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Factors of Success: A Study of Select Ohio School Districts' Achievement

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From segregation, integration by bussing, and near-bankruptcy, the Cleveland Metropolitan School District's history is embattled to say the least. The district has struggled to properly educate students for decades. Large metropolitan school districts, like Cleveland, have always faced difficulties in educating its students. The Ohio Department of Education rated the Cleveland Metropolitan School District in "Academic Emergency" for the 2011-2012 academic year; the worst of six academic rankings. Of the largest districts in Ohio, including Columbus, Cincinnati, Akron, Dayton, and Toledo, Cleveland has had the lowest four-year graduation rate every year since 2000, averaging only a 50.97% graduation rate over the eleven-year period.

Drawing from some of the recent research on public education, this study will present a model that predicts student achievement on state standardized tests in the Cleveland Metropolitan School District. After developing a well-specified model, the model and explanatory factors will be evaluated for potential contributions to the literature.

It is the purpose of this paper to aid researchers and district policy makers to better understand what factors significantly contribute to student achievement, and, possibly, how to improve the quality of education Cleveland students receive.

Historical Context

By almost all measures the Cleveland Metropolitan School District (CMSD) stands out as the poorest performing metropolitan school district. CMSD's graduation rate peaked in the 2006-2007 academic year with 62.3% of seniors graduating (Ott, 2009). Every year since the 2003-2004 academic year, when CMSD obtained a greater than 50% graduation rate, it has significantly lagged behind metropolitan districts in Ohio (Ott, 2009), as Table 1 in Appendix A shows.

In *DeRolph v. the State of Ohio* the Ohio Supreme Court ruled against the State of Ohio four separate times (1997, 2000, 2001, 2002) declaring the state's methods of funding schools was unconstitutional and inequitable (DeRolph, 1997). The court found that the school funding system was inequitable because it relied too heavily on local property taxes (DeRolph, 1997). The funding

system's design disproportionately disadvantaged poor and rural districts and students, creating an inequitable system of education as a whole (DeRolph, 1997).

Federal and Ohio policy and policy makers focus on improving achievement. Presuming minimum standards to comply with federal and state education policy, there are obvious differences in achievement within the large metropolitan districts throughout the state of Ohio. What factors lead to the wide discrepancies among these districts across Ohio? Is money the only issue, or are there some other underlying factors to contribute to these differences in district achievement?

Review of Literature

In the case of *DeRolph v. State of Ohio* (1996), the Ohio Supreme Court found that the Ohio school funding was woefully harsh and deleterious to the education of rural and inner city school districts (Carleton, Casto, & Pittner, 2010, p. 112). Part of this, the Court found, was due to the fact that the Ohio school funding system is largely based upon local property taxes. To this day, the Ohio funding system is still unconstitutional and deemed to be in need of a complete and systematic overhaul. The Education Challenge Factor, which is of particular interest for this study, is a measure in use now that accounts for the local districts' funding based upon district poverty/wealth, and adult educational achievement level; it is intended to adjust funding based upon a particular district's need (Carleton, Casto, & Pittner, 2010, pp. 139-140). In the current funding model, it is unclear as to how districts are rated for this factor; some districts suggest it is politically driven, not need-based (Carleton, Casto, & Pittner, 2010, p. 140).

A study conducted by Joshua Hall (2007) uses an ordinary least squares (OLS) model to examine the influence of the percentage of district revenue from local sources and percentage of district zoned residential on the performance of students on standardized math tests. Of particular interest for this study is the percentage of district revenue from local sources because large districts, like the Cleveland School District, have had a history of money mismanagement issues,

which can affect student achievement. Hall finds that as a school district's funding comes more from local revenue rather than from the state, all other things being equal, students perform better on statewide mathematics exams (pp. 299-300). Hall implicitly makes the case for the efficiency-equity tradeoff in public school financing (pp. 298-299). School districts are supposed to provide education to all students within the district, promoting greater equity, but potentially create inefficiency by raising the millage so much that it decreases the value of local properties; thus, hurting the long-term interests of both the school district and the city. He stresses that school districts are often at the mercy of voter approval of levies to increase the taxing millage (pp. 297-298). When local taxpayers are personally tied to the school district through higher taxes, school productivity increases (Hall, 2007, p. 297). The tradeoff, however, is the higher burden on district residents to provide for the district financing in order to increase productivity; therefore, they are giving up efficiency for equity (Hall, 2007, p. 297).

A study conducted by David Card and Abigail Payne (2002) examines the influence of state Supreme Court rulings' effect on school funding. Their study finds that, historically, when an unfavorable decision is handed down by a state supreme court against a state education department for education funding, significantly more money is made available to lower-income school districts (pp. 63-64). This study also finds that every dollar in additional funding made available to these lower-income school districts leads to a 30-65 cent spending increase within the school district (Card & Payne, 2002, p. 80). Card and Payne's findings lead this study to ask whether the increase in spending results in better student performance.

Card and Payne (2002) also model school funding's influence on standardized test scores, using SAT scores to model general standardized testing. They do have tentative findings on a correlation between increases in school funding and a rise in SAT scores. Taking the SAT suggests a student intends to go to college; thus, an increased SAT participation rate can demonstrate a better quality school (Card and Payne, p. 77). Moreover, the mean SAT score shows a modest increase in

SAT score equality between one and two parent households (Card and Payne, pp. 78-79). It is also suggested that the increase in spending leads to some equalization of the disparity between the number of children coming from one- and two-parent households who take the SAT (Card & Payne, 2002, p. 78). Thus, an increase in district spending could decrease the difference in student achievement that occurs between students coming from one-parent and two-parent households.

Contributory Factors to Student Achievement

Chiu and Khoo (2005) examined a litany of factors, such as socioeconomic status, parents' human capital, family income, and qualification of teachers, which can contribute to the achievement of students. Of particular focus is the Privileged Student Bias. In their study, when there were less qualified and experienced teachers and there were fewer educational resources available, any potential benefits a student from a well-off family had were mitigated (Chiu & Khoo, 2005, p.592). This means that privileged parents will enroll their children in schools with more resources and more experienced teachers, which creates an even larger gap between the good and the poor-performing students and the rich and the poor students (Chiu & Khoo, 5005, p. 595-596). Their results suggest—albeit not prove—there are diminishing marginal returns to education investment with regard to education; the rich students benefit less from an increase in educational resource investment than the poor students gain (Chiu & Khoo, 2005, p. 595). Additionally, Chiu and Khoo (2005) find that when policies are implemented that increase funding distribution equality, student performance rises (p. 595).

Condron and Roscigno (2003) find that quality of teachers is driven predominately by per-pupil expenditures (p. 27). They find that as per-pupil expenditures increase, so does the percentage of teachers who hold master's degrees (Condron & Roscigno, 2003, p. 30). They suspect that, in addition to the traditional "more money means more employees" argument, teachers look for better student bodies, with lower disciplinary issues and higher-performing students, and schools with more instructional resources Condron & Roscigno, 2003, p. 30). Condron & Roscigno

(2003) find that even within districts there is a heavy emphasis on racial and class components for per-pupil funding (p. 28). They find that race is significant, but schools and districts with higher student poverty rates are allocated fewer local dollars (Condron & Roscigno, 2003, p. 29). When fewer revenues come from local taxes, there is less of a focus on improving learning environments, such as hiring and keeping high quality teachers, which fails to create a better overall learning environment and higher student achievement (Condron & Roscigno, 2003, p. 29). This finding is consistent with, and supports Hall's (2007) findings, discussed previously.

Linda Darling-Hammond's (2007) study examines the effects of federal education policy, particularly No Child Left Behind (NCLB), and the role that teachers play in education. Her study finds that the education policy failed in its objective to help close the gap between minority and white student achievement. In reality, it may have set the minority students back even further (Darling-Hammond, 2007, pp. 250-251). One unintended consequence of NCLB is that urban and rural schools are more likely to have less-qualified, less-motivate teachers and aides, when the policy envisioned more teachers, who are equally qualified and motivated as suburban teachers, in poorly performing districts (Darling-Hammond, 2007, p. 248). Because NCLB leaves the definition of "qualified teacher" up to states and local districts, state and local education boards have begun to lower teacher qualification standards to meet NCLB requirements, while trying to save the cost of hiring high quality teachers, who demand higher wages (Darling- Hammond, 2007, pp. 248). She also finds that not only have states lowered their standards but also failed to increase teaching incentives (Darling-Hammond, 2007, p. 252). She concludes that NCLB did not incentivize hiring highly qualified and highly motivated teachers in poorly performing districts, and is adversely and disproportionately affecting low-income, minority students, who are a majority of urban school districts (Darling-Hammond, 2007, p. 254).

Ruth Lupton (2006) examines the success and failure of school districts through the context in which they operate. In the context of poverty, she finds that districts would do much better if

they were highly differentiated, meaning rich and poor and all races mixed, and the most disadvantaged students were not channeled to the poorest performing and least popular schools (Lupton, 2006, p. 602). Part of the issue with labeling schools "poor performing" is the lack of a comprehensive assessment system (Lupton, 2006, p. 600). Current assessments are heavily weighted toward students' performance on standardized testing, which does not measure all the teaching a school does accurately, if at all (Lupton, 2006, pp. 597-598). A second context examines the way schools use their funding. Simply having more funding does not guarantee better achievement scores (Lupton, 2006, p. 599). Lupton (2006) argues that funding should be reconsidered to allow for smaller student-teacher ratios, more contact time with students, and higher quality learning tools (p. 602). Thus, this study will include measures like student-teacher ratio to examine potential positive effects, as Lupton suggests.

A study performed by Okpala, Okpala, and Smith (2001) found that the percentage of students in free or reduced-price lunch programs is a statistically significant factor in explaining the difference in student achievement, particularly in elementary students (p. 115). In particular, the authors found that the greater the number of students participating in free or reduced-price lunches, the lower student achievement was on standardized testing (p. 115). This study also tested whether parental volunteerism and instructional expenditures per pupil were statistically significant, and found them not to be in the low-income county schools they studied (Okpala, Okpala, & Smith, 2001, pp. 114-115). This result is suspect because instructional expenditures are expected to have positive effects on student achievement—this could be an error in measurement, or a limitation of the sample used (Okpala, Okpala, & Smith, 2001, p. 115). [This study will test this hypothesis.] The authors are correct in pointing out that given the location and socioeconomic status of the schools studied, the effectiveness of parental involvement may depend upon total family income, race and ethnicity, and overall family environment (Okpala, Okpala, & Smith, 2001, p. 115).

Douglas Roby (2004) finds that there is a moderate to strong positive correlation between student attendance and achievement (pp. 12-13). Of particular focus in this study, however, are the potential causes of this relationship between student achievement and attendance. Roby (2004) suggests that there is a relationship between parental attitudes and attendance, general home life and attendance, and socioeconomic status and attendance (p. 13). One factor that is particularly interesting is the finding that there is a correlation between smaller school buildings and higher attendance, and by extension higher student achievement (Roby 2004, p. 10). This could potentially be a spurious relationship indicating a better student-teacher ratio or more contact time with students, which would explain higher student achievement. However, his point is well taken that higher attendance rates mean more higher achieving students, confirming commonsense theory.

Regression Model

Student achievement is a difficult variable to measure, in particular, because what defines student achievement itself is debatable.

The model for predicting student achievement, estimated later in this study, has the following general functional form:

$$\text{ACHIEVEMENT} = f(\text{LOCALREV, SPENDINC, TEACHEREXP, PCTBLACK, PCTMINORITY, TEACHERATT, STUDENTATT, SES, STTEARATIO})$$

where:

ACHIEVEMENT = percentage of students in district who passed the Ohio Graduation Test;

LOCALREV (+) = percentage of district revenue coming from local taxes;

SPENDINC (+) = percentage increase in district spending over previous year;

TEACHEREXP (+) = teacher certification within the district, as determined by state testing standard;

PCTBLACK (-) = percentage of student body that is African-American;

PCTMINORITY (?) = percentage of student body that is not Caucasian or African-American;

TEACHERATT (+) = average teacher attendance rate for an academic year;

STUDENTATT (+) = average student attendance rate for an academic year;

SES (-) = average socioeconomic status of students within the district;

STTEARATIO (-) = student-to-teacher ratio.

It is expected that the effect of the percentage of district revenue that comes from local taxes will positively affect student achievement. This is to say that as local taxes fund more of the local school district more students will perform better on standardized testing because it demonstrates a community's commitment to the district through increased taxation and revenues (giving up efficiency for equity), which is consistent with Hall (2007) and Condron and Roscigno (2003).

The expected effect of the percentage increase in spending over the previous year is also expected to positively affect student achievement. As Card and Payne (2002) discussed, following a state supreme court ruling against a state board of education, typically more money is made available to lower-income school districts, finding that between 30 and 65 cents of every additional dollar given translates into increases in district education spending. Okpala, Okpala, and Smith (2001) found that the relationship between student achievement and district education spending was positive, and this study will assume a positive relationship as well.

Teacher experience and certification is expected to positively affect student achievement. Chiu and Khoo (2005) found that students from affluent families were more likely to be enrolled in schools and districts with more experienced teachers; thus, performing better in school. It is expected that when teachers are more experienced and teaching the subjects they certified to teach, ceteris paribus, student achievement would increase.

An increase in the percentage of the school district that is African-American is expected to be associated with lower student achievement. Condron and Roscigno (2003) found that educational expenditures, in turn student achievement, were negatively correlated with race. This is consistent with the hypothesis that student achievement and educational expenditures are

negatively related, but adds that educational expenditures and race, particularly the rise in minority students, are negatively related. This study breaks race into two variables because it is well known that the Cleveland Metropolitan School District is overwhelmingly African-American, and the hope is that using two variables—one variable showing percentage of African-American and one variable showing percentage of all other minority students—will provide more detail about the relationship between race and student achievement, particularly because the second largest minority group is Hispanic students.

Similarly, as the percentage of non-white students within a school district increases, it is expected that student achievement will decrease, suggesting a negative relationship.

Teacher attendance rate and student achievement are expected to have a positive relationship with performance. This means that when teachers spend more time in the classroom, student achievement should increase. In her study, Darling-Hammond (2007) discusses districts providing incentives to attract and keep more-qualified and motivated teachers. This study will use attendance as a proxy for teacher motivation, using the logic that more-motivated teachers are more likely to be at work more often than less-motivated teachers.

As the student attendance rate increases, it is expected that student achievement will increase. Both conventional wisdom and Roby (2004) suggest that the more time students spend in the classroom the likelihood of students performing well on standardized testing and learning material increases.

It is also expected that as the percent of students who come from a lower socioeconomic status increases, there will be a decrease in student performance. Okpala, Okpala, and Smith (2001) discuss how their study found that there is an inverse relationship between the number of free or reduced-price lunches given out and student achievement. This study will use socioeconomic status as a proxy for qualification for free or reduced-price lunch because the Ohio Department of Education does not publish free or reduced-price lunch data.

Finally, as Lupton (2006) suggests that student-teacher ratios are important for both funding and student achievement. Thus, as the student-teacher ratio decreases, meaning as there are fewer students per teacher and more contact time with the teacher, student achievement should increase.

All data used within this model comes from the Ohio Department of Education Data Warehouse, available at www.ode.state.oh.us.

Estimation Results

The review of literature informs this study to include nine explanatory variables in the linear regression. The functional form of the modeled regression in this study is

$$Y=\beta_1+\beta_2\text{LOCALREV}+\beta_3\text{SPENDINC}+\beta_4\text{TEACHEREXP}+\beta_5\text{PCTBLACK}$$
$$+\beta_6\text{PCTMINORITY}+\beta_7\text{TEACHERATT}+\beta_8\text{STUDENTATT}+\beta_9\text{SES}+\beta_{10}\text{STTEARATIO}+u$$

and the results of the regression are depicted in Table 2, shown below.

The results of the linear regression predicting student achievement on state standardized tests (Table 2 - Model 1) were found using the data analysis package in Microsoft Excel. The model has a high F value (12.7768) with a low p-value (9.2222×10^{-11}), indicating that the model is statistically significant at an α value of 0.01. The adjusted R^2 value shows that approximately 61.99% of the variation in student achievement, as measured by student testing, is accounted for by the explanatory variables.

The correlation matrix, as found as Table 3 in Appendix B, shows several instances of relatively high correlation coefficients, particularly with the student attendance (STUDENTATT) variable, which may contribute to possible multicollinearity. In particular, student attendance was highly negatively correlated with the percentage of district revenue that comes locally (LOCALREV) and the percentage of the district student population that is non-African-American minority (PCTMINORITY). The review of literature and economic theory do not provide a clear line of reasoning to explain why student attendance may be highly negatively correlated with these two

variables; this may be the result of the data not being pure, or potentially a spurious relationship. As a result, an additional linear regression was modeled without the student attendance variable, in an attempt to assess whether multicollinearity is present. The results of this additional regression are found in Table 2 below as Model 2.

TABLE 2
Determinants of Predicting Student Achievement

Explanatory Variables	Expected Sign	Model 1	Model 2
Constant	?	-0.9769	0.4132
LOCALREV	+	1.2137×10^{-7}**	1.2537×10^{-7}
SPENDINC	?	-3.89792×10^{-11}	1.1863×10^{-10}
TEACHEREXP	+	-0.06117	-0.2563
PCTBLACK	-	-0.3024**	-0.3405**
PCTMINORITY	-	-1.08182**	-0.6644*
TEACHERATT	+	0.4224	1.0869*
STUDENTATT	+	2.00696**	N/A
SES	+	-0.1860**	-0.1231*
STTEARATIO	?	-0.006812*	-0.008172*
Adjusted R^2		0.61986	0.54483
F-Value		9.2222×10^{-11}	4.7037×10^{-9}

Notes: The coefficients shown are for a linear regression. * denotes significant at $p < 0.05$.
** denotes significant at $p < 0.01$

The second regression without the student attendance variable has an F-value of 10.7256 and a p-value that is statistically significant at α values of 0.01; however, the adjusted R^2 value drops to 54.48% of the variation in student achievement accounted for by the explanatory variables. This suggests that student attendance is a relevant explanatory variable, which explains a portion of the variation in student achievement. Table 4 in the Appendix shows a correlation matrix for the eight explanatory variables considered. There is a high positive correlation between the percentage of district revenue that comes locally (LOCALREV) and the percentage of the district student population that is non-African-American minority (PCTMINORITY). Once again, the literature provides no direct evidence to explain why this may occur, suggesting a spurious relationship. Overall, this model is no better than the original model, losing one variable for less multicollinearity and a decreased adjusted R^2 value. With there being solid evidence from theory

and literature to keep student attendance in the regression model, the second model will be disregarded.

With the predictive success of the original model, which includes student attendance, there are six statistically significant explanatory variables. The coefficient for the percentage of district revenue that comes from local taxes is statistically significant at an α value of 0.01, and the sign on the coefficient is consistent with expectations. The coefficient value, 1.2137×10^{-7}, indicates for every one-percentage point increase in revenue that comes from local taxes, there is a 1.2137×10^{-7} increase in the percentage of students who pass the Ohio Graduation Test. While the coefficient is statistically significant, the affect on the percentage of students who pass the Ohio Graduation Test is negligible.

The coefficient for the percentage of district student body that is African American is also statistically significant at an α value of 0.01, and the sign on the coefficient is consistent with expectations. The coefficient value for the percentage of African Americans in a district student body, -0.3024, indicates that for every one-percentage point increase in the percentage of African American students, there is a 0.3024 percent decrease in the percentage of such students who pass the Ohio Graduation Test.

Additionally, the percentage of district student body that is non-African-American minority coefficient is statistically significant at an α value of 0.01. The review of literature provides no indication for an expected sign on this variable. This is, in part, due to the fact that the literature looks primarily at the African-American student population's achievement, not other minority groups. As a result, the coefficient, -1.08182, suggests that for every one-percentage point increase in the percent of district student body that is non-African-American minority, there is a 1.08182 percent decrease in the percentage of students who pass the Ohio Graduation Test. This is possibly due to the second largest minority is Hispanic students, which may help to explain the negative relationship.

The student attendance rate coefficient proves to be statistically significant at an α value of 0.01, and is consistent with the expectations for the sign of the coefficient. An interpretation of the coefficient suggests that for every one-percentage point increase in the student attendance rate, there is a 2.00696 percent increase in the percentage of students that pass the Ohio Graduation Test. This coefficient has the largest effect on student achievement, as measured by percentage of students who pass the Ohio Graduation Test, of all the explanatory variables considered in this study.

The socioeconomic status coefficient is statistically significant at an α value of 0.01, but its sign is not consistent with expectations. Even in the second model, which attempted to correct some multicollinearity, the sign for this variable was inconsistent with expectations. Despite this, the coefficient can be interpreted to mean that a one unit increase in socioeconomic status (a one-percentage point increase in "economically disadvantaged" students in a district) results in a -0.1860 percent decrease in the percent of students who pass the Ohio Graduation Test.

Finally, the coefficient on the student-to-teacher ratio variable is statistically significant at an α value of 0.01. There was no expectation for the sign of this variable because the literature provided no concrete evidence to support a higher or lower student-to-teacher ratio to be better for education quality. That being said, the coefficient can be interpreted to say that a one unit increase in the student to teacher ratio for a district will result in a 0.006812 percent decrease in the percent of students who pass the Ohio Graduation Test. This coefficient has a negligible effect on the percentage of students that pass the Ohio Graduation Test.

Of particular interest is the total increase in per-pupil expenditures over the previous year and its lack of statistical significance. The body of literature on studying educational expenditures is expansive, yet surprisingly divided on its importance in predicting student achievement. John Chubb and Terry Moe (1990) conclude that money is not a valuable predictor of student achievement; rather, they suggest that parental involvement is an important—perhaps the most

important—explanatory variable. Conversely, Chiu and Khoo (2005) argue that money is a valuable predictor, but there is evidence to support the concept of diminishing marginal returns to education. This study's results suggest that per-pupil expenditures are not a valuable predictor for student achievement. However, per-pupil expenditures is one measure for money within a school district, and per-pupil expenditures was found to be statistically insignificant for the six districts studied within the state of Ohio.

Additionally, the percentage of teachers teaching the subjects they are certified by the State of Ohio to teach did not test to be statistically significant. This is surprising because both the review of literature and common sense dictate that a teacher who is certified to teach a subject is most likely going to know the subject better than other teachers. However, this study's results show that not only is the variable statistically insignificant, but, also, the sign on the coefficient is opposite of what would be expected. This would suggest that an increase in the percentage of teachers teaching the subjects they are certified by the state to teach results in a decrease in student achievement. It is possible that the unexpected sign is the result of the relatively high correlation coefficients discussed previously.

The lack of statistical significance of the teacher attendance variable is surprising. If it is statistically significant that students be in the classroom to learn, logical would follow that teachers should have to be in the classroom to teach. While there are potential statistical reasons, like the high correlation coefficients or variable measurement issues, to suggest why this is possible, there are also possible qualitative reasons. For example, perhaps in some of the districts technology has started to have an effect on how much teachers teach. There may be an increase in the reliance on online teaching tools, reading, and activities that require the teacher to be in front of the class less. Future studies can examine this variable's effect on student achievement in more depth by looking at the changes in teaching methods and how potential changes have affected student learning and achievement.

Policy Discussion

Based upon the results of this study, several policy recommendations can be made. The first policy recommendation comes from the local revenue variable. The results show that as the percentage of district revenue that comes from local taxes rises, student achievement improves. Thus, districts need to focus on developing annual budgets based primarily on the revenues that come in from local property taxes. A district has more autonomy to develop a dynamic curriculum that meets and exceeds state education requirements when more of its revenue comes from local property taxes. While it would require more data analysis, perhaps setting a minimum percentage of total revenues that must come from local revenues would be a prudent to help those districts where student achievement on the Ohio Graduation Test is low.

Currently, it takes five or more absences from school per month (approximately one-forth of the school days in one month) without an excuse to be labeled as truant. If a student is identified as being truant, written notification is sent home to the parents, and parents must see to it that students are in school immediately. If the problem is not rectified, the parents must go a parental education program. However, this entire process can take place over the course of several months, during which time the student is learning little or none of the information being taught in the classroom. Because this study finds that student attendance has such a large effect on student achievement, a second policy recommendation is to limit the definition of truancy to, perhaps, three days or more absent from school without a excuse, and then strictly enforce the policy.

Finally, the two variables that examine race, the percentage of student population that is African-American and the percentage of student population that is minority excluding African-Americans, both have negative coefficients, suggesting a negative relationship with student achievement. A policy recommendation is difficult to make from these results due to the complex nature of standardized testing, like the Ohio Graduation Test. Historically, standardized testing has been accused of being written from a Caucasian perspective, which makes non-Caucasian students

perform worse on them. So one policy recommendation would be to rewrite the standardized test from a more race-neutral perspective.

A second potential policy recommendation is to better integrate school districts; perhaps even reconsidering school district borders to obtain a more racially diverse student body. Most large, metropolitan school districts are, and have been, largely composed of minorities. By redrawing school district borders to obtain a more racially diverse student population, all students may perform better on the Ohio Graduation Test when a diverse student body is present.

Finally, one thing to bear in mind when considering policy recommendations and what motivation there is to fix the current education system is the cost to society when students are not educated, or educated improperly. Belfield and Levin (2007) focus on the costs to society and find that high school dropouts earn $12,000 on average—about one-half the amount of money earned by high school graduates, and about one-third the amount of money of those who were at least high school graduates (Belfield & Levin, 2007, p. 25). This translates into approximately $50 billion lost in federal and state income tax payments per year, and is $80 billion lost when including Social Security payments per year (Belfield & Levin, 2007, pp. 175-176). They further predict that a high school graduate gains approximately 1.7 years in healthy life, which is values at approximately $183,000 or $39,000 in government health care cost savings per year (Belfield & Levin, 2007, p. 177). Further, they find that a one-percent rise in graduation rate of males age 20-60 saves roughly $1.4 billion per year in costs to victims and society—approximately $1,170-2,100 per high school graduate (Belfield & Levin, 2007, p. 155-156).

The costs to educate students may be high, but the costs to society by not educating students properly, or at all, are even higher. Even beyond the obvious financial costs, there are qualitative costs, like the social and cultural cost of having an uneducated or poorly educated population. Belfield and Levin (2007) attempt to quantify the costs of an uneducated and poorly

educated population, but even they admit that despite their best efforts, they have underestimated the true total costs to society (p. 206).

Limitations and Future Research

The first, and perhaps most obvious, limitation is that this study only considers the six largest districts within the state of Ohio. A small district, like the Cleveland Heights-University Heights School District, undoubtedly has a different, much smaller cost structure than the Cleveland Metropolitan School District. Scaling these results down would not be an accurate representation of the true nature of much smaller districts within the state of Ohio. This study's results can act as a guide for future research into the determinants of student achievement in much smaller school districts. There most likely are greater effects of parental volunteerism in the classroom in a smaller district due to the lack of funding for teaching aides and such—something that should be considered in future research.

A second limitation to this study is that required standardized testing is used as a proxy variable to measure student achievement. This study acknowledges that it is possible for teachers within the district to teach exclusively to the test, which could, in turn, fail to reflect the true nature of student achievement. While this limitation was known from the outset, no other variable is known to capture the wide number of students within a district like the Ohio Graduation Test, not even the SAT or ACT. Perhaps future studies can identify a composite variable that better models student achievement.

Conclusion

This study seeks to find determinants of student achievement within the six largest districts in the state of Ohio: Cleveland, Columbus, Cincinnati, Dayton, Akron, and Toledo. Using the percentage of students that score a proficient score on the Ohio Graduation Test to measure the dependent variable, nine explanatory variables are considered, including the percentage of district revenue that comes from local sources, the increase in per-pupil expenditures over the previous

year, the percentage of teachers teaching the subjects they are certified to teach by the state, the percentage of the student body that is African American, the percentage of the student body that is minority, excluding African-American, the teacher attendance rate, the student attendance rate, socioeconomic status, and the student-to-teacher ratio.

The model this study develops has an adjusted R^2 of 0.61986, and is statistically significant. The percentage of revenue that comes locally, percent of student body that is African-American, percent of student body that is non-African-American minority, the student attendance rate, socioeconomic status, and the student-to-teacher ratio all test to be statistically significant explanatory variables. There are relatively high correlation coefficients with the student attendance variable. But when a second regression was run without the student attendance variable, the adjusted R^2 dropped significantly, which suggests that it is a relevant explanatory variable.

There are several policies recommended based upon the results of this study. The first policy recommendation is to derive more of the revenue from local property taxes. This can be achieved through developing a budget that is based largely on local revenues, and not planning a budget that requires state and federal funding. Second, redefining truancy to allow for fewer unexcused absences and enforcing truancy more strictly will force the students to be in the classroom as much as possible to learn the most possible. Finally, two policy potential recommendations are made with regard to race: 1) revamp the state standardized testing to write from a racially-neutral position, 2) redraw school district borders so that there is more racial diversity in the study body.

The damage and cost to society for having a poorly educated or uneducated population is detrimental. The costs in terms of federal and state tax revenue lost, imprisonment costs, and cots to the government for health care expenditures are enormous. The costs to society in terms of increased likelihood of crime and recidivism, poverty, poor health, unemployment, and drug use are just as high as monetary costs to the government and the economy. Rarely do many social and

monetary costs get resolved, or at least start to be resolved, by making changes to one area; yet, it many ways, fixing education is that silver bullet in the heart of many social costs.

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Appendix A

Table 1: Comparison of Graduation Rates

Academic Year	Cleveland	Columbus	Cincinnati	Akron	Toledo	Dayton
2000-2001	36.10%	54.80%	57.60%	76.00%	67.30%	51.10%
2001-2002	38.10%	55.50%	60.20%	73.50%	65.00%	62.20%
2002-2003	40.80%	59.90%	61.00%	74.80%	70.40%	53.80%
2003-2004	50.20%	60.60%	72.10%	79.70%	76.60%	69.70%
2004-2005	51.80%	68.60%	77.00%	80.30%	80.20%	73.30%
2005-2006	53.70%	72.90%	77.20%	77.40%	90.40%	79.50%
2006-2007	54.30%	70.60%	80.00%	75.80%	87.60%	82.80%
2007-2008	55.00%	73.90%	82.90%	78.30%	86.60%	83.10%
2008-2009	61.90%	72.70%	80.40%	76.00%	83.70%	79.80%
2009-2010	62.80%	77.60%	81.90%	76.40%	80.50%	84.40%
2010-2011*	56.00%	75.80%	63.90%	75.30%	62.40%	65.50%
Average Graduation Rate	**50.97%**	**67.54%**	**72.20%**	**76.68%**	**77.34%**	**71.38%**

*A new graduation rate formula was introduced, changing some districts rates significantly, including Cleveland, Cincinnati, Toledo, and Dayton.

Appendix B

TABLE 3
Explanatory Variable Correlation Matrix

	TEACHERATT	*STUDENTATT*	*LOCALREV*	*SPENDING*	*STTEARATIO*	*PCTBLACK*	*PCTMINORITY*	*SES*	*Teacher Certification*
TEACHERATT	1								
STUDENTATT	0.30645167	1							
LOCALREV	-0.221334266	-0.968261685	1						
SPENDING	-0.101498553	0.026859349	-0.005892562	1					
STTEARATIO	-0.08027341	0.559358762	-0.561116516	0.077892388	1				
PCTBLACK	-0.198018674	0.454373498	-0.533870184	-0.052190321	0.275192531	1			
PCTMINORITY	-0.356543689	-0.728945114	0.802595985	0.009013883	-0.20226846	-0.542970498	1		
SES	0.202763069	-0.022080128	0.16480868	0.008877578	0.130283682	-0.129269725	0.294386191	1	
TEACHEREXP	0.027475143	-0.129240501	0.105357928	0.173187753	0.079415556	-0.317248732	0.1975586	-0.073689934	1