential Location

Table 7 presents the estimates from equation (4) where we allow the use of school choice and student test scores to depend upon each student's current residential location. We continue to restrict the sample to students who are in CMS in the 2002-03 school year, and continue to use the 2002-03 attendance zone boundaries. All of these specifications include student fixed effects in order to minimize bias from selection into schools and neighborhoods. The inclusion of student fixed effects implies that our estimates are identified by the decision of individual students to attend choice schools following a failure. Similar to Table 6, columns 1 through 3 contain the estimated effects for attending non-assigned schools, non-assigned, non-magnet schools, and magnet schools, respectively while columns 5 and 6 presents estimates for reading and math scores. The estimates for attending a non-assigned school or a non-assigned, non-magnet school change dramatically relative to the results reported in Table 6 with students in the highest quality neighborhoods now being 32 and 24 percentage points more likely to attend such schools. The estimates for magnet school attendance are relatively unchanged, and the estimates for test scores are small and statistically insignificant. These findings suggest that recent movers play a major role in the effect NCLB failure has on attendance in non-assigned schools, but may not play a major role in the use of magnet schools.

For our core results in Tables 4-6, our balancing tests provide evidence that variation in AYP failure across boundaries is exogenous suggesting that we should have relative confidence in our difference-in-

[19] The effect of switching to a higher quality non-assigned school on test scores is ambiguous. On the one hand, the ability to attend a better quality school could increase student performance. On the other hand, the disruptions associated with changing schools could decrease student performance. See Hanushek, Kain and Rivkin (2004) and Schwerdt and West (2013) for evidence on the impact of switching schools on student performance.

differences estimates. However, the results in Table 7 exploit information on an individual's current neighborhood and attendance zone raising concerns that those results may be biased because households systematically sort across attendance zone boundaries. In order to address this concern, we conduct a series of falsification tests for the current school and neighborhood models. The idea behind our falsification tests is simple: if the school choice outcomes we identified in Table 7 are causal, they should hold only after a school fails to meet AYP standards for two consecutive years and not prior to failure. To implement our test, we drop all observations after a school fails to meet AYP for two consecutive years (i.e. real failure) and then construct a placebo failing status indicator variable that takes the value of unity for school-years that are two years prior to the first year a school actually fails. We then re-estimated the models presented in Tables 7 using the placebo failure indicator and its interactions with neighborhood quality terciles instead of the actual failure indicator. Table 8 displays our falsification estimates. All of the point estimates reported in Table 8 are statistically insignificant and much smaller in magnitude than the corresponding point estimates reported in Table 7. Thus, we find no evidence of bias from families that were moving into the highest-quality neighborhoods of failing schools prior to the actual time of failure.

As noted above, the results reported in Table 7 suggest that recent movers play a significant role in the effect NCLB failure has on attendance at a non-assigned school. In order to examine this directly, we estimate our use of school choice models from equation (4) separately for students who live in a different neighborhood (movers) and for students who live in the same neighborhood (stayers) as compared to our base year of 2002-2003. These results are shown in Table 9. Columns 1-3 present results for the sample of movers on attendance at a non-assigned school, a non-assigned, non-magnet school and a magnet school, respectively. Columns 4-6 present the same information for stayers. We find that movers into the highest quality neighborhoods are dramatically 68 percentage points more likely to attend a non-assigned, non-magnet school. Again, the results are consistent with the effect of NCLB on non-assigned school attendance being driven largely by movers who appear more likely to select out of their assigned school after an AYP fail has occurred than before a fail.

Table 10 presents a final set of exercises to isolate decisions about school choice that are most likely to be related to failure. First, while our fixed effect estimates capture the effect of school choices that were made after a fail, these effects could arise simply because movers who have been in the school district for less time react more strongly to an AYP fail. In order to rule out that possibility, we re-estimate the models in Table 9 dropping all movers who moved to their current attendance zone prior to the AYP failure. These results are shown in the first three columns of Table 10, and all results are robust. Second, some families that changed residence and moved to a new school attendance zone may continue to send their child to the school associated with their previous residence, and this behavior may become much more likely when the school associated with their new residential location fails to meet AYP.[20] The next three columns of Table 10 mitigate this concern by recoding the dependent variable (attend a non-assigned school) to zero if a student remains in their original 02-03 school after moving. The last three columns both drop the movers before an AYP failure and recode the non-assigned school variable. As the last six columns in Table 10 reveal, recoding students that remain in their original 02-03 school after moving as *not* attending a non-assigned school, has a dramatic effect on the results: the estimated coefficients for movers into the highest quality neighborhoods (interactions with T3) fall substantially in magnitude but remain statistically significant at the 1% level. These results suggest that a significant fraction of the families that move into a failing school zone post failure, exercise school choice by continuing to send their child to their original 02-03 school after moving. Nevertheless, the results reported in columns 6-9 suggest that movers into the highest quality neighborhoods who do not continue to send their child to their original 02-03 school after moving, are approximately 27 percentage points more likely to attend a non-assigned, non-magnet school.

C. Examining the Location Choices of Movers

Table 11 presents estimates from equation (5) where we examine how AYP failure affects residential location choice within each block group. The first column presents the results for the full sample and the second column restricts our analysis to the children of movers who are observed in the school district in our base year of 2002-03. The last two columns repeat these analyses for the subsample of students for which we observe a test score prior to the move.[21] In the lowest price neighborhoods, failure reduces the likelihood of choosing the failing school attendance zone side of a block group presumably because the failure provides negative information about the school. As neighborhoods become more attractive, however, movers become more likely to select the attendance zone where the school failed, consistent with the idea that the choice provisions are more attractive to families with high tastes for amenities who tend to select into nicer neighborhoods.

Table 12 presents a series of falsification tests for the results reported in Table 11. Similar to Table 8, we implement our falsification tests by moving the date of AYP failure two years forward and dropping observations that arise after the failure. The resulting estimates are the mirror image of the estimates in Table 11. Families are more likely to select into the “soon to fail” attendance zone in lower quality neighborhoods, but become less likely to select into that “soon to fail” zone as neighborhood price/quality

[20] Movers are entitled to allow their children to remain at their current schools and so the school choice provisions may be of less value if the family intends to leave their children at their original school after the residential move.
[21] The analysis in the first two columns includes a dummy variable for students for which we do not have a pre-move test score, as opposed to using test scores from after the move as a control when no pre-move test score is available.

rises. The first implication of Table 12 is that our Table 11 estimates are not simply a spurious result associated with trends that are present in the data both before and after the AYP failure. Second, these results are also consistent with economic incentives. Presumably, AYP failure is often preceded by a period of declining school performance or at least improving documentation of poor school performance. The effect of declining performance on property values may lead to an influx of movers into the zone in lower quality neighborhoods, but might reduce the attractiveness of the zone for movers into higher quality neighborhoods who have stronger tastes for amenities. The choice provisions in NCLB appear to reverse these effects once an AYP failure has occurred.

V. Discussion

In this paper we examine the housing market, residential mobility, and academic performance changes that occur soon after a school fails to achieve Adequate Yearly Progress (for the second time) in the Charlotte, NC school district. We hypothesize that households with strong tastes for school quality may strategically move into the best neighborhoods in attendance zones of schools that fail to meet AYP standards for two consecutive years in order to improve their likelihood of being admitted into high-performing, over-subscribed schools. Consistent with that hypothesis, we find that after a school receives a failing designation, residential property values and new homebuyer income increase in the highest quality neighborhoods within attendance zones of failing schools in comparison to portions of the neighborhood just outside of the attendance zone. Our results also indicate that residential mobility decreases while the probability of attending a non-assigned traditional school or magnet school increases in these high quality neighborhoods. When we split our sample to examine the school choice decisions of families that remain in their original neighborhood both before and after their assigned school fails to meet AYP (stayers) and the school choice decisions of families that move into the attendance zone of a failing school post failing designation (movers), we find that our results regarding attendance at a non-assigned school are being driven largely by families that move into the highest quality neighborhoods in attendance zones of failing schools. Specifically, families that move into the highest quality neighborhoods in attendance zones of failing schools are 69 percentage points more likely to send their child to a non-assigned school and 28 percent more likely to send their child to a new, non-assigned school. Finally, among movers, families moving to the highest quality neighborhoods are more likely to select the attendance zone associated with the AYP failing school, which is the exact opposite of the pattern observed prior to AYP failure.

Collectively, our results suggest that families with strong tastes for school quality strategically move into the attendance zones of failing schools in order to gain access to expanded school choice. In that sense, our results are consistent with the findings of theoretical studies that examine the general equilibrium effects of expanded choice (e.g., Nechyba 2000, 2003; Epple and Romano 2003; Ferreyra 2007). For example, using structural and computable general equilibrium models, Ferreyra (2007) and Nechyba (2000) demonstrate that the introduction of private school vouchers, targeted to low performing school districts, induces relatively high income households to move into low-performing districts in order to take advantage of lower housing values and the ability to use school vouchers. These higher-income households purchase homes in neighborhoods with relatively high-quality housing stock, driving up property values and thereby "pricing out" some of the original lower-income residence of low-performing districts. Our finding that housing prices and the incomes of new homebuyers rise in the highest quality neighborhoods within attendance zones of failing schools provides empirical evidence consistent with the theoretical work of Nechyba (2000, 2003) and Ferreyra (2007).[22]

From a policy perspective, our findings that the choice advantages associated with failure to meet AYP standards causes incomes and housing prices to rise in the nicer neighborhoods within the attendance zones of failing schools, suggest that expanded school choice opportunities may reduce residential income stratification and induce gentrification effects. Furthermore, consistent with Vigdor (2010) our finding that residential mobility decreases in the highest quality neighborhoods in failing school attendance zones and thus that current residents do not appear to be crowded out of these neighborhoods due to rising housing values, suggests that original residents of these neighborhoods value the amenity effects of gentrification more than the increase in housing values. Finally, our results also point to an unintended consequence of the NCLB school choice provisions and other large scale accountability programs with significant school choice provisions, namely that the incentives created by these programs may lead to the benefits of the programs mainly accruing to households for which they were not intended. Specifically, our finding that households that move into the highest quality neighborhoods within the attendance zones of failing schools are substantially more likely to attend a non-assigned school than the current residents of those neighborhoods suggests that although the NCLB school choice provisions were designed to benefit the current residents of failing schools, the strategic behavior of mobile households leads to the benefits of the program mainly accruing to newer and presumably wealthier households.

[22] Brunner, Cho and Reback (2012) examine the effect of expanded inter-district choice on housing values and household income and also find evidence consistent with the predictions of the theoretical literature on the general equilibrium effects of expanded school choice.

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Table 1
Summary Statistics

	All	NBHD1	NBHD2	NBHD3	NBHD4
Average Sales Price (1998-2002) range		$31,466-$93,877	$93,930-$149,790	$150,235-$389,217	$391,362-$813,331
(Define Terciles)					
Sales Price	203,517	92,957	152,988	319,742	649,987
	(144,184)	(40,012)	(49,829)	(145,252)	(238,729)
Single Family Parcels	768.9	337.2	816.9	1073.3	278.7
	(663.9)	(229.0)	(624.0)	(739.7)	(133.5)
Multi Family Parcels	163.5	38.07	158.8	253.6	117.2
	(240.2)	(63.09)	(230.1)	(289.1)	(131.2)
Total Sales	69.57	21.52	70.04	108.1	21.49
	(85.41)	(20.24)	(77.66)	(103.9)	(26.91)
Mortgage Income	81.69	44.76	59.32	121.1	314.0
	(61.52)	(18.12)	(23.64)	(56.85)	(178.6)
Total Students	362.1	194.7	388.3	460.1	83.70
	(285.6)	(108.2)	(273.8)	(333.2)	(35.95)
Students Attend Non-assigned Schools (%)	0.288	0.393	0.317	0.270	0.300
	(0.195)	(0.148)	(0.159)	(0.192)	(0.197)
Magnet (%)	0.0785	0.0788	0.0791	0.0839	0.0627
	(0.0730)	(0.0594)	(0.0770)	(0.0870)	(0.0473)
Non-Magnet (%)	0.236	0.289	0.219	0.176	0.230
	(0.140)	(0.128)	(0.115)	(0.135)	(0.176)
Failing (%)	0.286	0.609	0.207	0.0776	0
	(0.410)	(0.425)	(0.358)	(0.230)	(0)
Avg Elementary School Test Scores	-0.0873	-0.454	-0.144	0.271	0.475
	(0.435)	(0.255)	(0.304)	(0.365)	(0.128)
Avg Middle School Test Scores	-0.134	-0.504	-0.184	0.222	0.463
	(0.450)	(0.277)	(0.304)	(0.395)	(0.151)
Avg High School Test Scores	-0.243	-0.475	-0.268	-0.0331	0.0836
	(0.312)	(0.273)	(0.250)	(0.237)	(0.103)
Census Block Groups	367	118	117	117	15

Notes: Panel Data by Neighborhood and Year-Quarter. Mean of each variable with standard deviation in parentheses. Neighborhood defined as census block groups. All summary statistics weighted by the number of students in a CBG. Test scores are normalized to mean zero an standard deviation of one relative to state average test scores in a given year and grade.

Figure 1
Distribution of Mean Sale Price by Block Group: 1998-2002

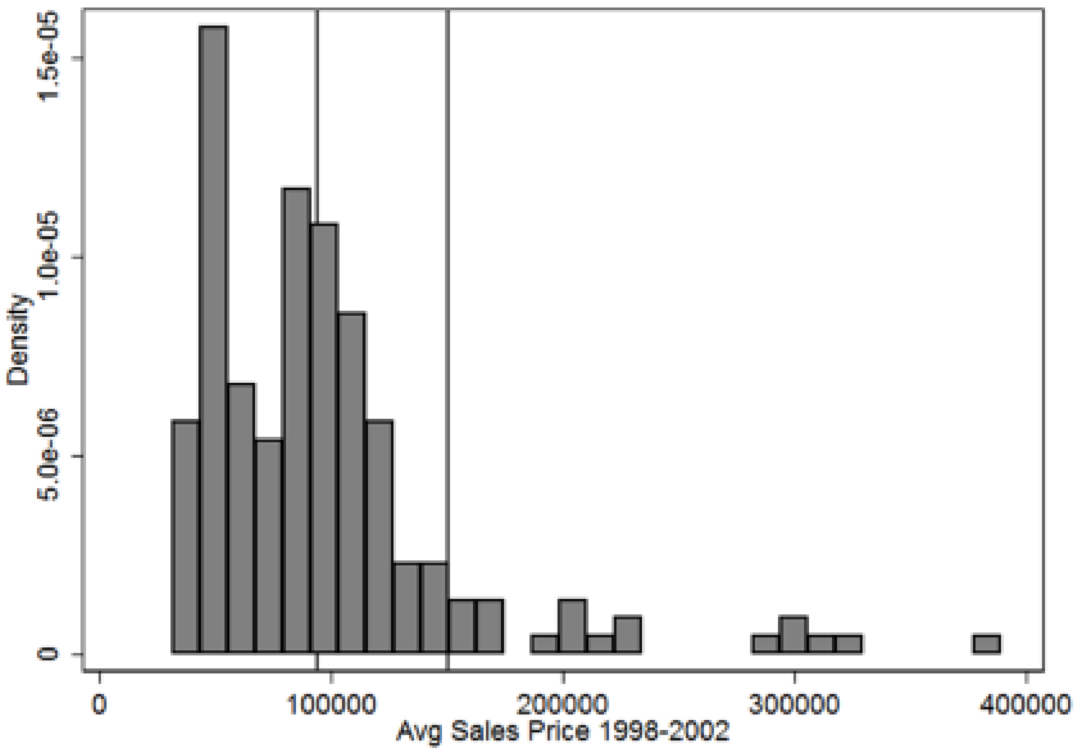

Figure 2
Distribution of Students Taking Advantage of School Choice Opportunities

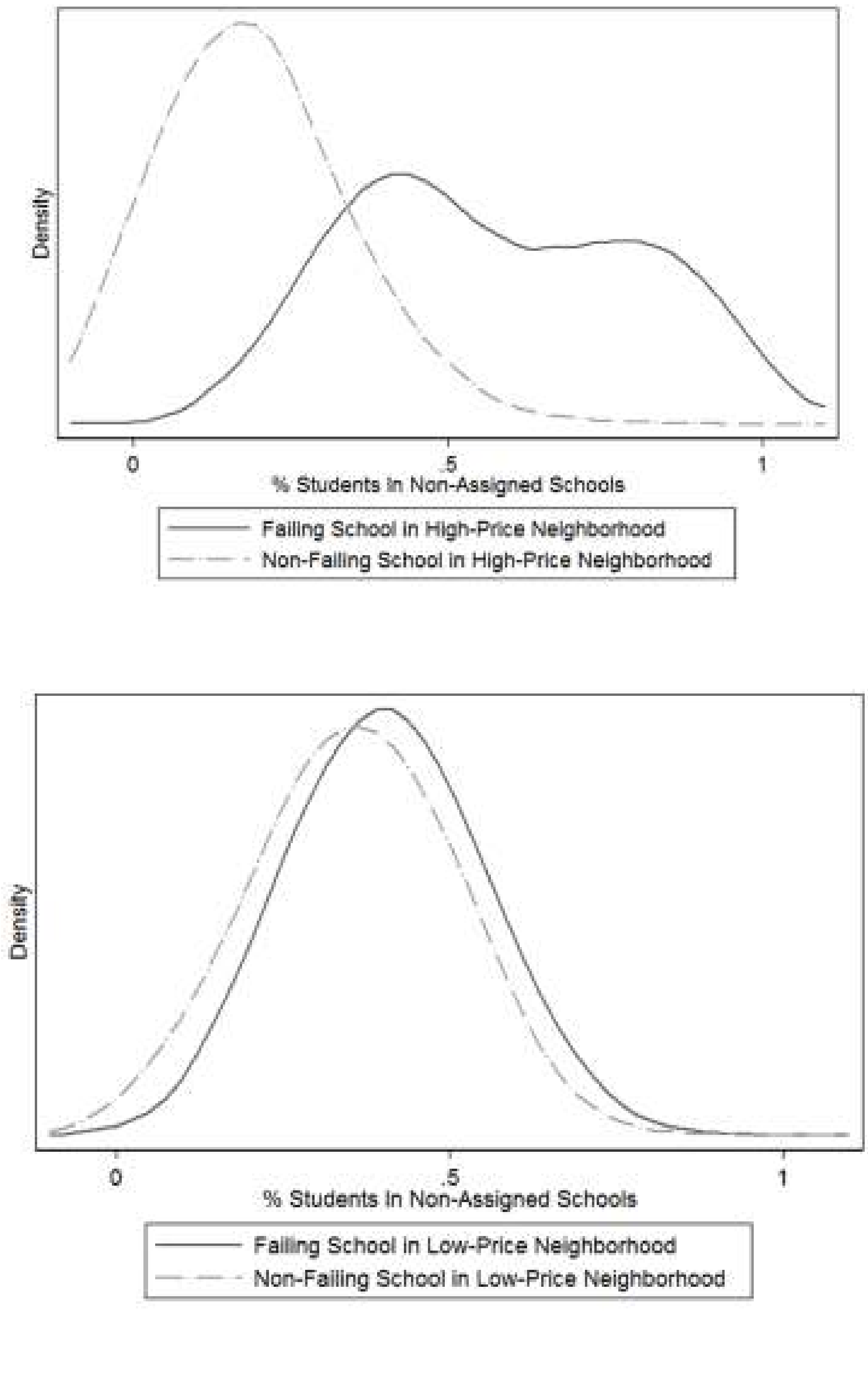

Table 2
Balancing Test

Variable	(1)	(2)
Male	0.0011	0.0013
	(0.0010)	(0.0010)
Black	-0.0057	-0.0080
	(0.0075)	(0.0067)
Hispanic	-0.0044	-0.0074
	(0.0072)	(0.0062)
Reading Test Score	-0.0030*	-0.0017
	(0.0016)	(0.0015)
Math Test Score	0.0005	0.0011
	(0.0014)	(0.0013)
Student Non-Compliance with School Assignment	0.0020	0.0021
	(0.0034)	(0.0031)
SF Parcel	-0.0042	-0.0075
	(0.0186)	(0.0165)
Missing Reading Test Score	0.0098	0.0035
	(0.0071)	(0.0073)
Missing Math Tes Score	-0.0086	-0.0023
	(0.0074)	(0.0071)
CBG Fixed Effects	X	X
School-level test score variables		X
F-Statistics p-value (All individual covars=0)	0.14	0.5
Observations	88,984	88,984

Notes: All covariates based on 2002-2003 school year and dependent variable is a dummy for a neighborhood ever being designated a failing school. All models include grade fixed effects and include all K through 8th grade students in CMS in 2003. Standard errors are clustered at the census block group level.

Table 3
Means by Failing Designation

	(1) All	(2) NBHD1	(3)	(4) NBHD2	(5)	(6) NBHD3	(7)
Average Sales Price (1998-2002) range *(Define Terciles)*		$31,466-$93,877		$93,930-$149,790		$150,235-$389,217	
CBG ever contains failing school	0.344	0	1	0	1	0	1
Student not attending Assigned Neighborhood School	0.350	0.401	0.456	0.330	0.411	0.252	0.450
Student attends Magnet School	0.0662	0.0542	0.0746	0.0651	0.0731	0.0584	0.152
Student attends Non-assigned Non-Magnet School	0.284	0.347	0.381	0.265	0.338	0.193	0.297
Live on SF Parcel	0.733	0.645	0.652	0.767	0.570	0.856	0.495
Male	0.514	0.517	0.515	0.517	0.513	0.510	0.516
Black	0.433	0.648	0.754	0.410	0.486	0.157	0.499
Hispanic	0.0958	0.133	0.101	0.0964	0.196	0.0473	0.0822
Reading test score	0.00439	-0.167	-0.255	0.00312	-0.110	0.270	0.0119
Math test score	0.00424	-0.189	-0.268	-0.00163	-0.112	0.287	-0.0383
School Grade	3.709	3.669	3.725	3.678	3.575	3.775	3.525
Avg Elementary School Test Scores	-0.0433	-0.218	-0.469	-0.00685	-0.322	0.379	-0.447
Avg Middle School Test Scores	-0.0502	-0.169	-0.403	0.00547	-0.368	0.296	-0.382
Avg High School Test Scores	-0.418	-0.536	-0.584	-0.396	-0.531	-0.252	-0.478
Observations	88,984	6,332	19,709	23,795	9,768	26,390	669

Notes: All variables based on 2002-2003 school year student population and individual covariates (except Avg Elementary/Middle/HS School Test Scores). Avg Elementary/Middle/HS School Test Scores are based on average reading and math test scores for all students assigned to that school. Each cell provides a mean for each tercile separately for students located in block groups that never contain a failing school (CBG ever contains failing school = 0) and students located in block groups that contain in failing schools (CBG ever contains failing school = 1). A few observations (1,258) are assigned to CBGs that did not have any property sales to characterize terciles but are included in the "All" column.

Table 4
Impact of Failing Designation on Housing Market Outcomes

	(1) Log Price	(2) Log Income	(3) Log Income	(4) Log Income
Any Failing	-0.054	-0.062	-0.065	-0.083
	(0.055)	(0.049)	(0.071)	(0.069)
NBHD T2 * Fail	0.171**	0.032	0.013	0.031
	(0.081)	(0.063)	(0.089)	(0.088)
NBHD T3 * Fail	0.138**	0.267***	0.215***	0.260***
	(0.060)	(0.083)	(0.082)	(0.083)
Observations	157,955	52,819	37,613	36,162

Notes: All boundaries based on 02-03 school year. Observations include 2004-2011 school years. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG Prices are restricted to CBGs where prices fall within the range of any CBG that contains a failing neighborhood. All models include CBG by year fixed effects as well as fixed effects for each unique combination of assigned elementary, middle and high school in 02-03, quarter by year fixed effects as well as lagged average school test scores for assigned elementary, middle and high schools. Price Model in column 1 also includes 47 indicators for unique structural attributes and measures of proximity to the downtown Charlotte and the Interstate. Standard errors clustered by CBG. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Table 5
Impact of Failing Designation on Student Residential Mobility

Variable	(1)	(2)
Any Failing	-0.018	-0.024
	(0.013)	(0.015)
NBHD T2 * Fail		0.023
		(0.027)
NBHD T3 * Fail		-0.024
		(0.020)
	Student Fixed Effects	
Any Failing	-0.009	-0.010
	(0.016)	(0.021)
NBHD T2 * Fail		0.007
		(0.035)
NBHD T3 * Fail		-0.055**
		(0.028)
Observations	224,994	222,643

Notes: Dependent variable is Movt = 1 for the year a student left their original (2003) neighborhood and a 0 for all years prior to Movt==1 or if a student never left their original neighborhood. All students observations after Movt=1 are removed. Top panel reports estimates based on equation (1). Bottom panel includes student fixed effects. All boundaries based on 02-03 school year. Observations include 2004-2011 school years. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG prices are restricted to CBGs where prices fall within the range of any CBG that contains a failing neighborhood. All regressions include student fixed effects as well as CBG by year fixed effects and assigned school fixed effects as well as lagged average school test scores for assigned elementary, middle and high schools. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 6
Impact of Failing Designation on Attendance at Non-assigned School and
Test Scores Based on Original Residence in 2002-2003

	(1)	(2)	(3)	(4)	(5)
Variable	Attend Non-Assigned School	Attend Non-Assigned Non-Magnet School	Attend Magnet School	Read Test Score	Math Test Score
Any Failing	0.045**	0.035*	0.010	0.034	0.026
	(0.021)	(0.018)	(0.007)	(0.022)	(0.022)
NBHD T2 * Fail	0.002	0.018	-0.016	-0.037	-0.053
	(0.030)	(0.024)	(0.014)	(0.031)	(0.034)
NBHD T3 * Fail	0.105*	0.041	0.065**	0.061	0.034
	(0.062)	(0.047)	(0.030)	(0.062)	(0.060)
			Student Fixed Effects		
Any Failing	0.059**	0.045*	0.015	0.004	0.000
	(0.029)	(0.026)	(0.009)	(0.025)	(0.029)
NBHD T2 * Fail	-0.004	0.013	-0.017	0.003	-0.017
	(0.052)	(0.045)	(0.019)	(0.030)	(0.039)
NBHD T3 * Fail	0.025	-0.067	0.093*	0.139	0.004
	(0.072)	(0.042)	(0.054)	(0.097)	(0.071)
Observations	301,805	301,805	301,805	238,000	238,777

Notes: All boundaries based on 02-03 school year. Observations include 2004-2011 school years. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG Prices are restricted to CBGs where prices fall within the range of any CBG that contains a failing neighborhood. All regressions include CBG by year fixed effects and assigned school fixed effects as well as lagged average school test scores for assigned elementary, middle and high schools. Only include students in grade 8 or lower since we have no failing high schools in our dataset. Column headings indicate dependent variables which are dummies for attending non-assigned schools, (non) magnet non-assigned schools. Dependent variables for Test scores are normalized to mean zero an standard deviation of one relative to state average test scores in a given year and grade. Specification in top panel includes controls for race, gender, grade, first test scores in CMS. No previous test scores included for columns for Read & Math Test Score, Specification in bottom panel replaces student ccharacteristics with student fixed effects. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 7
Impact of Failing Designation on Attendance at Non-assigned School and
Test Scores Based on Current Residence

	(1)	(2)	(3)	(4)	(5)
Variable	Attend Non-Assigned School	Attend Non-Assigned Non-Magnet School	Attend Magnet School	Read Test Score	Math Test Score
Any Failing	0.066***	0.044	0.022*	-0.016	-0.037
	(0.023)	(0.028)	(0.013)	(0.021)	(0.025)
NBHD T2 * Fail	-0.006	-0.004	-0.002	0.012	0.037
	(0.043)	(0.046)	(0.018)	(0.030)	(0.032)
NBHD T3 * Fail	0.326***	0.243**	0.083	-0.004	-0.053
	(0.074)	(0.095)	(0.059)	(0.093)	(0.097)
Observations	306,651	306,651	306,651	241,695	242,478

Notes: All boundaries based on 02-03 school year. Observations include 2004-2011 school years. Failing and test scores based on assigned school for a given year. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG Prices are restricted to CBGs where prices fall within the range of any CBG that contains a failing neighborhood. All regressions include CBG by year fixed effects and assigned school fixed effects as well as lagged average school test scores for assigned elementary, middle and high schools. Only include students in grade 8 or lower since we have no failing high schools in our dataset. Column headings indicate dependent variables which are dummies for attending non-assigned schools, (non) magnet non-assigned schools. Dependent variables for Test scores are normalized to mean zero an standard deviation of one relative to state average test scores in a given year and grade. All specifications include student fixed effects. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 8
Falsification Tests for Table 7 Results

Variable	(1) Attend Non-Assigned School	(2) Attend Non-Assigned Non-Magnet School	(3) Attend Magnet School
Any Failing	0.012	-0.005	0.016
	(0.018)	(0.011)	(0.019)
NBHD T2 * Fail	-0.002	0.001	-0.003
	(0.027)	(0.012)	(0.029)
NBHD T3 * Fail	0.045	0.018	0.027
	(0.055)	(0.034)	(0.068)
Observations	327,418	327,418	327,418

Notes: Table presents falsification tests for models presented in Table 7. See notes for Table 7 for complete description of sample. All specifications based on falsification tests where we drop all observations after a school fails to meet AYP for two consecutive years (i.e. real failure) and then construct a placebo failing status indicator variable that takes the value of unity for school-years that are two years prior to the first year a school actually fails. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 9
Separate Estimates of Impact of Failing Designation on Attendance at Non-assigned School for Movers and Stayers

	(1)	(2)	(3)	(4)	(5)	(6)
	Movers			Stayers		
Variable	Attend Non-Assigned School	Attend Non-Assigned Non-Magnet School	Attend Magnet School	Attend Non-Assigned School	Attend Non-Assigned Non-Magnet School	Attend Magnet School
Any Failing	0.030	0.008	0.022	0.090***	0.073*	0.018
	(0.028)	(0.033)	(0.015)	(0.034)	(0.037)	(0.018)
NBHD T2 * Fail	-0.012	0.001	-0.013	0.025	0.027	-0.002
	(0.036)	(0.039)	(0.017)	(0.070)	(0.071)	(0.032)
NBHD T3 * Fail	0.695***	0.685***	0.010	0.061	-0.063	0.124
	(0.146)	(0.105)	(0.072)	(0.140)	(0.069)	(0.100)
Observations	120,428	120,428	120,428	186,361	186,361	186,361

Notes: All boundaries based on 02-03 school year. Observations include 2004-2011 school years. Failing and test scores based on assigned school for a given year. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG prices are restricted to CBGs where prices fall within the range of any CBG that contains a failing neighborhood. All regressions include CBG by year fixed effects and assigned school fixed effects as well as lagged average school test scores for assigned elementary, middle and high schools. Only include students in grade 8 or lower since we have no failing high schools in our dataset. Column headings indicate dependent variables which are dummies for attending non-assigned schools, (non) magnet non-assigned schools. All specifications include student fixed effects. Columns 1-3 present results for students that are living in a different neighborhood than they did in 2003. Columns 4-6 present results for students that are living in the same neighborhood as they did in 2003. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 10
Alternative Specifications of Impact of Failing Designation on Attendance at Non-assigned School for Movers

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Attend Non-Assigned School	Attend Non-Assigned Non-Magnet School	Attend Magnet School	Attend New Non-Assigned School	Attend New Non-Assigned Non-Magnet School	Attend New Magnet School	Attend New Non-Assigned School	Attend New Non-Assigned Non-Magnet School	Attend New Magnet School
AnyFailing	-0.040	-0.045	0.004	0.020	0.009	0.011	-0.010	-0.023	0.013
	(0.030)	(0.033)	(0.016)	(0.023)	(0.026)	(0.013)	(0.034)	(0.028)	(0.017)
NBHD T2 * Fail	-0.010	-0.009	-0.001	-0.001	0.001	-0.003	0.010	0.006	0.004
	(0.040)	(0.040)	(0.019)	(0.032)	(0.033)	(0.015)	(0.043)	(0.036)	(0.019)
NBHD T3 * Fail	0.734***	0.690***	0.044	0.235**	0.278***	-0.044	0.308**	0.270**	0.038
	(0.159)	(0.137)	(0.054)	(0.105)	(0.100)	(0.039)	(0.133)	(0.121)	(0.037)
Drop Movers prior to Fail	X	X	X				X	X	X
Observations	105,183	105,183	105,183	120,428	120,428	120,428	105,183	105,183	105,183

Notes: All boundaries based on 02-03 school year. Observations include 2004-2011 school years. Failing and test scores based on assigned school for a given year. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG prices are restricted to CBGs where prices fall within the range of any CBG that contains a failing neighborhood. All regressions include CBG by year fixed effects and assigned school fixed effects as well as lagged average school test scores for assigned elementary, middle and high schools. Only include students in grade 8 or lower since we have no failing high schools in our dataset. Column headings indicate dependent variables which are dummies for attending non-assigned schools, (non) magnet non-assigned schools. All specifications include student fixed effects. Columns 1-3 present results that drop students who moved prior to a school failure. Columns 4-6 present results that recode the dependent variable to zero if a student remained in their original 02-03 school after moving. Columns 7-9 drop both the movers before an AYP failure and recode the non-assigned school variable. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 11
Impact of Failing Designation on Location Choice

	Full Sample		Sample with Test Score Prior to Move	
Variable	(1)	(2)	(3)	(4)
Fail	-0.077***	-0.081***	-0.072***	-0.078***
	(0.019)	(0.020)	(0.019)	(0.020)
NBHD T2*Fail	0.064***	0.059***	0.060***	0.059***
	(0.022)	(0.022)	(0.018)	(0.020)
NBHD T3*Fail	0.109***	0.101***	0.122***	0.110***
	(0.036)	(0.036)	(0.034)	(0.035)
Observations	73,686	38,398	33,645	23,266

Notes: Estimates based on a model that restricts observations to only CBGs that ever contained a failing school and each observation represents a move into a neighborhood in year *t* . Dependent variable is Mov = 1 for moves into the portion of a CBG that contains a failing school in any year and 0 otherwise and Fail is a dumy that equals one the first year and after for which a CBG contains a failing school. All terciles of CBGs based on average CBG housing prices for all transacted sales between 1998 and 2002. Terciles for CBG Prices are restricted to CBGs where Prices fall within the range of any CBG that contains a failing neighborhood. All boundaries based on 02-03 school year. Observations include 2003-2011 school years. All regressions include CBG fixed effects and controls for race, gender, grade, first test scores in CMS and includes a cubic polynomial for number of students in CBG by attendance zone neighborhood. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.

Table 12
Falsification Test on Impact of Failing Designation on Location Choice

	Full Sample		Sample with Test Score prior to Move	
Variable	(1)	(2)	(3)	(4)
Fail	0.121***	0.130***	0.123***	0.129***
	(0.029)	(0.029)	(0.028)	(0.027)
NBHD T2*Fail	-0.115***	-0.122***	-0.114***	-0.122***
	(0.032)	(0.033)	(0.032)	(0.032)
NBHD T3*Fail	-0.083**	-0.081**	-0.087***	-0.088***
	(0.035)	(0.037)	(0.032)	(0.033)
Observations	25,018	20,806	11,088	10,203

Notes: Table presents falsification tests for models presented in Table 11. See Table 11 notes for sample details. All specifications based on falsification tests where we drop all observations after a school fails to meet AYP for two consecutive years (i.e. real failure) and then construct a placebo failing status indicator variable that takes the value of unity for school-years that are two years prior to the first year a school actually fails. Standard errors clustered by CBG. *** p<0.01, ** p<0.05, * p<0.10.