Program on Education Policy and Governance
Conference Papers Series

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PEPG 25-15

This paper was presented at the School Choice Tradeoffs and Evidence-Based Policy Making conference held at the Harvard Kennedy School, May 8-9, 2025

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The Attraction of Magnet Schools: Evidence from Embedded Lotteries in School Assignment*

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February 28, 2025

Magnet schools provide innovative curricula designed to attract students from other schools within a school district, typically with the joint goals of diversifying enrollment and boosting achievement. Measuring the impact of attending a magnet school is challenging because students choose to apply and schools have priorities over types of students. Moreover, magnet schools may influence non-cognitive skill formation that is not well-reflected in test scores. This study estimates the causal impact of attending a magnet school on student outcomes by leveraging exogenous variation arising from tie breakers embedded in a centralized school assignment mechanism. Using a rich set of administrative data from a large school district, we find robust evidence that attending a magnet school significantly increases student engagement, as measured through absenteeism and on-time progress rates. Students are significantly less likely to change schools when attending a magnet. We find suggestive evidence that attending a magnet school led to higher performance in mathematics and that attending non-language immersion magnet schools increased students' reading scores. Together, these results suggest that magnet schools—a typically understudied school choice option—can benefit student learning and increase student engagement while enabling the system to achieve its goals of promoting racial and socioeconomic balance through school choice.

*For support throughout the project, we thank current and former Wake County Public School System (WCPSS) staff members Tamani Anderson-Powell, Glenn Carrozza, Eric Chancy, Beth Cochran, Elc Estrera, Laura Evans, Kimberly Lane, and Brad McMillen. We thank seminar participants at Appalachian State University, Stanford University, TCU, University of California-Davis, UNC-Charlotte, University of Kentucky, and the Association for Education Finance and Policy and Triangle Economics of Education Workshop conferences for helpful comments and suggestions, as well as seminar participants at UNC-Greensboro, University of Missouri, and the Association for Public Policy Analysis and Management conference for comments on an earlier version of this paper. We thank De Fen Hsu, Siyan Liu and John Westall for excellent research assistance.

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1 Introduction

Magnet schools represent an important, but understudied, form of school choice for school districts seeking to provide innovative instruction throughout an economically and racially diverse geographic area. These schools provide incentives such as enhanced curricula and specialized themes in order to attract (i.e., as a "magnet") parents and students. Despite the large number of magnet schools and their celebrated history as a popular approach to desegregation,[1] surprisingly little is known about the impact of magnet schools on human capital development. Magnet schools educate a similar number of students as charter schools, but research tends to focus on the effects of charter schools and voucher programs (e.g., Barrow and Rouse, 2009; Chabrier et al., 2016; Cohodes and Parham, 2021; Epple et al., 2016; Polikoff and Hardaway, 2017).

In this paper, we study the impacts of magnet schools in a large U.S. school system that enrolls a mix of base students and magnet students. Base students are drawn from the neighborhood attendance boundary, often from socioeconomically disadvantaged areas of the district. Magnet students apply for admission and are drawn from other parts of the district, often from socioeconomically advantaged areas. Both base and magnet students receive the same curricula in the same classrooms, which diversifies the student body at magnet schools relative to non-magnets. However, the costs associated with implementing magnet schools often exceed those of non-magnets due to expenses related to transportation (Bifulco et al., 2009; Frankenberg et al., 2008) and programming.[2]

Identifying the causal effect of attending a magnet school on student performance is particularly challenging since base students assigned to magnet schools and magnet students interested in special curricular themes may differ in unobserved ways from their peers. Moreover, since the objective of a magnet school is to improve the racial and socioeconomic balance of student populations, school systems themselves set "priorities" over the types of students that will ultimately be admitted.[3] This introduces two types of selection: students choosing to attend alternative schools and schools choosing particular types of students from those who apply. We overcome these selection challenges

[1] See Rossell (1990) for more detail on the history of magnet schools.

[2] The federal Magnet Schools Assistance Program (MSAP) funds the establishment of new magnet schools and maintenance of existing programs in districts that have historically operated under court-ordered or federally approved voluntary desegregation plans. The program has made 138 awards since 2010 valued at $1.5 billion, or roughly $10.9 million each. Through 2016, awards had a three-year duration, which increased to five years in 2017.

[3] For example, the Wake County Public School System, the site of our study, has four stated objectives for its magnet schools: (1) Reduce high concentrations of poverty; (2) Promote diverse populations; (3) Maximize the use of school facilities; and (4) Provide innovative and expanded educational opportunities.

by implementing a methodology introduced by Abdulkadiroğlu et al. (2017) for causal identification within centralized school assignment mechanisms. The inputs to a centralized assignment system are students' preferences over schools, schools' priorities over students, and schools' seat capacities. A centralized assignment system also uses lotteries to deal with coarse priorities. The process introduced by Abdulkadiroğlu et al. (2017) utilizes the full extent of randomness embedded in a district's centralized assignment process to identify the probability of random assignment, conditional on the inputs to the assignment process. The conditional probability of random assignment is the propensity score and conditioning on this score eliminates selection bias.[4]

We implement Abdulkadiroğlu et al. (2017)'s approach to evaluate the impact of magnet schools in the Wake County Public School System (WCPSS, hereafter "Wake County"), which has one of the largest and oldest systems of magnet schools among U.S. school districts. Wake County is the 14th largest school district in the nation and the largest in North Carolina with roughly 160,000 students enrolled across nearly 200 schools (Cornman et al., 2024). Since the establishment of Wake County's first magnet elementary school in 1978, the system has grown to include more than 40 magnets, which represent nearly a quarter of total schools in the district. The district represents a particularly advantageous setting in which to study magnet school impacts. First, the district's system of magnet schools is one of the largest in the nation, with the 12th largest number of magnet schools.[5] Second, among large magnet districts, Wake County's magnet school enrollees represent a diverse cross section of students. Finally, magnet enrollment in Wake County closely resembles national magnet enrollment across key demographic and socioeconomic groups.[6]

Our study estimates the net benefits of magnet schools by considering the benefits of magnet attendance for only a subset of students. The Abdulkadiroğlu et al. (2017) approach identifies the Local Average Treatment Effect (LATE), which characterizes the student population that contributes to the estimation of the causal impact of magnet schools. In our setting, the "compliers"

[4]Bergman (2018) uses this approach in his study of inter-district desegregation effects and Abdulkadiroğlu et al. (2018) combines this method with more traditional regression discontinuity design methods to study a full choice environment in New York City high schools. Abdulkadiroğlu and Andersson (2023) provide a more recent overview of designs and methods for optimizing student assignment in school choice contexts.

[5]Public school and enrollment counts by school type (e.g., magnets and charters) are available through the National Center for Education Statistics' Elementary and Secondary Information System (ELSi).

[6]Among school districts with more magnet schools than Wake County, only Florida's Hillsborough County Public Schools and the School District of Palm Beach County also closely resemble national enrollments across subgroups. Appendix Table A1 shows that across most available school-level demographic characteristics, Wake County's magnet population more closely resembles magnet schools nationally than magnet schools within North Carolina.

are applicant students whose attendance is affected by the lottery embedded in the centralized assignment mechanism. Thus, these findings do not provide evidence on the net benefit of magnet schools to Wake County or the benefit to students whose base school is a magnet school. However, for magnet schools to be effective, they must attract students from more affluent suburban areas. Because magnet schools are focused on desegregation, it is not obvious *a priori* that the benefits of magnet school attendance will be positively reflected in higher test scores. This study, therefore, provides robust causal evidence of the impact of attending a magnet school, which provides crucial insights into an important and relatively understudied aspect of school choice.

As is common in centralized assignment procedures, Wake County's schools have priorities over students that are coarse, which implies that many students have the same priority for assignment at a given school. To break ties, lotteries are embedded in the assignment process. Within the framework of Abdulkadiroğlu et al. (2017), we generate propensity scores that isolate exogenous variation from the lottery to provide causal estimates of the impact of magnet school attendance on a rich set of outcomes. We focus on kindergarten students who applied for the 2015-16 (hereafter, 2016) school year and follow this cohort for four years into their third grade year.[7] Kindergarten-entry students are particularly interesting for several reasons. Kindergarteners are at the beginning of their compulsory schooling, so the "treatment" they receive by attending either a magnet or non-magnet school is cleanly identified without concerns regarding the type of feeder elementary school for middle schoolers. Moreover, kindergartners are at an especially important phase of their education where any benefits or harm may generate lifelong consequences.

To preview our results, we find suggestive evidence that attending a magnet school improves performance in mathematics and reading achievement in second grade. These results are consistent with earlier work reporting cognitive returns to magnet enrollment (Betts et al., 2006; Bifulco et al., 2009; Engberg et al., 2014; Hastings et al., 2012). Results for third grade end-of-grade examinations are small and not statistically significant. We further measure the impact of magnet schools on non-cognitive skill formation and student behavior by using data on absenteeism, retention, and on-time progress. These student engagement outcomes capture aspects of human capital accumulation that influence students' longer-term performance in ways that are not well-measured by standardized

[7]Note that this is the last third-grade cohort to complete end-of-year accountability testing prior to pandemic-related school closures.

tests alone (Jackson, 2018). We find that elementary school students enrolled in magnet schools had significantly lower rates of absenteeism and higher rates of on-time progress. Together, these results provide new estimates of the effects of magnet schools and provide robust evidence that they increase student engagement during the earliest stages of student human capital development.

This paper contributes to a growing literature leveraging random assignment to identify causal impacts of schools.[8] Much of this work utilizes lotteries at oversubscribed or open enrollment schools (e.g., Bui et al., 2014; Cullen et al., 2006; Engberg et al., 2014) and frequently uses exogenous variation from lotteries in charter school settings (e.g., Abdulkadiroğlu et al., 2011; Angrist et al., 2013, 2016).[9] Such schools run school-specific lotteries that are not necessarily part of a centralized assignment algorithm. Work closely related to ours uses a first-choice instrumental variables strategy within a centralized school assignment algorithm in Charlotte-Mecklenburg Schools (Deming, 2011; Deming et al., 2014). Because we use the Abdulkadiroğlu et al. (2017) methodology, our identification comes from assignment to schools that were not necessarily oversubscribed, as well as at schools that were not listed as first-choice preferences.

This paper proceeds as follows. Section 2 describes magnet schools in more detail. Section 3 describes our data and analytic approach. Section 4 presents cognitive impacts, and Section 5 presents impacts related to behavior, engagement, and non-cognitive skill formation. Section 6 explores both robustness and within-sample heterogeneity. Section 7 concludes.

2 Background on Magnet Schools

The purpose of magnet schools is "to promote racial diversity and innovation, improve scholastic standards, and provide a range of curriculum options to satisfy parents' interests and priorities" (Smrekar and Goldring, 1999).[10] Magnets have been linked to among the oldest specialized schools in

[8]Studies using lotteries to measure school effects includes Angrist et al. (2010, 2012); Clark et al. (2015); Curto and Fryer Jr (2014); Davis and Heller (2019); Dobbie and Fryer Jr (2011, 2015); Fryer Jr (2014); Kline and Walters (2016); Tuttle et al. (2015).

[9]In a related literature, several studies have used admission cut-offs for special schools to identify causal effects in a regression discontinuity design (RDD) framework (e.g., Abdulkadiroğlu et al., 2014; Dobbie and Fryer, 2014; Pop-Eleches and Urquiola, 2013; Jackson, 2010).

[10]Definitions of magnet schools typically include some reference to racial balance, parental choice, academic advancement, and curriculum options. Magnet schools have also been defined as schools that "attract students of different racial/ethnic backgrounds or to provide an academic or social focus on a particular theme" (Grady et al., 2010) or "public schools which offer specialized subject themes or educational methodologies as a means of achieving desegregated student bodies" (Yu and Taylor, 1997).

the United States, including the nation's oldest public school, Boston Latin School, and 19th-century era schools including Chicago's Lane School and San Francisco's Lowell School (Blank et al., 1996). Magnets as we know them today first gained traction due to a confluence of social, legal, and political trends beginning in the mid-1970s. Then, a wide range of education stakeholders sought to design curricular programs that would attract families and educators to targeted areas of school systems that experienced high rates of racial isolation (Smrekar and Goldring, 1999). At the same time, a key court case dovetailed with new funding mechanisms to drive magnet school growth. *Morgan v. Kerrigan*, decided by the U.S. District Court for the District of Massachusetts in 1975, ordered the Boston Public Schools to "assur[e] that no school is markedly worse than another by providing for the development of magnet programs, so that desegregation may as far as possible occur through voluntary choices" (Morgan v. Kerrigan, 1975, 401 F. Supp. 235).[11]

Magnets are generally considered among other "alternative" school settings, such as charter, religious, and private schools. As shown in Figure 1, magnet student enrollment consistently exceeded that of public charter schools until 2014, when a growing enrollment gap emerged. The number of magnet schools roughly tripled during the two-decade period from 1999 to 2019, though charter school growth outpaced magnet school growth.

With magnet school growth came associated operating costs, which typically exceed those of non-magnets based on transportation (Bifulco et al., 2009; Frankenberg et al., 2008) and programming costs. To more deeply explore this, we reviewed awards granted through the federal Magnet Schools Assistance Program (MSAP) and estimate the MSAP-related magnet school costs based on their publicly available documentation.[12] Our setting, Wake County, received its most recent MSAP award in 2022, which provided $3.4 million in the first year and $13.5 million over the entire five-year grant period. This funding supported the establishment of two new elementary school magnet schools and revisions to two existing middle schools (DeFoor, 2022). In this latest cycle, Wake County's annual per-school costs in the first year average $860K and annually average $632K per school over the next four implementation years. These estimates are roughly in line with those

[11]In 1972, Congress enacted the Emergency School Aid Act (ESAA) to address broad racial segregation and, moreover, amended the law in 1976 to specifically incentivize the development of magnet school programs. While Congress eliminated ESAA in 1981, the Magnet Schools Assistance Program (MSAP) picked up in 1984 where ESAA left off, funding magnet school implementation not only to desegregate schools but to incentivize innovative magnet themes and curricular models (Blank et al., 1983, 1996; Christenson et al., 2003).

[12]See https://msapcenter.ed.gov for more on awards granted and program information.

provided by Rossell (1990) decades earlier and suggest that magnet school start-up and short-term implementation costs range from roughly $500K-$1 million in current dollars.

To attend a magnet school, students and their families use an application process to switch from one's base school that is based on school attendance boundaries. Proximate attendance boundaries may serve to minimize transportation costs and emphasize neighborhood schools, but many districts draw irregularly shaped attendance boundaries to achieve goals such as reducing socioeconomic isolation.[13] Saporito and Sohoni (2006) find that when attendance zones were drawn to promote racial balance, there was some degree of district exit by white families, which increased segregation. Similarly, Cook (2021) finds evidence that the 2007 Supreme Court ruling that race-conscious school admissions is unconstitutional led to an increase in racial segregation and lowered student achievement even within magnet schools due to white flight and increased segregation. In districts where magnet schools are present, evidence suggests they effectively reduce racial isolation (Saporito and Sohoni, 2007; Sohoni and Saporito, 2009).[14]

In the first credibly causal study of magnet schools, Betts et al. (2006) leverage lottery-based magnets in San Diego to show that magnet lottery winners did not outperform their counterparts on achievement tests. However, the authors also report that admission to high school magnets led to large test score gains three years following initial enrollment (See also Betts and Cao (2019) for a review that confirms secondary school magnet effects). Bifulco et al. (2009) report comparable lottery-based impacts in Connecticut magnet elementary and middle schools, which boosted achievement by as much as 0.14 standard deviations in math and one-third of a standard deviation in reading. The authors found similar results using a fixed effects approach across a larger sample.[15] More recent evidence finds small to negligible magnet school impacts across a range of settings and school types, including gifted and talented (GT) magnets (Bui et al., 2014), academically-themed magnets (Engberg et al., 2014), and undersubscribed magnets that use race-blind admission (Cook, 2021).

[13]With the same goal of minimizing concentrations of poverty in its schools, Wake County also has experimented with redrawing school boundaries. These neighborhood reassignments can cause some logistical disruption for families. However, Domina et al. (2021) and Hill et al. (2022) find evidence that in Wake County, the academic and behavioral consequences of reassignment have been fairly muted and, in some cases, academic achievement increased in response to direct reassignment itself as well as indirectly through exposure to reassigned peers.

[14]Irregularly shaped attendance zones are correlated with decreased income segregation (Saporito, 2017). Wake County is one of nine districts with less income segregation than their attendance zones would suggest and one of five with a difference greater than 2 standard deviations (Saporito, 2017). Richards (2014) finds that gerrymandered zones exacerbate racial segregation. See also Monarrez (2023) for more detail on attendance boundary maps and segregation.

[15]These impacts represent empirically large effects (Hill et al., 2008; Kraft, 2020), and appear to fall on the upper bound of achievement impacts.

To interpret magnet schools effects, it is important to distinguish between magnet school types. First, there is a difference between magnet "programs," which are initiatives *within* schools that impact select groups, and magnet "schools," which are *school-wide* magnet programs that include all students. Second, there is a difference between "traditional" and "destination" magnets (Betts et al., 2015). A traditional magnet is initially a low-performing school with a concentration of socioeconomically disadvantaged students; the magnet program is designed to attract socioeconomically advantaged students to promote socioeconomic balance. In contrast, a destination magnet is initially a high-performing school with a concentration of socioeconomically advantaged students; the magnet program is designed to attract students from other areas of the district, particularly students from low-performing schools with a concentration of socioeconomically disadvantaged students. The magnets we study are magnet *schools*—not programs within schools— and represent a mix of traditional and destination magnets.

Table 1 provides a comparison of average statistics for magnet and non-magnet schools. Magnets serve a higher proportion of Black and Hispanic students relative to non-magnets and receive slightly more resources relative to their non-magnet counterparts (e.g., more teachers per student). Teacher characteristics are similar between magnet and non-magnet schools, though magnets do attract less experienced teachers. Overall, these comparisons highlight the fact that magnet schools are slightly better resourced—a feature driven in part by additional MSAP funding.

3 Data and Methods

3.1 Study Setting: Wake County Public School System

The Wake County Public School System (WCPSS, hereafter "Wake County") was created in 1976 through the merger of the primarily socioeconomically advantaged Wake County school system with the primarily socioeconomically disadvantaged Raleigh City schools. Thus, it is a geographically large school district that encompasses the city of Raleigh and outlying suburban areas. The population is diverse in terms of race/ethnicity and socioeconomic status, resembling the nation along a number of key dimensions. The first magnet school in Wake County launched in 1978, and in 1982, the school board approved the district's first comprehensive "schools of choice" initiative that led to the designation of a number of new magnet schools. Through 2019, the district has established more than 40 magnet schools that serve more than 35,000 students. Our study includes 105 elementary schools as of 2016, of which 26 were magnet schools.

In Wake County, magnet school assignment is partially choice-based. Most magnet schools were established in areas of the district with high concentrations of poverty or undersubscribed schools. The goal is to recruit children who are attracted to a magnet school by a special theme-based schooling option, such as a science, technology, engineering, and mathematics (STEM) or gifted and talented (GT) focus.[16] Magnet schools differ from charter schools in that about half of the student population is drawn from within the school attendance boundary (i.e., students who attend the magnet school as their base, or "neighborhood," school), while the remaining enrollees are drawn from different attendance zones.

All students are initially assigned to a base school within school attendance boundaries that link a student's residential address to a base school. Students who do not apply for a magnet school or an alternative calendar school (e.g., year-round calendar) attend their default base school. Several authors of this paper worked with the district to redesign its centralized assignment process in 2015; since then the process has used the Deferred Acceptance algorithm (Gale and Shapley, 1962; Abdulkadiroğlu and Sönmez, 2003).[17] Magnet seats are assigned (up to a school's capacity of magnet seats) using students' submitted lists of preferences over schools and schools' priorities over students. The construction of priorities in Wake County is based on the district's four pillars found in Board of Education Policy 6200: student achievement, stability ("stay where you start"), proximity, and operational efficiency. For the elementary schools that we study, priority is given based on sibling status, whether the students' catchment area (i.e., neighborhood) is high performing in terms of test scores during the prior two years, and whether the students' base school is currently overcrowded.

The key feature of our approach that underlies the identification strategy is the embedded lottery used in assignment. In Wake County, the lottery is used in two distinct ways. First, a subset of seats, which we call lottery seats, are assigned solely based on students' lottery numbers. Second, lottery numbers break ties between students with the same priority for assignment. The same

[16] In terms of themes nationwide, science, technology, engineering, and mathematics (STEM) accounts for 30 percent of themes, followed by visual/performing arts (16 percent), International Baccalaureate (IB, 12 percent), gifted and talented (GT, 8 percent), and world languages (7 percent) (Nelson and Magnet Schools of America, 2018).

[17] In partnership with these authors in 2015, the district replaced the mechanism used in its assignment process. As discussed in Dur et al. (2018), the district previously used the Boston Mechanism, which rewards strategic play in which students have the incentive to highly rank schools at which they have a high priority. In contract, the Deferred Acceptance algorithm is a strategyproof mechanism in which truthful reporting is weakly dominant strategy.

lottery draw is used for lottery seats and for lottery tie breaking. Further, students have the same lottery number at all magnet schools. A student is not shown her lottery number prior to applying or after assignments are released, which implies that a student's lottery number cannot affect her application behavior—only her assignment.

In the assignment, any siblings of a school's current students are guaranteed placement.[18] Then, 10 percent of the remaining seats are assigned as lottery seats (i.e., a pure lottery that is independent of a student's priority). Wake County introduced the 10 percent lottery to encourage more students to participate in the magnet application process, but it also provides additional variation that can be leveraged for causal inference.[19] The remaining 90 percent of seats are allocated according to priorities. Because priority classes are coarse, magnet seat offers are made using tie breaking between students with the same priorities. This tie breaker uses the same lottery number as the 10 percent lottery. Therefore, conditioning on priorities allows identification to come directly from the lottery itself. Following Abdulkadiroğlu et al. (2017), we group students with equal *ex ante* priority, rather than simply controlling directly for preferences and priorities at each school. This provides a more powerful estimation strategy because we exploit the full extent of randomness in the assignment mechanism for causal identification. Further, our application of the Abdulkadiroğlu et al. (2017) methodology allows a straightforward extension to exploit the randomness from the lottery seats jointly with the randomness from lottery tie breaking.

Priorities are student-school specific and determine the order of consideration of each student's application at each school. Among students in a given priority class, assignment solely depends on the lottery. To group students with equal *ex ante* probability of receiving a magnet school assignment, we use a propensity score that is independent of the realization of the lottery at the time the assignment was made. These propensity scores are generated from one million iterations of the assignment algorithm with different lottery draws. This method identifies all students who are impacted by randomness, so that one student's probability of assignment can be affected by others' lottery draws. Further, assignment to undersubscribed schools also contributes to identification because tie breaking at a given oversubscribed school affects who is seated at other schools.

[18]The *guaranteed* sibling priority refers to a set of siblings in which the older sibling will attend the school next year and the younger student applies for the entry grade (i.e., kindergarten, sixth, or ninth grade).

[19]Before the introduction of the 10 percent lottery, certain neighborhoods were excluded from the magnet process. This included neighborhoods where the base schools were not overcrowded and that were not classified as high-performing areas. Wake County introduced the 10 percent lottery to increase engagement with the magnet program.

3.2 Econometric Strategy

Magnet school attendance is likely correlated with unobserved student characteristics that are also correlated with outcomes. The identification strategy, outlined in Abdulkadiroğlu et al. (2017), uses receiving a magnet school offer as an instrument for magnet school attendance conditioning on a propensity score. Receiving a magnet school offer is a function of a student's preferences over schools, her priority at each school, and a random lottery number. A propensity score is generated from one million iterations of the assignment algorithm with different lottery draws. The propensity score, therefore, mechanically accounts for how preferences and priorities affect the probability of receiving an offer to attend a magnet school. Thus, receiving an offer to attend a magnet school is a valid instrument for years of magnet school attendance when conditioning on propensity scores. By controlling for propensity scores, the magnet seat offer is itself exogenous to any action that a student might take to increase the probability of receiving an offer. Any unobserved differences between students in the probability of attendance are in the error term and, by construction, uncorrelated with the probability of receiving a magnet school offer.

Years of attending a magnet school is denoted as $\mathit{YrsMagAttend} = 1$, while receiving a magnet school offer is denoted as $\mathit{MagOffer} = 1$. The key equation of interest indicates the effect of magnet attendance on student outcomes, and it takes the following form:

$$Y_i = \beta \, \mathit{YrsMagAttend}_i + G(PS_i) + X_i \gamma + \epsilon_i. \tag{1}$$

Here, i indexes students, and $G(\cdot)$ is a flexible function of propensity scores. We include demographic characteristics, X_i, such as gender, race/ethnicity, and the presence of siblings (who also applied to attend a magnet school). A key concern is that attending a magnet school is correlated with the error term, ϵ. Receiving a magnet school offer is an instrumental variable that predicts magnet attendance in our first-stage equation:

$$\mathit{YrsMagAttend}_i = \alpha \mathit{MagOffer}_i + G(PS_i) + X_i \sigma + \mu_i. \tag{2}$$

The effect of attending a magnet school is identified only off of compliers: those whose years of magnet school attendance are affected by receiving an offer. Thus, students whose parents petition and ultimately enroll in a magnet school even when not receiving an offer (i.e., "always takers") and those that do not attend a magnet school even when offered (i.e., "never takers") do not bias the estimation of the local average treatment effect (LATE). These non-compliers simply reduce the statistical power of the estimation. In this setting, bias is only introduced if there are defiers: those who attend a magnet if not offered and do not attend if offered. The argument for the presence of defiers is if parents can successfully petition for admission to a magnet school if not offered a seat, but refuse to attend a magnet school if offered, which seems highly implausible.[20]

Our main specification uses propensity score fixed effects where the scores are rounded to the nearest 10th decimal place, yielding 11 possible bins.[21] The propensity scores control for all aspects of priorities and preferences over magnet school offers that affect magnet school attendance. Including the propensity score controls ensures that magnet offers are a valid instrument for years of magnet attendance.

3.3 Magnet Offers and Enrollment Destinies

We focus on kindergarten students who applied to magnet schools for the 2015-16 (hereafter, 2016) school year. To begin, we consider how the propensity scores and magnet offers predict magnet school attendance. Table 2 shows the *enrollment destinies* for magnet school applicants for the 2016 school year, when the students would be kindergartners. Not all applicants ultimately attend a Wake County school in kindergarten, so there are more students in Table 2 than in our analysis sample. The first column presents statistics for the 1,347 magnet applicants, while Columns (2) and (3) include those offered a magnet seat (N= 657) and those not offered a magnet seat (N=690), respectively. On average, 54.9 percent of magnet applicants attend a magnet school in kindergarten. Receiving a magnet seat offer is associated with a higher rate of magnet attendance: 82.5 percent of those offered a seat attend a magnet school compared to only 28.7 percent of those not offered a

[20]The process for petitions is called transfer requests, and district officials state that there is no reason for a parent who did not receive an offer to have a more successful transfer request relative to a parent who received an offer. In auxiliary data on transfer requests and outcomes from the year of study (assignments for 2015-16), we estimate the determinants of transfer request success using similar controls as in our later regressions as well as an indicator for magnet applicants who were not offered a magnet seat and an indicator for those who were offered a magnet seat. Relative to non-magnet-applicants, unsuccessful magnet applicants are much less likely to be successful in their transfer request and successful magnet applicants are similarly likely to be successful in their transfer request. The "transfer success" point estimates are -27.7 percentage points for unsuccessful magnet applicants (p-value = 0.00) and 2.8 percentage points for successful magnet applicants (p-value = 0.50).

[21]The results are not sensitive to the choice of $G(PS_i)$. Estimates using alternative functional forms are presented in Appendix Table A6.

seat. However, these statistics make clear that a "first stage" is necessary to account for the fact that many students are able to attend a magnet school even if not initially assigned.[22]

Next, we see that 17.8 percent of all magnet applicants do not ultimately matriculate to kindergarten in 2016. Families may move out of the district or enroll their child in a charter school, private, or home school. While 12.6 percent of those offered a seat attrit from the sample, nearly twice as many (22.8 percent) of those not offered a seat ultimately chose not to attend kindergarten in Wake County. We return to this issue later in Section 6.1, where we show in a regression framework that this difference disappears after conditioning on propensity scores. Further, we provide evidence that the findings are not sensitive to basic attrition corrections. The penultimate row presents the mean propensity scores.[23] The average propensity score is substantially higher for those offered a seat, which highlights the importance of controlling for the propensity score in a regression framework. In sum, Table 2 highlights that receiving a magnet offer does lead to a higher probability of magnet attendance but is not perfectly correlated with magnet attendance. Further, those offered magnet seats are different from those not offered magnet seats such that controlling for the propensity score will be essential to recover unbiased estimates of the effects of magnet schools.

3.4 Summary Statistics

The baseline sample includes students who enrolled in kindergarten in 2015-16 (2016). Table 3 presents summary statistics. The first column includes all Wake County kindergarten students. Column (2) includes the subset of students who applied to attend a magnet school when matriculating to kindergarten in Fall 2016. Columns (3) and (4) separate the analysis sample into students who attended a magnet school in 2016 and students who attended a non-magnet school in Wake County that same year. About 19 percent of all Wake County kindergartners attend a magnet school, and 67 percent of magnet applicants attend a magnet school. In the second row of Table 3, Column (4), 51.9 percent of magnet applicants are offered a seat at a magnet school for the 2016 school year. Interestingly, only 73.2 percent of magnet applicants attending a magnet school were originally

[22]Most students in the non-offered group who attend a magnet school are admitted via the magnet application waitlist. Students may be assigned to a magnet school as their base school but apply to a different magnet school. It is also possible to petition to transfer or receive an administrative reassignment due to hardship or special requirements.

[23]In our sample, 48.6 percent of students received a magnet offer (i.e., 657 out of 1,347 applicants). The average propensity score is identical to the percent receiving an offer. This is true by construction of the propensity scores. In particular, we repeatedly run the assignment procedure with different lottery draws and calculate the propensity score as the percent of draws in which the student is assigned to any magnet school across all lottery draws.

offered a seat, while 8.7 percent of those not initially offered a seat ultimately attend a magnet school in kindergarten.

Our identification strategy relies on the offer instrument resulting in magnet school attendance. If the assignment does not always translate into attendance, that weakens the first stage. As described in more detail above, the propensity score is the conditional probability of random assignment. As anticipated, students attending a magnet school have, on average, a higher propensity score than those not attending. All regressions control for these propensity scores.

Table 3 presents student demographic characteristics observed in administrative data at the time of magnet application. Demographics such as gender and race/ethnicity are important controls in our analysis, but these characteristics do not directly affect magnet priorities. In the raw means, slightly fewer boys are magnet applicants and magnet attendees than girls. Magnet applicants are more likely to be white, but the racial/ethnic differences in magnet attendance are not large. In Wake County, students are assigned a residence-based catchment area that determines their base school assignment. Students whose base school is high performing receive higher priority in the assignment process. We include an indicator for whether a student's catchment area is associated with a high-performing school, which is only available to us for students who applied to a magnet school. Students from high-performing catchments are more likely to attend magnets, reflecting their higher priority in the assignment process. The magnet assignment process allows us to impute sibling information for students who apply. *Has sibling* identifies whether another magnet applicant lives at the same residential address. We cannot confirm whether these students are, in fact, siblings, but they are treated as such in the assignment algorithm. *Twin* is an indicator for having another same-grade applicant in the household. This twin indicator represents a proxy for actual twins and is not restricted to include only those of the same age or having the same parents.[24]

Finally, the bottom half of Table 3 displays statistics for academic and behavioral indicators at kindergarten entry, where available. New enrollees are usually administered the North Carolina Kindergarten Entry Assessment, or KEA, to assess cognitive, behavioral, and physical traits. Each of the five categories includes a range of questions or tasks, and we generate a standardized index from each using principal components analysis. Magnet applicants score roughly a fifth to a third

[24] According to the CDC's National Center for Health Statistics, about one in thirty infants born in 2022 was a twin, (Osterman et al., 2024).

of a standard deviation higher than the average kindergarten student across all indices. Similarly, magnet applicants at kindergarten entry score higher than the average student on measures of number knowledge (NKT) and reading comprehension (TRC). Note that these variables are not used in the estimation because they are not available for all students in our data.

Table 4 presents evidence supporting identification through balance tests. We generate these by regressing each covariates seen in Table 3 on receiving an offer, conditioning on propensity score. Across nearly all covariates, differences are small, and when they are moderate in size (e.g., KEA Math), they are imprecisely estimated. Although the estimate for Black is marginally significant, the joint p-value is 0.198, indicating satisfactory covariate balance.

3.5 Compliance Probabilities

The results in Table 2 illustrate clearly that magnet school offers are not binding, thus we should not anticipate that the first-stage coefficient is near one. As described in Section 3.2, identification is derived from the group of compliers: students who attend a magnet if they receive an offer and do not attend if they do not receive an offer. We follow the method introduced by Abadie (2002, 2003) to characterize the population of compliers.[25] Since only one state of the world is realized, we cannot explicitly identify compliers within the data. The Abadie method recognizes that the population of magnet attendees is composed of both always-takers (those who attend irrespective of offer) and treated compliers, while the population of non-magnet attendees is composed of never-takers (those who do not attend irrespective of offer) and control compliers.

To better understand identification, Table 5 presents the probability of compliance. The first four columns report the sample size, probability of attending a magnet (i.e., $D = 1$), the first stage estimate, and the probability of receiving a magnet offer (i.e., $Z = 1$), respectively. Column (5) presents the probability of being a complier for the treatment group, while Column (6) is the probability for the control group. The sample is restricted to Wake County public school students attending kindergarten in 2016. The first row indicates that for the full sample of 1,107 students, 66.8 percent attend a magnet school and 51.9 percent receive a magnet offer. The first stage estimate implies that receiving a magnet school offer increases the probability of attending a magnet school by 40.7 percentage points. Using these estimates, Column (5) indicates that the probability of being

[25] See Angrist et al. (2016) for a detailed description of how to apply the method to determine complier distributions.

a complier among magnet attendees is 31.6 percent, while the probability of being a complier among non-attendees is 59.1 percent. This is consistent with many students ultimately enrolling in magnet schools from the waitlist, so that the group of non-attendees is more compliant with the instrument.

The other rows in Table 5 show compliance probabilities across the propensity score distribution, using the same bins as used in our propensity score controls (i.e., bin width of 0.10 with finer detail near 0 and 1).[26] The propensity score is the conditional probability of random assignment, which is the link between the propensity score and the mechanics of identification. The overall picture provided by these compliance probabilities is that identification is not concentrated on a small subset of students but comes from all but the students with the very highest probability of assignment. First, for students with a lower conditional probability of random assignment (e.g., propensity score lower than 0.35), the group of magnet attendees is composed almost entirely of "always takers," while most non-magnet attendees are compliers and very few are "never takers." Second, the group of students with intermediate propensity scores (e.g., propensity scores between 0.55 and 0.75), both attendees and non-attendees are roughly evenly split between compliers and "always-takers" / "never takers," respectively. Finally, students with the highest probability of receiving an offer (e.g., propensity scores above 0.75) do not contribute to identification because all received an offer in the actual assignment.[27]

3.6 Test Score Measures

All Wake County third graders complete standardized end-of-grade (EOG) exams in both reading and mathematics. These exams are "high stakes" in that low performance on the reading EOG can result in summer school remediation or retention, while both tests contribute to teacher- and school-level accountability. Second grade students, on the other hand, do not take standardized EOG exams, but instead take shorter mathematics and reading assessments three times annually. The purpose of these relatively "low-stakes" exams is to provide teachers with updates throughout the school year, which they use to inform instruction. For this study, we focus two such exams—one mathematics and one reading—which are typically administered during the last month of second

[26]Because we use a linear probability model, compliance probabilities are occasionally outside of the expected range of $[0, 1]$.

[27]Appendix Table A6 presents the main estimates on a sample that excludes students with propensity scores of exactly 0 or 1, and the results are robust to this restriction.

grade. We use the end-of-year (EOY) exams as outcome measures.

The first measure, the Number Knowledge Test (NKT), is a screening assessment for early progress and is designed to measure conceptual knowledge of numbers. The raw test score ranges from 1 to 30 and represents grade-level equivalents for pre-school through fifth grade.[28] The examination is used as a screening tool to identify students who might require remediation in the future. Thus, we consider whether the student is identified as scoring "proficient," meaning they are not identified as requiring specific intervention.

The second measure, Text Reading Comprehension (TRC), is designed to measure early literacy skills—specifically fluency, accuracy, and comprehension. Wake County has long used normed literacy probes in elementary school to screen students for reading difficulties.[29] The scores for the TRC represent reading levels ranging from A to Z+ (our sample includes levels B through U).[30] The assessment recommends using the "far below proficient" threshold to identify students who may require intervention, so we parameterize reading proficiency as not "well below" the proficient level.[31]

4 Results: Test Scores

4.1 Test Score Results

The main results are presented in Table 6. Panel A presents estimates for math and reading derived from the NKT and TRC, respectively. Panel B presents estimates from the third grade EOG as a standardized score with mean zero and unit standard deviation. Each panel is restricted to students with on-time grade progression and valid scores who applied to a magnet school for kindergarten in the 2016 school year. As described in Section 3.4, all regressions include controls

[28]The Number Knowledge Test (McGraw-Hill, 2008) has been found to have strong predictive validity for the nationally-normed Stanford Achievement Test (9th edition) and select subtests, with correlations ranging from 0.64 to 0.73 (Baker et al., 2002; Gersten et al., 2005).

[29]The district used DIBELS 6th Edition prior to passage of the state's Read to Achieve (RtA) legislation, and DIBELS NEXT and TRC afterwards. RtA required students to demonstrate grade-level reading mastery by the end of third grade or risk retention. To monitor student progress toward this goal, the district required the use of DIBELS and TRC in grades K-3 and offer it as a mainly optional assessment in grades 4-5.

[30]Using the Fountas and Pinnell published literacy-level equivalent chart to convert the scale to grade-level goal equivalence, the mean reading level in our data is 2.6 by the end of second grade (Fountas et al., 2001; Fountas and Pinnell, 2017).

[31]Figlio and Hart (2014) and Dhuey et al. (2019) operationalize scores on the comparable DIBELS assessment as a dichotomous readiness indicator in a similar fashion.

for gender, race/ethnicity, residing in a high-performing catchment area, and presence of siblings. Propensity scores are rounded to the nearest 10th decimal place. Standard errors are clustered by school. The first column of Table 6 reports the first-stage estimate of how receiving an offer of a magnet school seat affects years of magnet school attendance in second and third grade (i.e., the 2018 and 2019 school years, respectively). Receiving a magnet school offer increases the years of magnet attendance by 1.1 years as of second grade and 1.5 years as of third grade.

Table 6 Columns (2) and (4) present the OLS estimates of years of magnet attendance on mathematics and reading, respectively. Columns (3) and (5) presents the IV estimates that use the magnet offer as an instrument for years of magnet attendance and include propensity score controls. Column (3) shows that an additional year of magnet school attendance leads to a 8.74 percentage point higher probability of being proficient in mathematics.[32] In Table 6, Panel A, the second grade outcomes are dichotomous indicators for proficiency, which parallels how the exams are evaluated in practice. In second grade, among magnet applicants not receiving a magnet offer, roughly 83.7 percent of students are proficient in math and 83.1 percent are proficient in reading. Thus, the point estimate for mathematics suggests one year of magnet attendance increases the probability of being proficient in mathematics in second grade by roughly 10 percent. The point estimate is similar for reading, both in magnitude and percent, but it is not statistically significant.

Panel B shows a similar pattern for students who are on-time to third grade, but no test score effects are statistically significant. The third grade exams are standardized to mean zero, standard deviation one using the entire grade-level population of Wake County. Because the population of magnet applicants is positively selected, the mean of the dependent variable for the group of magnet applicants not receiving an offer is 0.121 and 0.185 standard deviations for mathematics and reading, respectively. Although neither IV estimate is statistically significant, the confidence intervals include positive test score gains that are qualitatively large.

Appendix Tables A5 and A6 presents a host of further robustness checks. In the former, we see that the results are robust to adding a control for the length of magnet applicants' rank ordered list and to excluding the demographic controls.[33] For a subset of students, kindergarten beginning of year

[32]Appendix Table A4 presents a parallel set of results using alternative parameterizations of the test score variables.

[33]Applicants may submit a list of ranked preferences over schools that includes between one and five schools. Applicants who submit a longer rank ordered list may differ from other applicants in terms of strategic sophistication or in terms of preferences for magnet schools relative to their base school. As such, we do not include length of rank ordered list in our main specification. However since propensity scores control for any endogenous differences among

(BOY) mathematics and reading proficiency are recorded. When restricting to this smaller sample, the estimates are somewhat attenuated, but including controls for math and reading proficiency do not qualitatively change the estimates. Interestingly, these estimates suggest that mathematics proficiency predicts later success better than reading proficiency, although this may be simply due to the quality of the exam rather than the underlying cognitive differences. In Appendix Table A6, results are not sensitive to alternative functional forms for $G(PS_i)$, restricting the sample to students with propensity scores strictly between 0 and 1, or to excluding base magnet students who applied to other magnet schools. The table also presents alternative estimates that use the *first choice lottery* instrument, as described in Appendix Section A.3. This approach finds similar benefits of magnet attendance, despite having a different complier population.[34]

5 Results: Student Engagement

The positive and (sometimes) statistically significant test score gains from attending a magnet school should be interpreted in context, as the primary objective of magnet schools is integration and expanded educational opportunities. Therefore, we next turn to other measures of student success and student engagement. A recent literature has established an important role for student engagement measures in predicting longer-term success of students (see, e.g., Jackson, 2018). The aims of magnet schools include providing enhanced curriculum that might challenge and ultimately benefit students in ways that are not well-measured by the test score measures analyzed above. Indeed, we predict that magnet schools might improve students' longer-term outcomes by increasing student engagement and improving non-cognitive skills such as executive function and perseverance (e.g., grit). To provide evidence on this, Table 7 presents IV estimates of the effect of magnet attendance on our key behavioral outcome: absences over 2016-2019 as a function of magnet attendance in 2019. Column (1) reports the first stage for this sample, which is slightly larger because it no longer requires students to have valid exam scores. The sample is still restricted to include only those continuously enrolled in a Wake County school for all four years. In Columns (2)

applicants, we can ensure the robustness to including length of rank ordered list as an additional control. The results are robust, which is consistent with the propensity score capturing all relevant aspects of preferences and priorities.

[34]Further, as shown in Table 1, magnet schools in Wake County differ from traditional public schools both in terms of resources and in terms of student body served. Appendix Table A7 includes estimates from regression models that include all school-level characteristics reported in Table 1. When controlling for these observable differences at the school level, the estimated impact of magnet schools is slightly more pronounced.

and (3), the dependent variable is the total number of absences experienced during the first four years of elementary school, with Column (2) estimated as a linear model and Column (3) estimated as a Poisson model. Column (4) estimates the model on the log of total absences plus one.[35] The estimates in Columns (2) and (3) suggest that an additional year of magnet school attendance reduces absences by roughly 4 days, which is about 14 percent of the sample mean for magnet applicants not receiving an offer (28 days). When considering the log, we find that one year of magnet attendance reduces absences by about 15 percent.

The final two columns of Table 7 present estimates for dichotomous indicators of chronic absenteeism. Wake County highlights students with 3 unexcused absences in a given year as "chronically" absent, while students with more than 20 unexcused absences in a given year are termed "excessively" absent. Our data do not allow us to distinguish excused and unexcused absences. Aggregating over the four years, Column (5) presents estimates for a dichotomous indicator of being absent more than 12 days over the course of the first four years of elementary school (mean is 83.8 percent for magnet applicants not receiving an offer), while Column (6) presents estimates for more than 80 days total (mean is 1.9 percent). The impact of years of magnet attendance on missing more than 12 days is not statistically significant, but years of magnet attendance substantially reduces the probability of being "excessively" absent. The results in Table 7 are important as they indicate magnet schools significantly improve student engagement, even among students motivated to apply for magnet schools.

Table 8 presents an analysis of on-time progress through elementary school to establish whether magnet schools enhance student engagement and facilitate timely grade completion. For this exercise, the key explanatory variable is magnet attendance in kindergarten in 2016. The first column presents the first stage for this expanded sample: the effect of receiving a magnet offer on attending a magnet school as a kindergartener in 2016, controlling for demographics and propensity scores. For this outcome, we include data through 2021 when this cohort is in fifth grade.

While switching schools may be a disruptive event, many students do so for a variety of reasons. Families may move within district, apply for reassignment, or petition for a transfer. Table 8, Column

[35] A Poisson model of total absences and a model of the log of total absences plus one are alternative ways to handle the distribution of count data variables such as absences. Coefficients estimated using Poisson are interpreted in levels, while those estimated using log absences are interpreted in percentage terms. Estimates from an inverse hyperbolic sine transformation are quite similar.

(2), considers whether students switched schools between kindergarten and third grade as a function of magnet attendance in kindergarten. About 27.5 percent of students who applied for a magnet school, did not receive an offer initially, but did enroll in a Wake County kindergarten, ultimately switched schools between kindergarten and third grade. The IV estimates suggest that magnet attendance in kindergarten lowers the probability of switching schools by 55.2 percentage points. Unlike in a full choice environment, our sample is composed only of students who voluntarily apply to attend a magnet school in kindergarten. Therefore, it is not surprising that they demonstrate a strong preference for attending a magnet school. Recall that our IV strategy implies that the effect of magnet school attendance in later grades is estimated only off of "compliers." Thus, switching schools will not bias the estimates but will only weaken the first stage.

Columns (3) and (5) of Table 8 present estimates of attending a magnet school in kindergarten on leaving Wake County any time before third and fifth grade, respectively. The IV estimate of attending a magnet school in kindergarten yields a large and statistically significant lower probability of leaving Wake County schools. Columns (4) and (6) similarly considers the probability of progressing "on-time." On-time progression to third grade is having a valid third grade test score in 2019 and being continuously enrolled in the district between 2016 and 2019; on-time to fifth grade is defined analogously. Thus, this includes both attrition and retention effects. Magnet attendance led to a 27.4 percentage point increase in on-time progress to third grade and 31.9 percentage point increase in on-time progress to fifth grade. These are very large effects.

Magnet schools clearly impact students' engagement and development along important non-cognitive and behavioral dimensions, such as preventing marginal students from falling behind. Moreover, the retention of marginal students implies that in the absence of improved learning, test scores would be predicted to fall as marginal students are included in the data when they otherwise would be omitted. As a result, the test score gains we observe may underestimate of the true benefit of magnet schools.

6 Heterogeneity and Robustness

6.1 Test Scores and Attrition

Unlike in a full choice environment, in our setting it is optional to participate in the centralized assignment to a magnet program. Table 2 showed that the probability of not attending any Wake County school is higher for those who do not receive a magnet offer relative to those who did. Appendix Table A8 provides more detail on this attrition rate. We break the sample into three broad categories of propensity scores: [0,0.05), [0.05, 0.95), [0.95, 1] and present attrition rates for each group. Recall that in Wake County, 10 percent of seats are allocated by random lottery to increase participation in the magnet program, so there are a large number of students with very low probabilities of receiving a magnet offer. Students with very low propensity scores have much higher attrition rates overall, but the difference between those receiving a magnet offer or not is modest. Students whose propensity scores fall between [0.05, 0.95) actually have a higher attrition rate when receiving a magnet offer. As was shown in Table 5, all students with very high propensity scores received a magnet seat offer. Beyond having received a magnet school offer, students with low propensity scores, and thus lower probability of receiving an offer, are likely different in observed and unobserved ways relative to those have high propensity scores, and thus have a higher probability of receiving an offer. This is precisely why our use of the Abdulkadiroğlu et al. (2017) methodology is an important contribution in studying magnet schools. Appendix Table A8 illustrates that the source of differential attrition is actually due to the composition of students, motivating our use of propensity score controls in the regression analysis.

To confirm this finding, Appendix Table A9 presents an analysis of attrition as a function of receiving a magnet offer. Similar to the raw means, in Column (1) with no propensity score controls, receiving a magnet offer is associated with a 9.6 percentage point lower probability of attriting. However, this is due to a key omitted variable. Students with propensity scores near zero, in the range [0, 0.05), have a high probability of attriting and a low probability of receiving a magnet offer – without controlling for propensity scores this leads to large omitted variable bias in our estimates. In Column (2), we simply remove those very low propensity score students from the regression and find no significant relationship between receiving a magnet offer and attrition. Further, in Column (3), when propensity score controls are added to the model estimated on the full sample, we also see no statistically significant relationship between receiving a magnet offer and attrition. The propensity scores control for all characteristics of students (student preferences and school priorities) that are correlated with receiving a magnet offer.

The results in Appendix Table A9 indicate that propensity score controls are necessary, but that once those controls are added, differential attrition before kindergarten matriculation by magnet offer is not apparent in our setting. Appendix Table A9, Columns (4)-(6) parallel these modeling assumptions on the sample of students who attended kindergarten. We regress attriting between kindergarten and third grade on receiving a magnet offer, first without propensity scores and then adding them. The estimates in Column (6) indicate that, conditional on attending kindergarten, students are significantly less likely to attrit between kindergarten and third grade if they initially received a magnet school offer. This result parallels the IV estimates for the causal effect of magnet attendance on on-time progress to third grade, presented in Table 8. If students failing to make on-time progress to third grade are negatively selected, then, together, the estimates in Appendix Table A9 illustrate that negative, not positive, attrition is the predominant problem. Differential negative attrition would lead us to understate any beneficial effects of magnet schools.

6.2 Bounding for Attrition Exercises

Although we do not observe differential attrition at kindergarten after conditioning on propensity score, we do observe differential attrition by third grade. Differential attrition by magnet offer status could threaten internal validity if those who attrit when not receiving an offer are doing so *because of* losing the lottery. Students who exit the district may be positively selected, for example, if parental engagement is correlated both with student performance and with the decision to seek enrollment in schools other than traditional public schools. Positive selection implies that differential attrition will bias our results away from zero because more students with highly engaged parents have exited the district from our sample of non-magnet students.[36]

However, if magnet schools improve on-time progress and the analysis of test scores relies on the

[36] Note also that in a Roy-selection type framework, students who have the most to benefit from attending magnet schools would be the ones who are most likely to choose to apply and enroll. Our identification strategy does not directly address this, as we estimate the impact only for the group of magnet applicants who are on the margin of receiving a magnet school offer or not. Thus, if there are heterogeneous treatment effects (i.e., the impact of magnet schools differs by student characteristics), then the magnet effect estimated here is an upper bound of the population-level average effect of magnet schools.

sample of on-time progressing students, then we have negative selection in our sample of non-magnet students. This is because the sample of non-magnet attendees includes more marginal students who, without the benefits of magnet schools, would have underperformed, on average. This would bias the estimated impact of magnet schools on performance towards zero. In Sections 5 and 6.1, we provide evidence of this latter type of selection, whereby magnet attendance led to higher rates of on-time progress.

Still, to quantitatively explore the effects of attrition on our main estimates, we present a simplified version of "bounding" described in Horowitz and Manski (2000).[37] We cannot estimate an instrumental variables model because magnet attendance is not observed for students who have attrited from the sample. Therefore, in Table 9 we present estimates from a version of Equation (1), the "reduced form" specification, which estimates the effect of being offered a magnet seat on mathematics and reading performance. The standard errors are robust, but cannot be clustered as school attended is not observed for attrited students. Consistent with the main estimates described above, being offered a magnet seat leads to statistically significant 10 percentage point higher probabilities of mathematics and reading proficiency. The estimates remain small and not statistically significant for third grade mathematics and reading standardized EOG's. Column (5) presents estimates showing a magnet offer reduces cumulative absences between 2016-2019 by 6.2 and increases in the probability of on-time third grade by 11 percentage points.

Because of the differential attrition observed for students with propensity scores between [0,0.05), as shown in Appendix Table A8, the Panel B of Table 9 estimates the models excluding these students. The results are nearly identical, providing evidence that attrition is not leading to bias in our estimates due to the inclusion of propensity score controls.

The bottom two panels present bounds using an imputation method to account for attrition. First, in Panel C, we simply assume that all students who attrited (i.e., did not have valid on-time test scores) are positively selected. For second grade proficiency outcomes and on-time progress to third grade, this is operationalized by imputing values of one where test scores are missing. For third grade EOG, we impute the 90th percentile scores. For absenteeism, we impute the 10th percentile.

[37]Note that attrition is not monotonically related to the propensity score, so application of a structural trimming procedure is not ideal in this setting (Horowitz and Manski, 2000). For example, one could potentially tighten the confidence intervals using additional assumptions, as described in Lee (2009) and employed by Engberg et al. (2014) and Abdulkadiroğlu et al. (2018). Because our treatment and second grade test score outcomes are dichotomous, we instead employ a simple bounding procedure that does not impose distributional assumptions.

Thus, the estimates in this panel represents the case whereby students exit Wake County because of better outside options. Under this extreme positive selection assumption, the estimated effect sizes are diminished, but the estimates for second grade performance are still positive and statistically significant. The effect on absenteeism is qualitatively similar. Panel C is consistent with positive attrition biasing estimates slightly upward, but demonstrates that imputing high performance for those who attrit does not affect the qualitative findings.

Alternatively, Panel D presents estimates that assume all of those who attrit were negatively selected and would have scored below the threshold or at the 10th percentile. This would represent the other extreme case where attrition is solely due to negative performance. In this case, if magnet schools help to retain the weakest students, then our estimates of magnet school effects are biased towards zero. Estimates are similar, but no longer statistically significant for second grade test scores. We do not detect any significant effects for second grade reading nor third grade mathematics or reading. The effect on absences is diminished and no longer statistically significant.

Overall, the estimates do not provide clear bounds. Rather, these results suggest both positive and negative selection are likely occurring. The key conclusion is that differential attrition does not invalidate our main results that magnet schools yield higher test performance when measured in second grade and lower rates of absenteeism.[38]

6.3 Heterogeneity by Student Demographics

For a more complete picture of the impacts of magnet schools, we explore heterogeneity by student characteristics. While understanding which students benefit most from magnet attendance is a key policy concern, we are somewhat limited in our ability to answer with an identification strategy that estimates impacts from compliers. This strategy reduces the statistical power to identify heterogeneity in subgroups of students. In other words, comparisons across subgroups are influenced both by heterogeneity in the effect of magnet schools and by the first stage of how a magnet offer predicts years of magnet attendance. Table 10 presents the first-stage estimates for the third graders in Column (1). Second grade mathematics and reading proficiency are presented in

[38] An alternative exercise would be to impute "worst case" scenario whereby the attrition is negative for those who are offered a magnet seat and positive for those not offered a magnet seat, while the "best case" scenario assumes the converse. This would be too extreme in this context as there is a high natural rate of attrition between magnet application and kindergarten attendance. Thus, these bounds would be too large to be meaningful.

Columns (2) and (3), while third grade standardized EOG's are in Columns (4) and (5). Absenteeism rates in Column (6) parallel Table 7, Column (3) and are estimated using a Poisson model. Column (7) presents estimates for having on-time, valid third grade test scores.

Estimates are reported separately for non-Hispanic Black and non-Hispanic white students and for students from a low- or high-performing catchment.[39] The sample size is not sufficient to provide reliable estimates for other racial or ethnic groups separately. When comparing Black and white students, we find that the effects are concentrated on the former, despite having a smaller first stage.

The district sets priorities to attract high performing students to attend magnet schools because these students strengthen these formerly struggling schools and promote racial and socioeconomic balance. If certain groups of students are most likely to benefit from magnet school attendance, priorities can be updated accordingly. In the district's current priorities, one component is the past two years test score performance of students in a catchment area (i.e., neighborhood). Students who live in a high-performing catchment area (i.e., top tercile) have higher priority for magnet schools that have high concentrations of minorities in their base populations. The bottom panel of Table 10 explores heterogeneity in terms of catchment performance. Students who live in low-performing catchment areas benefit more from magnet attendance, while for students from high-performing catchments, we fail to find a benefit in terms of test scores, absenteeism, or on-time progress. Note, again, that magnet priorities are set to achieve the goals of integration. These estimates suggest that benefits to application students are largest among Black students and those from low-performing catchments, but we also do not detect test score declines or lower student engagement for white students or those from high-performing catchment areas.

6.4 Heterogeneity by Magnet School Themes

We now explore heterogeneity by school characteristics, specifically in terms of special curricular themes. While themes at magnet schools introduces differences with non-magnets, magnet schools also differ by base student population, capacity, location, and myriad other characteristics. Thus, when analyzing subsets of magnet schools, we must recognize that many school attributes are correlated and may differentially impact student performance. Still, it is worthwhile to consider several distinctions among magnet schools. For this exercise, we change our specification so that the

[39] Note that when disaggregating by gender, boys and girls experience similar benefits from magnet school attendance.

key explanatory variable of interest is magnet school attendance in kindergarten. This simplification allows us to abstract away from students who might have exposure to multiple magnet schools between 2016-2019.

First, we consider the classification of Betts et al. (2015) that separates "traditional" and "destination" magnet schools. The base student population at traditional magnets tends to be more disadvantaged relative to non-magnets but tends to be less disadvantaged at destination magnets. To explore whether variation in magnet school effects along this dimension, we use Wake County's magnet group classification that defines destination magnets as "Group 2" or "Group 2A." The top panel of Table 11 presents results disaggregated by magnet type. Following Abdulkadiroğlu et al. (2017), we define two instruments (an offer at a traditional and an offer at a destination magnet), two endogenous variables (attendance at a traditional and attendance at a destination magnet), and two sets of propensity scores. Like Abdulkadiroğlu et al. (2017), we include the propensity scores separately for each magnet type and do not interact them. Table 11 presents separate first-stage regressions in Columns (1) and (2), with the instrumental variables estimates in columns (3) and (4) for mathematics and reading, respectively. While we find no statistically significant effects on third grade EOG test scores, attendance at either type of magnet in kindergarten yields a statistically significantly higher probability of scoring above the threshold in second grade mathematics. Similarly, absences are significantly lower and on-time progress to third grade is significantly higher. Although not statistically significant, the results are qualitatively similar for second grade reading.

Second, we look at world language immersion programs, which are offered at three elementary schools.[40] While students attending these programs may have delayed English language skill development, we anticipate gains along other dimensions. To observe whether the English language test scores are improved for non-language immersion programs, we estimate the model again with separate variables by language immersion status. The bottom panel of Table 11 shows that language immersion programs have similar gains in mathematics performance in second grade. But, for reading, language immersion programs do not significantly affect reading performance. At the same time, we now find a larger and statistically significant effect of non-immersion magnet attendance

[40] Hodge Road Elementary and Jeffreys Grove Elementary are Spanish dual language immersion programs, while Stough Elementary is a Mandarin-Chinese immersion program. Another magnet school, Joyner Elementary, is not included in this group but does also has a theme that includes a Spanish language focus. Joyner Elementary offers Spanish language instruction for 45 minutes a day, while the world language immersion programs we study offer world language instruction for approximately 80 percent of the academic day.

on reading performance. This suggests that the reduced statistical power we see in the main reading results in second grade, relative to the mathematics results, may be due to heterogeneity in the impact by magnet theme.[41] Findings for the impact of magnet attendance on absenteeism are similar, but attending a language immersion magnet does not significantly affect on-time progress to third grade.

7 Conclusion

Magnet schools are typically designed to “attract” suburban students (who are traditionally more likely to be socioeconomically advantaged) to apply to attend a school in an inner-city location (e.g., in traditionally socioeconomically disadvantaged parts of the district). Magnet schools are pervasive and are widely celebrated for curricular innovations and promotion of socioeconomic balance. The related literature has largely focused on schools with a very different set of features, such as charter schools that do not typically aim to achieve socioeconomic balance (e.g., Cohodes and Parham, 2021; Epple et al., 2016); academically selective schools like the exam schools in Boston and New York City (Abdulkadiroğlu et al., 2014; Dobbie and Fryer, 2014); or voucher programs that financially incentivize families to enroll in private schools (e.g., Barrow and Rouse, 2009; Figlio and Hart, 2014; Ladd, 2002; Rouse, 1998).

Estimating the effects of magnet schools is challenging since applicants are a selected sample and students’ magnet admission probability is a function of student characteristics. We overcome these challenges by applying the innovative methodological approach outlined in Abdulkadiroğlu et al. (2017) to provide causal estimates of magnets on important measures of human capital development. This approach provides robust identification by ensuring that unobserved factors in the residual are uncorrelated with the probability of receiving a magnet school offer.

Understanding the causal effects of magnet schools is important as school districts struggle to reconcile stakeholder preferences amid creeping resegregation (Billings et al., 2014; Clotfelter et al., 2021; Reardon et al., 2012; Weinstein, 2016). Our results fill an important gap in the school choice literature alongside examinations of charter schools, exam schools, and vouchers. While

[41] Bibler (2021) estimates the impact of attending language immersion magnet schools in the Charlotte-Mecklenburg School District on performance on third through eighth grade EOG’s. That study finds benefits for both dual language and non-dual language students. It may be that elementary school students initially lag in reading through second grade, but then improve and exceed non-magnet students in later grades.

we show only mixed evidence of test score gains, we provide robust evidence that magnet schools significantly increase student engagement. Magnet school attendance reduces absenteeism rates and increases on-time progress through the early elementary grades. Heterogeneous effects show that achievement effects accrue in large part to Black students and represent an important contributor to education equity efforts. Additional research is needed in this area to more fully understand the role of promoting socioeconomic balance, achievement, and engagement across various school choice models.

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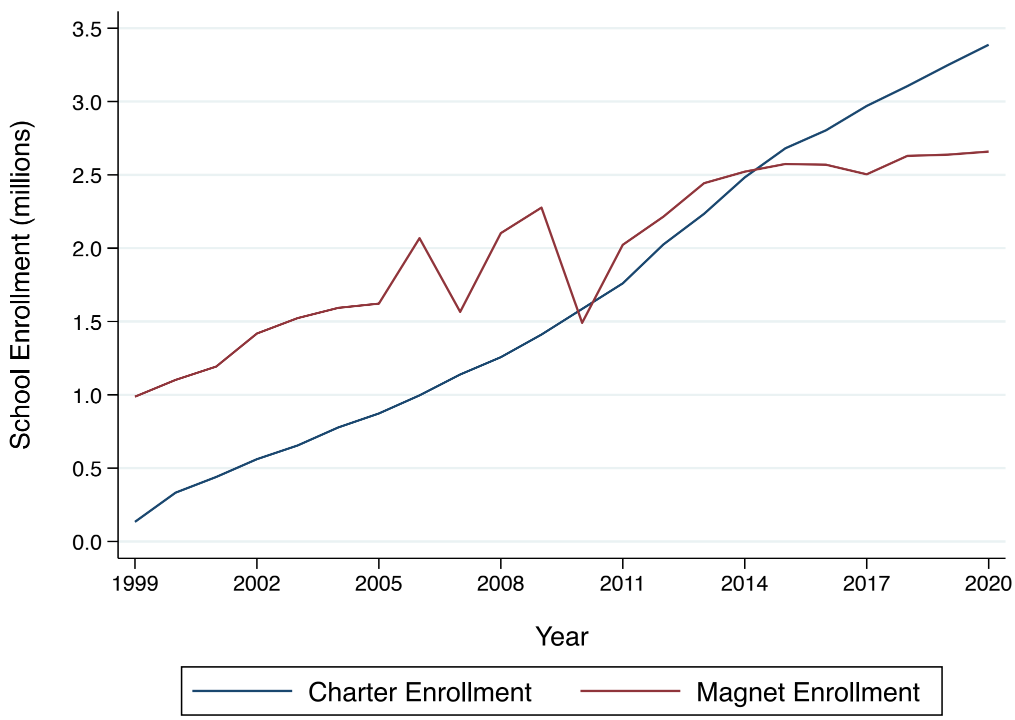

Figure 1: Magnet and Charter School Enrollment Trends in the United States, 1998-99 to 2019-20

Notes: Author calculations drawn from the Common Core of Data (CCD) Elementary/Secondary Information System (ElSi) Table Generator.

Table 1: Wake County School Characteristics

	Elementary Schools	
	Non-Magnets (1)	All Magnets (2)
Number of Schools	81	26
Number of Students	60,045	14,764
Percent Applicants	—	40%
School Classifications (CCD)		
School-Wide Title I	37	17
Targeted Assistance Title I	3	3
Urban	24	20
Rural	9	0
Student Body (CCD)		
Female	49%	49%
Asian	7%	7%
Black	21%	32%
Hispanic	18%	24%
White	49%	33%
Other	4%	4%
Student Body (DFR)		
English Language Learner	11%	15%
Special Education	11%	11%
Percent Proficient (EOG Performance Composite)	70%	59%
Economic Disadvantage (CCD)		
Receiving Free and Reduced Price Lunch	37%	52%
Student:Teacher Ratio	15.3	13.4
School Environment (NCDPI)		
Students:Computers w/Broadband	2.2	1.7
Books per student	23.7	23.1
Average Class Size	20.3	19.5
Crimes (Per 100)	0.1	0.1
Suspensions (Per 100)	2.9	5.6
Teacher Characteristics(NCDPI)		
Percent Board Certified	16%	13%
Percent w/ Advanced Degree	36%	37%
Percent 0-3 Years Experience	19%	25%
Percent 4-10 Years Experience	30%	30%
Percent 11+ Years Experience	51%	45%

Notes: Author calculations drawn from district administrative data and the Common Core of Data (CCD). Statistics are as of the AY2015-16. Note that 10 non-magnet schools opened between 2016 and 2019 and are not represented in this table. Percent applicant is the number of seats available for magnet applicants divided by the total student enrollment at that school. Statistics are at the school level, and means are not weighted by the school size or population of students.

Table 2: Magnet Applicants Enrollment Destinies

	Magnet Applicant (1)	Offered Seat (2)	Not Offered Seat (3)
Attend Magnet 2016	0.549	0.825	0.287
Attend Non-Magnet 2016	0.272	0.049	0.486
Never Attended Wake	0.178	0.126	0.228
Propensity Score	0.486	0.910	0.083
Observations	1,347	657	690

Notes: Column (1) presents the enrollment statistics for students applying to magnet schools for kindergarten entry in 2015-16. Columns (2) and (3) disaggregate this group into those who were offered a seat at a magnet school and those who were not, respectively.

Table 3: Summary Statistics

	All K Students			Only Magnet Applicants		
	Full	Attend Magnet	Attend Trad.	Applicants	Attend Magnet	Attend Trad.
	(1)	(2)	(3)	(4)	(5)	(6)
Magnet 2016	0.194	1.000	0.000	0.668	1.000	0.000
	(0.004)	(0.000)	(0.000)	(0.014)	(0.000)	(0.000)
Offered Seat				0.519	0.732	0.087
				(0.015)	(0.016)	(0.015)
Propensity Score				0.516	0.703	0.139
				(0.014)	(0.015)	(0.014)
Male	0.491	0.489	0.496	0.491	0.489	0.496
	(0.015)	(0.018)	(0.026)	(0.015)	(0.018)	(0.026)
White	0.507	0.496	0.529	0.507	0.496	0.529
	(0.015)	(0.018)	(0.026)	(0.015)	(0.018)	(0.026)
Black	0.211	0.211	0.213	0.211	0.211	0.213
	(0.012)	(0.015)	(0.021)	(0.012)	(0.015)	(0.021)
Hispanic	0.100	0.109	0.082	0.100	0.109	0.082
	(0.009)	(0.011)	(0.014)	(0.009)	(0.011)	(0.014)
Other Race	0.182	0.184	0.177	0.182	0.184	0.177
	(0.012)	(0.014)	(0.020)	(0.012)	(0.014)	(0.020)
High Performing Catchment				0.452	0.505	0.343
				(0.015)	(0.018)	(0.025)
Has Sibling				0.347	0.386	0.267
				(0.014)	(0.018)	(0.023)
Twin				0.065	0.051	0.093
				(0.007)	(0.008)	(0.015)
Observations	12055	2335	9720	1107	740	367
Kindergarten Entry Assessment (KEA):						
KEA Math	0.009	-0.118	0.039	0.234	0.249	0.204
	(0.010)	(0.023)	(0.011)	(0.034)	(0.043)	(0.057)
KEA Reading	0.014	-0.010	0.020	0.290	0.325	0.223
	(0.010)	(0.025)	(0.011)	(0.030)	(0.037)	(0.051)
KEA Fine Motor Skills	0.004	-0.078	0.023	0.215	0.205	0.234
	(0.010)	(0.024)	(0.011)	(0.026)	(0.031)	(0.045)
KEA Physical Tasks	0.013	0.012	0.013	0.135	0.167	0.074
	(0.010)	(0.021)	(0.011)	(0.026)	(0.026)	(0.056)
KEA Social Interactions	0.015	0.012	0.016	0.238	0.281	0.155
	(0.010)	(0.024)	(0.011)	(0.030)	(0.036)	(0.053)
Kindergarten Beginning-of-Year (BOY) Assessments:						
BOY NKT Proficiency	0.758	0.678	0.776	0.853	0.848	0.863
	(0.004)	(0.011)	(0.005)	(0.012)	(0.015)	(0.020)
BOY TRC Not Well Below 0.357	0.306	0.369	0.421	0.393	0.476	
	(0.005)	(0.011)	(0.005)	(0.016)	(0.020)	(0.028)
Observations	9,667	1,802	7,865	919	607	312

Notes: The sample is restricted to Wake County students who attended kindergarten in 2015-16. Columns (1)-(3) include all kindergarten students, while Columns (4)-(6) include only students who applied to at least one magnet school. High-performing catchment and sibling information is derived from the magnet assignment data and is not available for students who did not apply to magnet schools.

Table 4: Covariate Balance

	Difference	S.E.
Main Balance Estimate (N = 1,107)		
Male	0.006	(0.072)
Black	0.122	(0.065)
Hispanic	-0.001	(0.038)
Other Race/Ethnicity	-0.036	(0.053)
High Performing Catchment	-0.010	(0.056)
Has Sibling	-0.006	(0.055)
Twin	0.007	(0.032)
Joint p-value race	0.198	
Joint p-value all covars	0.617	
Kindergarten Entry Assessment (KEA)		
KEA Math (N = 1,065)	0.121	(0.151)
KEA Reading (N = 944)	-0.061	(0.154)
KEA Fine Motor Skills (N = 1,001)	-0.004	(0.109)
KEA Physical Tasks (N = 1,010)	0.095	(0.095)
KEA Social Interactions (N = 943)	0.125	(0.156)
Kindergarten Beginning-of-Year Assessments (N=1,075)		
BOY NKT Proficiency	0.059	(0.049)
BOY TRC Not Well-Below	-0.006	(0.072)

Notes: Each row presents estimates of a regression of the covariate indicated on receiving a magnet offer with propensity score controls rounded to the 10th decimal place.

Table 5: Probabilities of Compliance

	(1)	(2)	(3)	(4)	(5)	(6)
	N	Magnet 2016	First Stage	Offered Seat	Compliance Probabilities	
		$P[D=1]$	$P[D_1 > D_0]$	$P[Z=1]$	$P[D_1 > D_0 \mid D=1]$	$P[D_1 > D_0 \mid D=0]$
Full Sample	1107	0.668	0.407	0.519	0.316	0.591
PScore [0, 0.05)	367	0.305	0.704	0.027	0.063	0.986
PScore [0.05, 0.15)	68	0.471	0.288	0.074	0.045	0.503
PScore [0.15, 0.25)	68	0.691	0.356	0.221	0.113	0.897
PScore [0.25, 0.35)	55	0.836	0.194	0.309	0.072	0.817
PScore [0.35, 0.45)	14	0.357	0.406	0.286	0.325	0.451
PScore [0.55, 0.65)	13	0.615	0.741	0.615	0.741	0.741
PScore [0.65, 0.75)	14	0.643	0.662	0.714	0.735	0.529
PScore [0.75, 0.85)	6	0.500	0.000	0.500	0.000	0.000
PScore [0.95, 1]	502	0.952	0.000	1.000	0.000	0.000
PScore [0.05, 0.95)	238	0.630	0.332	0.261	0.137	0.663

Notes: The sample is restricted to Wake County public school students attending kindergarten in 2016. Treatment, D, is defined as attending a magnet school. The instrumental variable, Z, is receiving a magnet offer. Propensity scores are derived from simulating the assignment one million times. Note that no magnet applicants had propensity scores between 0.45-0.55 or 0.85-0.95. First stage estimates include controls for gender, race/ethnicity, residence in a high-performing catchment area, and the presence of siblings.

Table 6: Elementary School Test Results

Panel A: Second Grade, NKT and TRC Proficiency

	First Stage (1)	OLS Math (2)	IV Math (3)	OLS Reading (4)	IV Reading (5)
Offered Seat	1.104***				
	(0.220)				
Years Magnet by 2nd Grade		0.00916	0.0874*	-0.00942	0.0833
		(0.00822)	(0.0484)	(0.00953)	(0.0550)
Observations	942	942	942	942	942
Cntrl Mean Dep Var	1.287	0.837	0.837	0.831	0.831

Panel B: Third Grade, EOG Math and Reading Standardized Score

	First Stage (1)	OLS Math (2)	IV Math (3)	OLS Reading (4)	IV Reading (5)
Offered Seat	1.497***				
	(0.289)				
Years Magnet 3rd Grade		-0.0112	-0.00209	-0.00449	0.0659
		(0.0220)	(0.0618)	(0.0223)	(0.0740)
Observations	887	887	887	887	887
Cntrl Mean Dep Var	1.754	0.121	0.121	0.185	0.185

Notes: Each panel restricts to students on-time to grade with valid scores in both reading and mathematics. Years of magnet attendance at the time of test taking is instrumented with having received a magnet offer for the 2015-16 academic year. The specifications include propensity score controls rounded to the 10th decimal place. All regressions include controls for gender, race/ethnicity, residence in a high-performing catchment area, and the presence of siblings. Standard errors, clustered by school at test taking, are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Total Absences Time 2016-2019

	Magnet 2019	Tot Abs	Poisson	Ln(Abs + 1)	Abs ≥12	Abs ≥80
	(1)	(2)	(3)	(4)	(5)	(6)
Magnet Offer	1.529***					
	(0.270)					
Magnet Years 2019		-4.074**	-3.759**	-0.147**	-0.029	-0.024**
		(1.678)	(1.573)	(0.064)	(0.029)	(0.012)
Observations	907	907	907	907	907	907
Control Mean Dep. Var.	1.738	27.798	27.798	3.151	0.838	0.019

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The dependent variables are: Columns (2) and (3) total absences over the four years; Column (4) the log of total absences plus one summed over the four years; Column (5) indicator for more than 12 total absences over four years; and Column (6) indicator for more than 80 total absences over four years. The sample is restricted to individuals who are in the Wake County data continuously over the four years and not retained with non-missing absence information over all four years. Years of magnet attendance between 2016-2019 is instrumented with having received a magnet offer. The specifications include propensity score controls rounded to the 10th decimal place. All regressions include controls for gender, race/ethnicity, residence in a high-performing catchment area, and the presence of siblings. Standard errors, clustered by school, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: On-time Progress 2016-2021

	First Stage	Switch Schools	Attrit by 2019	Ontime 3rd	Attrit by 2021	Ontime 5th	Valid 5th EOG
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Offered Seat	0.407***						
	(0.051)						
Magnet 2016		-0.552***	-0.219**	0.274***	-0.319**	0.360**	0.169
		(0.139)	(0.099)	(0.104)	(0.152)	(0.153)	(0.214)
Observations	1107	984	1107	1107	1107	1107	1107
Control Mean Dep. Var.	0.371	0.275	0.197	0.790	0.261	0.726	0.595

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The sample is students attending Wake County kindergarten in 2015-16 with outcomes measured over the following four years. Magnet attendance in 2016 is instrumented with having received a magnet offer. The specifications include propensity score controls rounded to the 10th decimal place. All regressions include controls for gender, race/ethnicity, residence in a high-performing catchment area, and the presence of siblings. Standard errors, clustered by school attended in 2016, are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Bounding for Attrition

	Math 2nd (1)	Reading 2nd (2)	Math 3rd (3)	Reading 3rd (4)	Absences (5)	On-time 3rd (6)
Panel A: Baseline, No Imputation						
Offered Seat	0.101**	0.099*	0.001	0.111	-6.230***	0.112***
	(0.045)	(0.051)	(0.114)	(0.111)	(2.148)	(0.041)
Observations	950	950	900	900	907	1107
Cntrl Mean Dep Var	0.836	0.832	0.121	0.185	27.798	0.790
Panel B: No Imputation, Dropping P-Score [0, 0.05)						
Offered Seat	0.103**	0.107*	-0.055	0.104	-5.682**	0.109**
	(0.049)	(0.058)	(0.125)	(0.120)	(2.551)	(0.044)
Observations	644	644	616	616	623	740
Cntrl Mean Dep Var	0.786	0.766	0.079	0.027	27.828	0.818
Panel C Top Performers Attrit: Impute 90%ile Test Scores, On-time; 10%ile Absences						
Offered Seat	0.067**	0.062*	-0.147	-0.046	-2.664	0.086**
	(0.033)	(0.036)	(0.109)	(0.104)	(1.687)	(0.034)
Observations	1347	1347	1347	1347	1347	1347
Cntrl Mean Dep Var	0.893	0.888	0.663	0.655	20.225	0.838
Panel D Low Performers Attrit: Impute 10%ile Test Scores, On-time; 90%ile Absences						
Offered Seat	0.071	0.065	0.069	0.163	-6.097***	0.086
	(0.060)	(0.061)	(0.110)	(0.108)	(2.006)	(0.056)
Observations	1347	1347	1347	1347	1347	1347
Cntrl Mean Dep Var	0.552	0.551	-0.311	-0.287	35.078	0.610

Notes: Estimated coefficients are the reduced form of receiving a magnet offer on test performance in 2018 (Columns 1 and 2) and 2019 (Columns 3 and 4) on absenteeism (Column 5) and on-time progress to 3rd grade (Column 6). Panel A includes the baseline data, while Panel B omits students whose propensity score is in the range [0, 0.5) where attrition is the highest. Panels C and D impute values for students who attrit any time between application and test taking, who are not on-time to grade, or who do not have a valid score for both tests. Panel C assumes high quality attrition and imputes the 90th percentile of performance for missing values (or a value of 1 for dichotomous variables), while Panel D assumes low quality attrition and imputes the 10th percentile (or a value of 0 for dichotomous variables). The specifications include propensity score controls rounded to the 10th decimal place. Robust standard errors are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Heterogeneity by Student Characteristics

	(1) Magnet 2019	(2) Math 2nd Proficient	(3) Reading 2nd Proficient	(4) Math 3rd EOG	(5) Reading 3rd EOG	(6) Absences	(7) On-time 3rd
Non-Hispanic Black							
Offered Seat	0.958^{**}						
	(0.411)						
Yrs Magnet 2018		0.174	0.388^{**}				
		(0.126)	(0.180)				
Yrs Magnet 2019				0.071	0.322	-11.755^{***}	0.051^{*}
				(0.140)	(0.227)	(4.333)	(0.029)
Observations	186	199	199	186	186	193	193
Cntrl Mean Dep Var	2.038	0.667	0.655	-0.439	-0.488	25.279	0.791
Non-Hispanic White							
Offered Seat	1.739^{***}						
	(0.367)						
Yrs Magnet 2018		0.054	-0.002				
		(0.037)	(0.048)				
Yrs Magnet 2019				0.027	0.081	-2.434	0.015
				(0.094)	(0.071)	(1.960)	(0.009)
Observations	448	476	476	448	448	454	454
Cntrl Mean Dep Var	1.595	0.907	0.920	0.303	0.481	27.837	0.782
Low Performing Catchment							
Offered Seat	0.954^{***}						
	(0.322)						
Yrs Magnet 2018		0.204^{*}	0.242^{*}				
		(0.105)	(0.125)				
Yrs Magnet 2019				-0.017	0.136	-10.360^{***}	0.040^{**}
				(0.125)	(0.136)	(3.708)	(0.020)
Observations	466	502	502	466	466	483	483
Cntrl Mean Dep Var	1.806	0.782	0.770	-0.025	0.008	28.458	0.765
High Performing Catchment							
Offered Seat	2.456^{***}						
	(0.362)						
Yrs Magnet 2018		-0.007	-0.050				
		(0.017)	(0.034)				
Yrs Magnet 2019				-0.003	-0.009	0.206	-0.000
				(0.054)	(0.082)	(1.433)	(0.001)
Observations	421	440	440	421	421	424	424
Cntrl Mean Dep Var	1.591	0.958	0.965	0.433	0.561	26.356	0.848

Notes: The specifications in Columns (1)-(5) parallel Table 6. Column (6) parallels Table 7, Column (3), while Column (7) parallels Table 8, Column (4). Years of magnet attendance up through 2018 / 2019 are instrumented with having received a magnet offer in 2016. The specifications include propensity score controls rounded to the 10th decimal place. All regressions include controls for gender, race/ethnicity, residence in a high-performing catchment area, and the presence of siblings. Clustered standard errors are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Heterogeneity by School Characteristics

	(1) Attend Trad K	(2) Attend Dest K	(3) Math 2nd	(4) Reading 2nd	(5) Math 3rd	(6) Reading 3rd	(7) Absences	(8) On-time 3rd
Offer Traditional Magnet	0.448***	-0.063**						
	(0.075)	(0.028)						
Offer Destination Magnet	-0.424***	0.867***						
	(0.072)	(0.034)						
Attend Traditional Magnet K			0.293**	0.265	0.153	0.317	-16.482**	0.063**
			(0.148)	(0.165)	(0.255)	(0.280)	(6.503)	(0.032)
Attend Destination Magnet K			0.236*	0.245	-0.071	0.251	-14.215**	0.067**
			(0.134)	(0.159)	(0.265)	(0.266)	(6.436)	(0.027)
Observations	900	900	950	950	900	900	907	920
Cntrl Mean Dep Var	0.207	0.207	0.837	0.832	0.121	0.185	27.798	0.790
P-value Difference	0.000	0.000	0.086	0.684	0.050	0.459	0.334	0.778

	(1) Attend Imm.	(2) Attend Non-Imm.	(3) Math 2nd	(4) Reading 2nd	(5) Math 3rd	(6) Reading 3rd	(7) Absences	(8) On-time 3rd
Offer Immersion Magnet	0.900***	-0.497***						
	(0.051)	(0.067)						
Offer Not Immersion Magnet	-0.046*	0.453***						
	(0.025)	(0.071)						
Attend Immersion K			0.348**	0.003	0.392	0.584*	-20.109***	0.041
			(0.144)	(0.397)	(0.245)	(0.308)	(6.659)	(0.032)
Attend Not Immersion K			0.253*	0.272*	-0.093	0.197	-13.649**	0.072**
			(0.139)	(0.143)	(0.264)	(0.267)	(6.561)	(0.028)
Observations	900	900	950	950	900	900	907	920
Cntrl Mean Dep Var	0.030	0.030	0.837	0.832	0.121	0.185	27.798	0.790
P-value Difference	0.000	0.000	0.050	0.428	0.000	0.015	0.129	0.141

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: The key explanatory variable in these regressions is attending a type of magnet school in kindergarten with a type-specific magnet offer serving as instrumental variables. The outcomes in Columns (1)-(5) parallel Table 6. Column (6) parallels Table 7, Column (3), while Column (7) parallels Table 8, Column (4). The specifications include propensity score controls rounded to the 10th decimal place. All regressions include controls for gender, race/ethnicity, residence in a high-performing catchment area, and the presence of siblings. Clustered standard errors are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A Appendix

A.1 Complier Characteristics

To characterize the population of compliers, we apply the methods introduced by Abadie (2002) and Abadie (2003). Essentially, the means are weighted to recover values for the complier population. In our setting, the distribution of values of the outcome are discrete, so we do not apply kernel density smoothing. We estimate the following equations for treated and control compliers, respectively:

$$I(Y_i = v) * (MagAttend_i) = \alpha_0(MagAttend_i) + G(PS_i) + X_i\Gamma + \mu_{0iv}, \tag{A1}$$

$$I(Y_i = v) * (1 - MagAttend_i) = \alpha_1(1 - MagAttend_i) + G(PS_i) + X_i\Gamma + \mu_{1iv}, \tag{A2}$$

In words, the treatment complier group mean is calculated by estimating a regression of the dichotomous variable of interest multiplied by treatment status on the probability of being treated (i.e., magnet status) using receiving a magnet offer as an instrument, as in Equation (A1). The control complier group mean is calculated by estimating a regression of the dichotomous variable of interest multiplied by one minus treatment status on the probability of not being treated (i.e., attending a non-magnet school) again using receiving a magnet offer as an instrument, as in Equation (A2).

A.2 Alternative Measures of Test Scores

As described in detail in the manuscript text, the second grade tests used for this study are typically used to identify students who are struggling academically. Thus, our main results rely on a dichotomous indicator for performing well-below the benchmark level. We present alternative parameterizations of the test score values.

For the NKT, scores range from 1-30.[42] Appendix Table A4 presents estimates for the standardized NKT score (mean 0, std 1). The TRC test provides only grade-level equivalent score, so that is modeled linearly. For the EOG, we define proficiency as score at achievement level 3-5 (vs. 1-2). No

[42]The NKT has the following grade-level equivalents: (0) Preschool, Score 1-6; (2) Pre-K to K, Score 7-8; (3) K to 1, Score 9-14; (4) 1 to 2, Score 15-19; (5) 2 to 3, Score 20-25 (6) 3 to 4, Score 26-28; (7) 4 to 5; Score 29-30. Scores between 15-19 correspond to ages 6-7 years old at grade level 1-2 (Level D), while scores between 20-25 correspond to ages 7-8 at grade level 2-3 (Level E). In our sample, the mean is 4.133 (the median is 5).

results are statistically significant with these alternative parameterizations.

A.3 First Choice Lottery Instrument

It is useful to compare the results from the Abdulkadiroğlu et al. (2017) model with the first choice instrument (e.g., Deming et al., 2014). In our setting, an additional lottery happens after the "guaranteed" students are seated for 10 percent of the remaining seats. Then, the rest of the seats are allocated according to the Deferred Acceptance algorithm. The standard first choice instrument defines a dummy variable for whether the student was offered a seat at their first choice school. Rather than the propensity score, that model includes a lottery fixed effect. To guarantee exogeneity, a full control for student type would be required, which is not feasible in this setting. Thus, the first choice instrument is not strictly valid as entering the lottery itself may be endogenous to student characteristics. Still, we provide a simplified first choice instrument specification as a comparison point. In this case, this would be simply controlling for the first choice school because we only consider students entering at kindergarten and all students subject to randomization are eligible for the 10 percent lottery. We define the instrument Z_i as whether the student received an offer from her first choice school and include first-choice school lottery fixed effects, in addition to the demographic controls. Note that this specification may be biased without a full set of controls for student type.

The main equation of interest is similar to equation (1), but excludes the propensity scores:

$$Y_i = \beta MagAttend_i + X_i\gamma + FirstChoiceSchool_i\rho + \epsilon_i. \tag{A3}$$

Again, i indexes students. Demographic characteristics, X_i, include: gender, race/ethnicity, and the presence of siblings (who also applied to attend a magnet school). Here ρ is a vector of coefficients and *FirstChoiceSchool* are fixed effects indicating which school was listed first. The first stage is estimated from an instrument on whether the student received an offer from her first choice school, conditioning on first choice school fixed effects.

As discussed in Abdulkadiroğlu et al. (2017), the first choice instrument captures a different local average treatment effect as it only utilizes variation stemming from first choice schools. Appendix Table A5 shows results are similar using this alternative, simplified version of the first choice lottery instrument.

Table A1: Elementary school-level characteristics by magnet status and geography, 2015-16 school year

	United States			North Carolina			Wake County		
	All	Non-magnet	Magnet	All	Non-magnet	Magnet	All	Non-magnet	Magnet
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Title I school	0.63	0.63	0.71	0.81	0.81	0.69	0.50	0.46	0.65
	[0.48]	[0.48]	[0.46]	[0.40]	[0.39]	[0.47]	[0.50]	[0.50]	[0.49]
Female	0.48	0.48	0.50	0.48	0.48	0.50	0.49	0.49	0.49
	[0.04]	[0.04]	[0.04]	[0.03]	[0.03]	[0.04]	[0.02]	[0.02]	[0.02]
Male	0.52	0.52	0.50	0.52	0.52	0.50	0.51	0.51	0.51
	[0.04]	[0.04]	[0.04]	[0.03]	[0.03]	[0.04]	[0.02]	[0.02]	[0.02]
Asian	0.04	0.04	0.05	0.03	0.02	0.04	0.07	0.07	0.07
	[0.09]	[0.09]	[0.09]	[0.05]	[0.05]	[0.06]	[0.11]	[0.12]	[0.09]
Black	0.15	0.15	0.31	0.26	0.25	0.41	0.24	0.21	0.32
	[0.24]	[0.24]	[0.30]	[0.24]	[0.24]	[0.22]	[0.15]	[0.14]	[0.16]
Hispanic	0.24	0.24	0.26	0.17	0.17	0.20	0.20	0.18	0.24
	[0.27]	[0.27]	[0.26]	[0.14]	[0.14]	[0.14]	[0.11]	[0.10]	[0.13]
White	0.51	0.52	0.33	0.49	0.50	0.30	0.45	0.49	0.33
	[0.33]	[0.33]	[0.28]	[0.28]	[0.28]	[0.21]	[0.21]	[0.20]	[0.19]
FRPL	0.56	0.56	0.60	0.66	0.67	0.62	0.41	0.37	0.52
	[0.29]	[0.29]	[0.27]	[0.29]	[0.29]	[0.28]	[0.22]	[0.22]	[0.20]
FTE teachers	28.56	28.45	31.88	32.83	32.63	36.24	46.59	48.06	42.03
	[14.19]	[14.18]	[13.92]	[12.28]	[12.32]	[11.08]	[10.06]	[10.38]	[7.47]
Student-teacher ratio	16.82	16.80	17.23	15.38	15.42	14.63	14.85	15.31	13.41
	[21.73]	[22.06]	[4.42]	[2.48]	[2.51]	[1.79]	[1.43]	[1.18]	[1.16]
Students	24,176,496	23,340,128	836,370	724,288	683,478	40,810	74,809	60,045	14,764
Schools	52,490	50,906	1,584	1,432	1,355	77	107	81	26

Notes: Data source: U.S. Department of Education, National Center for Education Statistics Common Core of Data (CCD) "Public Elementary/Secondary School Universe Survey" (PE/SSUS) 2021-22 v.1a; "PE/SSUS CCD School Data" 2015-16 v.2a; "PE/SSUS Directory Data" 2015-16 v.2a; "PE/SSUS Survey Free Lunch Data" 2015-16 v.2a; "PE/SSUS Geographic Data (EDGE)" 2015-16 v.2a; "PE/SSUS Membership Data" 2015-16 v.2a. Standard deviations are in brackets.

Table A2: Wake County Magnet School Characteristics, 2015-16 School Year

School Name	Theme (1)	Title I (2)	Total K Students (3)	Number of Applicants Listing First (4)	Offered + Attrited (5)	Offered + Attended (6)	Offered + Attended Diff. Wake School (7)
Brentwood	STEM	1	83	22	2	17	4
Brooks	Art-Science	0	94	87	1	14	1
Bugg	Art-Science	1	75	60	0	32	6
Combs	STEM	0	138	141	5	46	2
Conn	Act Learning	1	85	29	3	15	5
Douglas	Art-Science	0	105	38	5	21	4
Farmington Woods	IB	0	125	75	3	37	0
Fox Road	IB	1	68	1	0	0	1
Fuller	GT	1	81	71	13	35	5
Green	World Lang	1	109	12	3	10	2
Hodge Road	Lang Imm.	1	112	3	1	1	0
Hunter	GT	1	107	98	8	56	6
Jeffreys Grove	Lang Imm.	0	92	38	4	20	0
Joyner	World Lang	0	111	65	4	34	2
Kingswood	Montessori	1	82	28	2	13	2
Millbrook	IB	1	104	20	3	15	1
Partnership	GT	0	46	21	4	18	2
Poe	GT	1	55	24	3	14	3
Powell	GT	1	60	18	1	14	2
Smith	IB	1	90	13	0	16	0
Stough	Lang Imm.	1	103	8	4	5	1
Underwood	GT	0	77	58	1	32	0
Washington	GT	0	92	92	7	41	2
Wendell	Art-Science	1	77	21	1	7	0
Wiley	Intl Studies	0	77	45	3	9	0
Zebulon	GT	1	87	6	2	1	0

Notes: This table presents statistics by school for the 26 magnet schools in our data. Column (1) shows the school's magnet theme; Column (2) equals 1 if it is a Title I school; Column (3) presents the total number of kindergartners in 2016, which includes base and magnet students; Column (4) presents the total number of magnet applicants who listed the school first on their application; Column (5) presents the total number of magnet applicants who were offered a seat and subsequently attrited; Column (6) presents the total number of magnet applicants who were offered a seat and attended the school; and Column (7) presents the total number of magnet applicants who were offered a seat and attended a different Wake County school.

Table A3: Enrollment Destinies for Students Attending Wake County, 2019 School Year

	Magnet Applicant (1)	Offered Seat (2)	Not Offered Seat (3)
Attend Magnet 2019	0.464	0.656	0.281
Attend Non-Magnet 2019	0.219	0.093	0.339
Never Attended Wake	0.178	0.126	0.228
Left Between 2016-2019	0.139	0.125	0.152
Propensity Score	0.486	0.910	0.083
Observations	1,347	657	690

Table A4: Test Score Alternative Parameterization

Panel A: Second Grade, NKT Standardized and TRC Grade Level (0-7)

	First Stage	OLS Math	IV Math	OLS Reading	IV Reading
	(1)	(2)	(3)	(4)	(5)
Offered Seat	1.104***				
	(0.220)				
Years Magnet by 2nd Grade		0.0242	0.108	-0.0303	0.0197
		(0.0248)	(0.0989)	(0.0353)	(0.0979)
Observations	942	942	942	942	942
Control Mean Dep. Var.	1.287	0.121	0.121	2.730	2.730

Panel B: Third Grade, EOG Math and Reading Proficiency (Achievement Level 3-5)

	First Stage	OLS Math	IV Math	OLS Reading	IV Reading
	(1)	(2)	(3)	(4)	(5)
Offered Seat	1.497***				
	(0.289)				
Yrs Magnet 3rd Grade		-0.00895	-0.00123	-0.0104	-0.00138
		(0.0105)	(0.0314)	(0.0104)	(0.0399)
Observations	887	887	887	887	887
Control Mean Dep. Var.	1.754	0.759	0.759	0.742	0.742

Notes: This table parallels manuscript Table 6 with alternative parameterizations of the test score variables.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Specification Checks

	Magnet 2019 (1)	Math 2nd (2)	Reading 2nd (3)	Math 3rd (4)	Reading 3rd (5)	Absences (6)	On-time 3rd (7)
Preferred specification							
Offered Seat	1.497***						
	(0.273)						
Yrs Magnet 2018		0.091*	0.087				
		(0.050)	(0.057)				
Yrs Magnet 2019				-0.002	0.066	-4.074**	0.018**
				(0.064)	(0.073)	(1.678)	(0.008)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790
Add controls for the length of the rank ordered list							
Offered Seat	1.507***						
	(0.264)						
Yrs Magnet 2018		0.090*	0.084				
		(0.050)	(0.055)				
Yrs Magnet 2019				-0.001	0.062	-3.834**	0.018**
				(0.065)	(0.073)	(1.614)	(0.008)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790
Exclude demographic and socioeconomic covariates							
Offered Seat	1.526***						
	(0.272)						
Yrs Magnet 2018		0.066	0.059				
		(0.048)	(0.050)				
Yrs Magnet 2019				-0.062	0.006	-4.211**	0.017**
				(0.085)	(0.071)	(1.738)	(0.008)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790
Preferred specification for students with non-missing Kindergarten Beginning of Year (BOY) test scores							
Offered Seat	1.428***						
	(0.273)						
Yrs Magnet 2018		0.083	0.089				
		(0.055)	(0.064)				
Yrs Magnet 2019				-0.029	0.016	-4.417**	0.021**
				(0.061)	(0.073)	(1.849)	(0.009)
Observations	838	892	892	838	838	855	855
Cntrl Mean Dep Var	1.802	0.845	0.840	0.133	0.223	27.480	0.786
Add controls for Kindergarten Beginning of Year (BOY) math and reading proficiency							
Offered Seat	1.422***						
	(0.271)						
Yrs Magnet 2018		0.065	0.070				
		(0.044)	(0.061)				
Yrs Magnet 2019				-0.065	-0.019	-4.272**	0.018**
				(0.046)	(0.064)	(1.852)	(0.008)
K Math Proficiency	0.212	0.265***	0.276***	0.848***	0.808***	-4.207**	0.068***
	(0.195)	(0.039)	(0.042)	(0.081)	(0.111)	(1.966)	(0.026)
K Reading Proficiency	-0.099	0.078***	0.063***	0.445***	0.417***	1.124	0.011
	(0.114)	(0.020)	(0.024)	(0.050)	(0.044)	(1.327)	(0.007)
Observations	838	892	892	838	838	855	855
Cntrl Mean Dep Var	1.802	0.845	0.840	0.133	0.223	27.480	0.786

Notes: Sample and specifications are parallel to the IV results in Table 6,Table 7, Column (3), and Table 8 Column (4), except where indicated. Column (1) predicts magnet attendance by 2019. Columns (2) and (3) use years of magnet attendance in 2018, where second grade outcomes correspond to 2018. Columns (4)-(7) use years of magnet attendance in 2019, where third grade outcomes correspond to 2019. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Specification Checks

	Magnet 2019 (1)	Math 2nd (2)	Reading 2nd (3)	Math 3rd (4)	Reading 3rd (5)	Absences (6)	On-time 3rd (7)
Propensity Scores (0,1)							
Offered Seat	1.460***						
	(0.277)						
Yrs Magnet 2018		0.102**	0.087				
		(0.052)	(0.060)				
Yrs Magnet 2019				-0.000	0.073	-4.105**	0.019**
				(0.064)	(0.076)	(1.752)	(0.009)
Observations	417	450	450	417	417	424	424
Cntrl Mean Dep Var	1.828	0.822	0.826	0.092	0.148	27.878	0.799
No Base Magnet							
Offered Seat	1.464***						
	(0.296)						
Yrs Magnet 2018		0.075	0.090				
		(0.052)	(0.066)				
Yrs Magnet 2019				-0.035	0.022	-4.789***	0.021**
				(0.063)	(0.068)	(1.833)	(0.010)
Observations	717	763	763	717	717	731	731
Cntrl Mean Dep Var	1.668	0.845	0.836	0.127	0.188	27.819	0.791
Propensity Score Bins 100's							
Offered Seat	1.350***						
	(0.270)						
Yrs Magnet 2018		0.058	0.074				
		(0.055)	(0.062)				
Yrs Magnet 2019				-0.049	0.008	-5.278***	0.027**
				(0.070)	(0.087)	(1.902)	(0.012)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790
Linear Propensity Score							
Offered Seat	1.549***						
	(0.269)						
Yrs Magnet 2018		0.094**	0.074				
		(0.045)	(0.053)				
Yrs Magnet 2019				-0.011	0.058	-3.222**	0.017**
				(0.058)	(0.073)	(1.536)	(0.007)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790
First Choice Lottery							
First Choice Offer	1.026***						
	(0.230)						
Yrs Magnet 2018		0.010	0.041				
		(0.041)	(0.045)				
Yrs Magnet 2019				-0.060	0.024	-2.610	0.007
				(0.096)	(0.087)	(1.800)	(0.011)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790
Non-Clustered SE's							
Offered Seat	1.497***						
	(0.213)						
Yrs Magnet 2018		0.091**	0.087*				
		(0.043)	(0.049)				
Yrs Magnet 2019				-0.002	0.066	-4.074***	0.018**
				(0.076)	(0.074)	(1.540)	(0.009)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.837	0.832	0.121	0.185	27.798	0.790

Notes: Sample and specifications are parallel to the IV results in Table 6, Table 7, Column (3), and Table 8 Column (4), except where indicated. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Include School-Level Control Variables

	Magnet 2019 (1)	Math 2nd (2)	Reading 2nd (3)	Math 3rd (4)	Reading 3rd (5)	Absences (6)	On-time 3rd (7)
	Preferred Specification, School Characteristics Sample						
Offered Seat	1.497***						
	(0.273)						
Yrs Magnet 2018		0.091*	0.087				
		(0.050)	(0.057)				
Yrs Magnet 2019				-0.002	0.066	-4.074**	0.018**
				(0.064)	(0.073)	(1.678)	(0.008)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.836	0.832	0.121	0.185	27.798	0.984
	Includes Controls for School Characteristics						
Offered Seat	1.104***						
	(0.235)						
Yrs Magnet 2018		0.113	0.120*				
		(0.070)	(0.073)				
Yrs Magnet 2019				-0.097	0.068	-4.635**	0.025**
				(0.108)	(0.100)	(2.253)	(0.012)
Observations	887	942	942	887	887	907	907
Cntrl Mean Dep Var	1.738	0.836	0.832	0.121	0.185	27.798	0.984

Notes: The bottom panel includes the covariates listed in Table 1. Sample and specifications are parallel to the IV results in Table 6, Table 7, Column (3), and Table 8 Column (4). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8: Differential Attrition Rates by Propensity Scores, 2015-16 School Year

		Mean Attrition Rate by P-Score Bin (Never Attended Wake)		
Sample	Sample Size	All Magnet Applicants (1)	Offered Seat (2)	Not Offered Seat (3)
Full Sample	1,347	0.178	0.126	0.228
P-Score [0,0.05)	500	0.266	0.231	0.267
P-Score [0.05,0.95)	280	0.150	0.195	0.133
P-Score [0.95,1]	567	0.115	0.115	.

Table A9: Magnet Offer and Attrition

	Attrit K (1)	Attrit K Omit [0,0.5) (2)	Attrit K + P-Score (3)	Attrit 3rd (4)	Attrit 3rd Omit [0,0.5) (5)	Attrit 3rd + P-Score (6)
Offered Seat	-0.096***	-0.019	-0.000	-0.040	-0.005	-0.089**
	(0.023)	(0.031)	(0.050)	(0.025)	(0.034)	(0.040)
Male	-0.005	0.007	-0.010	0.021	0.006	0.018
	(0.021)	(0.023)	(0.021)	(0.023)	(0.026)	(0.023)
Black	-0.040	0.011	-0.019	-0.059*	-0.028	-0.047
	(0.029)	(0.032)	(0.029)	(0.033)	(0.040)	(0.033)
Hispanic	-0.057*	0.000	-0.056	-0.054	-0.037	-0.052
	(0.034)	(0.039)	(0.034)	(0.040)	(0.047)	(0.041)
Other Race	0.064**	0.056*	0.066**	-0.037	-0.024	-0.035
	(0.030)	(0.032)	(0.029)	(0.030)	(0.034)	(0.030)
High Performing Catchment	0.013	0.070**	0.008	-0.053**	-0.032	-0.056**
	(0.025)	(0.028)	(0.025)	(0.027)	(0.033)	(0.028)
Has Sibling	-0.060***	-0.047*	-0.054**	0.004	-0.019	-0.004
	(0.023)	(0.025)	(0.023)	(0.026)	(0.029)	(0.027)
Twin	0.023	0.025	0.038	-0.007	-0.018	0.007
	(0.045)	(0.052)	(0.044)	(0.049)	(0.054)	(0.050)
PScore [0, 0.05)			-0.087			0.090
			(0.105)			(0.077)
PScore [0.05, 0.15)			-0.292***			0.036
			(0.108)			(0.086)
PScore [0.15, 0.25)			-0.273**			0.017
			(0.108)			(0.081)
PScore [0.25, 0.35)			-0.158			0.084
			(0.114)			(0.088)
(Reference category PScore [0.35, 0.45))						
PScore [0.45, 0.55)			0.574***			
			(0.106)			
PScore [0.55, 0.65)			-0.203			0.039
			(0.137)			(0.105)
PScore [0.65, 0.75)			-0.009			0.258*
			(0.146)			(0.143)
PScore [0.75, 0.85)			-0.379***			-0.041
			(0.106)			(0.078)
PScore [0.95, 1)			-0.229**			0.135*
			(0.109)			(0.075)
Constant	0.240***	0.102***	0.362***	0.227***	0.188***	0.152**
	(0.025)	(0.033)	(0.107)	(0.027)	(0.039)	(0.076)
Observations	1347	847	1347	1107	740	1107

Notes: The dependent variable in Columns (1) - (3) is attrition before kindergarten as a function of receiving a magnet offer. The dependent variable in Columns (4) - (6) is attrition before third grade and the sample is restricted to students attending kindergarten in 2016. Columns (2) and (5) restrict the sample to students with propensity scores above 0.05. Columns (3) and (6) include controls for the propensity score. Robust standard errors are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$