

College of the Holy Cross Economics Department
Final Thesis Paper

The Effect of Opening Knowledge is Power Program Charter
Middle Schools and High Schools on Public School
District-Wide Standardized Test Achievement

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Introduction and Background:

Many prominent business leaders, celebrities, and athletes are also renowned philanthropists.

Providing funding for projects revolving around the improvement of youth education is a popular form of magnanimity. Entertainer Sean "Diddy" Combs has assisted the Capital Prep network of charter schools in the opening of three locations, including his gift of \$1 million to open a school in the Bronx in 2018 (Mitchell 2020). The Bill and Melinda Gates Foundation has also been active in supporting charter schools in Washington. The foundation has donated more than \$25 million to the Washington State Charter Schools Association and spent additional funds on political lobbying for the purposes of expanding the state's charter school network. Despite declining political interest in these endeavors, the Gates' have continued to support charter schools designed to serve students who have struggled in traditional public schools (Ho 2018).

Finally, basketball star LeBron James was instrumental in the opening of a quasi-public school in his hometown of Akron, OH. His "I Promise School" was designed to serve students deemed "at risk" of not eventually graduating high school based on their academic and behavioral track records (Green 2019). Although the generosity of these philanthropists is certainly commendable, it is fair to consider whether the schools they help open are improving widespread educational attainment in these localities, or if these schools are rather prioritizing the success of a small group of students.

In addition to this dilemma, the unusual place charter schools occupy in the wider educational system is a bit precarious. Charter schools are unique institutions within the public school apparatus given that their financing and operations are a combination of public and private resources. The extensive costs necessary to open these schools, which are funded in addition to

the more traditional public schools, make charter schools a commonly criticized institution. Support for charter schools has waned in recent years; as recently as 2016, polls found that more than half of Americans supported charter schools. However, this number has fallen to less than 40% in recent years, while the percentage of Americans who oppose the expansion of charter schools has risen to almost the same level. Efforts by the NAACP and the National Education Association to restrict the growth of the nation's charter school network have seemingly been successful. Notably, a 2016 state vote against raising the cap on the number of charter schools in Massachusetts was a major defeat for groups supporting charters; the success of Massachusetts' charter network made this result rather surprising (Barnum 2017).

The declining political support for charter schools has generally been linked to beliefs held by teachers' unions and local education officials that charter schools are a drain on their districts' available funds and facilities. As a result, enrollment growth rates have stagnated since 2013 (Prothero 2018). Currently, a mere 6% of American schoolchildren study at charter schools, and with enrollment in these types of schools concentrated in urban centers, detractors from non-urban areas do not believe significant and widespread investment in these schools is worth the cost. Additionally, the use of federal funds for charter schools has been seismically inefficient and has opened up this model of educational funding to further examination (Strauss 2019). Most notably, a recent report from the U.S. Department of Education's Charter Schools Program (CPS) found that of the \$4 billion allocated for charter school grants from 1994-2015, over \$1 billion was spent on "ghost" charter schools which failed to ever open or schools which closed down soon after opening (Burriss and Bryant 2019). This scathing "Asleep at the Wheel" report highlighted a tremendous waste of taxpayer dollars; this inefficient handling of grant

money legitimized many of the arguments against the charter school model. However, recent findings have highlighted the merits of a charter school education, especially here in Massachusetts. Studies conducted on charter school student performance in the Boston metropolitan area find that "test-score gains produced by Boston's charters are some of the largest that have ever been documented for an at-scale educational intervention;" additionally, "studies show Boston charters substantially increase SAT scores" and are not merely focusing their resources on the Massachusetts standardized testing in order to achieve these gains (Cohodes and Dynarski 2016). Studies conducted on charter schools in Boston, New York, and New Orleans find that the most impactful charter schools fall under the "high expectations, high support" model. These schools spend the vast majority of their resources on professional development in order to maximize productive classroom time; additionally, these schools tend to keep their students for a longer school day (Leonhardt 2016).

A prominent example of a collection of "high expectations, high support" schools is the "Knowledge is Power Program" (KIPP), which began operations in Houston, TX in 1994. KIPP schools are rigorous K-12 institutions located in underperforming urban school districts. The goal of these publicly-funded charter schools is to enhance the educational experience and success of students residing in districts with poor public schools. KIPP schools are certainly "high expectations, high support" schools given their reformatory model: classroom time is maximized, the school day runs from the early morning to late in the afternoon, and there are mandatory weekend and summer sessions ("KIPP's Structure..."). Carnoy et al. noted that students who take the initiative to engage in the enrollment process for a KIPP school are "almost always ... students with unusually supportive parents or intact families" (2005, 58).

KIPP is the "largest nonprofit charter network in the country" and has received considerable federal funding to expand its network to over 200 schools. In 2019, KIPP was again awarded federal money; this iteration was more than \$86 million over a five-year period in order to add additional middle and high schools to its already vast network. KIPP schools have demonstrated high test achievement and high school graduation rates; additionally, the majority of KIPP students have consistently "outperformed similar students in district schools" (Barnum 2019). However, the overwhelmingly positive impact of the KIPP model has been challenged in recent years. The test score edge of KIPP students over their traditional public schools peers has fallen somewhat, and the KIPP model's strict disciplinary code and high suspension rates have been criticized (Barnum 2019). A negative byproduct of this policy rigidity is a student attrition rate five times as large as the public school average (Chappell 2011). A recent investigation into one of KIPP's founders regarding sexual harassment has unfortunately also tainted the network's reputation (Barnum 2019).

The high volume of funding received by KIPP also complicates the evaluation of the network's efficiency. Miron et al. used U.S. Department of Education data to determine that KIPP charter schools were granted nearly \$13,000 per student (2011, ii). This amount dwarfed the average amount of grants to public schools and other charter schools by more than \$3,200 and \$1,000, respectively. Additionally, Internal Revenue Service data indicates that in addition to this public grant advantage, KIPP also receives nearly \$6,000 per student from private donors (Miron et al. 2011, ii).

In studying the impact of KIPP schools on the education system at-large, understanding the policy ramifications of balancing equity in educational spending and educational attainment is

significant. Specifically, the goal of this study was to perform an event study on the impact on standardized testing results in school districts after the opening of a KIPP school. With these KIPP schools drawing on federal funds, it is worth understanding the overall impact these charter schools have on the entire educational system. Measuring the impact on standardized testing results in school districts which lose students to KIPP in order to analyze whether KIPP is worth the federal funding it receives is important in evaluating the effectiveness of past KIPP grants, and determining whether this network is worth funding in the future. There is a clear tradeoff between using funds for more equitably across school districts versus funding the prioritization of a small subset of students chosen through a lottery at a KIPP charter school. Understanding how district-wide test results are immediately impacted by the opening of KIPP schools will provide clarity into the evaluation of the effectiveness and justness of allocating federal funding to these schools; quantifying the achievement premium provided by a KIPP school will give policymakers an additional data point in the process of appropriating national education spending for charters.

Understanding the full impact that the KIPP model has on the traditional public school system is also important from a policy perspective because of the uniformity of KIPP schools. While states across the U.S. have varying curricula, the KIPP model is relatively homogenous across the entire country. Therefore, identifying the true impact of these schools is significant in determining whether expanding the KIPP model is beneficial. This is especially important given the findings of Cohodes et al. (2019). The study identified the success of "proven providers" of charter school education:

"When a program is successful, policymakers face the decision of whether to have the original implementer continue to provide the program, or whether governments or other agencies should take over the program at a larger scale. This paper shows that, in the

charter school context, replicating existing charters may be a better option than allowing new providers to enter the sector" (Cohodes et al. 2019)."

If replicating existing successful charter models is preferable, understanding the effectiveness of the KIPP model is crucial in determining whether to continue funding this already large network of schools.

It is expected that the KIPP schools will have a largely positive impact on district-wide performance as a result of increased intra-district competition and innovation provided by the opening of these charter schools. However, examining KIPP schools as a whole may be imprudent given that the network has schools serving various grade levels. During the early years of the network, KIPP elementary and middle schools were scattered across the country; however, beginning in 2006, the KIPP network began the process of scaling up and standardizing the model nationally. The two main points of emphasis were the expansion of KIPP's middle and *high* school network and the "clustering" of middle schools and high schools in the same, or nearby, districts (Powers 2006). Therefore, quantifying the impact of this shift in strategy is valuable for determining whether funding this particular method of KIPP proliferation is advisable.

Review of Existing Literature:

Review of Literature on Peer/Background Effects on Achievement

While this research was focused on KIPP schools, reviewing existing literature on the impact of academic peers and a student's background is important for this project. Understanding the relationship between a school's student body composition and student achievement is vital given that this project is attempting to measure the impact of student flight from traditional public schools to KIPP charter schools.

When reviewing the literature on factors impacting student achievement, a student's family background was consistently mentioned as a contributing component. Specifically, a family's economic situation seems to be an important predictor of the academic success of their children. When considering the impact of a student's affluence on test scores, it seems logical that students from a higher socioeconomic level would, in the aggregate, perform at a higher level than students from lower socioeconomic backgrounds. Although the literature supports this claim, the papers considered nuanced this expected finding. Much of the research on affluence and education also considers race as a factor. However, Battle and Lewis investigated the impact of both race and socioeconomic status on student achievement in high school. It was determined that "socioeconomic status is more than three times more important than race in predicting outcomes" (2008, 21). Ceballo et al. expanded the definition of home "affluence" by measuring the impact of neighborhood wealth on student achievement. It was found that "adolescents residing in communities with more middle-class neighbors tend to view education as more important" and, in turn, achieve greater success in the classroom (2004, 732). These findings underscore the impact of students' socioeconomic background on academic achievement. As a result, it was important for this study to review the socioeconomic indicators of the districts containing KIPP schools and the socioeconomic backgrounds of KIPP students. According to reports from KIPP, the districts served by their network are generally heavily populated, relatively low-income, and racially diverse. Overall, the student body of KIPP schools are made up of low-income, minority students with relatively low proficiency in the English language. Specifically, 95% of KIPP students are African American or Latinx, 88% qualify for free or

reduced price school lunch, and nearly $\frac{1}{5}$ are designated English Language Learners because their native language is not English ("National Report Card").

Other papers have used an expanded and more holistic definition of affluence to study the impact of students' backgrounds on their academic success. An earlier study from Baharudin and Luster found similar results indicating that higher student achievement was linked with increased income; however, affluence was just one factor of many used to model the degree of stimulation within a student's "home environment" (1998, 384). A number of variables, including marital status, number of children, and academic support strategies, were used to gauge the stability/quality of a student's home environment. Increased quality was strongly correlated with higher achievement in the classroom (Baharudin and Luster 1998, 397). For the purpose of the study, this literature served an important role given the previous observation that KIPP students tend to come from "supportive" or "intact" families. A more holistic definition of a supportive home environment is a useful model for families sending their children to KIPP schools. A parent involving themselves more intimately in their child's education by encouraging and/or allowing attendance at a reformatory KIPP school, which requires a greater time commitment than a traditional public school, is indicative of the family being more supportive and active. Logically, this type of enhanced commitment seems to increase the degree of accountability and support provided by KIPP students' families; based on the existing literature, better academic results for students moving to a KIPP school should be expected. As a result, it is reasonable to call the students transferring to KIPP institutions *motivated*, even if the motivation for greater educational success is not coming from the student initially.

In addition to the impact of home environment on student achievement, the impact on the achievement level of a student's peers is important when considering how the loss of motivated students to KIPP schools would affect students from the traditional public schools being left behind. Heissel and Ladd noted that as a result of increased federal grants in North Carolina, there was an influx of lower performing students from *failed* schools to the schools receiving grants (2018, 308). At the conclusion of their period of study, the authors noted that the highest achieving students saw significant decreases in test scores, while students just below proficiency level experienced a slight increase in achievement (Heissel and Ladd 2018, 314-315). Neal seconds Heissel and Ladd's presumption that this latter result most likely stems from educators inefficiently devoting inordinate resources to students just below a mandated proficiency level in order to increase passing rates on standardized testing (2010, 124). Zimmerman, who studied college students, found a similar result to Heissel and Ladd; he found that students with *roommates* in the bottom 15% of the student body in terms of incoming SAT scores achieved slightly worse than expected grades based on their own SAT score (2003, 21). When considering the other end of the spectrum, the literature is not in complete agreement. Kiss observed a natural experiment in Germany and found "that students benefit from abler peers, but pupils with high class percentile ranks do so to a smaller extent" (2013, 64). Kiss' basic findings are that an environment filled with higher achieving peers have a positive impact on the academic success of lower achieving students. However, Dobbie and Fryer reached the opposite conclusion when studying marginal students at elite New York City public schools which require an entrance exam: "Our results suggest that the typical applicant does not significantly benefit from attending a school with dramatically higher-achieving ... peers" (2014, 74).

The lack of consensus and variance in techniques in the literature regarding the impact of peers on student achievement added intrigue and importance to this study. With KIPP schools poaching motivated students from other public schools, analyzing the *extent* of the impact on the students who remain in traditional public schools is particularly important. However, more research on KIPP students in particular was needed in order to make use of this literature and make any kind of useful prediction on the impact of KIPP student flight from traditional public schools.

Review of Literature KIPP Achievement and Student Body Composition

While this study was not limited in focus to the performance of students in KIPP schools, it was important to understand what had been written on the effectiveness of the KIPP model.

Currently, the literature is almost exclusively focused on the change in test scores for students after they enroll in a KIPP school; the literature finds KIPP schools to be effective in elevating the test scores of their own students. Angrist et al., in papers from 2010 and 2012, found that student achievement improved significantly after enrollment in the KIPP school in Lynn, MA (2010, 243; 2012, 837). Additionally, Tuttle et al. found a statistically significant "positive" and "substantial" change in achievement by students after they enrolled in a KIPP school (2010, 28).

The positive impact on standardized test achievement found in these studies, although it did not fully answer the question of this paper, was very important. The overwhelmingly positive results of the KIPP model on its own students proves that KIPP's reformatory methods improve the test scores of a small subset of a district's students. Barnum's aforementioned finding that KIPP students consistently "outperform similar students in [traditional] district schools" further validates the ability of KIPP schools to elevate the achievement of the students who attend

schools in the KIPP network (2019). As a result, all else held constant, KIPP schools should also have a positive impact on district-wide test scores. However, the purpose of this study was not assume there is no impact on the schools KIPP students leave behind, and to try to understand what the effect of these students leaving traditional public schools has on the entire district. The majority of the literature on KIPP schools has analyzed the effectiveness of the institutions on their own students. This is important because many KIPP students come from very low achieving school districts. However, the lack of research on how the flight of students in low-income school districts to KIPP schools impacts overall achievement levels in districts with a KIPP institution represents an exploitable gap in the existing literature. Although Tuttle et al. do produce results consistent with other literature, one finding in their report which added complexity to this research is the finding that KIPP enrollees "typically had prior achievement levels that were lower than average achievement in their local school districts" (2010, xi). It was previously reasoned that KIPP enrollees are more motivated students; Tuttle's conclusion indicates that prospective KIPP students may come from more motivated households, but this does not make them high achievers prior to enrollment in the KIPP network. This added further intrigue to this event study. Motivated students leaving a traditional public school for a KIPP school would presumably have a negative impact on achievement in the district's traditional public schools; however, it has been found that inefficiency in many schools is caused by an inordinate amount of resources being spent on students just below passing rates (Heissel and Ladd 2018, 308). Considering that Tuttle et al. found that KIPP students on average are below average performers at their previous schools, it is feasible that many KIPP students could have been in this "just below proficiency" class of students. Therefore, schools experiencing student

flight to KIPP schools may *benefit* if they are able to more efficiently distribute learning resources.

Research was also conducted on the relationship between socioeconomic indicators specific to the KIPP student population and achievement. Angrist et al. in particular used the lottery enrollment system as a natural randomized experiment and provided important context for this study regarding the role of language proficiency on test achievement (2012). This analysis indicated that the large "reading gains are driven almost completely by ... and [English Language Learner] students, whose reading scores rise by roughly 0.35 standard deviations for each year spent at KIPP Lynn" (Angrist et al. 2012, 837). This result signaled that the lower baseline proficiency of KIPP students in English prior to transferring to a KIPP school represents a prime opportunity for a relatively easy and swift increase in English proficiency upon entrance into a KIPP school.

Booker et al. was reviewed in order to examine any observable differences between the impacts of KIPP middle schools and high schools (2015, xiv). This paper indicated that, similar to the network's middle schools, "KIPP high schools have positive, statistically significant, and educationally meaningful impacts on achievement for new entrants to the network;" however, it was observed that "for students continuing from KIPP middle schools, the marginal impacts of having the option to attend a KIPP high school were not statistically significant" in comparison to outcomes for KIPP middle school students who went on to traditional high schools. This result indicates that a KIPP school has an immediate impact on *new* students; however a student continuing their education at KIPP high school after attending a network middle school results in much less of a positive impact on achievement. The observable benefits of this path instead

involves increased rates in advanced course taking and improved college planning/application rates (Booker et al. 2015, xiv). These findings led to expectations for this study regarding the differences between the impact of high schools and middle schools on district-wide achievement. The declining rates of return on achievement stemming from attending a KIPP school over an extended period of time indicates that high schools were expected to have a lesser positive impact on district-wide achievement.

Review of Literature on Impact of Charter School Flight

This study was aimed at examining how the opening of a KIPP school impacts the achievement of an entire school district; aforementioned papers prove the positive impact "high expectations, high support" model schools have on their own students. Therefore, the aim of this study was to determine what impact the flight of students from traditional public schools to KIPP schools has on a district's standardized test scores immediately after a KIPP school is opened. Although there have not been any studies answering this question on KIPP schools specifically, there is a significant amount of literature on this issue for all types of charter schools. Overall, although there still exists empirical disagreement, the majority of papers suggest that charter schools have a positive impact on students in traditional public schools in the same district. This has been rationalized by the suggestion that charter schools "[create] innovative approaches that district schools can borrow, and ... [produce] healthy competitive pressure on district schools that would otherwise hold a local monopoly (Gill 2016). This argument using basic economic logic regarding the benefits of competition seems cogent. However, the literature is still far from unanimous in recognizing a large positive impact of charter schools on public school districts.

There is one prominent study which has found that charter schools have a negative impact on district-wide outcomes. Imberman focused on one "large urban school district in the Southwest" and controlled for the endogenous factor of physical proximity of charter schools in relation to public schools (2011). The results show statistically significant decreases in performance for elementary school students, but finds positive results for older students (Imberman 2011, 850-851). The small sample size, paradoxical results, and unique focus on the physical distance between charter and public schools makes the results of this study an outlier in the greater literature. In order to avoid these pitfalls, this paper collected data from many school districts and focused on certain grade levels (as opposed to studying all grades K-12), and proximity between public and charter schools was not a factor which was considered.

Some of the literature finds more neutral or inconclusive evidence on the impact of charter schools on traditional public schools. These studies tend to study a wide variety of locations/states and many different forms of charter schools (i.e. not all "high expectations, high support" model schools). Additionally, these studies examine the effects of charter schools over a long period of time and do not account for when the charter schools are opened. Instead, they focus on charter school "penetration" into school districts, meaning they control for how many charter schools *exist* within the districts being studied. Han and Keefe found a rather small, not statistically significant "negative association between charter school prevalence and both math and English achievement" in traditional public schools over a six year period; additionally, the authors suggest that "it seems premature to emphasize the virtue of competition charter schools bring to public education" (2020, 28-29). A study on charter-occupying school districts in California found that there were no positive effects on traditional public schools found (Buddin

and Zimmer 2005, 27). Similarly, in a study across eight states, Zimmer et al. determined that the existence of charter schools had neither a positive or negative influence on traditional public school achievement scores (Zimmer et al. 2009, xv). While the results of these studies are important to consider, this paper was more focused by exclusively studying a certain type of charter school immediately after opening in order to isolate the impact of the KIPP model in particular.

Two studies examining more specific localities found the impact of charter school flight to be mildly positive. In particular, these studies find mild, statistically insignificant test score improvement for traditional public school students from large, urban school districts with charter school competition. A study from New York City finds that traditional public school test scores "benefit mildly in both Math and English" when there is "competitive pressures" resulting from the presence of charter schools (Winters 2012, 293). Similar findings by Nisar were observed in Milwaukee; however, the importance of this study is its consideration of the "heterogeneity" of the charter schools in Milwaukee (2012). Although the study did not specify when the charter schools were opened, the author concluded that the magnitude of the impact on traditional public school districts was related to the kinds of charter schools in the district. Specifically, Nisar found that "non-district sponsored charter schools have significant positive effect on students' math ... achievement in neighboring public schools," which was greater than the effect district sponsored charter schools exhibited (Nisar 2012). This result was significant for framing the impact of the KIPP network because KIPP schools would be considered non-district sponsored, and they would be expected to have a larger, statistically significant positive effect on traditional public school standardized test scores. Additionally, these studies potentially offered a preview

into the results of this KIPP study given that KIPP schools are located in urban districts with large populations.

Finally, two studies have found there to be a large and consistently positive impact of charter schools on traditional public schools. These two papers also primarily studied urban-based private schools. In New York City, Cordes found that the entry of a charter school into a school district had an immediate positive impact on the existing public schools; it was also suggested that "potential explanations for improved performance include increased per pupil expenditures, academic expectations, student engagement, and a more respectful and safe school environment after charter entry" (Cordes 2016). Additionally, a study of the opening of charter schools in predominantly urban school districts in North Carolina also found positive impacts on the traditional public schools (Jinnai 2013). Jinnai's paper adds to the analysis by observing the impacts across grades which are offered at both the traditional public schools and the newly opened charter schools. Jinnai adds this dimension in an attempt to "follow" the students who have left the traditional public school system and compare the results of the school district as a whole from before and after the opening of a charter school (Jinnai 2013, 27).

Overall, the existing literature on how charter schools impact traditional public schools suggests that there is a benefit for school districts as a whole resulting from the presence and/or opening of a charter school. Specifically, large, urban school districts seem to benefit the most from charter schools. Logically, this is understandable given that it has been established that charter school enrollment is far more concentrated in urban settings; these districts have greater competition provided by a multitude of charter schools. Conversely, smaller suburban/rural districts with fewer schools and/or much smaller charter school enrollment numbers do not reap

the rewards of competition among schools. The limitations in this literature are in the studies which do not account for the heterogeneity of the wide array of charter schools found across the country. The importance of some papers in this literature is the consideration of time of entry into a school district by a charter school (i.e. when the school opened) instead of simply studying the impacts of existing charter schools. This consideration allows for the study of the impacts of a charter school immediately after its opening by controlling for the date of entry; the impact of a charter school on its school district could presumably change as more time passes since the opening of the charter school.

Question:

The goal of this study was to extend the existing literature by studying the impact of KIPP schools on the school districts in which they are located; the literature in this area is not robust in the examination of KIPP schools in particular. Specifically, this study was aimed at evaluating the impact that the opening of a KIPP school has on a district's state-sponsored standardized test achievement. This approach is novel and is suited for testing the impact of these charter schools by eliminating many of the differences and variations observed in data sets used in other studies. First, KIPP schools are located predominantly in urban centers with substandard school districts. Second, it has been established that KIPP schools, on average, do not tend to attract top performing students from the traditional public school system. Third, studying KIPP schools exclusively means all the schools in question are relatively homogenous; although each state has a different academic curriculum, KIPP schools themselves operate in a similar fashion throughout the country. Fourth, this paper controlled for the date of opening in order to understand the *immediate* impact each KIPP school has on its district's achievement. Observing

effects on achievement over an extended period of time does not isolate the impact of a KIPP school. Long term impact on achievement could be influenced by other events. For example, the presence of a high-performing KIPP school may alter the population by attracting a new batch of residents to that district. Further, events completely separate from educational options could also impact the population of the district in a way which may exaggerate, or minimize, the achievement premium or discount provided by the opening of a KIPP school. Finally, this study complexified the analysis of the impact of a KIPP opening by generating results across different grade levels, areas of study, and level of achievement. The impact of opening a KIPP middle school was compared to the impact of the opening of a KIPP high school on district-wide achievement in order to determine if KIPP's shift in its expansionary policy in 2006 was well advised. Additionally, impact on proficiency, advanced, and proficiency plus advanced levels in both English and Math testing were quantified.

Hypotheses:

Given the background found in the literature and the setup of this question, it is expected that the opening of a KIPP school would yield the following effects on district-wide outcomes.

First, it was expected that the impact of KIPP schools on district wide achievement will be consistently positive and sizable. The low-income, minority students attending KIPP schools were expected to benefit greatly from the KIPP model. Additionally, as a result of the location of KIPP schools in large, urban school districts, the opening of these schools should have a positive impact on the proficiency plus advanced rates of achievement in the school districts in which they are located. Additionally, because KIPP schools are not simply poaching high achieving students, the schools KIPP-bound students are leaving should not be worse off; as

previously mentioned, this loss of slightly below passing rate students may free up significant resources for teachers to spend on other students. The homogeneity of KIPP schools also ensures that all of the schools being studied are "high expectations, high support" models; these schools are expected to have the most positive impact.

Second, increases in proficiency rates were expected to outpace advanced achievement rate gains. KIPP students are on average below proficiency level students prior to transferring, so it is unlikely that one year of reformatory schooling would lead to a large hike in advanced rate of achievement. However, traditional public schools are not dealing with an influx of lower performing students but rather an outflow of below average students; therefore, the loss of these students from traditional public schools was expected to lead to a small positive impact on advanced rates.

Third, although rates of achievement were expected to improve in both English and Math, the large portion of KIPP students being designated as English Language Learners led to expectations of English proficiency gains outpacing Math proficiency gains. The "low-hanging fruit" nature of potential English proficiency gains are the result of incoming KIPP students' propensity to have lower English proficiency prior to enrollment.

Finally, the impact on district-wide achievement resulting from the opening of a KIPP middle school was expected to be larger than the opening of a KIPP high school. The literature suggests that the impact of KIPP's methods are significantly larger for students new to the network.

Logically, middle school KIPP students are also younger, more impressionable, and are making a much more dramatic change in their educational plan by removing themselves from the traditional public school system prior to high school. Conversely, high school students are older,

may have developed poor academic habits in their K-8 years, have most likely spent more time in underperforming K-8 schools, are making a more common, and less consequential, move away from traditional public schools.

Methods:

This research project culminated with an event study which examined the impact that the opening of a KIPP school had on a school district's state-sponsored standardized test achievement. The study was conducted nationally using all available test score/achievement information from KIPP schools and their respective public school districts. District-level public school data including both traditional public schools and district charter schools was utilized to compare academic achievement from the year before opening with the year of the school opening. The study used data from the 2006-2007 school year up until the 2018-2019 school year in order to capture results from KIPP schools opened between 2006 and 2017. Although there were a number of KIPP schools opened prior to 2006, this year was used as a beginning point in the data because 2006 was the year when KIPP shifted its expansion policy to include the opening of high schools in addition to the increased proliferation of middle schools. This delineation is both convenient and necessary, as beginning the data set after a specific change in policy ensures more standardization among the schools being studied.

Data

Since each state offers different standardized testing with various scoring systems, data on test scores was gathered at the state level for district level achievement in the year prior to the opening of a KIPP school. Additionally, individual state scoring systems were ignored; instead, proficiency and advanced level percentages in both English and Math were collected instead of

raw scores. Gauging test achievement by the percentage of students deemed "proficient/passing" and percentages of students achieving "top scoring/advanced" normalized the data across different states with distinct tests. This normalization of the data also allowed for the establishment of comparable baseline achievement level results across different states and districts. For example, for a KIPP school opening in the fall of the 2006-2007 school year, district-wide percentages of proficiency and advanced achievement from testing conducted in the spring of 2006 were collected. These statistics were gathered from reports on individual states' education websites.

Next, state education data was cross-referenced with KIPP reports on district-wide achievement to collect data on test achievement in the year the school was opened in order to determine the immediate impact of KIPP school openings. Some states assign standardized testing in both the fall and spring, so results from the spring were used in order to measure the *full year* impact of a KIPP school on a public school district; fall results would presumably be too similar to the results of previous years. For example, for a KIPP school opening in the fall of the 2006-2007 school year, district-wide percentages of proficiency and advanced achievement from testing conducted in the spring of 2007 were collected.

This study analyzed and compared the impact of both KIPP middle schools and high schools. Therefore, it was necessary to determine which grade levels would be used in the study. KIPP middle schools universally included both 5th and 6th graders, so these grade levels were used to measure the impact of a KIPP middle school opening. Similar to the approach used in Jinnai's 2013 study, 5th grade achievement results were used for the year prior to opening, while 6th grade results were collected in the year of the opening of the KIPP middle school. This setup

derived from Jinnai's approach allows the study to "follow" or track the same set of students in the district; the 5th grade results include students who attend the existing public schools in the year prior to opening and the 6th grade results include the same students who now attend both the newly opened KIPP school and the existing traditional schools. At the high school level, 9th and 10th grade results were collected and utilized in a similar fashion. As a result, the KIPP high school in Pennsylvania was excluded from the data set because Pennsylvania high school achievement is only reported for 11th grade students. Without high school test result data from subsequent years, this school was not appropriate for a data analysis of the *immediate* impact of the opening of a KIPP high school.

Regression Variables

Much of the literature reviewed in the research process used a difference-in-difference regression model or utilized KIPP's lottery enrollment process as a natural experiment. For this study, a natural experiment modeled event study unique to this paper was developed in order to measure the immediate district-wide impact of a KIPP school opening. This event study did not involve the use of an outside control group and instead measured change in mean outcome in the treatment group over time. The pre-treatment time period is represented by the year prior to KIPP school opening, while the post-treatment period is represented by the year of the KIPP school opening. Because the KIPP schools being studied opened in different years, it was necessary to divide the periods of interest this way instead of by year. The dependent/output variable in these regressions was test achievement, which was measured by passing rate plus advanced achievement rate, proficiency rate, and advanced achievement rate in both English and Math. As a result, twelve total regressions were performed: six regressions using middle school

data and six regressions using high school data. Within each subset, three regressions used English achievement scores and three regressions used Math achievement scores.

The main input variable in this empirical regression was the opening of a KIPP school in a district, which was accounted for by using a binary variable. The event study regression model for this project, in addition to a table explaining the regression variables, is outlined below:

$$Y_{d,s,y} = \beta_0 + \beta_1 * \mathbf{KIPP} + \lambda_{d,s} + \alpha_y + \varepsilon_{d,s,y}$$

Variable Name	Meaning
$Y_{d,s,y}$	This "Y" is the output variable representing test score achievement. It was measured as a percentage of either proficiency plus advanced rate, proficiency rate, or advanced achievement rate. The subscript "d,s,y" is included to represent the variation across "district," "state," and "year."
β_0	This variable is the intercept/constant term and represents the mean rate of achievement prior to the opening of a KIPP school.
β_1	This is the coefficient of interest as it represents the calculated impact of the opening of a KIPP school on the output variable. This coefficient will represent the change in the mean outcome of the treatment group (the school districts) over time (from the year prior to KIPP opening to the year of the KIPP opening).
KIPP	This is a binary variable. It took a value of "0" to represent the pre-treatment period: a school district not having a KIPP school (in the year prior to a KIPP school opening); alternatively, this variable took a value of "1" to represent the post-treatment period: a school district having a KIPP school (in the year when the KIPP school opens).
$\lambda_{d,s}$	This variable is the fixed effects term for district-level variance. This term was a fixed variable as it accounted/controlled for the inherent/fixed variability in achievement across the different districts within the states being studied.
α_y	This variable is the fixed effects term for variance across time. This fixed variable accounted for the differences in achievement from year to year which are not explained by the previous fixed effects term. An example of this variability could be changes in the format or difficulty of the test from year to year. Based on the setup of this study, it was assumed that these year to year changes would not be substantial enough to alter the percentage based test results.
$\varepsilon_{d,s,y}$	This variable is the error term.

In addition to this basic empirical model, adding complexity through the inclusion of variables based on socioeconomic factors was considered at first; however, it was determined in reviewing the data and composition of the student body of KIPP schools that the relative homogeneity of the school districts with KIPP schools and the socioeconomic background of KIPP students made this type of analysis less consequential. Instead, the complexification of this study was derived from stratification of the results based on grade level, subject matter, and different rate-based measures of achievement.

Results:

Prior to running the twelve regressions, the descriptive statistics of the pre-treatment data set were analyzed. Table 1 summarizes the descriptive statistics of the school districts in the middle school data set prior to the opening of a KIPP school, while Table 2 shows the same statistics for the high school data set.

Table 1

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Eng Proficiency+Advanced Rate	65	49.769	19.997	13.8	86.9
Eng Proficiency Rate	65	36.575	13.156	12	64.1
Eng Advanced Rate	65	13.185	8.872	1.8	33.7
Math Proficiency+Advanced Rate	65	49.358	22.837	4	91
Math Proficiency Rate	65	33.668	14.32	3.9	59
Math Advanced Rate	65	15.691	11.873	0.1	42.7

Table 2

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Eng Proficiency+Advanced Rate	28	49.45	18.671	19.3	85.5
Eng Proficiency Rate	28	37.1	14.82	10.3	68.5
Eng Advanced Rate	28	12.35	8.656	1.2	33
Math Proficiency+Advanced Rate	28	43.718	19.227	13.9	80.5
Math Proficiency Rate	28	31.293	13.692	12.6	53.6
Math Advanced Rate	28	12.425	8.918	1.3	33

Notably, the proficiency rates in both English and Math were significantly greater than the advanced achievement rates. Additionally, when examining the individual data entries, it was observed that many of the districts with the highest levels of proficiency and advanced achievement prior to the opening of the KIPP school were districts with existing KIPP schools. Specifically, Metropolitan Atlanta and Houston, the Bay Area in California, and Lynn, MA were districts with existing KIPP schools prior to 2006, and exhibited some of the highest pre-treatment levels of student achievement.

Regression Results on the Treatment Effect on Middle School Achievement in English

The data set for middle schools includes results from 65 KIPP middle school openings between 2006-2017. Table 3 shows the results from the three regressions run on the impact of district-wide English achievement resulting from a KIPP middle school opening.

Table 3

Variable	Model on Middle School English Prof+Adv Rate	Model on Middle School English Prof Rate	Model on Middle School English Adv Rate
β_1	5.858 (1.67)	3.949 (1.69)	1.918 (1.24)
β_0	49.769 (20.07)	36.575 (22.19)	13.185 (12.07)
R-squared	0.0213	0.0219	0.0119

The regression run on the impact on district-wide English proficiency plus advanced rate revealed that the opening of a KIPP middle school was correlated with a 5.9 point overall increase in English proficiency plus advanced percentage. This result was statistically significant at the 10% significance level. The impact of a KIPP middle school opening was a 3.9 point increase in proficiency rate which was statistically significant at the 10% significance level. The treatment impact on advanced rate of achievement was positive, but smaller, than the impact on proficiency; this positive result was not statistically significant.

Regression Results on the Treatment Effect on Middle School Achievement in Math

Table 4 shows the results from the three regressions run on the impact of district-wide Math achievement resulting from a KIPP middle school opening.

Table 4

Variable	Model on Middle School Math Prof+Adv Rate	Model on Middle School Math Prof Rate	Model on Middle School Math Adv Rate
β_1	3.588 (0.91)	3.363 (1.30)	0.225 (0.11)
β_0	49.358 (17.61)	33.668 (18.36)	15.691 (11.21)
R-squared	0.0064	0.0130	0.0001

The regressions run on the impact on district-wide Math achievement revealed that the opening of a KIPP middle school was correlated with a much smaller, yet still positive, increase in achievement rates in Math when compared with the results on English test achievement. All of the three results for Math were not statistically significant at the 10% significance level.

However, similar to the results observed in the regressions in middle school English achievement, the treatment impact on proficiency was much greater than the effect on advanced achievement rate.

Regression Results on the Treatment Effect on High School Achievement in English

The data set for high schools included results from 28 KIPP high school openings between 2006-2017. Table 5 shows the results from the three regressions run on the impact of district-wide English achievement resulting from a KIPP high school opening.

Table 5

Variable	Model on High School English Prof+Adv Rate	Model on High English Prof Rate	Model on High School English Adv Rate
β_1	3.011(0.60)	2.586 (0.63)	0.429 (0.19)
β_0	49.45 (13.93)	37.1 (12.82)	12.35 (7.67)
R-squared	0.0066	0.0073	0.0006

The regression run on the impact on district-wide English proficiency plus advanced rate revealed that the opening of a KIPP high school was correlated with a 3.011 point overall increase in English proficiency plus advanced rate. However, this result was not statistically significant at the 10% significance level. The impact of a KIPP high school opening was a 2.5 point increase in proficiency rate which was also not statistically significant at the 10% significance level. The treatment impact on advanced rate of achievement was positive, but significantly smaller, than the impact on proficiency; this positive result was also not statistically significant.

Regression Results on the Treatment Effect on High School Achievement in Math

Table 6 shows the results from the three regressions run on the impact of district-wide Math achievement resulting from a KIPP high school opening.

Table 6

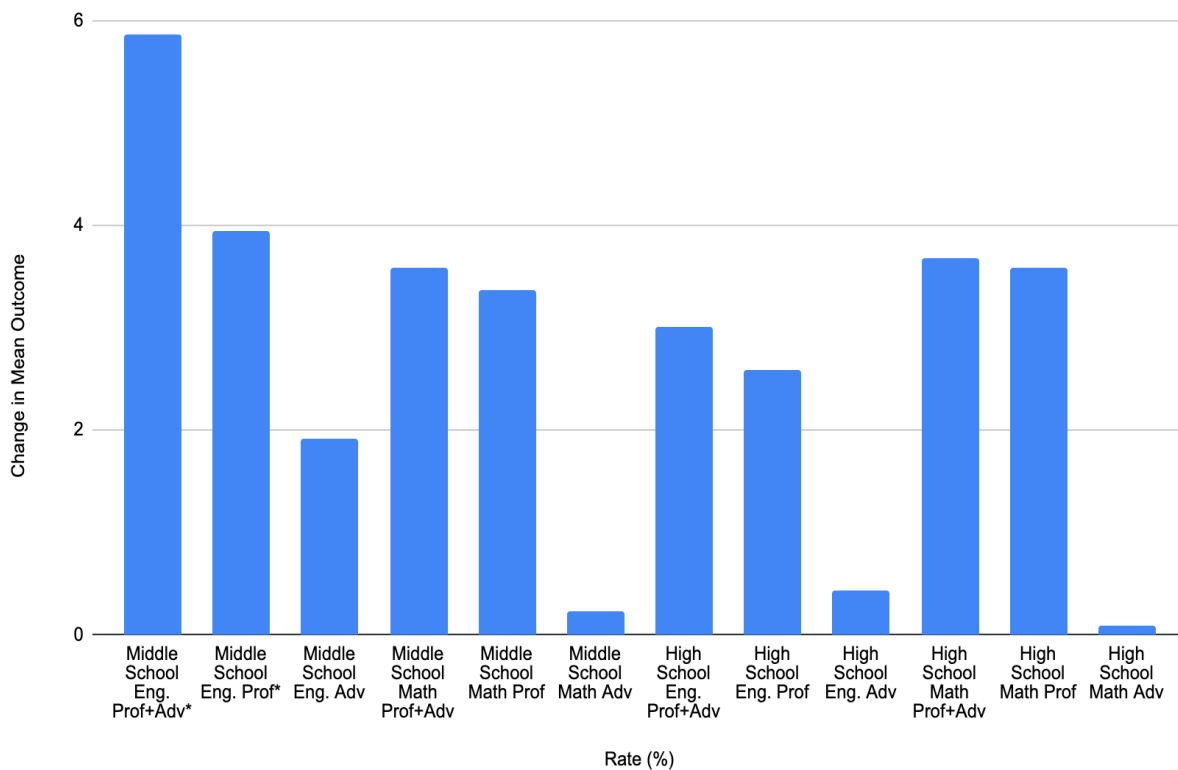
Variable	Model on High School Math Prof+Adv Rate	Model on High School Math Prof Rate	Model on High School Math Adv Rate
β_1	3.675 (0.70)	3.593 (0.93)	0.082 (0.04)
β_0	43.718 (11.82)	31.293 (11.47)	12.425 (7.54)
R-squared	0.0091	0.0158	0.000

The regression run on the impact on district-wide Math proficiency plus advanced rate revealed that the opening of a KIPP high school was correlated with a 3.7 point overall increase in Math proficiency plus advanced percentage. However, this result was not statistically significant at the 10% significance level. The impact of a KIPP high school opening was a 3.6 point increase in proficiency rate which was also not statistically significant at the 10% significance level. The treatment impact on advanced rate of achievement was barely positive; this positive result was also not statistically significant.

Analysis:

Table 7 summarizes the calculated coefficients of interest across the twelve regressions.

Table 7



*Indicates statistical significance: $p < 0.1$ *

In order to understand the quantitative results of this study, it is helpful to analyze the calculated results in the same manner predictions were made in the hypothesis section. First, although many of the calculated coefficients of interest were not statistically significant at the 10% significance level, all twelve regressions showed post-treatment increases in proficiency plus advanced, proficiency, and advanced rates of achievement in both English and Math. The positive impacts observed in these regressions may even be undervaluing the true effect of the opening of a KIPP school on district-wide achievement. The presence of one or more KIPP schools in a district prior to the opening of an additional KIPP institution may result in

diminishing returns on achievement gains and skew the data in this model by not capturing the full effect of a KIPP opening. Second, post-treatment gains in proficiency rates were universally larger than post-treatment gains in advanced achievement rates. Third, post-treatment proficiency improvements were larger in English than in Math at the middle school level; however, the reverse was true at the high school level. Intuitively, this result makes sense given that KIPP students' lower proficiency in English prior to enrollment could be more easily overcome in middle school where the English material is less advanced than in high school.

Finally, the positive impact on district-wide English achievement resulting from the opening of a KIPP middle school was significantly larger than the opening of a KIPP high school.

Conversely, the positive impact on district-wide Math achievement resulting from the opening of a KIPP high school was slightly larger than the opening of a KIPP middle school.

Potential Error

The regression utilized in this study was designed with one independent variable in order to simplify the analysis and isolate the effect of a KIPP opening on district-wide achievement.

Nevertheless, the use of a single independent variable can lead to omitted variable bias.

Specifically, the α_y fixed effects term in the regression could represent a possible source of error.

In this type of natural experiment, the coefficient of interest will be biased if the change in the dependent variable is unrelated to treatment. In order to complete this study, year to year variance in the difficulty or format of state tests was assumed to be fixed; however, substantial year to year variance could bias the results as some change from the pre-treatment to the post-treatment period would be unrelated to the opening of a KIPP school.

An additional source of error could involve the process of "following" the students being studied

across multiple grade levels. Analyzing achievement data from subsequent grade levels was done in order to compare the achievement levels of the same group of students over time. While KIPP schools *primarily* draw students from the district in which the school is opened, out-of-district students can be admitted as well. As a result, the analysis of achievement data from subsequent grade levels was imperfect. An influx of out-of-district students with above average achievement levels could lead to an overestimation of the treatment effect. Conversely, an influx of out-of-district students with below average achievement levels could lead to an underestimation of the achievement premium created by the opening of a KIPP school.

A final source of error involves the previously mentioned effect of the presence of one or more KIPP schools in a district prior to the opening of an additional KIPP institution. All KIPP high schools are impacted in this way as the opening of each of KIPP's high schools was preceded by the opening of a KIPP middle school. Therefore, the results of this study at the high school level could be understated as the full effect of the opening of a KIPP high school may not have been captured accurately. This theory is supported by the report from Booker et al. that the continuation of KIPP education from middle school to high school does not provide a significant marginal benefit when comparing these students to KIPP middle school students who instead chose to attend non-KIPP high schools.

Conclusion:

The quantitative results of this study regarding the impact KIPP schools have on district-wide student achievement were consistently positive but not universally statistically significant.

Despite this lack of statistical confidence in the results of this event study, it would be misguided to dismiss the results of this study altogether. Instead, understanding the possible limitations of

this natural experiment in capturing the complete change in mean outcome of the school districts used in this data set is necessary to discern the true value of this study. The observed treatment effect on mean outcomes was universally positive across all twelve regressions, and there exists evidence suggesting that these results were understated; therefore, the observed positive impacts of KIPP school openings on district-wide achievement should be seen as a meaningful result in the expanding literature on the impact of charter school flight.

At the middle school level, the relatively large changes in mean outcomes calculated by the model indicate that the expansion of the middle school network beginning in 2006 has been largely beneficial for the districts served by KIPP. This study was able to generate statistical evidence in English achievement indicating that KIPP's targeted model for education reform in underperforming districts has been successful in elevating the achievement of both its own students and the overall district. Consequently, further spread of the KIPP middle school network would be advisable based on the results generated by the empirical model used in this study.

There are potential areas of further research which could assist in the making of a more specific recommendation on additional KIPP middle school expansion. First, running a similar experiment which only includes the first KIPP middle school opened in each district could help capture the complete district-wide effect of a KIPP opening. This type of analysis would be extremely helpful in understanding a KIPP middle school's true value to the overall district by removing any potential bias based on the diminishing returns of multiple treatment effects. However, many of the schools which would be part of the data set in this type of study were opened well before 2006. This is problematic for a number of reasons. First, the KIPP model

was less refined and homogenized at a national level prior to the 2006 efforts to scale up; therefore, this type of study would not necessarily be able to generalize results regarding the strength of the KIPP model. Next, the data set would be significantly smaller for this type of analysis. Finally, setting aside any data collection troubles stemming from the age of the results needed to complete the study, the assumptions codified by the α_y fixed effect term would be less likely to hold up. Extending the sample to include schools from the 1990s would create a larger window for fundamental changes in the tests being issued by various states. This could result in changes to the coefficient of interest unrelated to the opening of a KIPP middle school which would bias the results of this type of study.

A more feasible additional study would involve controlling for the presence of other KIPP schools in the district prior to opening. Similar to the models used in papers by Zimmer, Buddin and Zimmer, and Han and Keefe, this type of study would control for the amount of KIPP schools in a district at the time of the opening of an additional KIPP middle school, and it could help quantify the rate of diminishing returns on additional KIPP investment in specific districts. Additionally, measuring the effect two KIPP schools opening simultaneously in one district would be invaluable.

At the high school level, the relatively small change in mean outcomes calculated by the model indicates that the development of a high school program beginning in 2006 designed to supplement the existing middle school network has been less beneficial for the districts served by KIPP. Although combining this conclusion with the findings of Booker et al. may suggest that the KIPP high school network may be less valuable than its middle schools, this finding needs further context. As detailed in the review of the existing literature, Booker et al. did find that

KIPP high schools had a statistically significant, positive impact on KIPP students entering the network at the high school level. It is difficult to propose further study to isolate the effect of KIPP high schools given that all of the network's high school openings have been preceded by middle school openings. It is unrealistic to assume that KIPP will change this policy in enough new districts in order to develop a robust data set necessary to measure the isolated effect of KIPP high schools. Despite this difficulty, KIPP high schools should not simply be dismissed and viewed as not beneficial. Tables 8-10¹ show the positive impacts of the KIPP high school model on higher educational attainment for its students. This type of success in secondary and tertiary education for students in underperforming districts is extremely valuable. Continuing to open KIPP high schools in districts with existing middle school(s) may be optimal for enhancing both district-wide middle school achievement on state-sponsored standardized testing *and* post-middle school educational outcomes.

Table 8

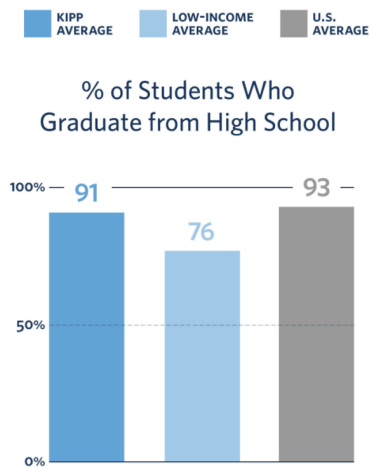


Table 9

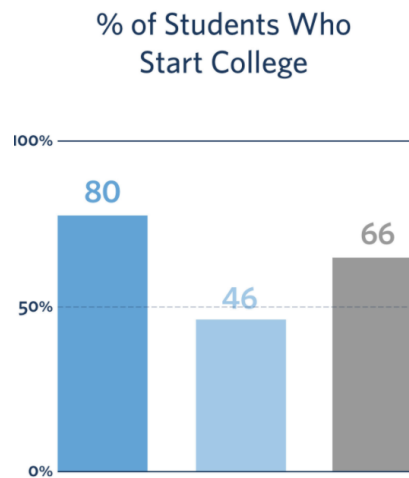
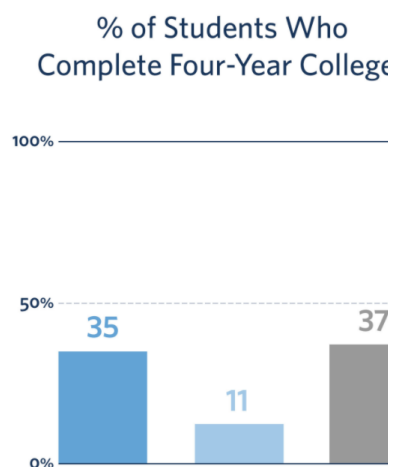


Table 10



Further study on the long term benefits of KIPP infiltration in a school district could be designed to measure the "efficiency" of the large amount of per student funding received by KIPP schools. Specifically, using calculated wage premiums for high school or college graduates and district-wide high school graduation rates/college completion rates from before and after the opening of a KIPP school could monetize the wage gains of a KIPP opening.

Applications:

The results of this study could have potentially major policy implications. First, this study has provided some evidence to suggest that the KIPP network has benefited school districts throughout the country through enhancements in district-wide achievement resulting from the opening of KIPP school. This information can be added to the existing knowledge on charter schools to help federal and state governments determine which charter school programs are worth funding at certain price points. Given the findings of Cohodes et al. in 2019 regarding the benefits of replicating proven providers of charter education, funding the expansion of the already strong brand of KIPP charter schools would be an effective use of limited grant money. In addition to the network's success, the homogeneous nature of KIPP's institutional operations ensures that this option can be readily available to the education system of any state if it is able to receive the necessary funding. Finally, with Joe Biden assuming the office of President of the United States next month, quantitative support will be necessary for any charter network hoping to expand. Biden has pledged to "focus on 'neighborhood public schools' rather than charter schools" (Blad 2020). The President-elect has even characterized charter schools as "very misguided school reforms" (Wigfall 2020). As a result, it is logical to expect that charter networks like KIPP will have to engage in more intense competition for less federal funding, or

have to look to private donors for an increased share of their funding. Either way, charters will need to arm themselves with evidence regarding the merits of their model. However, specifically in the competition for federal funds, charter networks could counter Biden's ideological stance against non-neighborhood schools with evidence that charters can elevate the performance of entire school districts.

Notes

1. Charts were taken directly from the KIPP website:
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<https://www.kipp.org/results/national/#question-1:-who-are-our-students>

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