Investigating the Causal Effects of Student Mobility on Negative Academic Outcomes*

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ABSTRACT

While much research has investigated the negative consequences of transferring schools, researchers do not agree whether 1) school transfers *cause* students to have worse academic outcomes or 2) the relationship between school transfers and academic outcomes is spurious due to the relative economic, social, and academic disadvantages experienced by transfer students. This study utilizes the National Education Longitudinal Study and propensity score modeling to provide a more stringent test of the causal relationship between school transfers and academic outcomes. The results indicate that transferring schools once during high school causes students to have lower levels of bachelor's degree attainment and lower GPAs, and transfer students also complete significantly fewer units in math and science. Moreover, transferring more than once during high school leads to more dramatic disadvantages in academic outcomes, though there are few significant differences between students who transfer once and students who transfer more than once.

Introduction

Despite the fact that education research often describes a student's "school context" as if it were a monolithic entity, students transfer between schools at an amazing rate. For instance, 24% of the respondents in the National Education Longitudinal Study (NELS) had transferred between school districts (or experienced what I refer to as student mobility) at least once within the past four years (since the 8th grade), and 8% had transferred schools at least twice (Pribesh and Downey 1999; Rumberger and Larson 1998). Moreover, several researchers have recognized that a few segments of the population are disproportionately represented among those who experience school transfers. For example, one study found that 73% of low-income black children in Chicago had changed schools by the seventh grade (Temple and Reynolds 1999) while another nationally-representative study found that only 52% of white students had changed schools by the eighth grade (Ream 2005). According to Astone and McLanahan (1994), 53% of students who live with a stepparent transferred schools between the fifth and tenth grades compared to only 27% of students who live with two biological parents. Because recent changes in education policies *encourage* parents to seek out new schools if their current schools are not performing up to national standards, these high levels of student mobility are not likely to decrease in the near future.

Unfortunately, while an increasing number of children are changing schools, research has shown that school transfers are related to various negative outcomes including increased risk of dropping out of high school (Ou and Reynolds 2008; Rumberger and Larson 1998; South, Haynie, and Bose 2007), lower scores on

standardized tests (Strand and Demie 2007; Temple and Reynolds 1999), and decreased probability of enrolling in higher education (Sandefur, Meier, and Campbell 2006). What is still unclear, however, is whether transferring schools *causes* lower levels of academic achievement and attainment. Past studies have recognized that those students who experience student mobility are those same students who have the lowest average test scores and are at the greatest risk of dropping out of high school before the school transfer occurs(Rumberger and Larson 1998). Therefore, past studies that control for characteristics such as race, socioeconomic status (SES), and family structure may not completely account for the fact that groups of transfer students and non-mobile students systematically differ on these background characteristics.

In the current study, I use propensity score modeling to investigate how student mobility during the high school years affects students' test scores, course-taking behavior, grade point averages (GPAs), high school completion, and postsecondary participation once transfer students are matched to non-mobile students with similar *propensities* of transferring schools.

Literature Review

Unfortunately, while a large proportion of students are transferring schools, research has consistently shown that student mobility is related to a variety of negative student outcomes. Students who experience a school transfer have been found to receive lower test scores than non-mobile students even after controlling for students' race and socioeconomic backgrounds (Kerbow 1996; Wright 1999) and even prior achievement (Temple and Reynolds 1999). Transfer students are also up to twice as likely as non-

mobile students to drop out of high school (Rumberger and Larson 1998; South, Haynie, and Bose 2007). The experience of student mobility appears to be cumulative: while students who transfer only once during high school are only 50% more likely to drop out of high school, those who move more than once are twice as likely to drop out (Rumberger and Larson 1998).

Studies of student mobility have also found that transferring schools has a negative effect on student attitudes and behaviors which are likely to affect later educational outcomes. For example, using data from the NELS, it has been found that transfer students have lower educational expectations than non-mobile students even after controlling for pre-transfer expectations (Pribesh and Downey 1999), indicating that they experience a decline in expectations over their high school years. Transfer students are also more likely to participate in more deviant and risky behaviors such as early sexual behavior and violent behavior (Haynie and South 2005; South, Haynie, and Bose 2005). Rumberger and Larson (1998) recognize that the same characteristics that are associated with student mobility (such as lower educational expectations, lower levels of achievement, and deviant behavior) also predict dropping out of high school, and so they suggest that student mobility should be considered as a different form of "academic disengagement": not as severe as leaving school permanently, but certainly a risk factor for lower levels of academic achievement and attainment.

Past research has investigated the mechanisms through which student mobility affects academic outcomes. South et al. (2007) suggest that transfer students become friends with students who have low levels of achievement and educational expectations, and the characteristics and composition of their friendship networks explain why transfer

students are more likely to drop out of high school. On the other hand, Pribesh and Downey (1999) investigate whether the loss of social ties between students, their parents, and their schools (social capital) or the stressful life events that cause students to transfer schools (such as parental divorce or a parent losing a job) explain the relationship between school transfers and negative academic outcomes. However, most studies find that students' background characteristics, such as their socioeconomic well-being and their previous levels of academic achievement, largely account for the association between school transfers and later academic achievement and attainment (Pribesh and Downey 1999; Ream 2005; Temple and Reynolds 1999). In fact, Pribesh and Downey (1999) find that as much as 70% of the association between school transfers and educational expectations and math test scores is explained by systematic differences in the background characteristics of students who transfer schools and students who do not transfer schools during high school

Research that shows that the relationship between school transfers and negative academic outcomes is severely mitigated or disappears entirely after controlling for background characteristics suggest a selection effect: before they officially drop out of school, low-achieving students may be forced to transfer schools or choose to attend a new school as a final effort to solve (or remove from the school's responsibility) the students' academic or behavioral problems. Studies have shown that minority, immigrant, and low-SES students as well as students from non-traditional family structures are more likely to transfer schools (Astone and McLanahan 1994; Ream 2005; Rumberger and Larson 1998; Wright 1999), and these are the same students who are at the greatest risk of receiving low grades and test scores and dropping out of high school.

If the predictions of the selection perspective are accurate, then the negative associations between student mobility and academic outcomes only exist due to pre-existing differences between transfer students and non-mobile students. Supporting the selection hypothesis, qualitative research has uncovered that schools may rid themselves of their low-achieving and misbehaving students by transferring them to another school, often within the same school district (Bowditch 1993; Ream 2005).

It is also likely that parents choose to move their children to a new school when they are having behavioral problems, hoping that a change in scenery may improve their children's behavior (Sorin and Iloste 2006). However, while past research has evidenced that disadvantaged students are more likely to experience student mobility, many studies have found student mobility to have a significant effect on academic outcomes net of parental SES, race, and even prior measures of achievement (Pribesh and Downey 1999; Rumberger and Larson 1998; Temple and Reynolds 1999). Methodologically, it is possible that these studies which utilize common regression techniques are not adequately addressing the fact that transfer students and non-mobile students differ greatly in their background characteristics. Some researchers suggest that other statistical techniques that focus on estimating the counterfactual, or the outcome that transfer students would have experienced if they had not transferred schools, more adequately address the issue of selection effects (Winship and Morgan 1999).

To address this issue of negative selection, I perform propensity score modeling to clarify the causal relationships between student mobility and academic outcomes. Moreover, because previous studies have suggested that student mobility has a cumulative effect on students, such that students who transfer schools more than once

have worse academic outcomes than students who transferred once (Rumberger and Larson 1998), I use propensity score models to investigate whether these two groups of transfer students significantly differ in terms of their eventual academic achievement and attainment. Therefore, I perform propensity score modeling three times in order to compare the academic outcomes of three different groups of students: students who did not transfer during high school, students who transferred once during high school, and students who transferred more than once during high school.

Data and Measures

In the current study, I utilize data from the National Education Longitudinal Study of 1988-2000 (NELS). This study interviewed a nationally-representative sample of approximately 12,000 eighth graders in 1988 and then re-interviewed the same respondents in 1990, 1992, 1994, and 2000. Data collectors provided questionnaires to students, parents, administrators, and teachers so that researchers may look at the same social and educational experiences from several different perspectives. After removing 760 respondents who did not complete the baseline survey (including those who were ineligible at the time of the survey, those who did not complete the survey, and "freshened" respondents who were interviewed for the first time after the 8th grade), my final sample includes 11,380[1] 8th grade students. To minimize sample restrictions due to missing data, I perform multiple imputation (Royston 2004) and all analyses proceed using the resulting five datasets. Imputed values replace the missing values for all variables in this study, including the dependent variables, in order to maximize the

[1] As per the restrictions set forth by the Institute of Education Sciences, because I am using the restricted NELS data, all of the reported sample sizes have been rounded to the nearest ten.

amount of information that informs the imputation. In final analyses, however, the imputed values for the dependent variables are recoded to missing so that analyses will not be performed for those respondents who were originally missing information on the outcome.

The independent variable of interest is transferring schools during the four years following students' 8th grade year. In 1992, students (including those who had dropped out of school) were asked how many school transfers they experienced since the 8th grade that were not normal transitions between middle school and high school within the same district. For this study, the outcomes of students who transferred once (16.61% of the weighted NELS sample) and more than once (8.16% of the sample) are compared to the outcomes of students who did not transfer schools after the 8th grade. Other researchers who have used the NELS to study student mobility have also used this measure (Rumberger and Larson 1998).

The dependent variables in this study include many academic outcomes in the 12th grade as well as postsecondary educational attainment. The 12th grade achievement variables (measured at the third wave of data collection) include 12th grade math and reading test scores and students' 12th grade GPAs. This variable is measured using the NELS transcript data so that all respondents have a value that ranges between 0 and 4. This variable takes into account the different grading scales that schools implement across the country, and this results in an increased number of missing cases when information about the grading scale is not known. Other outcomes that I consider include the number of units in math and science that students completed, dropping out of high school, and whether respondents ever attended any type of post-secondary education. All

students who dropped out of high school by the fifth wave of data collection (12 years after the 8th grade survey), even those who later continued their education at some form of post-secondary institution, are classified as high school dropouts. I also measure college degree attainment using information provided at the fifth wave of data collection. For this variable, students who received a 4-year college degree or a higher level of education are coded with a value of one.

All of the control variables that are utilized in this study come from the first wave of the NELS, before students enter high school. These variables can be categorized into three broad groups: variables that describe students' academic histories/educational expectations, variables that describe students' demographic characteristics and family backgrounds, and measures of school quality and school characteristics. I also include in propensity score equations missingness flags for these independent variables to determine if nonresponse to certain items significantly differs between groups depending on how many times they transferred schools during high school (D'Agostino and Rubin 2000)[2]. These control variables are listed with descriptive statistics in Table 1. While it is imperative to understand how these variables are measured, in the interest of space, I describe how these variables were coded in Appendix A.

Methods

I begin by providing descriptive statistics for the extensive list of covariates in the propensity score model including the demographic, socioeconomic, and educational backgrounds of students who do and do not experience school transfers during the four

[2] Propensity score estimates that do not include the flags for missingness result in estimates that are similar to the estimates presented here.

years following the eighth grade. Significance tests are performed reveal which characteristics are significantly associated with different levels of student mobility during high school. Histograms that depict the propensity scores of students who did not transfer schools, students who transferred once, and students who transferred more than once during high school also illustrate the comparability of these three groups of students.

To investigate whether transferring schools during high school causally affects various academic outcomes, I perform propensity score modeling in Stata to match mobile students to non-mobile students with similar propensities of transferring schools. In trying to approximate a randomized experiment, propensity score matching requires that assignment to the "treatment" (here, experiencing one or more than one school transfer) is basically random once the researcher accounts for all of the covariates in the propensity score model (Rosenbaum and Rubin 1983). While analysis of survey data requires that subjects are not randomly assigned to a treatment, once individuals are matched on a substantial number of traits that are related to the treatment, the observation of who *actually receives* the treatment may be considered to be quasi-random. Matching techniques are especially useful when it is likely that members of the treatment group would have experienced different outcomes even in the absence of the treatment (i.e. respondents are positively or negatively selected into the treatment group). Once I match transfer students to non-transfer students on a substantial number of background characteristics, summarized by the propensity score, I will be able to estimate causal effects of student mobility on academic outcomes that approximate the effects that would have been observed if students were randomly assigned to transfer schools.

Propensity scores provide an efficient method to match treatment and control groups by identifying a single scalar dimension (rather than a large vector of covariates) on which respondents can be matched to eliminate observable differences between groups (Dehejia and Wahba 1998). I calculate propensity scores using logistic regression models that predict the probability of receiving the treatment (either transferring once or transferring more than once depending on the comparison under consideration). The selection of predictors that are included in the propensity score equation ultimately determines the accuracy of the propensity score results. In general, the greater the number of predictors in the model predicting the propensity of treatment, the more closely researchers may match treated and untreated cases.

Next, respondents are placed in hierarchical strata based on their propensity scores, and balancing is performed in Stata to ensure that, among cases within a specified range of propensity scores, treatment and control cases do not significantly differ in terms of their average propensity scores or average values on background characteristics (Becker and Ichino 2002; Rosenbaum and Rubin 1983; Rosenbaum and Rubin 1984). Assignment to the treatment cannot be considered quasi-random if only those with the highest propensity of receiving the treatment belong to the treatment group. While it is not required that all variables balance within each stratum, having greater imbalance hints at the possibility of greater bias in the results (Hong and Raudenbush 2006). In fact, given a 95% confidence level, up to 5% of the t-tests could be expected to be significant just by chance, but if more than 5% of the tests are significant, then this may indicate that the matched treatment and control cases are not sufficiently similar (Luellen, Shadish, and Clark 2005).

Once this stage of the process is complete, the results, termed the "average effect of treatment on the treated" or the ATT, may be calculated as the average difference of the outcome between members of the treatment and control groups with identical (or nearly-identical) propensity scores. Many different matching techniques exist to calculate the ATT (Becker and Ichino 2002), and in the current study, I utilize nearest neighbor, stratification, radius, and kernel matching.

Nearest neighbor matching, one of the most common matching techniques, directly compares treated respondents with the single control respondent that has the most similar propensity score (Becker and Ichino 2002; Caliendo and Kopeinig 2005). In this study, I "allow for replacement": if the cases that received the treatment greatly outnumber the cases in the control group within a given range of propensity scores (as would happen if the treatment cases are largely concentrated at the higher values of propensity scores), it may be necessary to match a respondent who did not receive the treatment to more than one of the treated respondents (Caliendo and Kopeinig 2005). While this creates an oversample, by permitting some respondents to count more than once, allowing for replacement ensures that treated cases are not thrown out of analyses simply because there are not a sufficient number of control cases with the appropriate propensity score. Once the difference in the outcome variable is measured within each matched pair, the ATT is calculated as the average difference in the outcome between the treated and control respondents, and weighting is applied to account for cases that are used more than once.

Similar to nearest neighbor matching, radius matching only compares treatment and control cases that have similar propensity scores. However, in radius matching, the

outcome for each treatment case is compared to the outcome of each control case within a given range of propensity scores. In this study, this range, also referred to as the caliper, is 0.05. This matching technique increases the number of comparisons being made while also ensuring that matched treatment and control cases have very similar propensity scores.

The next matching technique, stratification matching, retains respondents in hierarchical strata based on their propensity scores. Using stratification matching, the outcomes are compared between treatment and control groups within each stratum rather than between a matched pair of respondents (Caliendo and Kopeinig 2005). The overall average effect of the treatment on the treated (ATT) for the sample is then found by weighting each block's mean difference (based on the number of cases within the stratum) and then finding the weighted average of the means (Becker and Ichino 2002).

Rather than limiting the number of comparisons that are made between members of the treatment and control groups, the kernel matching technique weights the data and then matches every available pair of treatment and control cases in order to obtain the ATT (Becker and Ichino 2002). With kernel matching, the outcomes of each of the treated cases are compared to the outcomes of all of the members of the control group regardless of the propensity score. However, each difference is weighted based on the distance between the treated case's propensity score and the control case's propensity score (Becker and Ichino 2002; Caliendo and Kopeinig 2005). Weights are larger when the propensity scores are closer in value, and so the difference in the outcomes between members of a good match has greater weight in the calculation of the ATT than the difference in the outcomes between members of a bad match. In the current study,

propensity scores and estimates of the ATT are calculated within each of the five imputed datasets, and then results are averaged across these datasets (Allison 2002).

Results

I begin by describing the ways in which students who did not transfer during high school, students who transferred once, and students who transferred more than once significantly differ in their academic outcomes and their background characteristics at the bivariate level. Survey weights have been applied to all of the descriptive statistics and bivariate comparisons to ensure that these results are representative of the population of 8th graders in 1988. Next, estimates of the ATT are reported which indicate how transfer students significantly differ from students who did not transfer during high school in their academic outcomes once they are matched based on their propensity scores. These estimates of the ATT and their standard errors resulted from averaging estimates across the five imputed datasets and considering the between-dataset and within-dataset variance of the estimated effects. These results estimate the causal effect of transferring schools by estimating the counterfactual: the outcome that transfer students would have achieved if they had not transferred schools after the 8th grade.

Descriptive Statistics

Table 1 presents the descriptive statistics for all of the variables in the propensity score equation, and for the outcome variables, for the entire sample as well as separately based on how many times students transferred schools after the 8th grade. Bivariate comparisons were performed in order to uncover which background characteristics

significantly differ between these three groups of students. A quick glance at Table 1 reveals that students who did not transfer after the 8th grade and students who transferred once after the 8th grade differ in many ways. In general, students who transferred schools during high school have lower levels of academic achievement and exhibit fewer pro-academic behaviors, come from more disadvantaged families, and go to schools that consist of a larger proportion of students from disadvantaged backgrounds compared to students who did not experience student mobility.

[Table 1 about here]

It is of particular interest in this study that students who transferred once after the 8th grade and students who did not transfer after the 8th grade significantly differ on all 8 of the academic outcomes considered in this study. The 12th grade math and reading test scores of transfer students are 3 and 1 points lower, respectively, than the test scores of students who did not transfer. Moreover, students who transferred once were approximately twice as likely to drop out (9.5% vs. 4.5%) and much less likely to attend college (76.9% vs. 81.5%) or receive a bachelor's degree (23.4% vs. 36.3%). Transfer students also have 12th grade GPAs that are significantly lower than the GPAs of non-transfer students, and they have completed, on average, fewer units of math and science.

Consistent with past research, I find that transfer students also have significantly lower test scores and self-reported GPAs in the 8th grade, though these differences are relatively small in size. For instance, transfer students' math test scores are about 2.5 points lower than non-transfer students' test scores, and their GPAs are only 0.10 points lower on a 4-point scale. Transfer students are also much more likely to have been held back and some point in their academic histories (25.2% vs. 15.7%). Finally, students

who transferred once during high school report significantly higher levels of cutting class, and these students are more likely to report having a larger number of academic or behavioral problems. Transfer students are also more likely to have experienced a larger number of school transfers before the 8th grade compared to non-transfer students. Overall, it is clear that, while many of the differences between students who did not transfer and students who transferred once after the 8th grade are small in size, transfer students consistently have significantly lower levels of academic achievement, and they are consistently more likely to behave in ways that are not beneficial to their academic careers.

There are also many demographic and family background characteristics that significantly differ between students who transferred once and students who did not transfer after the 8th grade. While boys and girls are equally likely to experience a school transfer, transfer students are significantly more likely to be African American and significantly less likely to be white compared to students who did not transfer. Transfer students are also significantly less likely to live in a two-parent family (57.1% vs. 72.4%) and significantly more likely to live with two cohabiting parents or with another family structure (such as a non-parent guardian). Moreover, transfer students have a lower average household income, indicating that transfer students are coming from more economically disadvantaged homes. Finally, the parents of transfer students are less likely to know the parents of their children's friends and are less likely to be involved in clubs or groups with other parents in the school, indicting that these parents have fewer ties with other adults in the school community.

There are also significant differences between students who transferred once and students who did not transfer after the eighth grade in terms of the schools that they attended in the 8th grade. First, transfer students were more likely to attend private schools, less likely to attend public schools, more likely to live in urban areas, and less likely to live in rural areas. The schools that transfer students attended in the 8th grade also have a slightly larger number of LEP teachers and have a higher percentage of minority students compared to students who did not transfer after the 8th grade. Their schools also have a larger proportion of students who come from single parent homes and who are limited English proficient, and these schools also have a higher average percentage of students who do not attend daily. Interestingly, the schools that these two groups of students attended did not significantly differ in terms of their policies about allowing school transfers.

Table 1 also presents the descriptive statistics and the results of significance tests which uncover which characteristics significantly differ between students who did not transfer schools and those who transferred more than once after the 8th grade. In general, the differences between students who did not transfer and students who transferred more than once are larger than the differences that were observed between students who did not transfer and students who transferred once. First, it is important to note that students who transferred more than once after the 8th grade fare significantly worse than students who did not transfer on 7 of the 8 outcomes considered in this study. The math test scores of students who transferred more than once are almost 3.5 points lower than the test scores of students who did not transfer. Moreover, students who transferred more than once are over twice as likely to drop out of school compared to students who did not transfer

(4.6% vs. 11.1%), are much less likely to attend college (64.0% vs. 81.5%) and are less than 1/4 as likely to receive a bachelor's degree (8.9% vs. 36.3%). Finally, students who transferred more than once have significantly lower 12th grade GPAs (by approximately 0.25 points on a 0-4 scale) and have taken approximately 0.6 fewer units of math and science on average (which range from 0-8.33 and 0-10 respectively) compared to students who did not transfer.

Table 1 also reveals the significant differences between these groups of students on various academic and demographic characteristics in the 8th grade. It is apparent that students who transferred more than once have significantly lower levels of academic achievement than students who did not transfer after the 8th grade in terms of both 8th grade test scores (by as much as 4.5 points for math test scores) and grade point average (which has a mean of 3.0 among students who did not transfer and 2.5 among students who transferred more than once). These transfer students also had slightly lower educational expectations, and they were more than twice as likely to have been held back at some point in the past (35.5% vs. 15.7%).

Students who transferred more than once during high school also reported a larger number of academic/behavioral problems, experienced a higher level of boredom during school, and had higher levels of absenteeism, tardiness, and cutting class. These students were also more likely to come to class unprepared and participated in fewer extracurricular activities on average. Finally, students who transferred more than once took fewer enrichment classes, were less likely to belong to a gifted program (15.0% vs. 20.8%), and were much less likely to be enrolled in algebra in the 8th grade (26.9% vs. 42.0%) compared to students who did not transfer schools after the 8th grade.

There are also many differences in the family backgrounds and demographic traits of students who transferred more than once and students who did not transfer during the high school years. Students who transferred more than once are significantly more likely to be African American (17.4% vs. 9.9%), and they are significantly less likely to be white or Hispanic. Students who transferred more than once after the 8th grade are also much more likely to have a disability compared to students who did not transfer schools (29.5% vs. 14.8%). These students are older on average and report a larger number of school transfers before the 8th grade compared to students who did not transfer after the 8th grade. Students who transferred more than once are much less likely to come from a two-parent home (37.0% vs. 72.4%), twice as likely to come from a single parent home (30.6% vs. 15.2%), and more than twice as likely to come from a home with two cohabiting parents or "another" family structure. Transfer students have more siblings on average, have fewer parents working full-time, have somewhat younger parents, and have significantly lower values for both the NELS-created SES variable and household income compared to students who did not transfer after the 8th grade. Finally, the parents of these transfer students are significantly less likely to be involved in clubs or groups with other parents from the school and are less likely to know the parents of their children's friends relative to the parents of children who did not transfer schools.

The results in Table 1 also indicate that the schools that transfer students and non-transfer students attended in the 8th grade differed systematically. Transfer students were significantly more likely to attend schools in urban areas (37.9% vs. 22.7%) and were less likely to attend schools in rural areas (21.9% vs. 31.5%). Moreover, students who transferred more than once after the 8th grade attended schools with a higher percentage

of minority students (36.8% vs. 22.9%) and students who received a free or reduced price lunch (29.2% vs. 22.2%). These schools also had a higher student-teacher ratio and a larger percentage of students who were limited English proficient and who left the school before the end of the school year due to transferring or dropping out. Finally, and consistent with expectations, the schools that transfer students attended in the 8th grade were significantly more likely to have policies that allowed students to transfer between schools (35.5% vs. 23.3%) and encouraged school transfers in order to achieve racial balance (11.8% vs. 7.9%). Moreover, the averages of five scales measuring school quality are significantly lower among students who transferred more than once, indicating that these students attended lower-quality schools based on student and parent reports of school characteristics and administrators' reports of school problems.

Finally, I look at the differences between two groups of students who have not been compared in previous research: students who transferred once and students who transferred more than once after the 8th grade. The bivariate results in Table 1 show that three of the eight the academic outcomes significantly differ between these two groups of students. Students who transferred more than once are significantly less likely to both attend college (64.0% vs. 76.9%) and obtain a bachelor's degree (8.9% vs. 23.4%) compared to students who transferred once after the 8th grade, and they also completed fewer units in math. These results indicate that transferring schools during high school has a cumulative effect where transferring a larger number of times results in increasingly negative academic outcomes.

Though the differences are relatively small in size, the bivariate results in Table 1 show that students who transferred more than once after the 8th grade had lower reading

and history test scores, self-reported GPAs, and educational expectations in the 8th grade compared to students who only transferred once. For example, students who transferred more than once had reading test scores that were approximately 1.5 points lower than the reading test scores of students who transferred once.

It appears that students who transfer more than once after the 8th grade also exhibit more of the behaviors that are not conducive to educational achievement and attainment compared to students who transferred once. These students reported a larger number of academic and behavioral problems, higher levels of absenteeism and tardiness, and came to class unprepared more often. Finally, students who transferred multiple times were less likely to be enrolled in algebra in the 8th grade (26.9% vs. 42.6%) compared to students who transferred schools once, and they participated in fewer extracurricular activities on average.

There are also several demographic and family background characteristics that significantly differ between these two groups of students. Students who transferred more than once are significantly more likely to be Asian (16.4% vs. 10.3%) and less likely to be Hispanic (1.9% vs. 4.7%). These students are also more likely to have a disability compared to students who only transferred schools once (29.5% vs. 18.5%) and transferred a larger number of times before the 8th grade. Finally, students who transferred more than once are less likely to come from a two-parent home (37.0% vs. 57.1%), more likely to live with two cohabiting parents (24.7% vs. 15.2%), and have fewer parents working full-time. These results suggest that, while past studies have often grouped together all students who experience varying levels of student mobility, there seem to be a few systematic differences between students who transfer once and students

who transfer more than once such that students from more disadvantaged homes, and with more disadvantaged academic backgrounds, transfer schools more frequently.

Interestingly, there are very few differences in the schools that students attended in the 8th grade based on the number of times they transferred schools. Students who transferred more than once were more likely to attend schools with a higher percentage of students who leave during the school year due to transferring or dropping out, indicating that these highly mobile students are more likely to attend schools with other students who are highly mobile. Finally, students' reports of actions against them in school (someone stole something from them, someone tried to sell them drugs, or someone threatened to hurt them) were higher among students who transferred more than once.

Figures 1-3 illustrate the systematic differences between groups of students who have and have not experienced student mobility during high school. While Figure 1a clearly shows how the propensity scores of students who transferred once largely exceed the propensity scores of students who did not experience student mobility (which are largely clustered among the lower values of propensity scores), the inequality in propensity scores is much greater between students who did not transfer and students who transferred more than once (Figure 2a). In contrast, Figure 3a shows that there is greater overlap in propensity scores between students who transferred once and students who transferred more than once. Figures 1b, 2b, and 3b illustrate the samples utilized in this study after "trimming" outlying cases that have propensity scores below the second percentile and above the 98th percentile (Li and Zhao 2006). These figures demonstrate how utilizing trimming procedures leads to a greater overlap in the propensity scores of

treatment and control cases, ensuring that estimates of the ATT are not biased by outlying cases[3].

[Figures 1-3 about here]

Propensity Score Estimates

In order to estimate the causal effects of school transfers on academic outcomes, propensity scores are calculated, and the causal effects of transferring schools are estimated, three times in order to compare three groups of students: students who did not transfer (control) are compared to students who transferred once during the four years following the 8th grade (treatment), students who did not transfer (control) are compared to students who transferred more than once during those four years (treatment), and students who transferred once (control) are compared to student who transferred more than once (treatment). To calculate propensity scores, which I do three times within each of the five imputed datasets, 135 variables (57 student-level background characteristics, 12 school-level characteristics, 9 scales that describe parents' and students' social capital with the school and the school's climate and characteristics, and 57 variables indicating whether students were missing information on specific variables prior to the multiple imputation) are included in logistic regressions predicting assignment to the treatment group.

Once propensity scores are calculated, respondents are grouped into hierarchical strata based on the values of their propensity scores, and t-tests are performed to make sure that average propensity scores, and values for the 135 variables in the propensity score equation, do not significantly differ between respondents who did and did not

[3] Estimates of the ATT obtained using an untrimmed, complete sample follow the same pattern as the results presented here, though as theory suggests, many of the ATT estimates are much larger in size when outlying cases remain in the sample.

experience the "treatment" (either transferred schools once or transferred schools more than once). While at least a few of the variables in the propensity score equation do not balance between groups within each comparison, it must be taken into consideration that five percent of the t-tests would be expected to be significant by chance given a 95% confidence level. In all cases, fewer than 3% of all t-tests did not balance between groups. A detailed description of the balancing procedure is available from the author upon request.

Comparing students who transferred once to students who did not transfer

In order to estimate the causal effect of transferring once during the high school years, I perform propensity score modeling to estimate the counterfactual, or the outcome that transfer students would have experienced if they had not transferred schools. Estimates of the "average effect of treatment on the treated" or the ATT are provided in Table 2 using the nearest neighbor, kernel, radius, and stratification matching techniques.

[Table 2 about here]

The results in Table 2 indicate that, after being matched to non-transfer students with very similar educational and family background characteristics (and therefore similar propensity scores), students who transferred once during the high school years achieved lower levels of academic achievement and attainment relative to their peers that did not transfer schools. Out of the eight educational outcomes under consideration in this study, five of these outcomes significantly differ between these two groups of students based on the results of all four matching techniques. The consistency of the results across different matching strategies attests to the robustness of the findings.

According to the results in Table 2, students who transferred once after the 8th grade are significantly more likely to drop out of school (by 2.4 to 4.1 percentage points) and significantly less likely to obtain a 4-year degree (by 6.4 to 10.0 percentage points) compared to students who did not transfer. They also have 12th grade GPAs that are between 0.13 and 0.22 points lower than non-transfer students who have been matched to them based on their propensity scores. Finally, the number of units in math and science that students completed by the 12th grade is significantly lower among transfer students by 0.32 to 0.45 units each. This effect size approximates 1/3 of a standard deviation in math and science units. Overall, it is apparent that transferring schools even once during high school has a significant, negative effect on the educational achievement and attainment of transfer students.

According to the estimates resulting from the kernel, radius, and stratification matching techniques, transfer students are also significantly less likely to attend college compared to students who did not transfer schools during high school. This effect size ranges from 3 percentage points (using stratification matching) to 5.7 percentage points (using radius matching). Finally, according to the kernel and radius matching techniques, transfer students also have significantly lower reading and math test scores compared to non-transfer students, though the effect sizes are relatively small at around 1/10 of a standard deviation in test scores. It appears that the effect of transferring schools is stronger and more robust for those outcomes that are likely to be affected by the loss of ties between students, families, and schools: course-taking behavior, grade point average, dropping out of high school, and college attendance and attainment. Compared to these

outcomes, the effect of transferring schools on math and reading test scores is relatively weak and not as robust to the various matching techniques.

Comparing students who did not transfer to those who transferred more than once after the 8th grade

To estimate the causal effects of transferring more than once on academic outcomes, students who transferred more than once during the four years following the 8th grade are defined as the treatment group. According to the propensity score results obtained through all four matching techniques, students who transferred schools more than once and students who did not transfer schools significantly differ on 5 academic outcomes even after they are matched based on their propensities of receiving the treatment (Table 3). These transfer students are significantly less likely to both attend college (with an effect size ranging from 8.4 to 16.2 percentage points) and obtain a bachelor's degree (with an effect size ranging from 12.1 to 25.5 percentage points) compared to students who did not transfer schools during high school.

[Table 3 about here]

Students who transferred more than once also have lower 12th grade GPAs and completed fewer units in both science and math even after being matched to non-transfer students based on a multitude of background characteristics. The consistency of significant results across all four matching methods supports the claim that these transfer students and students who did not transfer schools significantly differ in these areas of academic achievement and attainment. The effect sizes are still quite substantial after the matching procedure is performed: for instance, the difference in GPAs between students

who did not transfer and students who transferred more than once but who have similar propensity scores differ by 0.21 to 0.46 points, approximating between 28 and 62% of a standard deviation in student GPA. Also, the average treatment effects that are estimated for the outcomes of math units (ranging from -0.68 to -1.00) and science units (ranging from -0.56 to -0.92) are both larger than one half of a standard deviation of these outcomes, and quite large given that the mean number of math and science units that students completed are 2.999 and 2.76 respectively.

While the nearest neighbor matching technique failed to find a significant difference between the math test scores of students who transferred more than once and students who did not transfer after the 8th grade, the remaining 3 matching techniques revealed a significant difference that ranged from 2.31 to 6.53 points on the test, or between 1/7 and 2/5 of a standard deviation in math test scores. According to the kernel, radius, and stratification matching techniques, students who transferred more than once are also significantly more likely to drop out of high school by as much as 3.1 to 7.1 percentage points, a very large effect size considering only 5% of the total sample dropped out of high school. Finally, the kernel and radius matching techniques both observe that students who transferred more than once received significantly lower reading test scores. Overall, these results indicate that, even after being matched to students who did not transfer but who had very similar academic and family backgrounds, students who transferred more than once after the 8th grade experienced significantly lower levels of academic achievement and attainment.

Comparing students who transferred once to students who transferred more than once after the 8th grade

To compare the academic outcomes of the two groups of students who experienced student mobility, students who transferred more than once are defined as the treatment group, and students who transferred once after the 8th grade are defined as the control group. Estimates of the ATT indicate that students who transferred once after the 8th grade and students who transferred more than once significantly differ on various academic outcomes (Table 4). However, only two differences are consistently significant across all four matching techniques: units completed in math and bachelor's degree attainment. The percent of students who received a bachelor's degree is approximately 6 percentage points lower among students who transferred more than once, though results from the radius matching technique estimate an effect size as large as 12.5 percentage points. Therefore, while the bivariate results showed the difference in bachelor's degree attainment between these groups to be approximately 16 percentage points, anywhere from 25% to 62% of this difference can be explained by systematic differences in these students' background characteristics.

[Table 4 about here]

The results for units in math are somewhat smaller in size (ranging from 0.28 to 0.50 units), but they still show that students who transferred schools more than once after the 8th grade have lower levels of achievement even when compared to those who experienced a single school transfer during high school. Several other significant differences are revealed among results that use the stratification, radius, and kernel matching techniques, which utilize larger samples than the nearest neighbor matching

technique. For instance, students who transferred schools more than once completed significantly fewer units in science (ranging from 0.22 to 0.41) and received significantly lower math test scores (ranging from 2.29 to 4.20 points) based on the results of these three matching techniques.

The estimates that result from the radius matching technique suggest even more significant differences between groups. According to the radius matching results, students who transferred more than once were significantly more likely to drop out of school (by 3.5 percentage points), less likely to attend college (by 8.4 percentage points), had lower reading test scores (by 1.5 points), and achieved lower 12^{th} grade GPAs (by 0.21 points) compared to students who transferred once during high school. However, because these results were only significant using one of the four matching techniques, and the radius matching technique generally estimates larger effect sizes than the other matching techniques, it is likely that only the outcomes of bachelor's degree attainment, math test scores, and completion of units in math and science significantly differ between these groups.

Conclusion

This study had two main objectives: to identify the ways in which transfer students differ from students who did not transfer during high school (and how students who transferred once differ from students who transferred more than once), and to use propensity score modeling to estimate whether transferring schools significantly affects academic outcomes one transfer students and non-transfer students are matched based on their background characteristics. The results of both of these analyses are very revealing.

First, the descriptive statistics and the bivariate significance tests presented in Table 1 indicate that there are only a few ways in which transfer students and non-transfer students do *not* significantly differ. Students who transferred schools during high school are more likely to have lower levels of academic achievement, are more likely to have been held back, and are more likely to exhibit behavioral problems and problematic behaviors such as absenteeism and tardiness compared to students who did not transfer schools after the 8th grade. It is important to note that all of the background variables were measured before the school transfer occurred, so it cannot be argued that the school transfer itself caused students to exhibit lower levels of achievement and more behavioral problems. Moreover, transfer students were more likely to come from homes with non-traditional family structures, have lower levels of household income, and have a larger number of siblings. The schools that transfer students attended also tended to have a larger percentage of at-risk students such as students who received a free or reduced price lunch, LEP students, and students that left the school before the end of the school year due to transferring out of the school or dropping out. Therefore, in addition to having lower levels of academic achievement, transfer students also disproportionately come from disadvantaged homes and attend poorer-quality schools, factors that are likely to affect their later academic achievement and attainment.

Surprisingly, while it could be expected that students who transferred once and students who transferred more than once would be more similar in their background characteristics because they all experienced at least one school transfer, the results of the bivariate analyses revealed that these two groups of students also significantly differed in many ways. Though there were greater difference between students who transferred

more than once and students who did not transfer after the 8th grade, even when compared to students who only transferred once, students who experienced multiple school transfers had lower levels of academic achievement in the 8th grade, came from more economically disadvantaged homes, and attended lower-quality schools. Therefore, there appears to be a negative association between the number of times students transfer schools and their academic and family backgrounds such that students with more disadvantaged backgrounds are more likely to transfer multiple times during high school.

The above discussion suggests that the relationship between school transfers and academic outcomes may be spurious due to the disadvantaged backgrounds that transfer students are more likely possess. However, the results from the propensity score analyses suggest that transferring schools during high school has a significant causal effect on various student academic outcomes even after transfer students are matched to non-transfer students based on their calculated propensities of experiencing one (or more than one) school transfer. By performing propensity score matching three times, to compare the outcomes of students who did not transfer to those who transferred once or more than once, while also comparing the outcomes of students who transferred once to the outcomes of students who transferred more than once, I was able to decompose the effects of student mobility to reveal whether the number of school transfers matters for later educational outcomes.

The results of this study indicate that the number of school transfers that students experience during high school does in fact affect students' later educational outcomes. While the estimated treatment effects of transferring more than once were generally larger than the treatment effects of transferring once, the results in Table 4 indicate that

students who transfer more than once perform significantly worse than students who transferred once during high school, particularly for the outcomes of math and science course-taking behavior and 4-year college degree attainment. However, even students who only transferred once during high school were significantly less likely to get a 4-year degree, more likely to drop out of high school, had significantly lower GPAs, and completed fewer units in math and science compared to students who did not transfer during these four years. These results bring into question current educational policies that encourage parents to transfer their children to higher-quality schools when they are not satisfied with the performance of their current schools.

The goal of this study was to document the causal effects of transferring schools on later educational outcomes. Further research is necessary to explain why student mobility causes students to have worse academic outcomes. In particular, it would be interesting to uncover whether the loss of ties between students, families and the school community, what some researchers would refer to as social capital, lead transfer students to have less favorable academic outcomes.

Works Cited

Allison, Paul D. 2002. *Missing Data*. Thousand Oakes, CA: Sage Publications, Inc.

Astone, Nan Marie and Sara S. McLanahan. 1994. "Family Structure, Residential Mobility, and School Dropout: A Research Note." *Demography* 31:575-584.

Becker, Sascha O. and Andrea Ichino. 2002. "Estimation of Average Treatment Effects Based on Propensity Scores." *The Stata Journal* 2:358-377.

Bowditch, Christine. 1993. "Getting Rid of Troublemakers: High School Disciplinary Procedures and the Production of Dropouts." *Social Problems* 40:493-509.

Broh, Beckett A. 2002. "Linking Extracurricular Programming to Academic Achievement: Who Benefits and Why?" *Sociology of Education* 75:69-91.

Caliendo, Marco and Sabine Kopeinig. 2005. *Some Practical Guidance for the Implementation of Propensity Score Matching*: IZA: Institute for the Study of Labor.

D'Agostino, Ralph B. Jr. and Donald B. Rubin. 2000. "Estimating and Using Propensity Scores with Partially Missing Data." *Journal of the American Statistical Association* 95:749-759.

Dehejia, Rajeev H. and Sadek Wahba. 1998. *Propensity Score Matching Methods for Non-experimental causal studies*. Cambridge: National Bureau of Economic Research.

Haynie, Dana L. and Scott J. South. 2005. "Residential Mobility and Adolescent Violence." *Social Forces* 84:361-374.

Hong, Guanglei and Stephen W. Raudenbush. 2006. "Evaluating Kindergarten Retention Policy: A Case Study of Causal Inference for Multilevel Observational Data." *Journal of the American Statistical Association* 101:901-910.

Kerbow, David. 1996. "Patterns of Urban Student Mobility and Local School Reform." *Journal of Education for Students Placed at Risk* 1:147-169.

Li, Xianghong and Xinlei Zhao. 2006. "Propensity Score Matching and Abnormal Performance after Seasoned Equity Offerings." *Journal of Empirical Finance* 13:351-370.

Luellen, Jason K., William R. Shadish, and M. H. Clark. 2005. "Propensity Scores: An Introduction and Experimental Test." *Evaluation Review* 29:530-558.

Ou, Suh-Ruu and Arthur J. Reynolds. 2008. "Predictors of Educational Attainment in the Chicago Longitudinal Study." *School Psychology Quarterly* 23:199-229.

Pribesh, Shana and Douglas B. Downey. 1999. "Why are Residential and School Moves Associated with Poor School Performance?" *Demography* 36:521-534.

Ream, Robert K. 2005. *Uprooting Children: Mobility, Social Capital, and Mexican American Underachievement*. New York: LFB Scholarly Publishing, LLC.

Rosenbaum, Paul R. and Donald B. Rubin. 1983. "The central role of the propensity score in observational studies for causal effects." *Biometrika* 70:41-55.

—. 1984. "Reducing Bias in Observational Studies Using Subclassification on the Propensity Score." *Journal of the American Statistical Association* 79:516-524.

Royston, P. 2004. "Multiple imputation of missing values." Pp. 227-241, vol. 4: STATA PRESS.

Rumberger, Russell W. and Katherine A. Larson. 1998. "Student Mobility and the Increased Risk of High School Dropout." *American Journal of Education* 107:1-35.
Sandefur, Gary D., AM Meier, and ME Campbell. 2006. "Family Resources, Social Capital, and College Attendance." *Social Science Research* 35:525-553.
Sorin, Reesa and Rosemary Iloste. 2006. "Moving Schools: Antecedents, Impact on Students and Interventions." *Australian Journal of Education* 50:227-241.
South, Scott J., Dana L. Haynie, and Sunita Bose. 2005. "Residential Mobility and the Onset of Adolescent Sexual Activity." *Journal of Marriage and the Family* 67:499-514.
—. 2007. "Student Mobility and School Dropout." *Social Science Research* 36:68-94.
Strand, Steve and Feyisa Demie. 2007. "Pupil Mobility, Attainment, and Progress in Secondary School." *Educational Studies* 33:313-331.
Temple, JA and AJ Reynolds. 1999. "School Mobility and Achievement: Longitudinal Findings from an Urban Cohort." *Journal of School Psychology* 37:355-377.
Winship, Christopher and Stephen L. Morgan. 1999. "The Estimation of Causal Effects from Observational Data." *Annual Review of Sociology* 25:659-706.
Wright, Dan. 1999. "Student Mobility: A Negligible and Confounded Influence on Student Achievement." *The Journal of Educational Research* 92:347-353.

Appendix A: Description of the Coding of Control Variables

Student Academic Histories

A variety of measures from the NELS are included in this study to describe in detail students' academic experiences up until the 8th grade. Students received tests from the NCES data collection team at the time of the 8th grade survey, and so propensity score models include measures of students' math, reading, science, and history test scores. Students' pre-transfer academic achievement is also measured using an NCES-created variable indicating students' self-reported average performance in their math, reading, science, and social studies classes during the 6th to 8th grades. This variable approximates a student grade point average by ranging from 0 to 4.

Student educational expectations are measured with an ordinal variable that ranges from 0 (less than a high school diploma) to 5 (education beyond a 4-year college degree). Parents' academic expectations for their child are measured on the same scale. In cases where information on the parent questionnaire is missing, values from the student questionnaire (the higher expectation between the mother and the father's expectation for the child) is substituted for the missing value. Dummy variables are also created that indicate the academic track that students expect to be placed in during high school. The expected academic track is measured with six dummy variables representing the general education (reference), college preparatory, vocational, specialized program, or "other" track as well as an additional dummy variable indicating that students don't know which track they will be placed in. Finally, because students who participate in extracurricular activities are likely to have stronger ties to their school community (Broh 2002), I include an indicator that counts the number of activities students belonged to in

the 8th grade. This study considers eleven different extracurricular activities: interscholastic sports, intramural sports, cheerleading, band/music-related activities, academic clubs, drama club, honors society, student newspaper or yearbook, student council or student government, a vocational education club, or a hobby club.

This study also includes dummy variables that indicate the modal ability level (the ability level at which the student is attending two or more classes) among students' math, reading, science, and social studies classes. Two dummy variables indicate whether the student generally attends classes at the higher or lower ability level (with middle ability level as the reference group) while a third dummy variable indicates that a majority of 8th graders' classes are not grouped by ability. In addition, an ordinal variable is used to measure how many enrichment-level courses a student is enrolled in during the 8th grade (ranging 0-4) and a dichotomous variable is used to indicate whether the student belongs to a gifted program. Two additional dummy variables that are included in analyses indicate whether students were ever held back in any grade up until the 8th grade and whether the student attended algebra during the 8th grade. Finally, an ordinal variable that ranges from 0 to 5 indicates how many times a student changed schools before the 8th grade. This variable provides evidence of the great extent to which students transfer schools in America: while about 50% of respondents did not transfer schools before the 8th grade, approximately 28% of students transferred two or more times.

Additional variables describe the location and types of schools that students attend. Two dummy variables indicate whether students attend a Catholic or private school (with public school as the reference group). Also, dummy variables indicate whether schools are located in rural or urban areas as opposed to suburban areas (the

reference group). Finally, dummy variables are utilized to measure whether the school is located in the north central, northeastern, or western regions of America (with schools in the south serving as the reference group).

Because students who transfer schools are generally perceived to have lower levels of academic achievement and worse academic experiences relative to students who do not transfer schools, propensity score models will include additional variables that measure students' school experiences. For instance, one variable (ranging from 0 to 12) indicates the extent to which students experienced the following six academic/behavioral problems in school: being sent to the office for misbehaving, being sent to the office with school work problems, parents receiving a warning about attendance, parents receiving a warning about grades, parents receiving a warning about behavior, or students getting into fights with other students. Responses to these six questions, which range from 0 (never happened) to 2 (happened more than twice) are summed so that higher values of this variable indicate that students experienced more of these problems and at a higher frequency. These six variables have a Cronbach's alpha of 0.754.

This study also includes a measure of student disengagement. Ranging from 0 to 24, this variable measures the extent to which students disagree with statements stating that they 1) believe that what they learn in their core classes (math, reading, science, and social studies) will be useful in their futures and 2) usually look forward to attending their classes. Each of these eight variables range from 0 (strongly agree) to 3 (strongly disagree), and responses are summed to create the indicator of student disengagement. This scale of student disengagement has a Cronbach's alpha of 0.726. Another variable, which ranges from 0 to 12, indicates the extent to which students feel afraid to ask

questions in their core classes (with higher values indicating a greater degree of fear). Again, this indicator is created by summing responses to the extent to which they agree (on a scale of 0 to 3) with statements that refer to students' English, science, math, and social studies classes. The four variables that comprise this indicator of the uneasiness students feel about asking questions in class have a Cronbach's alpha of 0.737. A single variable in the NELS also asks students how often they feel bored in their classes. Ranging from 0 to 3, higher values in this variable indicate that they experience a higher frequency of boredom.

The final four variables indicate how often students attend class and whether they come to class prepared. Higher values on the variable "unprepared" (which ranges from 0 to 9) indicate that students go to classes without paper and/or pencils, books, and homework more often. For each of these three variables, students were asked how often they came to class without these items on a scale of 0 (usually) to 3 (never), and this indicator has a Cronbach's alpha of 0.695. Variables that measure the frequency of tardiness and absenteeism range from 0 to 4 with higher values indicating a higher frequency of being absent from, or late to, school. Finally, students were asked how often they cut classes. This variable ranges from 0 to 3 with higher values indicating that students cut class more often.

Demographic Characteristics and Family Background

Many basic demographic traits are included in this study. Students' sex (with males comprising the reference group), race/ethnicity (black, Asian, Hispanic, and "other" with white as the reference group), and generational status (first or second

generation with third generation as the reference group) are measured as dummy variables. A respondent is classified as first generation if the student and at least one of his/her parents were not born in the United States. Similarly, a student is classified as second generation if at least one parent was born outside of the US but the student him or herself was born in the US. A separate dummy variable indicates whether respondents are considered to be a language minority (a language other than English is the primary language in respondents' homes) or limited English proficient (LEP). In addition, a single dichotomous variable is used to indicate whether or not a parent reported that his or her child had one of the following disabilities: a visual handicap, a hearing problem, deafness, a speech problem, an orthopedic problem, another physical disability, a specific learning problem, an emotional problem, mental retardation, or any other health problem. A variable that indicates students' age, which is centered at the mean value of 14 (all students were in the 8th grade at the time of the baseline survey), ranges from -4 to 4.

Family structure at the time of the 8th grade survey is measured as a series of dummy variables. These variables indicate whether the student lived in a home with two parents (the reference group), a single parent, two cohabiting parents, or an "other" family structure. Also included in this study are variables indicating how many siblings respondents have, which is truncated so that the value of 6 indicates that the respondent has 6 or more siblings. Parents' age is measured as an ordinal variable that ranges from 0 to 6 (with higher values signifying that parents are older). In two-parent homes, parental age is calculated as the average between the mother's (or female guardian's) age and the father's (or male guardian's) age. In single parent households, parental age is simply the age reported by the resident parent.

Because it is generally agreed that transfer students are more likely to belong to the lower socioeconomic stratum, I include many measures of students' economic situations in this study. The NELS provides a standardized measure of SES that takes into account parents' education, occupations, and income. This variable ranges from -2.88 to 2.56 with a mean of -0.08. In addition, I include ordinal measures of parents' income and education in propensity score equations. Household income ranges from 0 to 14, with high values indicating higher household income. Parents' education is measured as the highest level of education achieved by either parent in two-parent homes. This variable ranges from 0 (less than a high school education) to 5 (a Ph.D., M.D., or other advanced degree). I also include a variable that measures how many parents in the respondents' household (0, 1, or 2) have full-time jobs.

Finally, two variables are utilized to measure parents' connections within the school community. The first is a dichotomous variable which indicates whether parents are involved in organizations in which other parents from their children's schools are also involved. The second variable measures intergenerational closure. In the baseline survey, parents are asked 1) if they know the names of their children's friends and 2) if they know the parents of these friends. Parents were able to list a maximum of five of their children's friends, and so intergenerational closure measures the percentage of their children's friends' parents that they know.

School-level characteristics

Several variables are included in this study that measure the demographic and economic composition of the school. First, the percentage of the student body that is

non-white and the percentage of the student body that receives free or reduced-price lunch are measured as continuous variables. Also included are continuous variables that measure the percentage of students who are absent on an average day (ranging from 0-40) and the percentage of students who begin the school year at the school but leave before the end of the school year (ranging from 0-50). Ordinal variables measure the percentage of the student body that come from single-parent families (0-3) and the percentage of students who are limited English proficient (0-8). Also included is a student-teacher ratio that is truncated on both sides and ranges from 10 to 30 and a count of the number of ESL or LEP teachers in the school (ranging from 0 to 31). To measure the size of the school, a single continuous variable indicates how many 8^{th} graders attend the school at the baseline survey. Finally, a continuous variable is used to indicate the typical baseline salary of a new teacher in the school. All of these variables are measured using information from the administrators' baseline survey.

While these descriptive traits of the students and staff at schools are important predictors of whether a student will transfer schools, I also include two variables that measure institutional constraints to transferring between schools. Two dichotomous variables are included in propensity score equations that measure whether 1) transfers are frequently allowed despite the fact that pupils in a particular geographic area are generally assigned to the school and 2) pupils are recruited from particular areas to achieve a desired racial or ethnic composition in the school.

Social Capital and School Characteristics

Information from the baseline student questionnaire pertaining to students' relationships with school personnel was considered in order to measure 8th grade student-school social capital. In particular, I looked at questions that referred to students seeking or receiving advice or guidance from teachers, counselors, and principals within their schools. In the end, ten variables were selected to represent the social capital that encompasses students' relationships with school personnel.

In the first set of questions, respondents were asked if they ever talked to their counselors and teachers (separately) about four different topics: high school programs, jobs or careers after completing high school, help with selecting courses, and things studied in class. These eight variables are dichotomous with a value of 1 if the student talked to a counselor or teacher about the specified topic. While there exist additional questions in this section of the survey that deal with conversations between students, teachers, and counselors, these questions have been omitted because they refer to conversations about academic, behavioral, or personal problems. A response of "no" to these questions could either mean that 1) students do not have these relationships with teachers or counselors or 2) students do not have these problems, and so it would be difficult to interpret responses to these questions. Two additional questions ask students how often they talked to their teachers and counselors about planning their high school program. For these two questions, responses range from 0 (never) to 2 (3 or more times).

The Cronbach's alpha of these 10 variables is 0.750, and the removal of any one of these variables would not substantially improve the calculated alpha. Moreover, when all variables are placed in one factor using exploratory factor analysis in SPSS, all factor

loadings are greater than 0.40. Therefore, 8th grade student-school social capital is measured with a single standardized scale that utilizes these 10 variables.

To measure parent-school social capital in the 8th grade, twelve variables were selected from the baseline questionnaire. The first four questions asked parents whether they belonged to a parent-teacher organization (PTO), whether they attended PTO meetings, whether they participated in PTO activities, and whether they acted as a volunteer in their child's school. These four variables are dichotomous with 1 indicating that the parent performed the specified activity within the child's school. The next three questions asked parents how often they contacted their child's schools for specific reasons since the beginning of students' eighth grade year. Again, I avoided questions that concerned contacting the school about behavioral or academic problems because a negative response could simply imply that respondents' children do not have problems to talk to the school about. The three variables I selected asked parents how many times they contacted the school concerning fundraising activities, doing volunteer work, or discussing their children's academic program. These variables range from 0 (never) to 3 (more than four times).

Because relationships between parents and school personnel travel in both directions, I also selected five questions that ask about the frequency with which the school contacted parents about various topics since the beginning of students' eighth grade year (omitting those that concerned behavioral or academic problems). These five variables measure how often the school contacted the parent about fundraising activities, doing volunteer work, selecting high school courses, placement decisions regarding students' high school program, and students' current academic program. These variables

are also coded from 0 (never) to 3 (four or more times). Altogether, these twelve variables have a Cronbach's alpha of 0.812, and the removal of any single item would not improve this value of alpha.

The quality of the schools that student respondents attend is measured through responses to questions administered to the students themselves, their parents, and school administrators. To measure parents' ratings of their children's schools in the 8th grade, I found nine variables in the parents' baseline survey that asked them about the schools. The first eight questions ask parents how much they agree with the following statements about their child's school: the school places a high priority on learning, the homework that is assigned is worthwhile, standards set by the school are realistic, the school is preparing students well for high school, the school prepares children adequately for college, the school is a safe place, parents have an adequate say in setting school policy, and parents work together in supporting school policy. The values of these variables range from 0 (strongly disagree) to 3 (strongly agree). The ninth question directly asks parents how satisfied they are with the education that their child has received so far. The values of this variable range from 0 (not satisfied at all) to 2 (very satisfied). Exploratory factor analyses revealed that all of these nine variables loaded onto a single factor, and all factor loadings were grater than 0.60. The Cronbach's alpha of this single standardized scale is 0.882, and the removal of any single indicator does not improve this value of alpha.

I identified thirteen questions in the baseline student questionnaire which ask students about their schools. The results of exploratory factor analyses revealed that these variables fall onto three separate factors within the construct of student-rated school

characteristics. Moreover, while the Cronbach's alpha of these variables was found to be 0.691 (with the removal of one variable improving the alpha to 0.712), when forced onto a single factor, six of the variables had factor loadings below 0.30 (with the lowest having a factor loading of 0.059). Therefore, I decided not to measure student-rated school characteristics using a single standardized scale. Below I describe each of the three factors and the variables that load well onto these factors.

The first factor includes six variables that describe positive aspects of students' schools. Students were asked how much they agree with the following statements about their schools: there is real school spirit, discipline is fair, teaching is good, teachers are interested in students, students get along well with teachers, and most teachers listen to what students have to say. Values of these variables range from 0 (strongly disagree) to 3 (strongly agree). The Cronbach's alpha of these variables is 0.774, and all of the variables fit onto a single factor with factor loadings greater than 0.50. Also, the removal of any single item from this scale would not improve the value of Cronbach's alpha.

The second factor that measures students' school characteristics is composed of four variables that ask about negative aspects of the school (reverse-coded so that high values indicate a better-quality school). Again, students were asked, on a scale from 0 to 3, how much they agree with the following statements: I feel safe at this school, student disruptions inhibit learning, other students often disrupt class, and misbehaving students often get away with it. These four variables have a Cronbach's alpha of 0.565, a value that would not increase if any single item were removed from the scale. While this is a relatively low value for alpha, exploratory factor analyses showed that all four variables loaded onto a single factor with factor loadings greater than 0.50.

The third factor includes responses to three questions about things that happened to the student during the first semester of the school year. Students were asked if they had something stolen from them, if someone had tried to sell them drugs, or if someone had threatened to hurt them. Responses to these questions range from 0 (happened more than twice) to 2 (never happened) so that higher values indicate a higher-quality school. The Cronbach's alpha of these variables is only 0.414, but all of the factor loadings are greater than 0.60 on the single factor. Therefore, the construct "student-rated school characteristics in the 8th grade" is measured with three standardized scales: positive climate in the school, distractions from learning, and criminal acts against the student.

I also measure student-rated problems within the school. In the baseline survey, students are asked eleven questions about whether the following phenomena are problems within their schools: robbery, vandalism, alcohol consumption, students doing drugs, students bringing weapons to school, physical conflicts between students and teachers, verbal conflicts between students and teachers, tardiness, absenteeism, cutting classes, and physical conflict between students. Responses to these questions range from 0 (serious problem) to 3 (not a problem) so that larger values represent a higher-quality school. These eleven variables have a Cronbach's alpha of 0.921, and when placed on a single factor, all of the factor loadings are greater than 0.50. Therefore student-rated school problems are measured using a single standardized scale.

School climate in the 8th grade is measured using responses to nine questions in the baseline administrator questionnaire. Administrators were asked how accurate the following statements were in describing their schools: there are problems with discipline, teachers place a high priority on learning, the school day is structured, teachers encourage

high achievement, students do their homework, teachers have problems boosting student morale, teachers have negative views of students, teachers have problems motivating students, and there is conflict between teachers and administrators. Responses to these questions range from 0 (not at all accurate) to 4 (very much accurate), and some variables are reverse-coded so that larger values always indicate a higher-quality school.

The Cronbach's alpha of these nine variables is 0.784. Only the removal of the variable "teachers (do not) have problems motivating students" would increase the Cronbach's alpha to a value of 0.798. However, when forced to load onto a single factor, all but one of the factor loadings are greater than 0.30 (problems motivating students has a factor loading of 0.266), and most of the factor loadings are greater than 0.60. Therefore, I measure administrator-rated school climate with a single standardized scale.

Finally, to measure administrators' reports of problems within their schools, they were asked on a scale of 0 (serious problem) to 3 (not a problem) if they had problems with the following in their schools: robbery, vandalism, alcohol consumption, students doing drugs, students bringing weapons to school, physical conflicts between students and teachers, verbal conflicts between students and teachers, students' tardiness, students' absenteeism, students cutting classes, and physical conflicts between students. Administrator responses to these questions had a Cronbach's alpha of 0.869, and the removal of any single item would not improve this value of alpha. All of these eleven variables loaded sufficiently strongly onto a single factor with the smallest factor loading exceeding 0.50. Therefore, I measure administrator-rated school problems in the 8th grade with a single standardized scale.

Appendix B: Tables and Figures

Table 1: Weighted descriptive statistics by transfer status

Variable	*Total Sample Mean/Prop.*	*No Transfers Mean/Prop.*	*Transferred Once Mean/Prop.*		*Transferred > Once Mean/Prop.*	
Educational Background Variables						
8th grade math test score (ranges 16.03-66.81)	36.1032	36.9564	34.3445	**	32.4601	***
8th grade reading test score (ranges 10.61-43.83)	27.1606	27.7015	26.1334	***	24.6722	***[1]
8th grade science test score (ranges 9.46-32.88)	18.816	19.1415	18.0208	***	17.6784	***
8th grade history test score (ranges 19.23-41.3)	29.6112	29.874	29.1627	**	28.3004	***[1]
self-report of grades since 6th grade (ranges 0.5-4.0)	2.93597	2.99772	2.88169	**	2.52426	***[3]
educational expectations in 8th grade (ranges 0-5)	3.59839	3.65148	3.55396		3.23993	***[2]
predicted hs academic program						
general education	0.149396	0.153209	0.143445		0.129243	
vocational track	0.167471	0.171468	0.138233		0.192994	[1]
specialized track	0.064516	0.050941	0.126787	*	0.052947	
other track	0.075287	0.070063	0.074203		0.121634	*
college prep	0.29951	0.320223	0.241643	**	0.241831	*
don't know	0.243819	0.234096	0.275688		0.261351	
parents' educational expectations for student (ranges 0-5)	3.55589	3.58102	3.47241		3.51281	
student ever held back	0.190919	0.156937	0.251773	*	0.354672	***
Type of school attended in 8th grade						
public	0.86751	0.877269	0.822114	**	0.877112	
catholic	0.084528	0.080823	0.105232		0.073847	
private	0.047961	0.041908	0.072654	*	0.049042	
Urbanicity of school						
suburban	0.44394	0.458375	0.404357		0.402231	
urban	0.264112	0.226923	0.36237	***	0.379107	***
rural	0.291948	0.314702	0.233272	***	0.218662	***

Region					
Northeast	0.19594	0.209378	0.172022		0.130886	**
North Central	0.264378	0.279362	0.233422		0.200531	**
South	0.343279	0.328775	0.377939		0.395546	
West	0.196404	0.182484	0.216617		0.273037	***
Student behavioral/academic problems (ranges 0-12)	1.55622	1.37167	1.6982	*	2.82789	***[3]
student disengagement (ranges 0-24)	9.54625	9.54408	9.31459		10.0344	
student is bored at school (ranges 0-3)	1.64053	1.61756	1.67245		1.7699	**
level of absenteeism in past 4 weeks (ranges 0-4)	0.809516	0.766895	0.862542		1.06214	***[1]
level of tardiness in past 4 weeks (ranges 0-4)	0.514182	0.486777	0.519621		0.734739	***[2]
extent of cutting class in past 4 weeks (ranges 0-3)	0.112351	0.093253	0.151124	**	0.195109	**
comes to class unprepared (ranges 0-9)	2.59753	2.50618	2.70126		3.15903	***[1]
student is uneasy about asking questions (ranges 0-12)	3.59868	3.56628	3.67584		3.71602	
count of enrichment/advanced classes (ranges 0-4)	1.26291	1.31101	1.16083		1.06347	*
In a Gifted Program	0.197511	0.207615	0.178872		0.149921	*
In algebra class-8th grade	0.408162	0.420356	0.426048		0.268838	***[2]
school transfers before 8th grade (ranges 0-5)	1.14661	0.982847	1.3506	**	2.11685	***[3]
Other covariates					
Sex					
male					
female	0.494613	0.502135	0.4747		0.471423	
race/ethnicity					
white	0.727426	0.758694	0.649885	**	0.620453	***
black	0.120054	0.099424	0.179628	*	0.173577	*
Asian	0.103237	0.096184	0.102706		0.163918	[1]
Hispanic	0.036238	0.035593	0.047369		0.019115	***[2]
other	0.013045	0.010106	0.020412		0.022938	
SES (ranges -2.875-2.56)	-0.061325	-0.031279	-0.112617	*	-0.211201	**
Parent reports student has a disability	0.167764	0.148413	0.18549		0.295338	***[2]
age (centered at 14, ranges -5 to 4)	0.394473	0.367742	0.443384		0.521173	**

immigrant status						
first generation	0.043952	0.040053	0.064653		0.034921	
second generation	0.092047	0.090023	0.101329		0.090331	
third generation	0.864001	0.869924	0.834018		0.874748	
Student is a language minority or LEP	0.125777	0.119474	0.135205		0.15992	
family structure						
two parents	0.666098	0.723863	0.571343	***	0.370119	***[3]
single parent	0.178707	0.15158	0.228819		0.306322	***
cohabiting parents	0.128481	0.108751	0.152052	*	0.247412	***[2]
other family structure	0.026714	0.015807	0.047787	***	0.076146	***
number of siblings (ranges 0-6)	2.24083	2.16876	2.37344		2.58095	***
number of parents working full-time (ranges 0-2)	1.24428	1.26428	1.23468		1.09473	***[1]
Parents' age (ranges 0-6)	2.98564	3.03675	2.85185		2.82504	*
Parents involved with other parents	0.276877	0.298805	0.234526	*	0.177461	***
Intergenerational Closure (proportion, ranges 0-1)	0.542738	0.565601	0.478506	**	0.479794	**
family income (ranges 0-6)	8.74089	8.91317	8.46622	*	7.84205	***
Parents' education (highest) (ranges 0-5)	2.09644	2.12241	2.07348		1.92361	
Count of Extracurricular Activities (ranges 0-11)	2.45545	2.46205	2.58681		2.13324	*[1]
8th grade School Characteristics (Administrator)						
Size of 8th grade class (ranges 3-1327)	216.328	213.237	225.642		223.553	
Number of LEP/ESL teachers (ranges 0-31)	1.25096	1.17308	1.54983	*	1.30288	
percent of students who are minorities (ranges 0-100)	25.8082	22.8825	32.5933	*	36.772	***
percent of students who receive a free or reduced lunch (ranges 0-100)	23.3668	22.1782	25.4494		29.1877	***
student-teacher ratio (ranges 10-30)	17.8899	17.7646	18.1201		18.4814	**
percent of students from single parent families (ranges 0-3)	0.583294	0.560644	0.666897	*	0.605146	
percent of students who are LEP (ranges 0-8)	0.221917	0.191468	0.357224	*	0.20482	*
baseline salary for new teacher (ranges 5.5-25.428)	17.611	17.5801	17.6378		17.8181	
Pct. Students Not Attending Daily (ranges 0-40)	6.17442	6.03903	6.71198	**	6.22828	
Pct. Of Students who leave during school year (ranges 0-50)	6.63995	6.40525	6.58484		8.73506	***[3]
School often experiences (allows) transfers	0.256552	0.233205	0.305418		0.354737	***
School allows transfers to achieve racial balance	0.085709	0.079385	0.095942		0.118394	*

Scales						
Student-school social capital-8th grade (ranges -1.583-3.761)	0.000724	-0.009639	0.081009		-0.074529	
Parent-school social capital-8th grade (ranges -1.203-6.450)	0.012666	0.025642	-0.017445		-0.035927	
Student-rated school problems-8th grade (ranges -2.696-1.408)	-0.033627	-0.017471	-0.083784		-0.068442	
Student-rated school climate-8th grade (ranges -3.739-2.475)	-0.050906	-0.02385	-0.097579		-0.184894	*
Student-rated distractions from learning-8th grade (ranges -3.419-2.367)	-0.018033	0.010948	-0.059068		-0.179716	**
Student rating: actions against student-8th grade (ranges -4.954-0.872)	-0.01465	0.024492	-0.04755		-0.278704	***[1]
Parent-rated school characteristics-8th grade (ranges -4.266-2.097)	-0.05258	-0.039176	-0.036304		-0.198854	*
Administrator-rated school climate-8th grade (ranges -1.626-4.775)	0.044344	0.021551	0.11865		0.086258	
Administrator-rated school problems-8th grade (ranges -8.878-2.219)	-0.066376	-0.031043	-0.139226		-0.217214	*
Outcomes						
12th Grade Math Test Scores (ranges 16.97-78.1)	48.4353	49.2637	46.2059	**	45.9565	**
12th Grade Reading Test Scores (ranges 10.41-51.16)	33.391	33.7345	32.6049	*	32.0819	
Dropped out of high school	0.060055	0.045667	0.094837	***	0.111103	***
Attended College	0.791331	0.814654	0.768891	*	0.639749	***[2]
Obtained a BA degree	0.315977	0.362647	0.233578	***	0.088704	***[3]
12th grade GPA (ranges 0.06-4.00)	2.68879	2.73314	2.60356	**	2.48683	**
Units of Math (ranges 0-8.33)	2.92858	3.04891	2.70222	***	2.37082	***[1]
Units of Science (ranges 0-10)	2.70916	2.83501	2.42377	***	2.22448	***
12th grade Math Test Scores (standardized) (ranges 29.63-71.37)	51.1783	51.7464	49.7844	*	49.2051	***
12th grade Reading Test Scores (standardized) (ranges 29.01-68.35)	51.2071	51.5485	50.5073		49.7405	*
Missingness Flags						
expected high school track	0.019999	0.022745	0.011997		0.013018	
modal ability group (ranges 0-4)	0.350715	0.332836	0.340898		0.521719	**[1]
educational expectations	0.00921	0.010524	0.006903		0.002782	*
parental educational expectations	0.009059	0.008355	0.007827		0.01751	
ever held back in school	0.005992	0.00609	0.007311		0.002495	
academic problems	0.016166	0.016443	0.016885		0.01237	
race/ethnicity	0.007558	0.006555	0.011894		0.007245	
generation status	0.09284	0.074432	0.151401	*	0.129631	**

family structure	0.010733	0.010372	0.011699		0.011821	
School transfers before the 8th grade	0.062717	0.052653	0.08185	**	0.108953	***
parental education	0.005106	0.002865	0.006892		0.020421	***
Parents' age (ranges 0-2)	0.140251	0.122057	0.171774	*	0.230066	**
Parent involved with other parents	0.081465	0.069364	0.096688	*	0.152854	***
sibship size	0.000345	0.000367	0.000423		0	
count of enrichment classes (ranges 0-4)	0.22331	0.222045	0.242244		0.195605	
disengagement	0.037113	0.0372	0.037942		0.034696	
uneasy about asking questions in class	0.039352	0.038689	0.0447		0.03411	
absenteeism	0.049823	0.050298	0.044402		0.056798	
tardiness	0.042673	0.043895	0.040096		0.037569	
cutting class	0.038684	0.038615	0.036545		0.043605	
coming to class unprepared	0.050926	0.050577	0.050354		0.055028	
bored in school	0.04018	0.039373	0.039464		0.048458	
age	0.012366	0.012751	0.011329		0.011209	
income	0.082983	0.076774	0.092943		0.115249	
No. of parents working fulltime (ranges 0-2)	0.104949	0.084388	0.137154	**	0.213392	***
intergenerational closure	0.052788	0.042905	0.068415	**	0.104615	***
student is a language minority	0	0	0		0	
student has a disability	0.058263	0.04596	0.078934	***	0.120313	***
student is in algebra	0.130782	0.118245	0.189332		0.117988	
in gifted program	0.042092	0.041496	0.04276		0.045774	
8th grade math test score	0.03827	0.037953	0.032031		0.053607	
8th grade reading test score	0.037518	0.038219	0.023951		0.059108	[1]
8th grade science test score	0.03984	0.040463	0.024331		0.066035	[1]
8th grade history test score	0.042059	0.042486	0.027014		0.068963	[1]
8th grade self-reported grades	0.006727	0.006413	0.007647		0.007508	
count of extracurricular activities (ranges 0-11)	0.957155	0.902289	1.02143		1.29046	
% of school that is minority	0.01894	0.019341	0.022191		0.008957	
% of school that receives free/reduced price lunch	0.020073	0.021337	0.017068		0.015485	
student/teacher ration-8th grade	0.012498	0.01295	0.013225		0.007207	
baseline salary	0.032721	0.032248	0.035692		0.030694	
% students do not attend on average day	0.031659	0.033385	0.025691		0.029169	

% students who leave during school year	0.020906	0.022089	0.019693		0.013365	
school allows transfers	0.013623	0.013916	0.014435		0.009503	
school transfers for racial balance	0.013623	0.013916	0.014435		0.009503	
count of ESL/LEP teachers	0.013971	0.014524	0.015003		0.007207	
8th grade class size	0.013711	0.014419	0.013225		0.008714	
% students from single parent families	0.05666	0.058489	0.05913		0.036195	
% students who are LEP	0.01518	0.015748	0.015652		0.009426	
student-school social capital	0.009326	0.008726	0.012892		0.007167	
parent-school social capital	0.074118	0.065947	0.086224		0.118621	**
Student-rated school climate-8th grade	0.016583	0.016824	0.014292		0.019187	
Student-rated distractions from learning-8th grade	0.019465	0.0197	0.016673		0.02314	
Student rating: actions against student-8th grade	0.022447	0.023222	0.017438		0.02605	
parent-rated school characteristics	0.073882	0.059874	0.105238	***	0.128665	***
administrator-rated school climate	0.013505	0.014142	0.013442		0.008252	
administrator-rated school problems	0.012498	0.01295	0.013225		0.007207	
student-rated school problems	0.023301	0.023766	0.021514		0.022994	
Modal ability group						
Low track	0.028578	0.026336	0.035561		0.033469	
Middle track	0.409199	0.393362	0.413115		0.535744	***[1]
High track	0.314592	0.338544	0.269504	*	0.20256	***
School not tracked	0.24763	0.241758	0.28182		0.228228	
N	11110	9040	1420		640	

reference: did not transfer: * p<0.05, **p<0.01, *** p<0.001
reference: transferred once: [1] p<0.05, [2] p<0.01, [3] p<0.001

Figure 1: Propensity scores for students who transferred once (treatment) and students who did not transfer schools

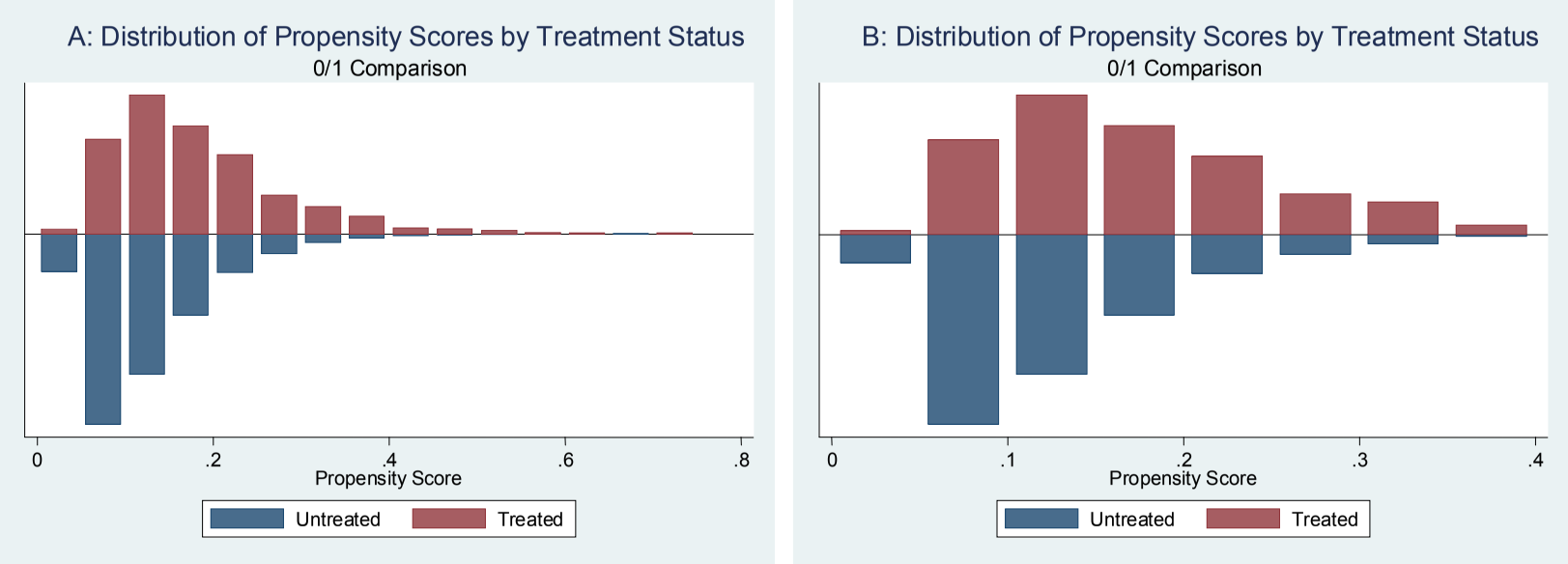

Figure 2: Propensity scores for students who transferred more than once (treatment) and students who did not transfer schools

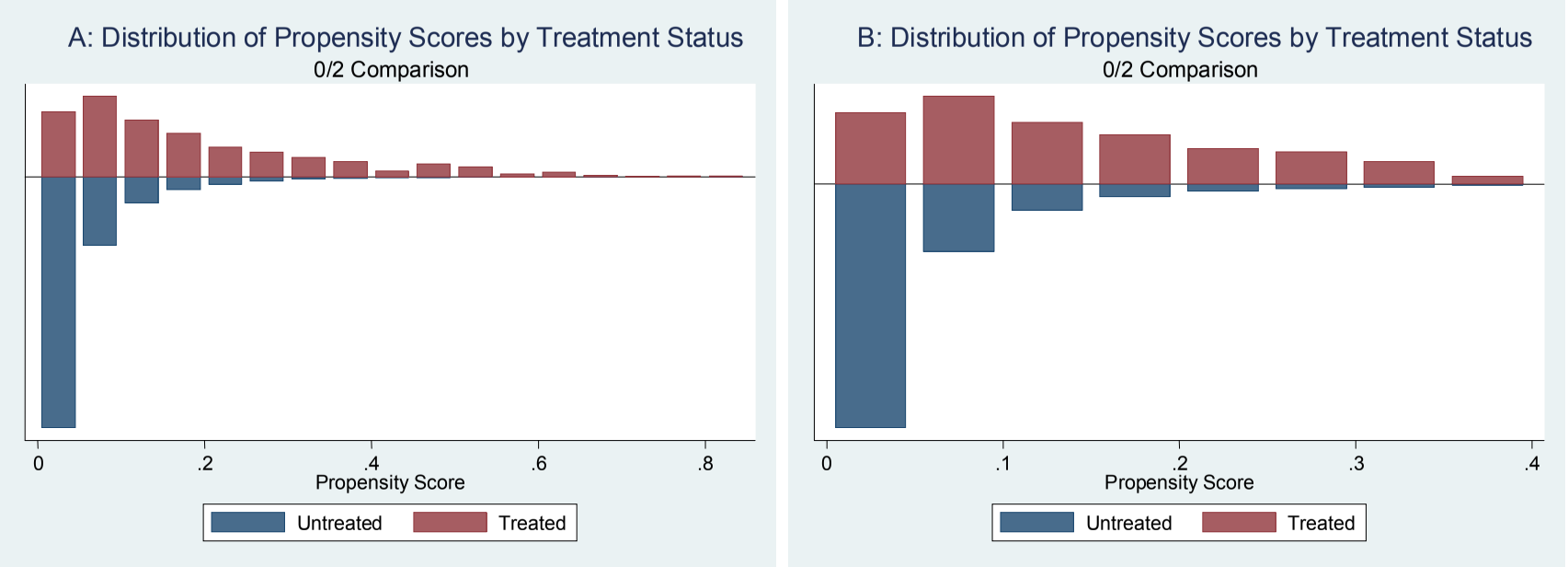

Figure 3: Propensity scores for students who transferred more than once (treatment) and students who transferred once

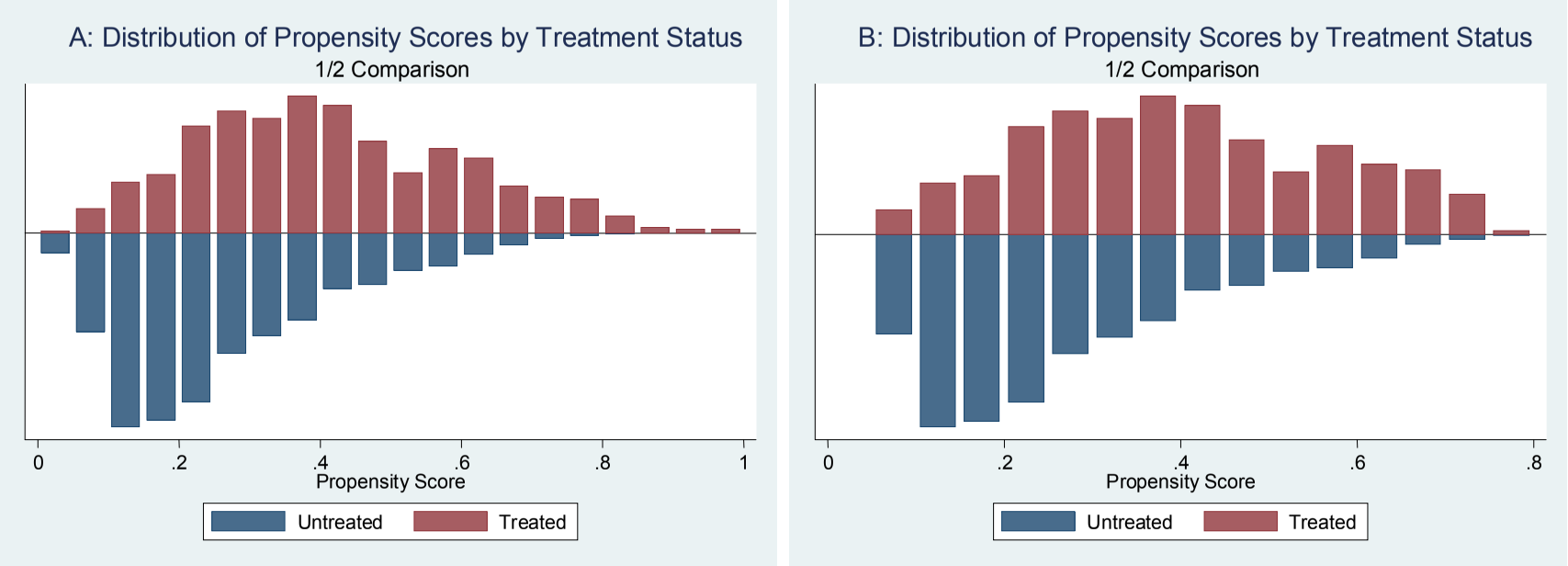

Table 2: Comparing Students who did not Transfer to Students who Transferred Once

	Nearest Neighbor		Kernel		Radius		Stratification	
Dropping out of High school	0.0266	*	0.0314	***	0.0408	***	0.024	**
	(0.012)		(0.008)		(0.008)		(0.008)	
College Attendance	-0.0350		-0.0436	***	-0.057	***	-0.03	*
	(0.021)		(0.013)		(0.013)		(0.013)	
4-year Degree attainment	-0.0678	**	-0.0828	***	-0.0998	***	-0.0638	***
	(0.024)		(0.014)		(0.014)		(0.014)	
Math Test	-0.5468		-1.2872	*	-2.219	***	-0.2762	
	(0.894)		(0.548)		(0.540)		(0.540)	
Reading Test	-0.6816		-0.8912	*	-1.3556	***	-0.3954	
	(0.688)		(0.383)		(0.379)		(0.380)	
12th Grade GPA	-0.1448	*	-0.1746	***	-0.2188	***	-0.127	***
	(0.060)		(0.035)		(0.033)		(0.033)	
Math Units	-0.3844	***	-0.384	***	-0.4492	***	-0.322	***
	(0.069)		(0.045)		(0.045)		(0.047)	
Science Units	-0.3802	***	-0.3888	***	-0.4536	***	-0.3198	***
	(0.062)		(0.045)		(0.043)		(0.044)	

Table 3: Comparing Students who Transferred Once to Students who Transferred More than Once

	Nearest Neighbor		Kernel		Radius		Stratification	
Dropping out of High school	0.0338		0.0474	**	0.071	***	0.0314	*
	(0.024)		(0.015)		(0.014)		(0.014)	
College Attendance	-0.0926	**	-0.1176	***	-0.162	***	-0.0844	***
	(0.035)		(0.022)		(0.021)		(0.022)	
4-year Degree attainment	-0.1312	***	-0.182	***	-0.2548	***	-0.121	***
	(0.033)		(0.014)		(0.015)		(0.016)	
Math Test	-1.5686		-4.2776	***	-6.5252	***	-2.31	**
	(1.643)		(0.809)		(0.854)		(0.853)	
Reading Test	-0.1048		-1.5472	**	-2.6636	***	-0.5794	
	(1.145)		(0.598)		(0.647)		(0.650)	
12th Grade GPA	-0.2064	*	-0.3666	***	-0.4756	***	-0.2726	***
	(0.087)		(0.055)		(0.058)		(0.057)	
Math Units	-0.6824	***	-0.8296	***	-1.003	***	-0.6926	***
	(0.149)		(0.064)		(0.069)		(0.070)	
Science Units	-0.5594	***	-0.7292	***	-0.9244	***	-0.5756	***
	(0.119)		(0.062)		(0.067)		(0.067)	

Table 4: Comparing Students who Transferred Once to Students who Transferred More than Once

	Nearest Neighbor		Kernel		Radius		Stratification	
Dropping out of High school	-0.0006		0.0042		0.0354	*	-0.0006	
	(0.029)		(0.019)		(0.016)		(0.019)	
College Attendance	-0.0006		-0.0346		-0.0836	***	-0.0248	
	(0.040)		(0.026)		(0.024)		(0.026)	
4-year Degree attainment	-0.0616	*	-0.071	***	-0.1248	***	-0.064	***
	(0.029)		(0.016)		(0.018)		(0.017)	
Math Test	-1.7162		-2.5418	**	-4.1974	***	-2.2856	*
	(1.459)		(0.944)		(0.976)		(1.003)	
Reading Test	-0.0074		-0.6016		-1.515	*	-0.4082	
	(1.150)		(0.771)		(0.721)		(0.744)	
12th Grade GPA	-0.142		-0.1118		-0.2116	**	-0.0914	
	(0.093)		(0.067)		(0.067)		(0.069)	
Math Units	-0.2822	*	-0.3294	***	-0.499	***	-0.2956	***
	(0.140)		(0.084)		(0.083)		(0.085)	
Science Units	-0.2416		-0.2534	***	-0.4118	***	-0.2246	**
	(0.154)		(0.076)		(0.076)		(0.079)	